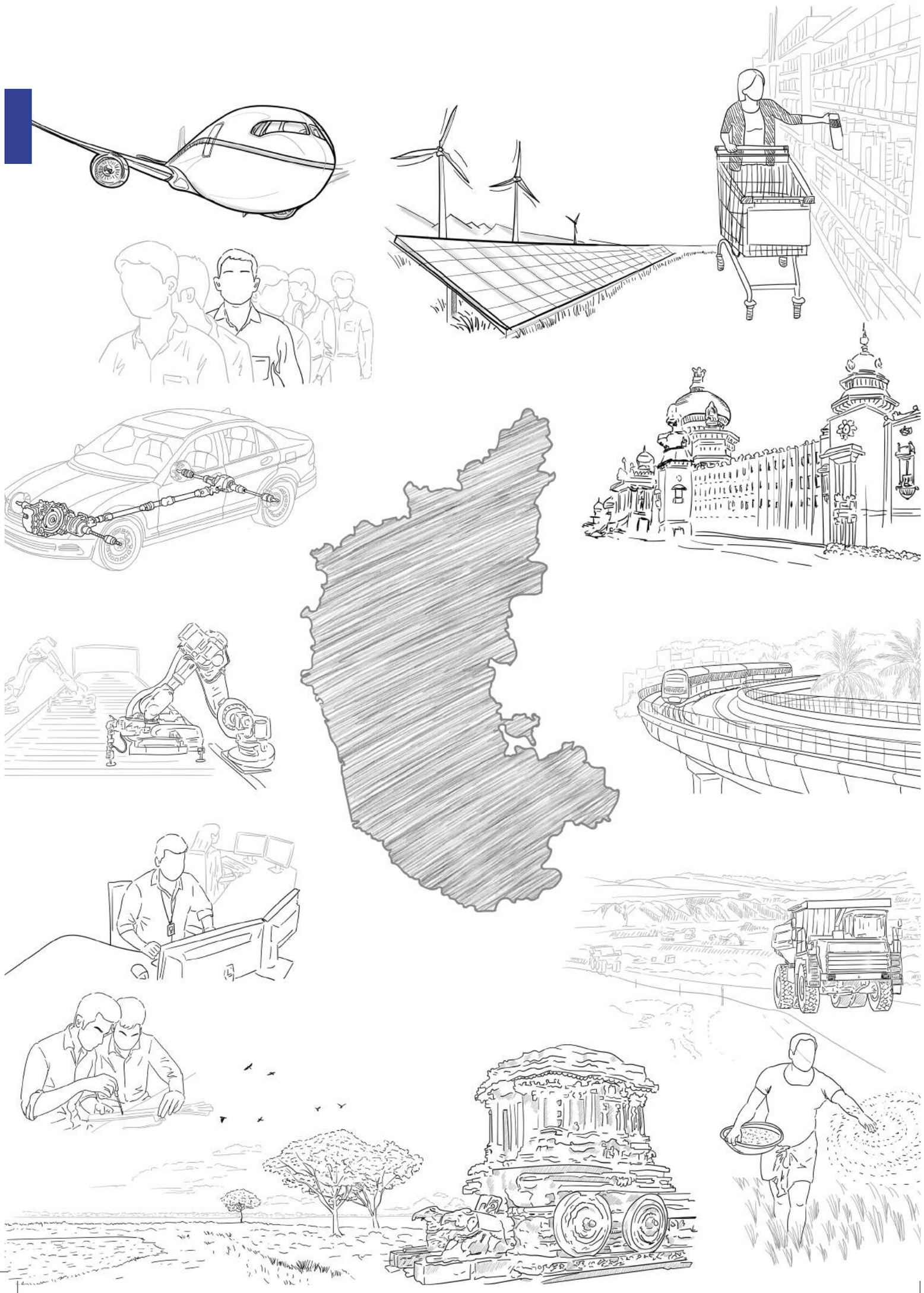

FICCI
GOVERNMENT OF KARNATAKA
$1 Trillion
ECONOMY
KARNATAKA'S VISION



Karnataka's decade – Roadmap to $1 Trillion

A road map for Karnataka

August 2023



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Preface

Dr. Shalini Rajneesh

Additional Chief Secretary, Planning, Programme Monitoring & Statistics Department, Government of Karnataka

Mr. K Ullas Kamath

Chairman, FICCI Karnataka State Council

Karnataka is among the top five states in India and has demonstrated strong growth over the past few years. The State has achieved national prominence for its progressive policies and strong implementation strategies across sectors. Today, the State has set the target to achieve 1Trillion Dollar GDP by 2032.

The Department of Planning, Programme Monitoring and Statistics Department, Government of Karnataka, and FICCI have taken the initiative to prepare this action-oriented report to provide a roadmap for the State and attain the desired level of growth rates.

A total of 14 priority sectors were identified and an expert committee for each of the sectors were constituted to discuss, debate, and address specific challenges and opportunities and strategize on how much each of the sectors can contribute towards achieving the vision of 'One trillion-dollar economy'. Each committee was chaired by the respective department secretary from the Government of Karnataka and was co-chaired by an industry expert. This ensured fair representation from the Government, industry and academia and enabled the team to develop comprehensive action-plans.

This report is only the first step towards achieving the state's goal. With efficient leadership and governance, active involvement of the private sector and with the support of the citizens of the state, Karnataka is well positioned to translate these action plans into reality. We are hopeful that all the stakeholders would join hands to accelerate the growth and development of the state to become a '1Trillion Dollar Economy' in the coming decade.

Message

TV Mohandas Pai

Chairman, 3one4 Capital

Karnataka is one of India's leading states and hosts a sophisticated economy. GSDP is projected to reach INR 25.7 lakh crore per Budget 2023-24, which translates to INR 3.83 lakh per-capita income for a population of 6.7 crore - the highest among the country's larger states. Services sectors with higher value-add and capacity for growth in the knowledge economy-led growth paradigm of the 21st century drive 66% of the state economy.

Bengaluru is Karnataka's crown jewel, with a per-capita income excess of $11,000. It drives more than 50% of the state economy and has emerged as India's indisputable Innovation and Hi-Tech Capital. The city has achieved global prominence for its innovation economy and startup ecosystem. Globally, it hosts the highest concentration of technical talent compared to its population, leading even to the Silicon Valley Bay Area.

Karnataka, indeed, has the potential to become a $1 Trillion economy in the coming decade. The state hosts numerous powerful drivers to do so – Bengaluru, technology sectors like IT/BT and hi-tech manufacturing, formal employment, education infrastructure, urbanization initiatives, agricultural base, manufacturing, etc. However, business-as-usual will not get the state there. We made a detailed analysis of the state's economic drivers, demographics, finances, education and other drivers in the 3one4 Capital report we launched in September 2022 – Karnataka: A $1 Trillion GDP Vision.

We are happy to see the State Government galvanize multiple resources into deeply understanding the state's immense capacity to grow to $1 Trillion this decade and condensing these learnings into concrete policy and investment decisions. They have brought together a stellar group of experts and knowledge partners under FICCI-Karnataka's stewardship to produce this roadmap on Karnataka's Vision of a $1 Trillion Economy.

This report and the effort behind mobilizing the detailed roadmap is first-of-its-kind in India. It promises to be a guiding document for this decade's growth, not only for Karnataka but for every state economy with ambitions to accelerate its socio-economic growth and become beacons of development globally.



Acknowledgement

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Note: All roles as on August 2023

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Consolidating bengaluru's position as a global hi-tech center

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Note: All roles as on August 2023

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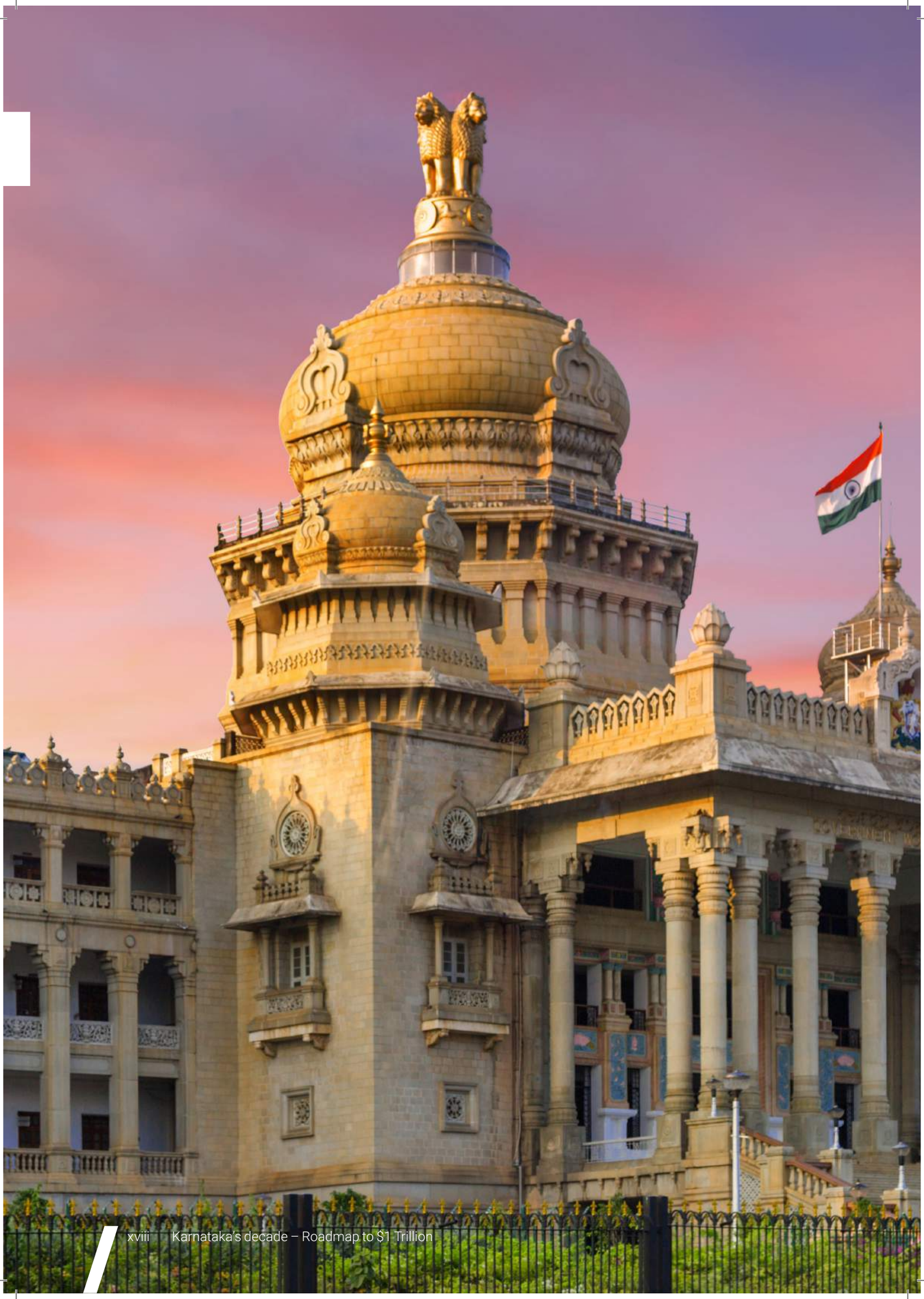
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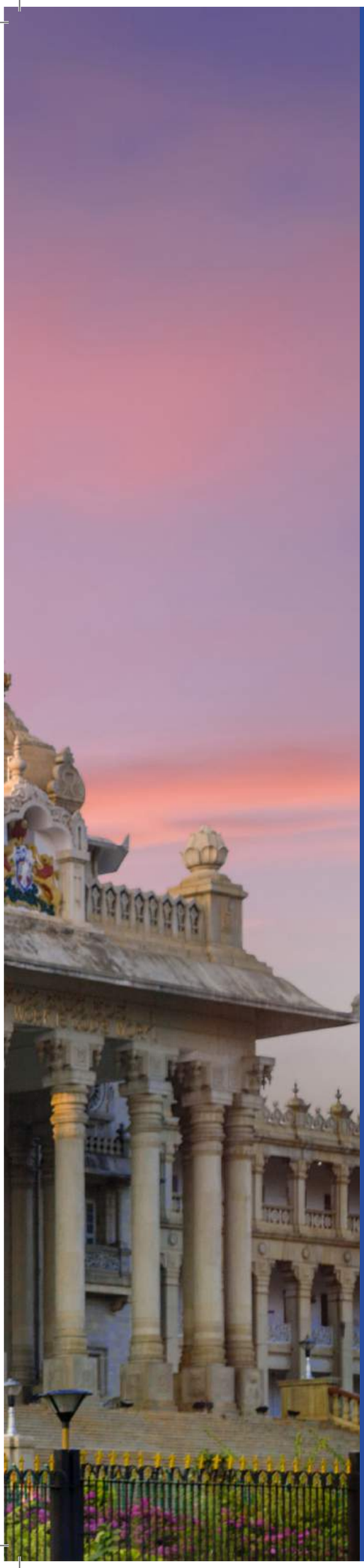
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Executive Summary

As the world steadies itself after the COVID-19 pandemic, and India looks towards a sustainable economy for its 1.4 billion inhabitants, Karnataka has the potential to increase its performance to become a $1 trillion economy by 2032. This will likely require increasing the state's economic growth rate from 13 percent to 17 percent per year and may involve targeted interventions to drive cross-sectoral growth initiatives across high- and low-performing sectors.

As one of India's top five states, Karnataka has demonstrated strong growth over the years. In the 2022–23 period, it had a per-capita gross state domestic product (GSDP) of INR 3.16 lakh and GSDP of INR 22,81,127 crore.[i] The services sector grew the most during this period, at 15.5 percent, followed by manufacturing at 10.8 percent, and agriculture at 11.8 percent. The services sector was also the largest contributor to Karnataka's GSDP, making up more than two-thirds of the economy.[i] This skewed sectoral landscape provides the state with an opportunity to invigorate agriculture and manufacturing to become economic powerhouses. Similarly, interventions in the services sector, particularly in education, healthcare, tourism, and technology, could help Karnataka attain its 2032 vision.

Overall, the interventions that these outcomes call for could involve a cumulative investment of INR 152.87 lakh crore over the next ten years, of which INR 22.93 lakh crore is expected from the Karnataka government and INR 107.01 lakh crore is expected from the private sector. On the growth path we envision, the Karnataka economy could be worth $500 billion by 2026–27 and $1 trillion by 2032.

In addition to the interventions, the state may have to overcome challenges in various sectors. These include poor urban mobility, duplication of functions by state departments and parastatals, low enrolment in education, inadequate transport services and infrastructure in rural areas, and the concentration of public services and employment opportunities around Bengaluru.

With a careful and detailed plan, Karnataka can tackle these challenges on a sector-by-sector basis. These interventions could add INR 23.4 lakh crore to the economy in 2031–32, taking the state to its $1 trillion goal. Beyond these cross-sectoral initiatives, each of the 14 sectors have been proposed for specific aspirations for growth.

Eleven aspirations across 14 priority sectors have been proposed for growth.

This executive summary delivers a truncated but comprehensive overview of Karnataka's $1 trillion vision by focusing the discussion on three umbrella sectors: agriculture, manufacturing, and services. For these sectors, key actions and priority sectors for facilitating growth are considered on the one hand. Additionally, insights about cross-sectoral areas of focus, including human development, urban development, and rural development are suggested.

01 Agriculture

Micro Irrigation coverage of Irrigated area, Percent





02 Manufacturing

Employment as a % of total employment





03 Tourism

Domestic Tourist/Footfall, Million





04 IT: Startups & Innovation

# of Startups

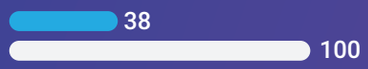




05 Urban Development[1]

Master Plan coverage of ULBs, Percent

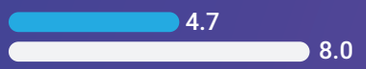




06 Healthcare

Healthcare spend as a % of GDP, Percent

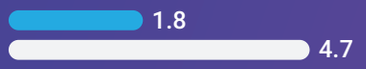




07 IT: ITeS

# of Jobs, Million

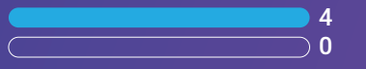




08 Natural Resource Management

Cultivable wasteland available to be repurposed, Lakh Ha





LEGEND

2022 2032

1. Karnatka economic survey and GDP performance and forecast
2. Based on Census 2011 (Latest)
3. Kerala, Best in Class in India at 7.1% (in 2011-12)

09 IT: ESDM[4]

Sector Revenue, USD billion



10 Mining

Exports, USD billion



11 Rural Development

% below poverty line



12 HumanDevelopment

HDI score



13 Education

GER in higher education, Percent



14 Bangalore

Maximum Distance for Metro, Kilometers



4. Karnatka economic survey and GDP performance and forecast

14 priority sectors

Considered

$1 Trillion aspiration

Agriculture

In the 2021–22 period, agriculture contributed 13.97 percent to GSDP, and grew by 13.3 percent.[i] With the right interventions, agriculture could become an even more important driver of economic growth in Karnataka. Such interventions could consist of a range of modernisation initiatives and coordinated support interventions from the government and private sector. For instance, modernising agriculture processes, matching crops and livestock to different agro-climatic zones, and promoting the use of modern irrigation methods could help lift GSDP growth to 16.3 percent per year by 2031–32. The state could also promote model village concepts in each agro-climatic zone, where practical demonstrations of how to use modern practices to produce high yields encourage farmers to adopt these processes. Rolling out alternative crop cultivation in the 47 talukas that exploit groundwater could also rejuvenate the sector.

The Karnataka government could support farmers with targeted interventions. These include launching an accelerator programme for farmer product organisations (FPOs), where two to three model FPOs are created in each district, earning top-line revenue of INR 10 crore in the next two years, and serving 30 percent of their members. Leveraging agritech start-up solutions to get real-time market intelligence, direct-to-consumer (D2C) inputs, and market linkages would also help to scale operations. In a bid to promote sustainability and efficiency, farmers could be trained in a variety of soil protection practices, including but not limited to residue mulching, no-till farming, growing cover crops or forage, managed grazing, the use of composts and bio-fertilisers, recycling of all bio-wastes on land, and more.

Digital solutions, including offering agronomy services via mobile devices to give farmers last-mile information, could be leveraged to develop an agriculture-focused app to provide information about government schemes and market demand. It can also be an opportunity to showcase pockets of excellence, such as high-yield achievement due to strategic interventions.

Supporting farmers with infrastructure development could also help to boost the sector. State-of-the-art post-harvest management centres could be established to improve post-harvest processing from its current levels of 1–2 percent and reduce spoilage from its current level of 25–30 percent.[i] The Karnataka government could also set up forward linkages – for markets and brands, prototype branded outlets, cold storage, and cold chains – to promote market-driven development. Other useful initiatives could include the institutionalisation of a cooperative-type structure to improve reach and maximise impact, creation of fishing-based eco-tourism hubs around reservoirs, and the development of large departmental water tanks with facilities to catch and carry fish.

Farming can be a tough business, vulnerable to the elements and the vagaries of markets. The state government could play an important role in easing capital availability for the sector, which would help reduce some of the intrinsic financial uncertainty. The government could amend the Co-operative Act to permit the Pari passu charge to enhance agriculture's ratio of credit to GDP. In partnership with financial institutions, the government could also make funds more easily available by provisioning a dedicated corpus and lower interest rates for FPOs and small farmers, with a special focus on rural areas. (Exhibit A)

Banks could also be incentivised to invest in rural agriculture by providing credit guarantees and land allocations at lower rates, expanding the use of Kisan credit cards (KCCs) for farmers, and adopting digital lending. The Karnataka government could launch schemes that target FPOs, promote the introduction of farmer collectives to engage with FPOs, and buttress co-lending structures, with significant

Exhibit A

Agriculture – GDP Forecast: Vision[1]

Macroeconomic indicators	From (2021–22)	To (2031–32)
Nominal sectoral GSDP (INR lakh crore)	2.9–3	**13–14**
GSDP growth (%)	13.3	**16–16.5**
Agri products exports (%)	4.6	**9**
Micro irrigation coverage of irrigated area (%)	12.4	**50**

1. GDP Performance and forecast

potential to align the strengths of banks and non-banking financial corporations in facilitating the flow of credit to FPOs.

Manufacturing

Manufacturing is a key element in Karnataka's vision to become a $1 trillion economy by 2032. With its huge potential for growth and untapped markets, it provides a potent opportunity for enhanced economic performance that Karnataka could consider. A growth rate of 16.83 percent – roughly on par with the 17 percent GSDP growth[ii] rate targeted by the state overall – to maintain its contribution to GSDP of, roughly, 20.2 percent is desirable. This could be achieved by, among others, optimising land use, modernising supply chains, clustering export businesses, focusing on MSME development, and facilitating ease of doing business.

Together with the private sector, the Karnataka government could support manufacturers with various land and infrastructure interventions. They could establish plug-and-play industrial parks and clusters on the 15,000 acres of industrial land in the Beyond Bengaluru region. They could also promote MSME clusters and establish export-oriented food parks in geographically relevant areas. Since land is at the centre of these interventions, Karnataka could act as a facilitator for land-use conversion to develop the clusters and industrial hubs.

Modernising supply chains by connecting developed and proposed clusters to ports, rail, and air would also give the sector a significant boost. Digitising end to end value chains would improve reliability and resilience, while creating end to end value chains and establishing infrastructure for the food-processing industry would help manufacturers expand their operations. Further, setting up clusters for export-oriented food parks (for example, chili in Byadgi and coffee in Chikkamagaluru, Hassan, and Kodagu) would streamline processes and the supply chain. (Exhibit B)

By partnering with technology companies to leverage Industry 4.0 technologies, the state of Karnataka could drive automation and develop AI-powered subscription products or services, such as scientific warehousing that builds on data compiled via the Internet of Things (IoT) and remote sensors, to systematise and improve performance and efficiency. The state could also partner with domestic technology firms to incorporate IoT-based assembly-line and distribution productivity enhancements, such as digital twins, analytics-based process automation, chatbots, robot process-automation-based maintenance, and 3D printing, to enhance operational efficiency across key metrics, including yield, quality, and cycle time. In maintaining the spirit of partnership, the Karnataka government could also work with private firms to develop solutions to enable small businesses to integrate with the Open Network for Digital Commerce and the Government e-Marketplace, personalise customer experiences, and optimise operations including inventory planning and supply chain management.

Exhibit B

Manufacturing: Vision

Macroeconomic indicators	From (2021–22)	To (2031–32)
Nominal sectoral GSDP (INR lakh crore)	2.8	**14–15** ($ 5.5–6.5 in 2026)
GSDP growth (%)	10.6% (Pre-COVID 2011–12 to 2019–20)	**17–18**
Employment as a % of total employment[1]	11.74	**23**
Exports ($ bn)	25	**95–100** (15% CAGR till 2031–32)
# of Large firms[2]	14	**40–50**
MSME investments[3] (INR lakh crore)	4	**10–11** (5 by 2025)

1. SDG Ranking, 2031 Aspiration: 10% more than current performance of Gujrat (best performing state in India)
2. Firms with revenue >~$500 m in a year HQ in Karnataka in manufacturing sector, Source Capital IQ
3. Micro, Small, and Medium Enterprises in Karnataka, Karnataka Economic Survey 2021–22

Source: GDP Performance and forecast value

MSMEs are often the backbone of an economy, and government support can help to scale them, thereby creating more jobs and boosting growth. A dedicated MSME fund to improve productivity via development programmes could give these enterprises the boost they need. Supplier grants for breakthrough innovation, sharing of technology licences and know-how, mentorship opportunities, capital availability, and partnerships to manufacture value-added offerings linked to the core product could help businesses flourish.

An important intervention could be facilitating ease of doing business. This intervention could involve speeding up approvals, rolling out infrastructure such as roads and water, improving access to transportation, and accelerating the implementation of new land policies and state-level compliance requirements. The state government could also promote new age sectors such as 3D printing, drones, composites, avionics, auto-guided vehicles, IoT, robotics, and expand production-linked incentive schemes to promote manufacturing and exports.

Services

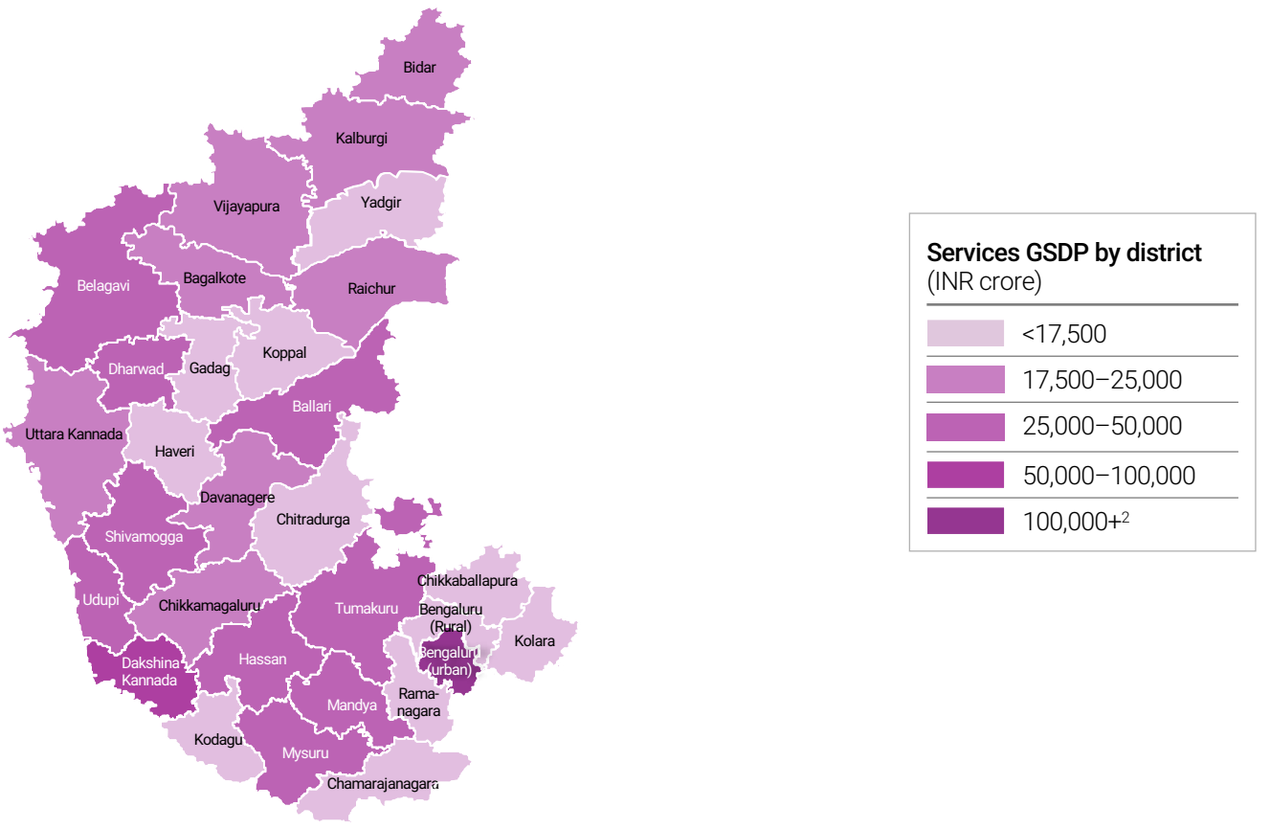
Services is a diverse category that requires differentiated but coordinated initiatives to encourage growth, inclusivity, and sustainability. Typically, in the Indian context, Services is a broad category for all sectors that don't fall under industry or agriculture, and it includes sectors of consequence for development in economic growth and human welfare.

Honing in on four of these sectors – tourism, technology, healthcare, and education – could enable the Karnataka government to identify and target opportunities. The services sector has historically grown at a rate of 14.97 percent.[ii] Within our vision, we forecast it to grow at 16.94 percent – roughly the same as the CAGR we forecast for other sectors and Karnataka at large towards 2032. (Exhibit C)

Exhibit C

District as a fulcrum of development – Services potential growth areas[1]

Services GSDP by district (INR crore)



1. Inputs from Committee and Industry experts
2. Bengaluru Urban has a significantly larger share of the state's services GSDP, at INR 576,929 crores, followed by Dakshin Kannada at INR 54,252 crores

Exhibit D

District as a fulcrum of development – Agriculture potential growth areas

Sl. No	District	Services		
		Focus area 1	**Focus area 2**	**Focus area 3**
1	Bangalore Urban	Tourism	Healthcare	
2	Dakshina Kannada	Technology cluster	Education cluster	Heritage Tourism
3	Belagavi	Technology cluster	Healthcare	
4	Tumakuru	Technology cluster	Healthcare	
5	Mysuru	Eco Tourism	Technology cluster	Healthcare
6	Ballari	Heritage Tourism		
7	Shivamogga	Eco Tourism	Technology cluster	
8	Udupi	Spiritual Tourism	Technology cluster	
9	Mandya	Technology cluster		
10	Bagalkote	Education cluster		
11	Dharwad	Technology cluster	Education cluster	
12	Chikkamagaluru	Tourism Hub		
13	Hassan	Tourism Hub		
14	Kalaburagi	Technology cluster		
15	Vijayapura	Spiritual Hub		
16	Davanagere	Spice Trade		
17	Uttara Kannada	Heritage and Beach Tourism		
18	Raichur	Tourism		
19	Kolar	Geo Tourism		
20	Chitradurga	Heritage Tourism		
21	Ramanagara	Technology cluster		
22	Bangalore Rural	Technology cluster		
23	Bidar	Heritage Tourism		
24	Haveri	Education cluster	Spiritual Hub	
25	Chikkaballapur	Tourism		
26	Koppal	Spiritual Hub	Technology cluster	
27	Chamarajanagar	Eco Tourism		
28	Gadag	Heritage Tourism		
29	Yadagiri	Heritage Tourism		
30	Kodagu	Eco Tourism and Nature Hotspot		

Tourism

With its natural beauty and rich cultural heritage, Karnataka could capitalise on its tourism sector to become the most preferred destination in India. The 2032 vision for the state includes growing the number of local tourists to 20 crores, from eight crores in 2021–22, and the number of foreign tourists to 300,000, from 72,000 in 2021–22. Realising this vision could create 61 lakh indirect and direct jobs, from 50 lakh in 2021–22.[iii]

Targeted interventions by the Karnataka government could spur growth in the tourism sector. These could include creating tourism circuits, with themes such as coastal, wildlife, heritage, adventure, wellness, religion and spirituality, ecotourism, and rural tourism. Experiences would include home stays, local culture, cuisine, and folk art, and religious circuits to be undertaken in Belur, Halebid, and Shravanabelagola. Creating mini-breaks of no longer than three days around local tourist attractions for each district would boost local economies and attract domestic tourism. The state government could also harness rail tourism by introducing rail circuits, prioritising hotspots around western ghats and Karnataka's coast.

Tourism cannot thrive without the necessary infrastructure. In acknowledgment, the state government could develop Karnataka's coastline of roughly 320 kilometres by setting up resorts and water-sport facilities to promote the region as a preferred destination for seaside vacations. It could also overhaul services and facilities at heritage sites to provide the highest quality customer experience at every price level. Getting tourists to the sites is vital, so developing end to end connectivity with railways, highways, airports, buses, and intracity transportation could be considered. Wayside amenities to elevate tourist experience, such as restaurants, fuel stations, station lounges, and bus terminals along major tourist circuits, could also be developed using franchisee, greenfield, and brownfield project models. (Exhibit E)

Enticing tourists to Karnataka requires a broad-ranging marketing campaign across all media touchpoints. Karnataka could be positioned as a state offering a range of experiences, including heritage, wildlife, nature, spirituality, wellness, arts and culture, adventure, highlands, coastal, and modern urban experiences. Each year, a subset of Karnataka's focus tourism destinations could be selected for priority promotions, with all of the state's prominent and upcoming

Exhibit E

Tourism: Vision[1]

Macroeconomic indicators

	From (2022–23)	To (2031–32)
Domestic tourist footfall (crores)	8.1 (12.9% of national)	**19–20**[2]
# of Foreign tourists ('000)	72.5 (6.9% of national)	**290–300**[3]
# of Focus tourist destinations	123	**200**
GSDP per visitor (INR '000)	14–15	**28–30**
Employment generated (direct + indirect) (lakhs)	49–50	**60–61** (2% growth)

Aspirations

1. Position Karnataka as the **preferred tourism destination in India**
2. Be rated among **top 50 destinations in the world**
3. Promote **sustainable and inclusive socio-economic development**
4. **Top destination for Eco Tourism and Heritage Tourism** in India

Tourism industry is an economic contributor with significant cross sectoral impact across Hospitality, Transport, Arts and Culture potentially creating more formal sector jobs and increasing the purchasing power of a section of the society

1. GDP Performance and forecast value
2. ~3x of the population
3. 15% CAGR, aspired growth rate of the sector

destinations showcased by 2026. The Karnataka government could identify and collaborate with digital channels, thought leaders in travel and tourism, and journalists to promote locations of significance in various media, particularly targeting those aged 20 to 35 with high spending power. The state could also conduct regular familiarisation tours to create strong business-to-business linkages.

Technology

India's technology industry is thriving, recording 15.5 percent growth in financial year (FY) 2022 and raking in $227 billion in revenue.[1] Start-ups are springing up and companies are increasingly adopting technology. The sector is therefore ripe for Karnataka to implement interventions and capitalise on this growth. The digital economy has the potential to contribute more than $300 billion to GSDP in 2031–32, from $61 billion in FY 2022.

The interventions in technology could target growth acceleration and the geographical positioning of Karnataka as the destination of choice for leading IT and IT-enabled services (ITeS). The state's support in this regard could take the form of infrastructure provision Beyond Bengaluru, including setting up electronic manufacturing clusters and ancillary units at Mysuru and Hubbali with an investment potential of more than INR 3,000 and the potential to create more than 30,000 jobs. It could also establish Beyond Bengaluru technology clusters in Kalaburagi, Belagavi, Dharwad, Mangaluru, Shivamogga, Mysuru, and Tumakuru. These cities are becoming attractive destinations for domestic and global investment in several industry verticals, including IT and ITeS; business processing outsourcing (BPO); electronics system design and manufacturing (ESDM); animation, visual effects, gaming and comic (AVGC); artificial intelligence; edtech; agritech; fintech; and telecom.

A world-class infrastructure in the form of 5,000-seater technology clusters in emerging hubs in Mysuru, Mandya, Chamrajnagar, Mangaluru, Udipi, Manipal, Hubli, Belgavi, and Dharward is another worthwhile state intervention. Building plug-and-play workplaces and co-working hubs would provide greater flexibility in workspaces and operational infrastructure, especially to benefit MSMEs. More broadly, encouraging innovation will be key to realising Karnataka's vision of growing the technology sector by 17 percent in 2031–32. The state could deepen the return on investment in tech by stimulating the start-up ecosystem and establishing technology sandboxes. Conducting mentorship programmes and connecting ESDM start-ups with international partners, markets, and matchmakers are also important valuable initiatives proven to facilitate growth. (Exhibit F)

[1] "Resilience to resurgence," Nasscom, February 2022. nasscom.in/knowledge-center/publications/technology-sector-india-2022-strategic-review

Exhibit F

ITeS: Vision[1]

Macroeconomic indicators

	From (2022–23)	To (2031–32)
Digital economy contribution ($ bn)	61 (FY22)	**300+**
Growth (%)	~14%	**~17%**
SaaS revenues by 2032 ($ bn)	2.05	**66**
# of Jobs (m)	1.8	**4.7**
Share of revenue Beyond Bengaluru (%)	~2.3%	**~4%**
Digitally skilled talent pool (%)	9.5% (2.1 m people)	**80–100%**

Aspirations

1. Become the **digital economic accelerator** where industry takes the leadership role to determine the strategy for the growth of digital economy and the government can provide support to run the strategy
2. **Destination of choice** for leading IT/ITeS multinational companies and Global Capability centers
3. **Retain leadership position in innovation and technology** and pace towards sustainable and holistic economic development

1. GDP Performance and forecast

As part of stimulating the growth of tech start-ups and infrastructure Beyond Bengaluru, a first step could be to establish an accelerator network, starting with one each in Mysuru, Mangaluru, and Hubbali Dharwad, with a goal of setting up one in each district. The state government could also partner with industry bodies to set up centres of excellence in AI, machine learning, blockchain, cybersecurity, Internet of Things (IoT), enterprise automation, and agritech, along with state-of-the-art laboratories to lead change in IT, collaborating with industry bodies and academic institutions.

To further grow the technology sector, nine technology business incubators – six in IT and electronics and three in biotechnology – could be established in Karnataka. A strong link between research and development (R&D) and the commercialisation of technologies in academics and technical sectors could also be prioritised. An initial list for tech commercialisation could include information and communication technology (ICT), IoT, and software products manufacturing for electronics systems design, robotics, 3D printing, manufacturing 4.0, nanoscience and engineering, healthcare, biopharma agriculture, and allied fields.

Karnataka's $1 trillion vision aims to produce a workforce that is digitally skilled. To help realise this, the state government could work with global capability centres to develop industry-specific curricula, with a view to integrate basic programming and IT skills in universities and colleges and nurturing talent at the grassroots level. It could also collaborate with institutes to curate and launch English-language training programmes across all districts, with a focus on rural areas. Finally, it could set up innovation laboratories and centres focused on AVGC, AI, edtech, agritech, fintech, and telecomms in colleges across the districts of Kalaburagi, Belagavi, Dharwad, Mangaluru, Shivamogga, Mysuru, and Tumakuru. These districts are emerging as attractive destinations for domestic and global investment.

Healthcare

Karnataka's healthcare sector could be ramped up with increased access to preventive and primary care, more skilled workers, enhanced digital systems, and improved networks. The $1 trillion vision aims to raise spending on healthcare to 8 percent of GSDP by 2025, from 4.7 percent in 2021–22. It also seeks to boost hospital beds to 50 beds per 10,000 residents, and the number of doctors to 60 doctors per 10,000 people, from 19.7 doctors in 2021 and 2022.[iv]

To create a preventive healthcare ecosystem for a healthier state population, the Karnataka government could establish strong public-health surveillance teams in districts to address local epidemics, disasters, communicable diseases, non-communicable diseases (NCDs), mental-health problems, and injuries by increasing the liaison between state-level agencies and academic institutions. The state could also focus on NCDs, creating an integrated programme with facility-level activities delivered by competent teams across all levels of healthcare provision, from health and wellness centres to district hospitals. Focus could also be given to the establishment of standard screening protocols for risk factors and diseases among individuals over 30 years old enabling early detection.

Counselling and regular follow-up services in all educational institutions, workplaces, community settings, and healthcare institutions could be introduced at district and taluka levels. The state could also enable and operationalise all health and wellness centres to increase awareness in communities, promote healthy lifestyles, and perform screenings, referrals, and follow-up activities, reducing the prevalence of NCDs. This preventive approach could focus on women and girls with the rollout of Society for Nutrition, Education, and Health Action (SNEHA) clinics to tackle malnutrition and promote health among adolescent women. This approach could further ensure timely access to basic health products and services such as immunisation, nutritional deficiency testing, and sanitary pads.

Developing state-of-the-art healthcare infrastructure could also help the state government reach more people. Multidisciplinary 500-bed hospitals, initially in identified districts and eventually in all districts, could be built. Scaling up digital interventions, including rolling out the National Digital Health Mission (NDHM), could also ensure patients have an end to end holistic experience. Three hundred ambulances could be made digital to provide advanced life support and healthcare services for new-borns and children. These services could further be scaled up to offer evidence-based treatment interventions, including early intervention through screening and effective referral linkages.

A health analytics division could be set up under the Department of Health to leverage NDHM by collecting hospital data, streamlining capacity allocation, monitoring disease prevalence in the state, and tracking patient demographics. With this, it would be possible to assess the health sector's performance at primary and secondary levels and recommend evidence-based interventions at general practitioner and taluk level. This would reduce inequality among different populations and provide better healthcare. (Exhibit G)

Exhibit G

Healthcare: Vision[1]

	From (2022–23)	To (2031–32)
Nominal sectoral GSDP (INR lakh crore)	0.25–0.26	**1.2–1.3**
Healthcare spend as % of GDP	4.7%	**8%** (by 2025)
Hospital beds per 10,000 population	9–10[2]	**47–50**[3]
# of Doctors per 10,000 population	19.70[4]	**50–60**[5]
# of Nursing and midwifery personnel per 10,000 population	38–43[6]	**180–190**[7]
Global maternal mortality ratio (per 100,000 live births)	92	**<70**
Under 5 mortality rate (per 1,000 live births)	28	**12** (goal for many countries) (23 as of 2025)

Aspirations

1. **One** amongst **top 5 in the National Health Index**
2. **50% Reduction in healthcare costs** in Sigma of government and private spending (incl. insurance) in these identified DHAs within 24 months
3. Preventative and primary healthcare **within 5 km of every citizen** either physically or virtually
4. **50% Reduction in Disease Burden Index** in identified Digital Health Areas (DHA) within within 24 months
5. Progressively **convert the entire state to DHA** by 2032

1. GDP Performance and forecast value
2. State population: 71,961,497; total number of beds: 70,474 (Handbook of statistics on Indian states)
3. Benchmark: OECD average
4. National Medical Council (2021)
5. Benchmark: OECD Best in Class
6. Benchmark: OECD Best in Class
7. Indian Nursing council annual report 2021–22

By partnering with tech companies to develop and deploy solutions, such as patient-flow management systems, dynamic staff-allocation systems, and inventory and procurement optimisation tools across public hospitals, could cut the cost of healthcare and improve patient turnover.

The Karnataka government could also set up a wide range of services through standardised, integrated approaches. An excellent way to do is by promoting the Ayush care model across four districts in the state, integrating Ayush services into existing healthcare services and identifying areas of stand-alone management of Ayush effective interventions.

The COVID-19 pandemic and its accompanying lockdowns meant medical practitioners had to engineer innovative solutions to consult with their patients. These solutions could be leveraged by converting all healthcare delivery institutions to smart healthcare clinics. The state could partner with technology companies to drive the integration and adoption of Industry 4.0 solutions. It could also institute remote monitoring solutions at primary healthcare centres, connecting them to urban healthcare hubs and making way for virtual diagnoses.

Finally, Karnataka could market itself as a medical and wellness tourism destination. It could onboard private hospitals as state-of-the-art portals for promoting wellness and tourism. It could also host medical tourism fairs in 15–20 countries identified to build Brand Karnataka as a preferred destination for medical tourism. The state could focus on countries in Africa and the Middle East, which already provide a high flow of medical tourists to India. Tier 2 cities, such as Mysuru, could become nuclei of medical tourism to help develop local infrastructure outside Bengaluru. This could improve healthcare facilities in all districts and capitalise on lower costs of operations. Towns such as Varanasi and Rishikesh, which are popular with foreign tourists, could be developed into world yoga destinations.

Education

A coordinated plan and sizeable investment to transform Karnataka's workforce into a highly skilled one across all sectors could accelerate job creation and significantly increase GSDP. In the education sector, boosting the pupil-to-teacher ratio can improve overall quality of education, as would raising spending on public schools to 7 percent of GSDP in 2031–32, from 1.5 percent in 2021–22.[v] The state could target four main issues: modern infrastructure, skills-based education, faculty development and expansion, and research.

A rollout of modern infrastructure could lead to the expansion of colleges and universities beyond Bengaluru, as well as to an increase in enrolment numbers, especially among girls. The Karnataka government could also set up a "knowledge city" around Mangaluru and Dharwad-Hubbali, as well as ten Karnataka Institutes of Technology, similar to the Indian Institute of Technology, to produce a highly skilled workforce.

Hub-and-spoke clusters of ICT and STEM laboratories could be established near all schools. These could be complemented with digital subject content in Kannada and other languages, including English. Government of India software platforms could be accessed for learning management systems and enterprise resource planning, such as Samarth, to improve operational efficiency and inform decision-making. (Exhibit H)

Exhibit H

Education: Vision

Macroeconomic indicators	From (2021–22)	To (2031–32)
GER (higher education)	32.2	**50**
GER (higher secondary education)	65.24	**100**
% of GDP spend on Education (govt) (%)	1.5%	**6–7%**[1]
Vocational training availed by children (%)[2]	14.2%	**60%**
Pupil teacher ratio	24	**30**
School Education Quality Index (SEQI) (national rank)	3	**1**
Average annual drop out rate at secondary level	16.25	**8.8**

1. Aarthika charche, FPI Journal of economics and governance
2. Economic Survey 2021–22 – Skill Karnataka 2030

Pivoting to an integrated skills-based education model could introduce internship opportunities for students from grade VI to XII to learn vocational subjects, such as farm mechanisation and basic machine operations, fulfilling industry's growing demand for talent. Industrial training institutes, the private sector, and vocational training centres could collaborate to design and launch creative and innovative courses, including short-duration (15–30 days) training courses, such as in machine operation, drone operation, and farm management, to reskill, upskill, and improve productivity. The state could also promote the co-development of industry-relevant content and courses between academia, higher education institutes, and edtech or online-education start-ups, leveraging India's strong edtech ecosystem. These could be disseminated to Indian and global learners to provide upskilling and vocational training to bridge skill gaps.

To develop and expand faculties, the Government of Karnataka could set up an independent, private-public teachers academy to tackle recruitment, foundation and induction training, periodic capacity building, performance assessment, professional development, ethics, research, and database management. Th government could also build ICT skills and capabilities among existing and future teachers, with mandatory assessments every two years, in the model of the Continuing Medical Education Programme for medical practitioners.

Finally, Karnataka could strive to become a globally preferred research destination by providing platforms and creating a consortium of institutes for collaboration and information sharing among industry and start-ups. R&D incubators could be established across so-called sunrise sectors, that is, new sectors with the potential for rapid growth at the Vishweshwaraiah College of Engineering, the Krishnarajendra Silver Jubilee Technological Institute, the Government Engineering College Talakal Koppal, and the BDT College of Engineering.

Inter-sectoral focus areas

Key to realising Karnataka's vision of sustainable, inclusive growth is focusing on inter-sectoral development areas. This focus reveals that there are developmental strategies that could unlock economic growth while improving the quality of life of the state's residents.

Rural Development

Development in Karnataka's rural areas has, historically, lagged behind that in urban areas. Improving quality of life in rural Karnataka, while growing the rural economy, will require coordinated interventions in infrastructure, education, and agricultural financing. Much of the state's targets in rural development are in agriculture, but there are areas needing intervention in numerous sectors.

Karnataka could make a thrust to agripreneurs and educate farmers on diversified agricultural and allied livelihoods, helping them adopt modern techniques like integrated farming systems, crop rotation, and multi-cropping. This, in turn, could boost farmer incomes. In tandem, the state could incentivise a shift from traditional cereals to higher-yielding fruit crops such as mangoes, pomegranates, grapes, and bananas, as part of a pro-growth agricultural strategy. This strategy could also involve working with agritech companies to develop digital platforms for allowing private sector participants to offer equipment as a service to farmers.

The sector could take major strides towards women's empowerment. The effort to do this may include specialised reforms – like women employment incentives – to target and promote sectors where women are more likely to be hired. These are sectors such as manufacturing, community services, cottage industries, education, and healthcare.

Accelerating the rollout of initiatives such as digital literacy, digital banking, and innovative financial products could help empower rural women to become entrepreneurs. Massive improvements in the empowerment of rural women could be made by prioritising the easier availability of resources, like safe water and clean fuels in homes and better transport infrastructure. Labour participation may be encouraged among women to help empower them in the workspace.

Developing a robust, scalable IT system in which every government service initiative is digitally available in local languages with efficient two-way communication is a realistic pathway to digitally enabled growth. To further this growth, the state could partner with technology companies to develop platforms, a marketplace, and a database of skilled labour banks. This partnership could also be used to map skilled labour profiles and provide details about the availabilities of skills and jobs in specific regions, enabling workers to seek opportunities proactively.

No initiative for rural development can ignore the development of human capital. In Karnataka, the state may roll out topical, short (15–30-day duration) training courses for reskilling and upskilling people who work on farms. This would improve their opportunities while having benefits for agricultural productivity. These programmes could include short-term skilling under the Mahatma Gandhi National Rural Employment Guarantee Act to incentivise the building of skills.

Alongside these short programmes could be long-term capability-building initiatives, including dedicated programmes for entrepreneurs in supply chains, sales, distribution channels, and other businesses. The state government could collaborate with industry players to curate employee capability-building programmes imparting industry-relevant skills.

Urban Development

Our vision for urban development in Karnataka involves making the state's cities more liveable. This requires coordinated interventions to make cities greener, safer, more decentralised, and accessible to their residents. One challenge that faces urban development in Karnataka is that Bengaluru is the dominant urban centre in the state, creating unequal development and access to resource throughout the state.

Karnataka could build eight self-sustaining satellite towns, two each along the Bengaluru–Mysuru, Bengaluru–Hubballi, Bengaluru–Hassan, and Bengaluru–Kola corridors. Driving the scale-up of small towns and municipalities into self-sustaining townships – such as city corporations, town municipalities, and pattana panchayats – could enable urban areas to achieve meaningful self-led growth. This could require a plan for utilising efficiently around INR 4,000 crore, sanctioned by the government, accelerating the provision of basic services like electricity, water, and sanitation. A similar initiative could involve converting 50 Gram panchayats to town panchayats to attract higher fund allocation and better governance to the region.

Creating master plans for the 120 Urban Local Bodies which remain without them could be key to improving planning, governance, and the effective application of policy. This could help urban areas to realise additional tax revenue and control their development. For smaller towns, accelerating the implementation of the Atal Mission for Rejuvenation and Urban Transformation scheme for establishing town commission rates for all towns of fewer than 50,000 people could unlock an increase in coverage from 68 to 118 and accelerate planning in towns.

The growing demand in the transport of food, grains and sugar may require increased government support for logistics infrastructure and the building of high-capacity corridors. The government could increase Karnataka's freight transport capacity by adding rail tracks in high-traffic areas and increasing warehousing capacity in high-production belts such as Mangaluru. It could also create dedicated rail freight corridors along major freight routes, similar to what has been achieved with the Western and Eastern Dedicated Freight Corridors. This huge infrastructural sweep could include setting up logistics zones on the peripheries of major cities, implementing an easy approval process for land use plans. These initiatives may be undertaken alongside the effective implementation of the Gati Shakti scheme.

Environmental sanitation could be improved by setting up sewage treatment plants – costing INR 2.5 crore per unit – across the 280 urban local bodies[vi] which are currently without them, to promote waste recycling and manure production. The pollution control board could implement an e-waste management regulatory framework, integrating informal waste pickers into the formal system and involving them in recycling and recovering waste – similar to practices employed in Maharashtra.[vi]

Mobility services could be strengthened by introducing holistic transport and transit-oriented urban-space planning. This is especially important in emerging townships and new regions in growing urban local bodies. Drawing up comprehensive city mobility plans for all cities and urban local bodies may be essential to enabling the efficient running of urban areas. An example of the successful implementation of mobility planning could be the strong monitoring and effective execution of the Bengaluru suburban rail project. Central to sustainable mobility plans is the design of an accessible infrastructure for pedestrians and cyclists in urban spaces.

Human Development

The human development sector consists of several indicators important to understanding the nature of development. Many of these indicators are served by development in other sectors – such as education and healthcare. The Karnataka state could benefit from focusing on the human development indicators in their own right to meet the state's target of inclusive sustainable development.

One of these indicators is public health, where an improvement in its health index performance through a 10 percent increase in the number of sanitation facilities in the state. This could be allied to the effort to reduce IMR by one point and reduce U5MR and the state's MMR Health Index.

Another key focus is on education. An improvement in education performance and an increase in gross enrolment ratio in secondary education could be helped by promoting individual teachers for science and maths, and rolling out ICT and innovation labs at schools, leveraging the Sarva Shiksha Abhiya and Rashtriya Uchhatar Shiksha Abhiyan.

The government could support social development by providing Pucca houses (which need to be provided in 35 percent of cases) and sanitation facilities (12 percent to be provided). Improvements in housing could be achieved by leveraging PMAY (U), PMAY (G), and RGHS for housing. Increases in housing capacity could be facilitated by enabling manufacturing MSMEs and increasing workers in manufacturing from their current rate of 12 percent.

Employing 31 Governance Fellows – at a rate of one per district – could provide technical support and foot soldiers for monitoring the implementation of the Aspirational Taluk Programme. This could be an SITK initiative with the Indian School of Business coordinating with district CEOs.

Conclusion

Concerted effort and thorough planning are required to execute this vision for Karnataka. The state could raise its growth rate from 13 percent to 17 percent per year to realise its economic goals. If this were achieved, the state's economy could be worth $1 trillion by 2032.

There are various challenges in the way, as Karnataka struggles with poor mobility in urban areas, limited access to medical facilities outside of limited urban hotspots, challenges in education, and an uneven spread of resources and opportunities across its area.

The state could target growth that is sustainable and inclusive if it is to meet developmental goals in various sectors. To achieve this, this report suggests that the state develop in inter-sectoral focus areas, such as urban, rural, and human development.

Broadly, this report suggests increasing mobility and widening access, and promotes the ideas of clusters, decentralisation, mobility, and efficiency. Leveraging technology, easing obstructive regulations, thinking holistically, and optimising systems by linking elements is key.

If done with intention and focus, the interventions in this report could be central to achieving sustainable, inclusive growth on Karnataka's journey to a $1 trillion economy.

References

i Karnataka economic survey

ii GDP performance and value forecast

iii Tourism committee

iv Healthcare committee and experts

v Education committee

vi Urban development committee

CHAPTER 01

Agriculture and Allied Sectors



Agriculture is one of Karnataka's most significant growth sectors

Agriculture and allied sectors are a significant pillar of Karnataka's economy. With its ten different agro-climatic zones, the state holds enormous potential for significant agricultural growth. In its aspiration of $1 trillion in GDP by 2032, agriculture will be a key growth driver and will need to accelerate growth rates.

Karnataka is the coffee capital of India, producing 70 percent of the country's output.[iii] It is also a leader in the horticulture and floriculture sector, ranking fifth in India in total area under horticulture. Karnataka is the largest producer of coffee, raw silk, sandalwood, ragi (finger millet), sunflower, and tomato.[iii] The state is also India's second largest producer of maize, safflower, grapes, pomegranate, and onions. It is fifth in the production of vegetable crops and third for fruit crops. It is also the largest producer of spices, aromatic and medicinal crops, and tropical fruits, and the second largest milk-producing state after Gujarat.[iii] Karnataka is also a major producer of ragi, bajra, cotton, groundnut, jowar, and maize.[2]

The agriculture and allied sectors together contribute almost 15 percent to the state's gross value-add and are expected to achieve a growth of 11.8 percent this year as per Karnataka's Economic Survey 2022–23. (Exhibit 1 & 2)

Karnataka's agriculture exports totalled about $1,300 million in 2019–20 and $1,582 million in 2020–21, with a significant increase of 21.7 percent.[i]

However, the sector's importance in the state goes beyond these economic indicators. It is one of the largest livelihood providers and is the key to rural prosperity, employing around 41 percent of the population.

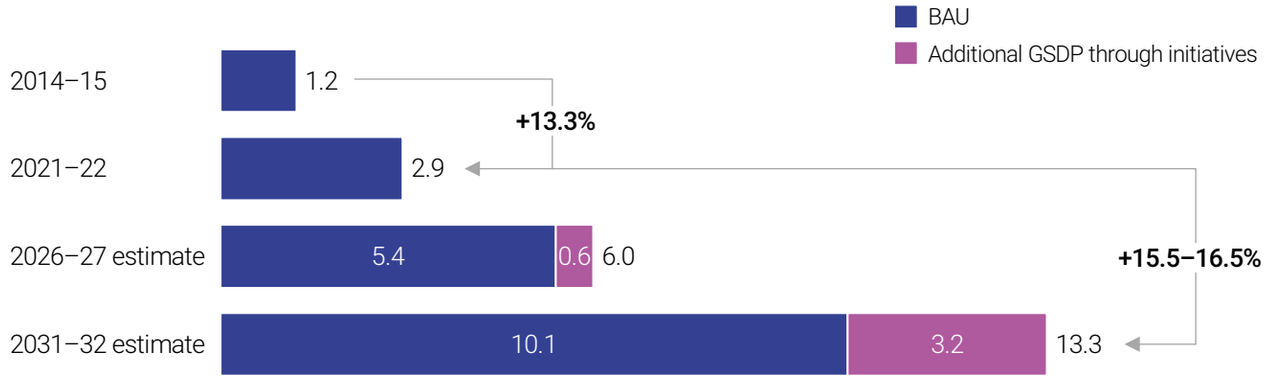
An examination of district contributions to the gross state domestic product (GSDP) presents a stark contrast. The highest contribution to agriculture GDP comes from states with a low share of agriculture as a part of their overall GDP. For instance, Tumakuru is the fourth highest contributor to the GSDP and ranks 17th in the share of agriculture contribution to the state. In absolute terms, it is the second largest contributor to agriculture's GDP. The districts with the highest dependence on agriculture for their GDPs, such as Kodagu, Koppal, Chitradurga, Davangere, and Yadagiri, have a low contribution to the overall GDP of the state. This means the high population in these states has a low per-capita income. It is imperative to plan for district-level interventions to create pockets of success that can be replicated within and across the districts. (Exhibit 3 & 4)

[2] ENVIS Centre: Karnataka

Exhibit 1

GSDP performance[1]

INR lakh crore

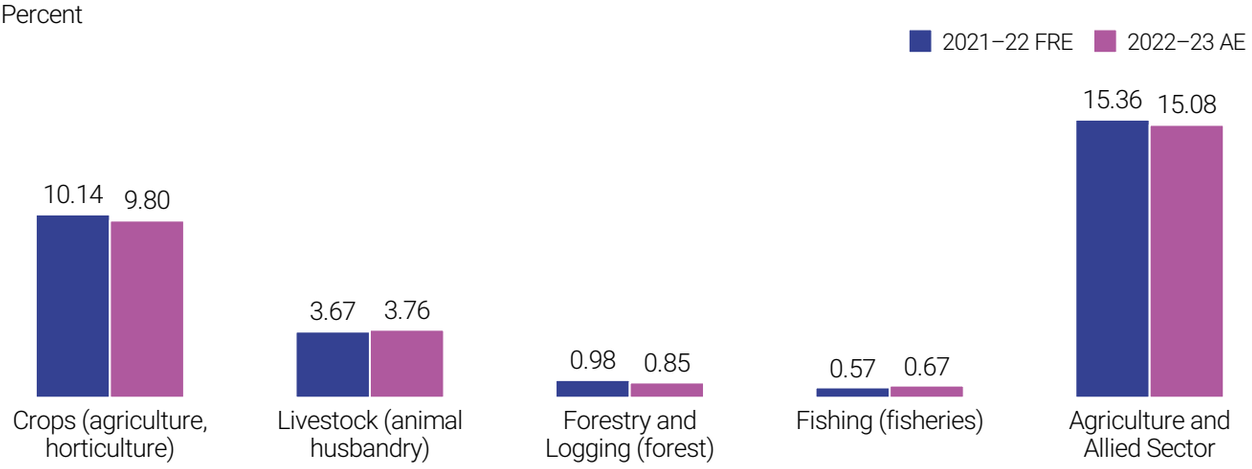


1. GDP performance and forecast

Exhibit 2

Sectoral shares of GSDP at current prices[1]

Percent

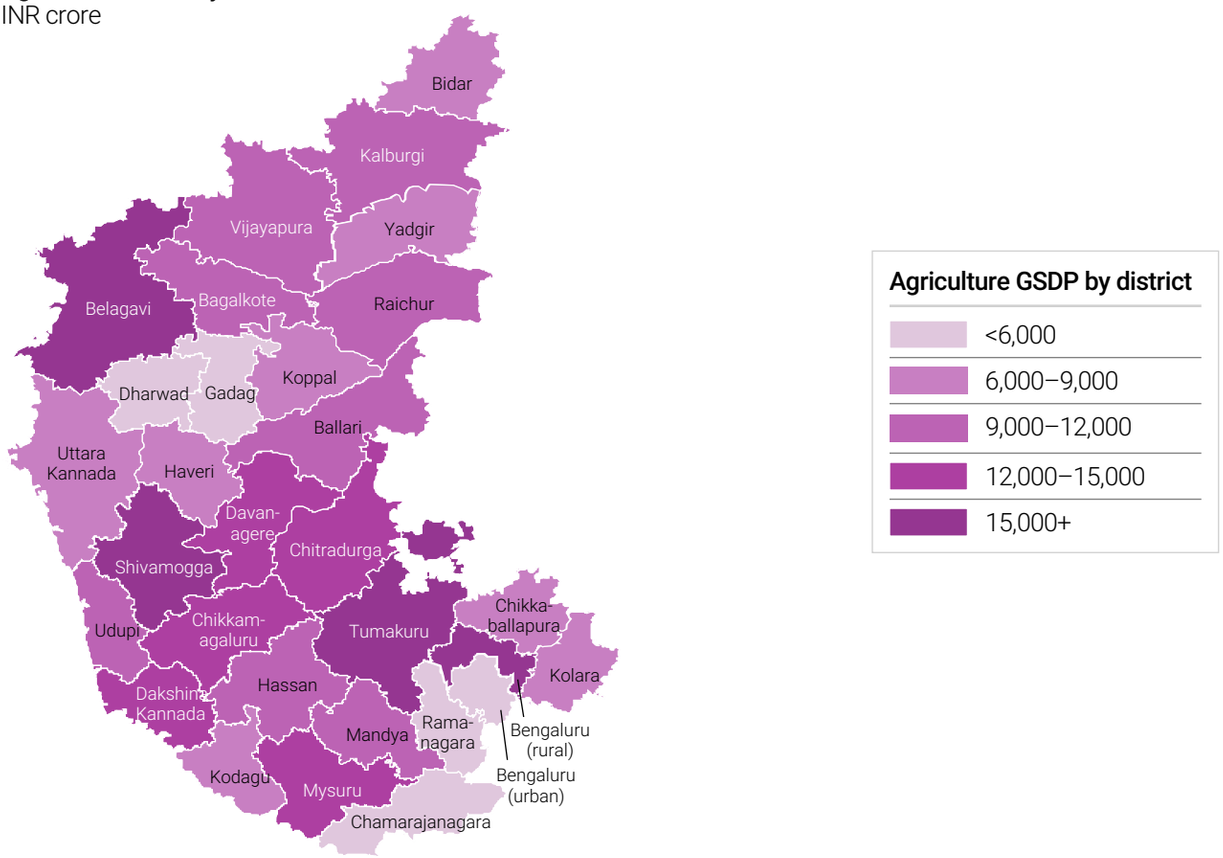


1. GDP performance and forecast

Exhibit 3

District as a fulcrum of development – Agriculture potential growth areas[1]

Agriculture GSDP by district
INR crore



1. GDP performance and forecast

Exhibit 4

District as a fulcrum of development – Agriculture potential growth areas[1]

Sl. No	District	Agriculture contribution to district GDP (%)	Agriculture GDP ('000 cr)	Agriculture contribution rank	Gross district domestic product (GDDP) ('000 cr)	District rank (GDDP)
1	Belagavi	26.1	21.51	11	82.40	3
2	Tumakuru	23.4	17.59	17	75.18	4
3	Shivamogga	28.5	16.54	9	58.04	7
4	Dakshina Kannada	13.1	14.65	28	111.86	2
5	Davanagere	35.3	13.94	2	39.49	15
6	Mysuru	19.4	13.25	23	68.30	5
7	Bengaluru Rural	32.7	12.43	6	38.00	17
8	Chitradurga	35.3	12.20	3	34.55	20
9	Chikkamagaluru	25.7	12.06	13	46.92	11
10	Vijayapura	30.6	11.95	7	39.06	16
11	Ballari	17	11.30	27	66.48	6
12	Hassan	24.2	11.18	16	46.22	12
13	Raichur	29.7	10.37	8	34.91	18
14	Kalaburagi	25.5	10.33	14	40.50	14
15	Bagalkote	21.2	9.96	21	46.99	10
16	Mandya	20	9.62	22	48.08	9
17	Udupi	18.1	9.50	26	52.50	8
18	Kodagu	49.8	8.40	1	16.88	30
19	Koppal	33	7.97	5	24.14	26
20	Chikkaballapur	28.1	7.80	10	27.76	25
21	Uttara Kannada	22.3	7.75	18	34.73	19
22	Haveri	25.9	7.60	12	29.35	23
23	Kolar	21.9	7.35	19	33.56	21
24	Yadagiri	33.9	6.92	4	20.42	29
25	Bidar	21.5	6.11	20	28.44	24
26	Chamarajanagar	24.2	5.51	15	22.77	27
27	Ramanagara	18.1	5.45	25	30.13	22
28	Dharwad	10.4	4.78	29	46.00	13
29	Gadag	18.8	3.88	24	20.62	28
30	Bengaluru Urban	0.5	3.49	30	698.46	1
	Total	**15.4**	**302.26**		**1,962.73**	

1. GDP performance and forecast

Karnataka is the largest producer of mulberry silk in the country.[iiii] Karnataka contributed around 47 percent of the total silk production in the country during 2021–22. The state has a greater contribution in earning foreign exchange for the country in producing ready-made silk garments and accessories through the raw material. During April 2022–January 2023, Karnataka produced 9716.083 metric tonnes of silk, an increase of 1.03 percent over the previous year (9,426.504 metric tonnes).[i]

Horticulture could champion more income for farmers

Horticulture is indeed making inroads throughout the state. Karnataka has registered rapid growth in the sector in the last decade, and today, 26.96 lakh planted hectares yield 215.07 lakh metric tonnes of horticulture produce.[i] Horticulture provides excellent opportunities to boost farmers' income, as it offers high unit productivity and scope for value addition.

Karnataka has the highest acreage under dry farming in the country,[iii] next only to Rajasthan, and could grow more high-value but less-thirsty horticultural crops. The state has a maximum number of geographic indication (GI) products.[iii] Karnataka also has six centres of excellence for mango, pomegranate, vegetables, flowers, protected cultivation, and precision farming. It is a significant producer of bio inputs, including bio-fertilisers in solid and liquid formulations. Karnataka also promotes 100 horticulture farmer producer organisations (FPOs), which is critical in augmenting the sub-sector's growth.[iii] Notably, Karnataka state was awarded "Best State for Horticulture 2022" for promoting horticultural development and production during the 13th Agriculture Leadership Awards 2022.

Animal husbandry is another sub-sector that plays a vital role in the agri-economy. In 2021–22, the share of animal husbandry in Karnataka's total GSDP was 3.80 percent. During this period, India ranked first in the world for buffalo milk production and second for cow milk. Among India's states, Karnataka ranked tenth for cow milk. Milk production in the state was 11.80 million metric tonnes during 2021–22. As per the 20th livestock census, Karnataka has 3.03 crore of livestock and 5.95 crore of poultry – 5.41 percent and 6.98 percent of the national figures, respectively.[i]

The fisheries subsector also plays an essential role in the state's socioeconomic development, given its contribution to the food basket, nutritional security, sizeable foreign exchange earnings, employment generation, and income. Using protein-packed fish as food helps eradicate malnutrition among the rural population. Brackish water and inland freshwater resources are the state's main sites of fish production.[iii]

Nationally, Karnataka was in fifth position in marine-fish production and seventh in inland-fish production in 2021–22.[iii] During that period, the total fish production was 10.74 lakh metric tonnes and fisheries contributed nearly 0.35 percent to the GSDP. Annual fish production in Karnataka has shown a considerable increase, from 2.97 lakh metric tonnes in 2005–06 to 10.74 lakh metric tonnes in 2021–22, with an annual average growth rate of 10.33 percent. During 2022–23 (up to November 2022), the state produced 5.52 lakh metric tonnes of fish.[iii]

Fish-seed production during 2021–22 was 7,669.06 lakh. During 2022–2023 (up to November 2022), [i] the state produced 7,320.50 lakh of fish seed against the target of 11,251 lakh.

The state recognises that agricultural development is important to end poverty, boost shared prosperity, and feed its population. Since independence, the government has focused on the growth and development of agriculture and allied sectors.

Development of the agriculture sector since 1966

Karnataka's agricultural development can be divided broadly into four phases.

In the first phase – from 1956 to 1966 – the developmental activities[iii] were confined to traditional measures such as expanding the cultivated area, increasing irrigational sources, popularising the use of chemical fertilisers, and improving agricultural practices.

The second phase, between 1966 and 1980,[iii] deployed new technology (particularly hybrids and high-yielding crop varieties), which significantly increased agriculture production, particularly cereals, with more emphasis on intensive cultivation than on extensive cultivation, as in the previous decade.

In the third phase, from 1980 to 1995,[iii] Karnataka paid particular attention to underprivileged sections, including small and marginal farmers, farmers belonging to scheduled castes and tribes, and dry-land farmers.

During the fourth phase, from 1995,[iii] the government introduced its own agricultural policy, emphasising adaptation to the changed scenario that arose from globalisation and the liberalisation of international trade. This was aimed at achieving integrated growth and a high growth rate in agriculture and allied sectors.[3] Since 1995, the industry has undergone numerous transformations and now finds itself on the cusp of a technological revolution.

Despite considered and planned interventions, the sector still performs below its potential. Karnataka could tackle numerous gaps and challenges to facilitate growth.

Gaps and challenges in Karnataka's agricultural sector

Fragmented land holdings is one of the most challenging issues facing the sector. Most farmers cannot leverage the benefits of economies of scale as they hold less than two hectares of land. The arable plot size decreases with each successive generation to the point where these lands eventually become economically unviable. The 2015–16 agriculture census cited in the Karnataka Economic Survey 2022–23 shows 86.81 lakh farm holdings operating in an area of 118.05 lakh hectares, with the average size of a holding being 1.36 hectares. Marginal and small holdings constitute 80 percent of total holdings and operate on 44 percent of the total operational area. In contrast, semi-medium, medium, and large holdings account for 20 percent of the total holdings, and their operational land holding is 56 percent of the entire operating area. This scenario emphasises the growing pressure on rapidly shrinking land holdings.

The other major challenge facing Karnataka's agricultural sector is the failure of marginal farmers to shift from conventional farming to modern, mechanised, and scientific agriculture. Farm mechanisation is vital for increasing the efficiency of agricultural operations, reducing production costs, and improving farm economics. It also reduces the drudgery of farm work and helps tackle the challenge of decreasing farm-labour supply.

Unfortunately, large-scale mechanisation has yet to materialise in the state due to numerous factors, such as lack of technical know-how among marginal farmers and higher equipment cost. Another deterrent is the lack of advisory services, particularly on precision and scientific farming.

Furthermore, the state's rampant use of chemical fertilisers and pesticides leads to reduced soil fertility and increased cultivation costs.

Dumping of Chinese silk at cheap prices, lack of monitoring of demand and supply of raw silk, urbanisation in traditional sericulture areas, and augmentation of bivoltine raw silk production among others have posed significant challenges for the sericulture industry.

There is also a need for more access to finance, especially for unsecured loans for farmers. Limited capital availability adversely affects the smooth functioning of Karnataka's farming sector. A farmer may need to have access to affordable institutional credit to start and sustain a good crop cycle based on quality inputs such as seeds, fertilisers, machinery and equipment, and sufficient water and power supply. Indirectly, credit also facilitates other essential agricultural functions such as marketing, warehousing, storage, and transportation, which are crucial to productivity. Agricultural credit is vital to providing essentials during adversity. It improves the ability of the farmer to absorb the shock of crop failure due to external factors such as drought, pest infestation, or price crashes.[4]

Food inflation and price volatility are also key challenges, causing flow and fluctuating farmer incomes.[5] Lenders in the agriculture space are unable to make informed decisions due a lack of effective risk mitigation and data. There is also a dearth of efficient, business-minded resource institutions to handhold farmer-producer companies. All or most of the resource institutions are non-governmental organisations that lack business experience.

Other growth inhibitors include weak forward and backward linkages, an array of middlemen, limited access to global markets, limited availability of market intelligence, and lack of infrastructure, including facilities such as cold storage and processing units. There is also a shortage of quality-control laboratories for various horticulture products and honey.

The inefficient supply chain is another hindering factor. Supply chain inefficiencies result in decreased ease of doing business and increased logistics costs. for example, moving a container by ship from Malaysia to Chennai is cheaper and faster than moving a container by road or rail from Chennai to Mumbai.[iii] Moreover, power for commercial use is expensive compared to other states.

[3] https://karnataka.gov.in/index.php/new-page/Agriculture/en
[4] Improving access to agricultural credit: New perspectives, Renita D'Souza
[5] RBI, 2022

In the fisheries sector, the market is grappling with a shortage in the supply of fish seeds (a gap of 30–40 crore seeds). [iii] Furthermore, the state does not have local feed companies and needs to depend on other states to source about 2–3 lakh tonnes of feed worth INR 40–60 crore. The involvement of intermediaries and higher prices is a key challenge in sourcing fish seeds from other states. The fishing sector also faces poor reservoir production and unscientific harvesting. The state could also focus on quality processing for global markets.

Food processing and agri-exports are an untapped opportunity for Karnataka. The global demand for agriculture (excluding cotton and tobacco and including spices and beverages) during 2021–22 was around $1,400 billion. India's exports of agri-commodities stood at $33.64 billion, just 2.3 percent of global demand. Karnataka's exports amounted to $2.37 billion, which is about 7 percent of national exports. Contributing nearly 8.5 percent to the national GDP and with an aspiration to contribute 10 percent in the coming decade,[iii] the state could to push for agri-exports and food processing. It can develop value-added products, reduce spoilage, and improve food and vegetable processing from the current 1 percent [iii] while putting Brand Karnataka on the global map. The sector could address the following challenges:

Food processing:

- Unavailability of basic infrastructure to set up micro, small, and medium enterprise (MSME) food-processing units in rural areas.
- Difficulty in the marketing of finished products in competition with big brands.
- Ease of credit availability for small processors.
- Lack of technical knowledge about food safety, packaging, and storage of processed products.

Agriculture exports:

- There is a considerable gap in producing quality products to meet specific challenges of sanitary and phytosanitary requirements stipulated by different countries. Even though Karnataka is the largest state growing tomatoes, it cannot increase its exports by more than $7 million. Likewise, for example, for lemon, maize, and mango – 90 percent of mango production does not meet international standards.[iii]
- The dearth of refer vans and pre-cooling facilities for perishable goods curtails the enormous scope for fruit and floriculture exports. The non-availability of guide vans in the hinterland is a significant challenge.

An analysis of the current surplus production, cold storage, and post-harvest processing capacity highlights the scope of developing cold storage and food-processing facilities across districts to produce value-added products and reduce post-harvest losses. (Exhibit 5)

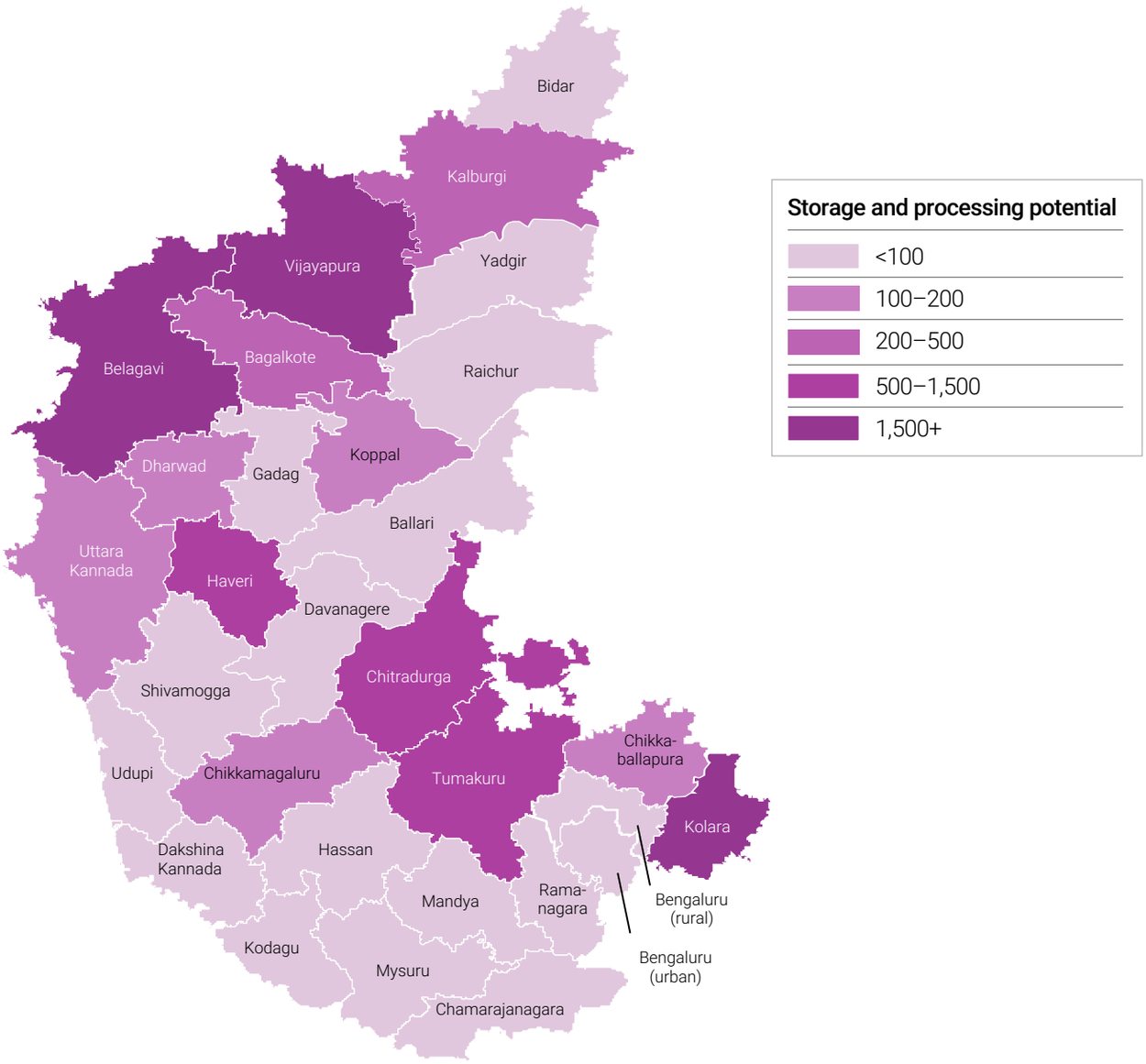
Furthermore, concerning the adoption of best practices in agriculture produce, farmers and farmer groups have no sufficient knowledge of international quality standards, which creates export challenges.



Exhibit 5

Potential for storage and processing[1]

'000 metric tonnes deficit



1. Agriculture committee

Options to drive growth

To address some of the challenges and accelerate the sector's growth of the sector, the following options could be considered:

Adoption of modern farming techniques

Improving yield and productivity could be a key focus area. Although traditional practices are still relevant, there is a need to adopt modern farming practices with technological interventions and new ways of working. These will likely impact small, medium, and large-scale farmers and increase their competitiveness while enabling them to improve their yield and productivity. Interventions could include:

Implementing integrated farming systems (IFS) or multi-cropping systems, with a total of 79 lakh hectares of land leveraging the Mahatma Gandhi National Rural Employment Guarantee Act, the National Horticulture Mission's Rashtriya Krishi Vikas Yojana, and the National Mission for Sustainable Agriculture's Rainfed Area Development scheme. Popularising and replicating integrated farming systems aims to increase the farmer's income. IFS covers crops, livestock and fisheries, plantations, and pasture-based composite farming for enhancing livelihood opportunities, ensuring food and income security, and minimising risks from crop failure through supplementary/residual production systems.[6]

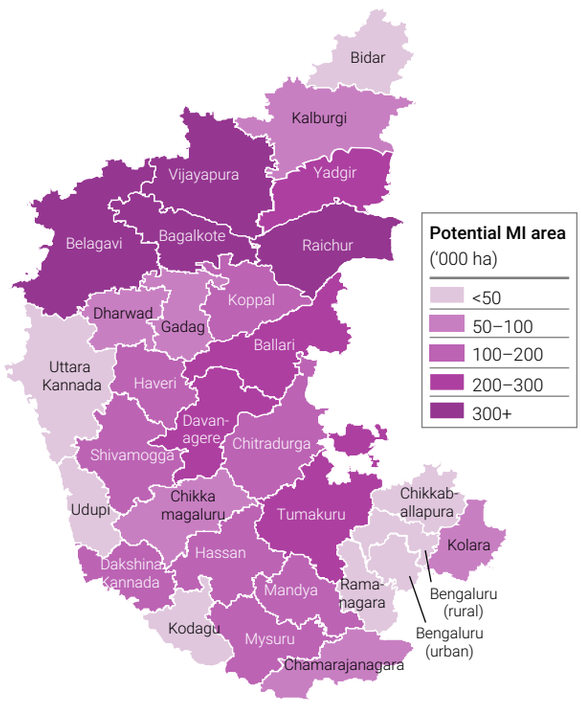
Expanding micro-irrigation to 50 percent of the potential to improve cropping intensity and productivity. These schemes leverage the National Bank for Agriculture and Rural Development (NABARD), Pradhan Mantri Krishi Sinchai Yojana, and Atal Bhoojal to spread awareness and drive the adoption of farm mechanisation (except tractors) for different agro-climatic zones and crops. The use of modern methods, such as micro-irrigation and precision agriculture, could also be promoted to reduce water stress and improve soil quality. (Exhibit 6)

6 Karnataka Economic Survey 2022–23

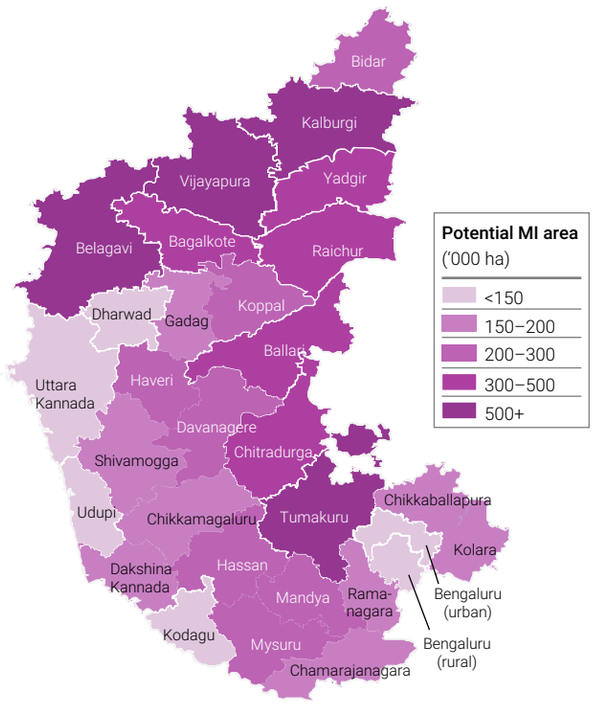
Exhibit 6

Expansion of micro irrigation and IFS[1]

Expand micro irrigation coverage in the state



Expand IFS and multi-cropping coverage in the state



1. Agriculture committee

Collaborating with ecosystem players, such as financial institutions, auditors, agricultural firms, and agritechs, to design a system of allocating carbon credits to farmers adopting sustainable practices, which could be redeemed against, for instance, lower-interest loans or subsidies, such as GrowIndigo India.

Promoting model setups could be as follows:

- Karnataka is divided into ten agro-climatic zones. Therefore the state could look at developing a model village concept under each agro-climatic zone to demonstrate how modern practices result in high-yielding crops. This would encourage farmers to adopt and adhere to the processes. The state could encourage and promote farmer tours to these model villages in the various districts to promote the adoption of region-specific interventions and best practices that will likely help improve yield and productivity. Karnataka could prioritise districts with a high dependence on agriculture contribution to GSDP, such as Belagavi, Vijayapura, Davangere, Kodagu, Koppal, and Yadagiri.
- The state could initiate a crop demonstration or IFS model project under the National Food Security Mission (NFSM) scheme (covering a plot of one hectare) per gram panchayat to demonstrate intercropping, integrated farming with pulses and maize, etcetera, for critical crops. These would provide a live demonstration of these practices to farmers on small farmland where the average holding size is 1.36 hectares. Marginal and small holdings constitute 80 percent of total holdings and operate 44 percent of the total operated area.[7]

[7] Karnataka Economic Survey 2022–23

Exhibit 7

Water exploited talukas[1]

Districts	Over exploited taluks	Crop cultivated	Area	Alternate crop
Bagalkote	Bagalkote	Sugarcane	7,119	Sunflower
Bengaluru Rural	Devanahalli	Grapes	1,495	Sunflower
Bengaluru Rural	Doddaballapura	Areca nuts	1,646	Sunflower
Bengaluru Rural	Hoskote	Mulberry	1,181	Sunflower
Chikkaballapur	Bagepalli	Tomato	1,535	Sunflower
Chikkaballapur	Chikballapur	Grapes	1,992	Sunflower
Chikkaballapur	Chinthamani	Tomato	2,740	Sunflower
Chikkaballapur	Shidlaghatta	Mulberry	4,915	Sunflower
Chikkamagaluru	Ajjampura	Areca nuts	6,508	Mango
Davanagere	Channagiri	Areca nuts	32,475	Mango
Tumkur	Tumkur	Areca nuts	11,354	Mango
Tumkur	Sira	Areca nuts	8,214	Mango

1. Agriculture committee

Promote hi-tech agriculture for marginal farmers, who own 20 percent or 53,453 of 2,67,266 hectares. These include greenhouses, policy houses, and shade nets to improve horticulture productivity.

Roll out alternate crops, such as mango and sunflowers, in 47 exploited groundwater talukas, such as Tumkur, Hoskote, and Bagalokote. As of March 2022, Karnataka had 47 talukas with over-exploited groundwater. They are spread among 15 districts, of which Bengaluru Rural, Bengaluru Urban, Chikkaballapura, and Kolar are growing high-intensity crops. Agriculture and horticulture departments could promote alternate, less thirsty crops. Below is a list of high-intensity crops grown in the various districts and taluks, and a proposed alternative. (Exhibit 7 & 8)

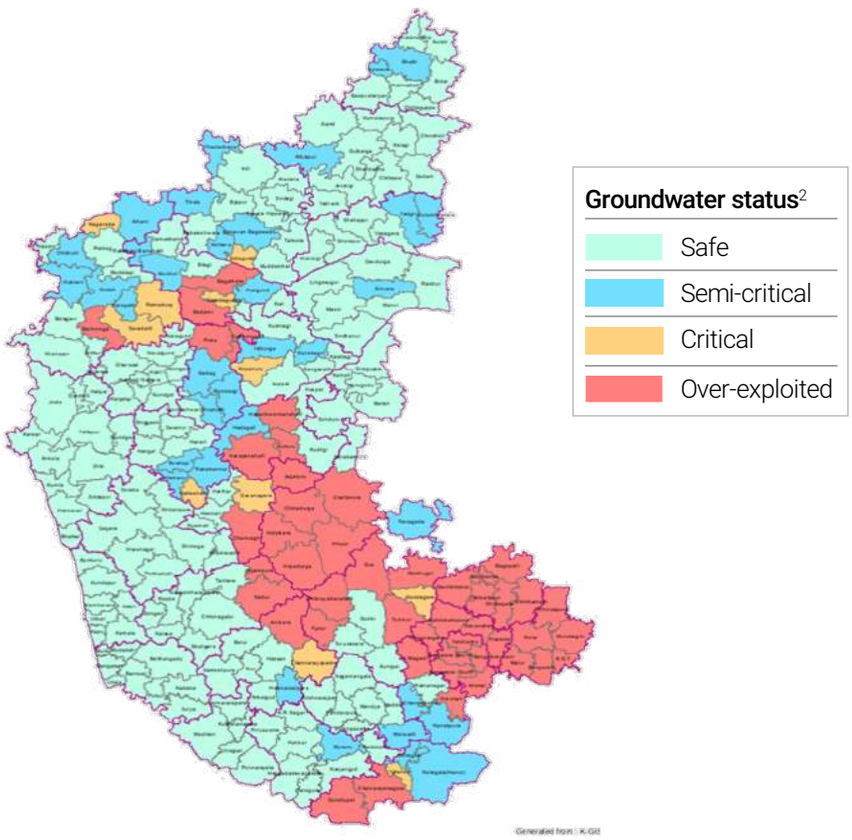
Promote farm ponds and water-storage structures for optimal management of rainwater to be used for critical irrigation, enhancing farm productivity and farmer income. Farm ponds are also an integral part of IFS, and a crucial option to improve farmer income in 65 percent of the state's rainfed area.

Promote the adoption of community farming, especially for inland fisheries, given that the average land holding in the state is less than one hectare. As per the agriculture census 2015–16, 86.81 lakh farm holdings are operating in an area of 118.05 lakh hectares. The average holding size is 1.36 hectares. Marginal and small holdings constitute 80 percent of total holdings and operate on 44 percent of the total operated area. In contrast, semi-medium, medium, and large holdings account for 20 percent of the total holdings, and their operational land holding is 56 percent of the total operational area.[8] (Exhibit 9)

[8] Karnataka Economic Survey 2022–23

Exhibit 8

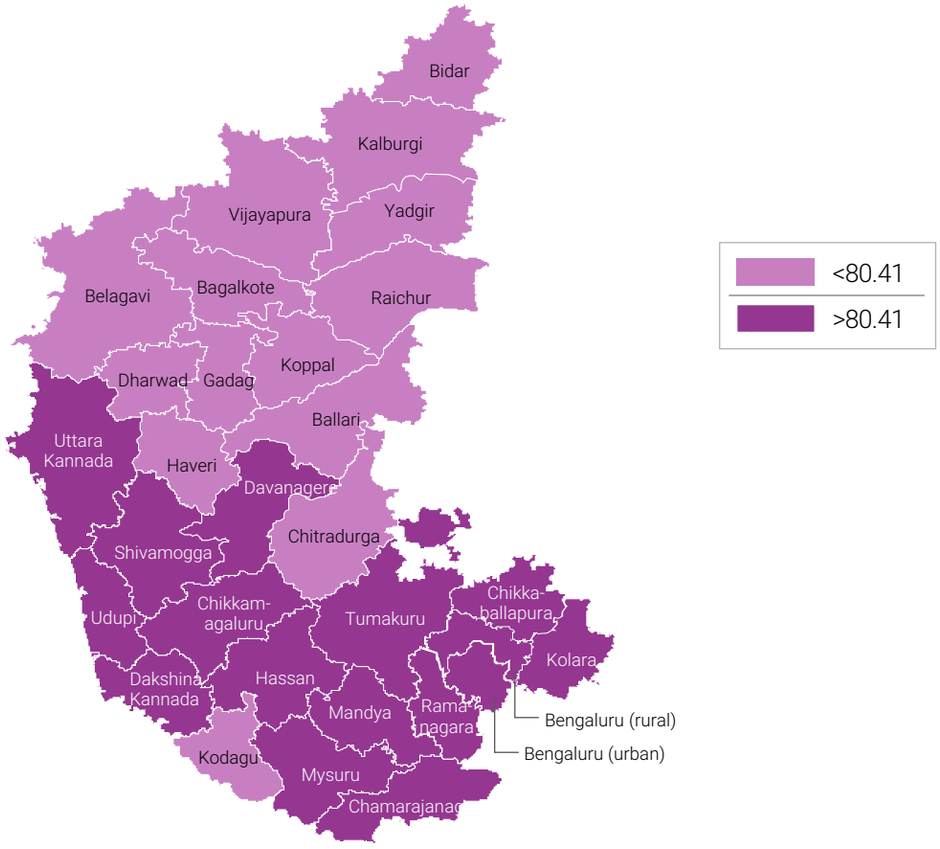
Overview of groundwater-exploited talukas[1]



1. Agriculture committee
2. Groundwater development to annual recharge ratio: over-exploited (>100%), critical (90–100%), semi-critical (70–90%), safe (<70%)

Exhibit 9

District-wise percent of marginal and small farmers greater than state average of 80.41% to total farmers as per 2015–16 agriculture census[1]



1. Agriculture committee

Support for scaling Farmer Producer Organisations

Small and marginal farmers are being collectivised to form Farmer Producer Organisations (FPOs) to tackle issues such as crop production, technology, marketing, and investments. Forming and promoting these self-governed FPOs could address the many challenges faced by small and marginal farmers, particularly in marketing produce. These organisations are created depending upon the needs of the producers. The following options could leverage FPOs to enhance producers' economic and social benefits:

- Create an accelerator for the FPOs programme, with two to three FPO models in each district with top-line revenue of 10 crore in the next two years, serving 30 percent of their members. Evaluate the scope of promoting the IFS model through these pilot FPOs. The two to three FPOs per district could be developed as an alternative market ecosystem, with priority given to areas when two to three surplus crops are available.
- Create a campaign and spread awareness about the importance of FPOs and farmer producer companies to farming communities, mainly where a significant percentage of farmers are marginal and these are alternate avenues for their market linkages.
- Promote and incentivise FPOs to leverage agritech start-up solutions to get real-time market intelligence, direct-to-consumer (D2C) inputs, and market linkages to improve D2C business, thus enhancing farmer earnings. Examples of such projects include NABARD and the Karnataka State Agricultural Produce Processing & Export Corporation initiating the direct export of rose onions from FPOs comprising mainly of small and marginal farmers.

- Collaborate with FPOs to train farmers on soil-protection practices such as residue mulching, no-till farming, growing a cover crop or forage, managed grazing, using compost and biofertilisers, drip sub-fertigation, agroforestry, integration of crops with trees and livestock, and recycling of all biowaste on land.
- Support farmers in increasing the overall value-addition of the agricultural industry in the state by linking farmers with FPOs, encouraging the development of higher value-added products, and providing branding and marketing support by leveraging agricultural federations. For instance, a farmer producing jaggery could partner with FPOs to convert it to chikki, and brand the chikki locally. NABARD has collaborated with the national coffee board for branding, packaging, and labelling to increase the marketability of the tribal FPOs' products.[9] Similar options for identified products across model FPOs could boost the revenue of small and marginal farmers while fully realising the potential of FPOs.
- Develop FPOs to act as knowledge centres. For example, they could display price transparency systems to educate farmers about various market rates other than those of the Agricultural Produce & Livestock Market Committee, such as registered procurement agencies, including agriculture start-ups and large-scale processing centres.

Skills and human capital development

With the continuous advancement of technology and the introduction of modern techniques, it is imperative that the government plans skills-development courses to enable skilling, upskilling, and reskilling of those engaged in agriculture activities. This can be achieved in the following ways:

Training and capability-building programmes to:

- Enable collaboration between industry players and the Indian Agricultural Research Institute (ICAR) to impart training programmes to farmers (especially on the use of technology) to encourage good agricultural practices and educate farmers on the judicious use of pesticides, integrated pest management, post-harvest management, good management practices, multiple crop inputs, growth cycles, supply chains, farm management, and quality assessment to improve land productivity.
- Train farmers in silage preparation to mitigate year-round availability of green fodder, new age practices that upcycle stubble, the use of rice straw and biogas, and growing less water-intensive crops such as millets.
- Incentivise corporates under their corporate social responsibility (CSR) activities to design and offer a structured training programme to inculcate an entrepreneurial mindset into FPOs, focusing on creating awareness of purpose, market study, customer analysis, business models, sales and marketing, and Registrar of Companies compliance.
- Build rigorous capacity exercises for officers and farmers on successful lab-to-field technologies.
- Incentivise food processors via subsidies or CSR benefits to create an ecosystem of partnerships to impart training to farmers for adopting best practices along with support in new technology investments.

Curate and spread awareness about the adoption of farmer guides on:

- Aggregation, grading, sorting, and packaging to enable competitive position in the export market.
- Multiple crop inputs, growth cycles, supply chains, farm management, quality assessment, and other crucial factors to improve land productivity.



[9] Karnataka Economic Survey 2022–23

Modernise crop management and production

Against the backdrop of technological advances, it is imperative to look at innovative and out-of-the box solutions that can be rolled out as pilots. These include:

- Rolling out pilots of crop calendars to 30 percent of farmers in villages with populations of about 3,000 to address the supply-demand gap and spread awareness on proper usage of seeds. Seed-treatment campaigns could be conducted to protect crops from seed- and soil-borne diseases. Given the current prevalence, the state could pilot this by prioritising five villages in Belgavi, Bagalkot, and Haveri.
- Developing high yielding and resistant verities of mulberry and silkworm races through research institutions. Through which achieving timeliness of operation, precision of operation, reduction of loss of crops, increased productivity of land, and thereby increased economic return to sericulturists.
- Co-developing commodity-specific digital platforms for, among others, shrimps, mangoes, bovine, and milk products. Connect directly with international buyers and ensure adherence to export requirements and awareness about sanitary and phytosanitary standards of importing markets. For example, the spices board launched a 3D virtual platform aimed at connecting India's spice exporters with buyers from around the world. NABARD also collaborated with Karnataka state Agricultural Produce Processing Export Corporation Limited (KAPPEC) and initiated the direct export of rose onions.[i]
- Implementing two to three identified projects in each village, leveraging a private-public partnership (PPP) model where the government can give land leases for extended periods of more than 15 years, encouraging private players to build and maintain the projects with fixed binding clauses. These infrastructure projects would ensure supply-demand checks, allowing farmers to sell enough to meet their financial needs (for example, ERGOS).

Infrastructure development

While the state plans a host of interventions that would need support from the entire ecosystem, it is essential to ensure proper infrastructure availability with backward and forward integration for maximum return on investment of the existing produce, while focusing on efforts to improve yield and productivity. These could include:

- Agri value-chain players, such as producers, agri-businesses, food-processing companies, financiers, and corporates entering into partnerships with the state government to enable the creation of end to end crop value-chain clusters.[10] For example, there could be food parks for lighthouse value chains, such as shrimp, mango, spices, and milk, with focus on districts with high primary food processing. This would support farmers on input and crop selection, provide credit, address critical infrastructure gaps – such as cold-chain logistics at shrimp farms – catapult value-add activities (for example, mango processing), and strengthen market linkages (which crop can be piloted and where).
- Establishing state-of-the-art post-harvest management centres within 25 kilometres of production and incentivising private investment for "One District One Product" schemes to improve post-harvest processing, from the current 1 percent to 2 percent. This could also help to manage 47 lakh metric tonnes of marketable surplus, reduce spoilage from current levels of 25 percent to 30 percent, and improve the proportion of horticulture product meeting grade-A criteria (from current levels of 30 percent to 45 percent).[iii] Training and educating mango growers about pre-harvest and post-harvest processes via technology demonstrations and technology dissemination would help them fetch better prices.

  Furthermore, services from Varuna Mitra, where more than 2,000 farmers have been contacted[11] and 40 percent of them reported a 40 percent decrease in post-harvest losses, could be accessed via the following:

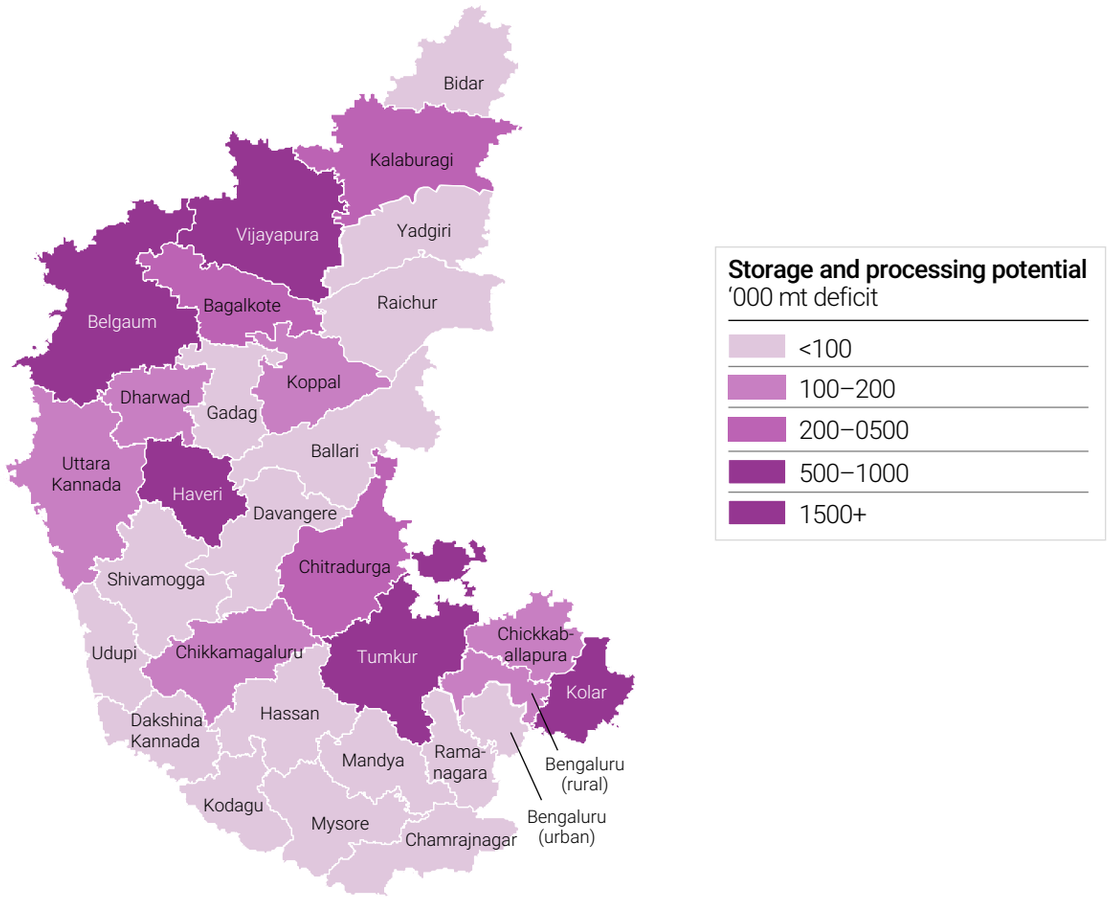
Food-processing centres in identified districts such as Belgavi,Tumakuru, Hassan, Vijayapura, and Uttara Kannada that produce value-added products such as bakery products, preserved fruits and nuts, fruit and vegetable juices, and ready-to-consume drinks products (including nutraceutical products), as well as pack houses, integrated cold-chain facilities, and testing laboratories in the agriculture export zones. (Exhibit 10)

[10] Crop value-chain cluster serves to build "vertical" relationships along the value chain among input suppliers, processors, exporters, and buyers. It also builds "horizontal" relationships at each link between producers and facilitating organisations such as technology providers, trainers, and research institutes. These stakeholders come together along the entire value chain to reduce transaction costs, minimise the cost of doing business including regulatory compliance and factor costs of production, improve quality across production, processing, logistics, and establish market linkages, thus benefiting farmers and agri-businesses alike.

[11] Karnataka Economic Survey 2022–23

Exhibit 10

Storage and post-processing potential[1]



1. Agriculture committee

- Setting up "seed to sales" single-window centres[iii] (like Andhra Pradesh's Rythu Bharosa Kendras) in every gram panchayat and calling them Farmers Welfare Centres. These could use staff and infrastructure of the departments of agriculture, horticulture, sericulture, animal husbandry and fisheries, Krishi Vigyan Kendras, and agricultural universities to sell pre-tested quality seeds, certified fertilisers, and livestock feed. These centres would also provide farm equipment and enable farmers to sell their produce at the prevailing minimum support price (MSP) via supporting systems of e-cropping, geo-tagging, soil testing, and consultancy about what crops to sow, and the quality and type of fertiliser to use.
- Incentivising the establishment of food-safety laboratories across the state to boost post-harvest testing for antibiotics, heavy metals, and histamines.
- Setting up agriculture export zones in the state.
- Establishing horticulture export zones near airports.
- Promoting the establishment of tissue culture laboratories.
- Developing forward linkages, such as markets and brands, prototypes (branded outlets), cold storage, and cold chain to promote the market-driven development of inland fisheries.
- Institutionalising a federation-type structure to drive collection through various centres.

Setting up models and pilots

Aquaculture has seen a strong boom in Andhra Pradesh in the recent decades. The state has become one of the largest producers of farmed fish and shrimp. The initial success of the aquaculture projects have made this sector an appealing and profitable choice for many farmers who regularly dealt with flooding, salt water intrusion into irrigation channels, and cyclones in Bay of Bengal. Some of the distinguishing factors that have been instrumental to the success of Andhra Pradesh's fisheries industry include:

- Right size of the seed, right starching density, and right scale (size of the pond / tank) for better ROI.
- Market availability due to the volume of production. (Andhra Pradesh Fisheries Corporation (APFC) represents the public sector in the marketing system. It has marketing units in coastal districts with fish and prawn procurement centres along the coast to procure fish and prawn directly from the small-scale fishermen.
- Forward linkages–markets and brand–branded outlets, cold storage, cold chain to promote market driven development
- Inland aquaculture farms along rivers and canals where people once raised crops (Godavari and the Krishna flow through the heart of the state along with their numerous tributaries. These rivers, streams, and ponds provide ample scope for development of inland fisheries).
- Large average size of land holding, compared to Karnataka (average land holding in the state is <2.5 acres) providing options for individual farming.

Source: Department, Fisheries sector in India and Andhra Pradesh: An Overview, A Madhu

Model food parks demonstrating best practices, processing centres, and the adoption of modern technologies for every four to five districts. These could prioritise major crops such as mango, guava, coconut, and turmeric powder at Haveri, Ramanagara, Kolar, and Tumkur, respectively.

Model farmlands across districts to showcase interventions needed to improve yield per hectare, moving away from model lands around agriculture universities. These could prioritise sugarcane at Bagalokot and Belagavi; coconut at Tumkur, Hassan, and Ramanagar; rice and cotton at Raichur; mango at Ramanagar, Kolar, Tumkur, and Haveri; and maize at Haveri.

Infrastructure specifically designed for fisheries can be established. This could include the following:

Establishing new fish-seed production farms.

- Upgrading existing farms for diversified species production.
- Creating and developing eco-tourism hubs in selected reservoirs and large departmental tanks with facilities to catch and carry the fish.
- Setting up offshore processing plants per every 50 kilometres of coastline.
- Establishing mini-ice plants at every fish landing centre with a potential of landing 100 kilograms of fish per day.
- Adopting 100 deep-sea fishing vessels.
- Expanding the area under brackish-water aquaculture.
- Establishing new fish-seed production farms in nine state divisions and upgrading existing farms in nine state divisions for diversified species production.
- Constructing modern sales outlets by the government, with the transition to a franchisee model. The government can increase the number of outlets under the Pradhan Mantri Matsya Sampada Yojana scheme. Altogether, 500 such outlets could generate income of INR 150 crore and generate employment for more than 1 lakh people.[iii]

Adoption of digital solutions

The state could leverage its technology ecosystem and the solutions from agritech start-ups to promote extended market linkages and information availability and empower farmers by leveraging technology to improve their income. This could be achieved in the following ways:

Launch agronomy services, ensuring last-mile information availability to farmers' mobile phones, with audio notes and text messages for problems posted by farmers. The government could collaborate with agritech companies to develop solutions focused on propagating information such as live rates (for example, AgroStar). These services could also set up a dedicated broadcasting channel and programmes on the local Doordarshan network, as well as YouTube channels to share information related to agriculture developments, agriculture schemes, Agriculture Infrastructure Fund (AIF) benefits, and start-ups.

Collaborate with technology companies to develop an agriculture-focused app providing information about government schemes and market demand, and showcasing pockets of excellence – such as high yield achievements due to strategic interventions (for example, Agrostar and Mooofarm) – to farmers, FPOs, and other players in the value chain. This would maintain information symmetry in the following ways:

- Promote the adoption of technology targeting the second generation of the farming community. Partner with agritechs to develop solutions that can connect FPOs with global buyers to generate more export opportunities.
- Create better market linkages through agritech start-ups for non-crop farmers, for example spices and condiments, fruits and vegetables, and agricultural producers not backed by the MSP, thereby enabling them to accrue better prices for their products and increase income.

Incentivise agritech players to develop platforms and solutions enabling "farm-to-fork" (both internal and global markets) to reduce inefficiencies and help farmers access higher prices from their customers. Furthermore, run pilots with farmers and FPOs to showcase the impact and provide training related to the use of technology, and export standards (for example, Sahyadri Farmers Producer Company).

Leverage data analytics to monitor cropping patterns across the state at farm level to identify the creation of potential bubbles (formed through excessive planting of any crop by farmers in response to a momentary price increase). Data analytics could also drive evidence-based interventions – for example, suggesting alternative profitable cropping options at farmer level to maintain demand-supply dynamics in the state.

Establish outsourced digital marketing platforms in every zone and help-centres for daily fish-price predictions, counselling farmers on export-related procedures and developing and managing farmer-friendly mobile applications.

Consolidate MSME food processors on a single unified state portal for connecting with retail, export, and tertiary processors.

Adopt digital solutions such as seed traceability using blockchain, and integrated pest management with plant protection advisories using artificial intelligence to improve the yield by 20 percent.

Easing capital availability

The availability of capital is of foremost importance for farmers to adopt modern techniques while carrying out ongoing farming activities. Government support could be provided to ensure ease of capital availability, especially for small farmers which could include:

- Amending the co-operative act to permit a pari passu charge to enhance agriculture's credit-to-GDP ratio.
- Collaborating with financial institutions to enable easier availability of funds by provisioning a dedicated corpus and lower interest rates for FPOs and small farmers with a special focus on rural areas. It could also introduce special schemes oriented towards FPOs, farmer collectives, and entities engaged with FPOs, and promote a co-lending structure that has significant potential to align the strengths of banks and non-banking financial companies (NBFCs) to accentuate the flow of credit to FPOs. The government could also incentivise banks (land allocation at lower rates, credit guarantees, etcetera) by creating a banking footprint and expanding the Kisan Credit Card across farmers adopting digital lending solutions.
- Incentivising farm equipment manufacturers to collaborate with bank financiers (by sharing 50 percent rental payout with farmers) and adopting innovative financing models (equipment as a service) for rental and shared use of farm equipment with a focus on driving mechanisation beyond tractors.

- Providing financing options or credit guarantees on equipment loans to farmers with continued support through priority sector lending to enable affordable credit.
- Encouraging banks to provide loans to farmers who have not exhausted their loan limits by providing minimum guaranteed support.

Governance of ongoing initiatives

While the government can facilitate the ease of doing business and create an environment where business can prosper, there needs to be a strong governance engine to monitor on-the-ground implementation and effective execution of the strategies. These may require the institution of multiple teams and task forces to drive the implementation, as follows:

- A task force to govern and manage the effective utilisation of the AIF (about INR 360 crore not utilised and INR 3,500–4,000 crore earmarked for use by states). [iii]
- A governing body to oversee the rollout of an agriculture start-up policy and the effective use of INR 50 crore per year.
- An agency to help farmers (for example, spices and condiments, fruits and vegetables) and agriculture producers who are not supported by the MSP to accrue higher value-add for their products, thereby increasing their incomes.
- A committee to oversee the implementation of a drip-irrigation policy with participation from private players as necessary for faster implementation.
- A team to address the power supply issues and develop an implementation plan to drive the adoption of drip irrigation and solar-based irrigation to address water scarcity in the state.
- A task force to define the agriculture export strategy focusing on all the factors of aggregation, grading, sorting, packaging, creating the required trust mark, and linking the products to the export market. Linkages include agencies to certify organic produce.
- A committee for each agro-climatic zone to ensure the implementation of targeted initiatives to improve yield per acre productivity. The committee would receive details such as residue impacting high-potential export crops and would encourage the use of technology, linking farmers with modern agritech entrepreneurs.
- Federations (such as the milk federation) for agricultural crops, vegetables and fruits, and horticultural products to promote value-added product creation (for example, jaggery and chikki from sugarcane), own brand of mutton, and attach Brand Karnataka to products to improve marketability and return on investment.

Case study [iii]

Learn from countries like Thailand, which has one of the most advanced food-processing industries in Southeast Asia. It has more than 10,000 food and beverage processing factories. This is the result of below developments:

- A shift towards high-value products
- A shift towards imported raw materials
- Increase in the internal demand for safe food
- Emergence of national brands and the consequent growth of the large-scale distributors
- Rapid rise of foreign retailers
- Rising intra-ASEAN trade in food
- Contract farming
- Vertical integration of food producers.

It has been the endeavor of the government to promote the food-processing industry in the country to reduce wastage of agricultural produce and minimize post- harvest losses.

Additionally, the state could spread awareness and push for adoption of central schemes like PMKSY (Pradhan Mantri Kisan SAMPADA Yojana) focused on modernizing processing and decreasing agri-waste. It is an umbrella scheme incorporating ongoing schemes.

Interventions to spread awareness

Efforts may be needed to drive campaigns and education sessions to spread awareness on available benefits, the adoption of sustainable practices, modern techniques, and the benefits of interventions to increase productivity, yield, and farmer income. These could include:

- Promoting sustainable agriculture practices by creating awareness of schemes around subsidising micro irrigation (for example, the Per Drop More Crop scheme and Micro Irrigation Fund), preserving soil health (Paramparagat Krishi Vikas Yojana and the Soil Health Card), and a host of other initiatives under the National Mission for Sustainable Agriculture. Districts such as Belagavi, Raichur, Vijaya Pura, and Bagalokote, which have a high potential for micro-irrigation, should be prioritised.
- Creating awareness programmes and conducting training to emphasise the importance of crop rotation and the adoption of better agriculture practices, such as precision farming and micro irrigation to improve crop yield and reduce water use. This could include creating awareness around pilots and models set up in districts and focusing on regions that showcase practical interventions (Bagalkot, Belgavi, Mandya, Dharwad, Raichur, and Haveri).
-
- Running campaigns in the animal-feed industry to improve livestock feeding through education on animal-feed-mix optimisation, feed additives, and feed-grain processing for digestibility to curb methane-driven emissions.
- Educating and spreading awareness about globally accepted certification standards and providing training to support farmers in meeting these standards to maximise value generated from their outputs. It is also important to boost technical knowledge about food safety, and the packaging and storing of processed products.
- Creating awareness campaigns on the availability of the MSP and the accompanying procurement organisations for farmers.[iii] This is crucial, as less than 50 percent of farmers are aware of the MSP for their crop, and less than 24 percent of crop output in India was sold under this scheme. Improved quality of support for this mechanism could reduce the probability of loan defaulting.
- Creating awareness about locally produced processed food items and promotion at government outlets.
- Promoting the cultivation and processing of mushrooms and other enriched foods in the state.
- Promoting the consumption of coconut by-products in the state through the development of products like neera.
- Promoting intrinsic cultural food items at global level via government officials and foreign delegates.

Privatising unutilised government farms and hatcheries to drive additional private-player inclusion in the sector.

Establishing relationships with foreign importing companies and aiming to export directly to quick-service restaurants and retailers. Consortia such as state agricultural marketing boards (for example, the Tamil Nadu State Agricultural Marketing Board) could extend their reach for MSMEs by focusing on branding and advocating for specific products abroad.

Easing the Agricultural Produce Market Committee and DDR licensing stringency.

Enabling long-term leasing of government warehouses that are under the Agricultural Produce Market Committee, with the assurance of smooth operations during lease tenure.

Enforcing higher standards (meat operator licence, streamline market with accountability on payments, etcetera) of meat and seafood retailing, which will catalyse supplies and consumption.

Setting up a mechanism to record the price of procurement by start-ups (usually higher than the Agricultural Produce Market Committee) to achieve correct reporting of gross value-add. Many start-ups deploy their own logistics and collection centres, which saves transportation costs and percentage cuts they give for traders. Checking the procurement prices of start-ups over INR 50 crore would help.

Implementing provisions for easier transfer of property across generations, or provisions to avail farm benefits (subsidised seed, fertiliser) offered by centre and state when land ownership is under an ancestral family member.

Pushing for near 100 percent adoption of the eNAM portal by all farmers in the state to ensure they have access to immediate market pricing information.

Developing stringent certification standards in collaboration with leading international agricultural countries and international agencies to boost exports.

Pushing for universal enrolment of farmers on a marketplace platform of their choice (the platform would be provided by the government and an agritech start-up), and training farmers how to use it to ensure they have the option to sell their product without a broker.

Launching a scheme for the procurement of MSME-processed items in bulk by railway canteens, malls, etcetera.

Improving insurance coverage offerings for farmers to support them during adverse conditions.

Increasing awareness of crop insurance schemes through campaigns and introducing designated agents and extension services. Special attention can be paid to non-loanee and tenant farmers (who lack access to land records and struggle to get access) to increase farmer insurance enrolment. Currently, 17 percent of farmed land in the state comes under crop insurance, lower than India's already low value of 24 percent.[iii]

Bringing silk reeling sector under the benefits of MSME and also strengthening linkages between the silk reelers and weaving industry.

Settling insurance claims in a time-bound manner and expediting the claims settlement process, as severe delays threaten farmers' survival during crop loss.

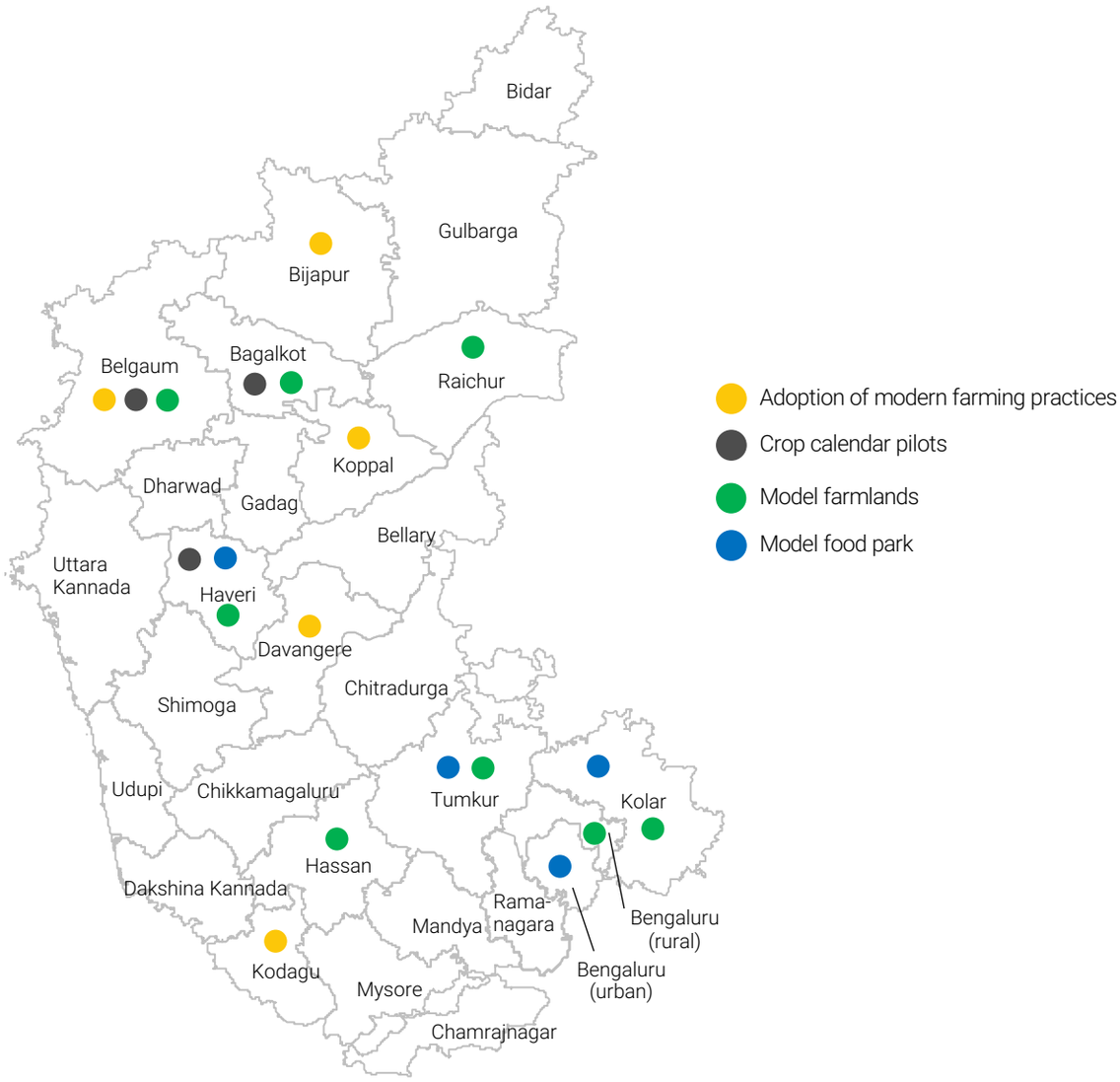
Providing a no-claim bonus for farmers who have not made any insurance claims for three years or a similar timeframe, either in the form of cash, kind (inputs), or in reduced premiums. Additionally, crop insurance premiums could be further subsidised for marginal and landless farmers to make insurance more attractive.

Bundling personal accident insurance with crop insurance, like models in the states of Tamil Nadu, Gujarat, and the Unified Package Insurance Scheme in the district of Chitradurga. This would encourage more farmers to enrol in crop insurance and ensure they are covered in case of accident.

One of the key near-term focus areas could be the launch of the pilots and model farmlands across districts to showcase interventions needed to improve yield per acre. This would increase farmers' confidence in the applicability of these methods in a live environment and not under controlled conditions. (Exhibit 11)

Exhibit 11

Model farmland[1]



1. Agriculture committee

References

i Karnataka economic survey

ii GDP performance and value forecast

iii Agriculture committee

CHAPTER

02

Manufacturing





The manufacturing sector is the driver of growth in Karnataka

Manufacturing could become the most significant factor in Karnataka's aspiration to reach $1 trillion GDP in the next decade. This vision took shape over the last decade under India's initiatives to strengthen the competitiveness of domestic manufacturing and create a favourable environment through policy reforms. Manufacturing also has incredible potential to create millions of jobs and boost exports.

However, over the past decade, the manufacturing and construction sectors' sub-par performance has slowed down Karnataka's growth and job creation endeavors. The state has, as a result, prioritised 11 subs-ectors to drive holistic manufacturing growth and married those with clear and attainable actions, initiatives, and interventions for each. The chapter concludes with sector-agnostic options needed to support overall growth and create an environment in which Karnataka's manufacturing industry can flourish.

Manufacturing could generate $1.25 trillion in GDP in 2030

The manufacturing sector has significant growth opportunities, which have been spurred by shifts in global trade flows, increased avenues for capital availability, the rising adoption of fourth-industrial-revolution technologies (Industry 4.0), and a favourable policy environment. Over the past decade, India has made significant progress in strengthening the competitiveness of its domestic manufacturing industry, especially under the Atmanirbhar Bharat and the "Make in India" initiatives. In addition, policy reforms have encouraged manufacturing growth.

At a national level, manufacturing has the highest potential of all sectors to propel job growth, with a possible 60 million to 70 million jobs created by 2030.[iii] The sector could generate $1.25 trillion in GDP in 2030, more than double the $500 billion it accounted for in 2020, growing at an annual CAGR of 9.6 percent–this is the bare minimum that Karnataka could target when focusing effort for the segment. India could aspire to boost its real GDP growth rate for manufacturing to 9 to 10 percent (from 7 to 8 percent in 2022), while aiming to triple manufacturing exports by 2030 to between $400 billion and $420 billion (from $120 billion to $140 billion in 2021).[12] With due effort and focus, Karnataka can capitalise on the market opportunity in the coming decade, growing at over 15 percent CAGR and improving the GDP contribution to over 22 percent. The state is well placed to capture the potential opportunity by focusing on core industries along with the sunrise sectors, which also have high export potential.

Historically, the industry sector has been a laggard with a ten-year CAGR of only 9.7 percent, [ii] compared to 14.8 percent for services and 13.2 percent for agriculture. It contains two highly under-utilised growth drivers: manufacturing and construction, both of which need policies, public investment, and structural interventions to grow into massive economic growth engines and provide quality employment to the workforce. Sub-par performance of these sectors has slowed down Karnataka's growth rate and job creation. The industry sector contributes to 19.8 percent of the state's GVA,[iii] much lower compared to other top-performing states like Gujrat (43 percent), Tamil Nadu (33 percent), and Maharashtra (26.8 percent). The additional impact from the COVID-19 pandemic has only delayed the potential realisation of this sector. While the service sector is leading the state economy, Karnataka could promote further manufacturing growth to unleash its potential to achieve the $1 trillion GDP goal for 2032 (Exhibit 12 & 13).

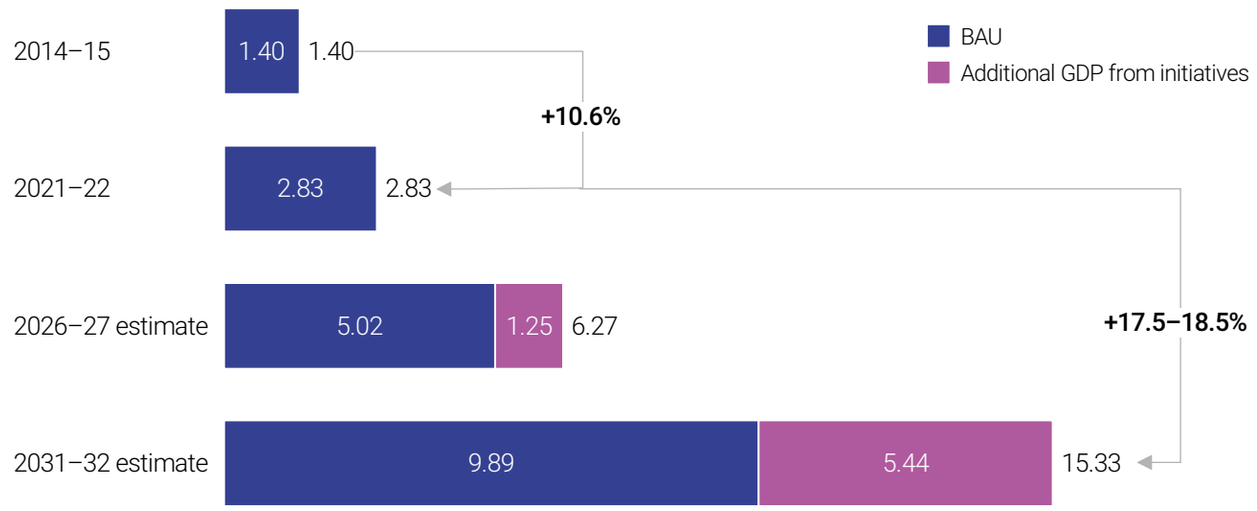
$1 trillion
GDP in the next decade

[12] India's turning point: An economic agenda to spur growth and jobs, August 26, 2020.

Exhibit 12

Manufacturing sector performance[1]

INR lakh crore



1. Manufacturing committee

Exhibit 13

Manufacturing sector vision

Macroeconomic indicators	From (2021–22)	To (2031–32)
Nominal sectoral GSDP (INR lakh crore)	2.8	**14–15** ($5.5–6.5 in 2026)
GSDP growth (%)	10.6% (Pre-COVID 2011–12 to 2019–20)	**17%–18%**
Employment as a % of total employment[1]	11.74	**23**
Exports ($ bn)	25	**95–100** (15% CAGR till 2031–32)
# of Large firms[2]	14	**40–50**
MSME investments[3] (INR lakh crore)	4	**10–11** (5 by 2025)

1. SDG Ranking, 2031 Aspiration: 10% more than current performance of Gujrat (best performing state in India)
2. Firms with revenue >~$500 m in a year HQ in Karnataka in manufacturing sector, Source Capital IQ
3. Micro, Small, and Medium Enterprises in Karnataka, Karnataka Economic Survey 2021–22

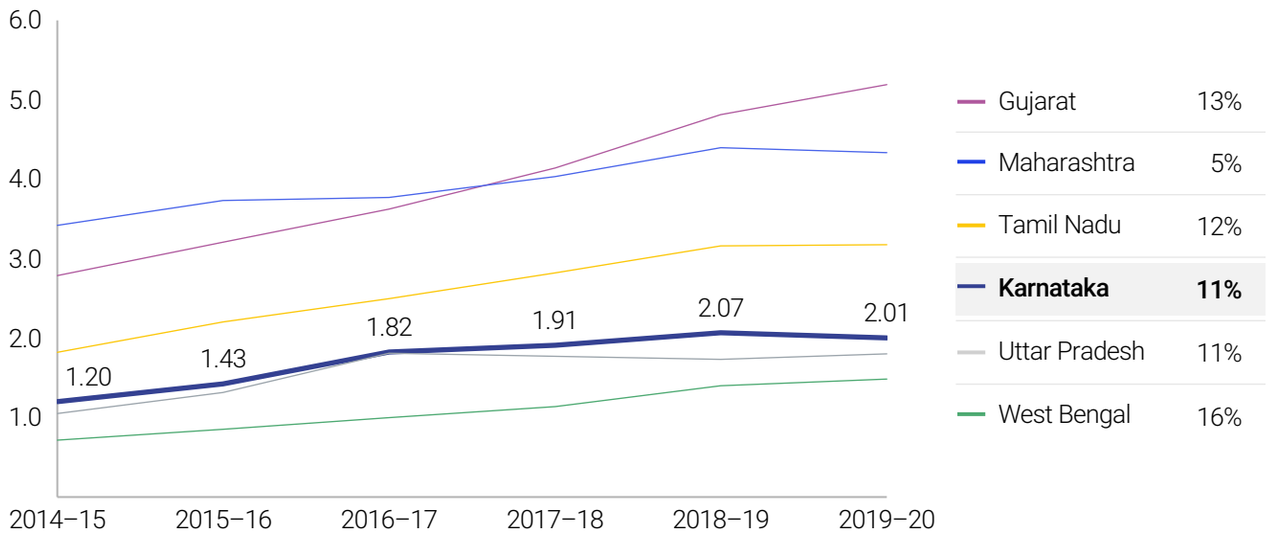
Source: GDP Performance and forecast value

Compared with the manufacturing performance of other top states, strong growth is exhibited across Gujrat, Tamil Nadu, Uttar Pradesh, and West Bengal. Industry agnostic growth is evident in Gujrat and Tamil Nadu, which reduces any landscape-specific advantages that might have driven the growth. Chemicals (24 percent) and oil and gas (17 percent)[iii] contribute to 41 percent of manufacturing GVA for Gujrat, where Tamil Nadu's manufacturing is dominated by automobiles (18 percent), machinery and equipment (11 percent), textiles and apparel (17 percent), and transport equipment, among others. Karnataka could to focus on an industry mix dominated by high-value addition, hi-tech, and employment-intensive sectors. (Exhibit 14)

Karnataka has shown a reasonable performance in exports.However, the share of exports for the state has remained stagnant at about 6 percent for the past five years.[ii] Given Karnataka's standing in the top five states of the country, its strong share of export for sectors like aerospace, electronics, and textiles, and its focus on export-oriented sectors like food-processing, electronic components, and development of industry corridors, means that Karnataka may have a significant opportunity to boost exports. (Exhibits 15, 16, and 17).

Exhibit 14

Manufacturing sector growth – comparison across top states[1]

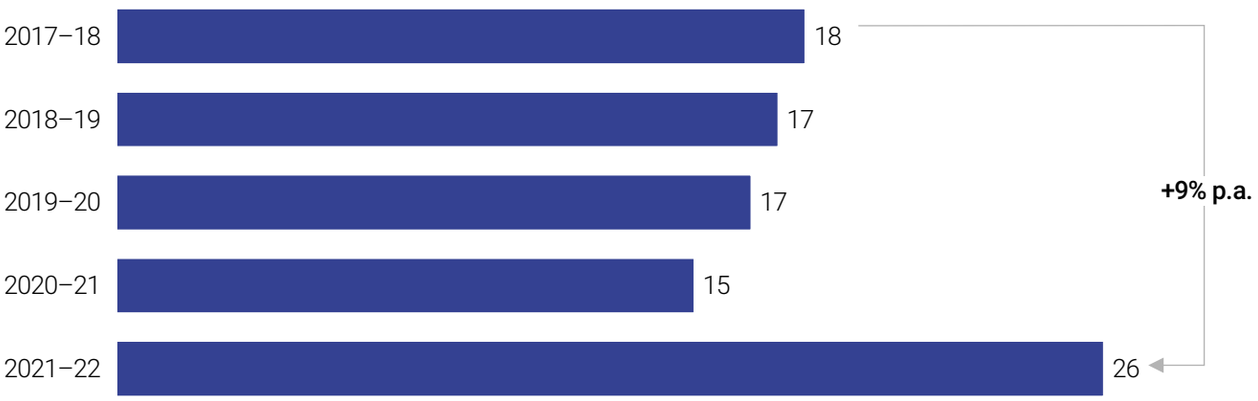


1. Manufacturing committee

Exhibit 15

Karnataka export performance – Manufacturing

$ billion

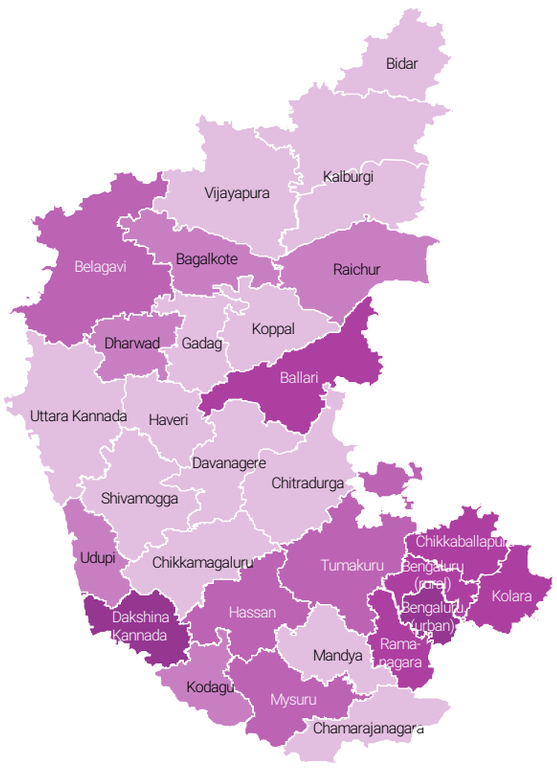


Source: State export data

Exhibit 16

Karnataka district-wise export[1]

2021–22, $ million



Five districts (Bengaluru Urban, Dakshin Kannada, Bengaluru Rural, Ballari, and Kolar) contribute to 83 percent Karnataka's exports, followed by Mysuru, Hassan, Tumkur, and Belagavi.

Strategic plans to set up export-focused industries and clusters aligning to Beyond Bengaluru's goals and aspirational districts programme could help boost exports from districts in the northern and central part of the state that have a lower share in export.

Total exports
$ m

- <100
- 100–500
- 500–1,000
- 1,000–5,000
- 5,000+

1 State export data

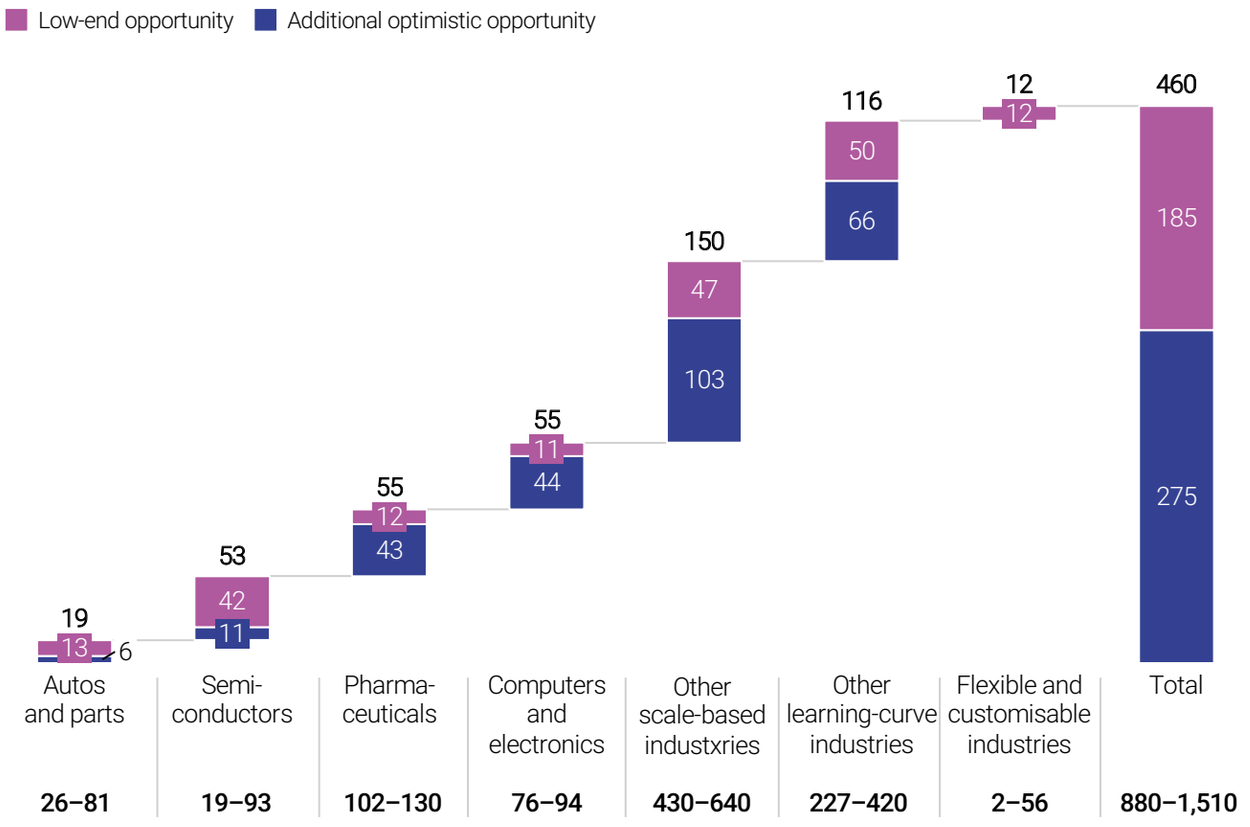
In large, developed economies like the United States,[iii] the focus on manufacturing across key sectors has the potential to drive incremental GDP of about $275 billion to boost it to $460 billion, while adding up to 1.5 million jobs.

Development expenditure in the industry sector may need to increase to move people from the agricultural sector, which also provides opportunities for higher income in close vicinity to homes. Formal job creation in EPF also shows that formal job potential in Karnataka is very high.

Driven by the need to push growth across manufacturing, Karnataka has prioritised 11 subsectors to identify key unlocks that could help drive growth for the identified industries (Exhibit 18). The gradual development of skilled labour in the low-skilled and semi-skilled population can be most effectively employed in labour-intensive industries like textiles, automobiles, and electronics assembly, among others. These industries can drive per-capita income, economic growth, and volume-export capabilities in Karnataka.

Exhibit 17

Opportunities to grow export[1]



1. Manufacturing committee

Exhibit 18

Manufacturing subsectors

Textiles	Aerospace and defence	Auto and auto Components	Food processing
Pharmaceuticals	Petrochemicals	Capital goods	FMCG
Electronics	Electric vehicles	Steel	

The 11 identified and prioritised subsectors focus on driving holistic growth to provide stability and mass employment, while being a leader across cutting-edge technology. These include:

- **Core manufacturing** industries like capital goods and automotive, which can provide a solid foundation for the state to attract long-term, large-scale investments and provide employment.
- **Cross-sector industries** like food-processing and FMCG, which can provide strong links with the agriculture sector and assist in transitioning the workforce to complementary industries, while Karnataka moves some of the workforce from agriculture to industry.
- **Sunrise sectors,** like electric vehicles, aerospace, and digital infrastructure and connectivity, are areas where Karnataka can capitalise on its leading position, owing to research organisations and start-ups in the state.

Textiles and apparel

Karnataka is India's leading destination for the textile and apparel sector. People refer to the capital city, Bengaluru, as India's garment capital.[iii] Karnataka's textile industry — valued at $1.56 billion — contributes 20 percent to garment production in the country.

Around 35 percent of the country's raw silk production occurs in Karnataka,[iii] and the state's silk exports account for 24 percent of the silk goods export value nationally. Karnataka also contributes 11 percent of the country's total wool production and nearly 6 percent of cotton.

Karnataka's textile industry currently exports nearly $1.85 billion, which accounts for around 8 percent of India's national exports.[iii] This sector has significant job creation potential, with nearly 70 jobs created for one crore investment. With a dedicated focus, the textile sector could drive sectoral growth of almost 15 percent CAGR — faster than the historical performance shown (Exhibit 19).

Looking through a global lens

India as a country is experiencing remained stagnant exports, and the competitiveness of both the Karnataka and the country may need to be examined.

India currently lags behind its neighbouring countries concerning global market share and textiles' exports.[iii] China dominates the global textile market with a 60 percent to 70 percent share. Bangladesh and Vietnam (above $40 billion) perform better than India ($16 billion) in exports. Bangladesh target for exports is $100 billion, whereas India's target is only around $30 billion and lacks a robust road map to achieve this. This considerable quantum difference between these countries with such geographical proximity may need to be delved into in more depth.

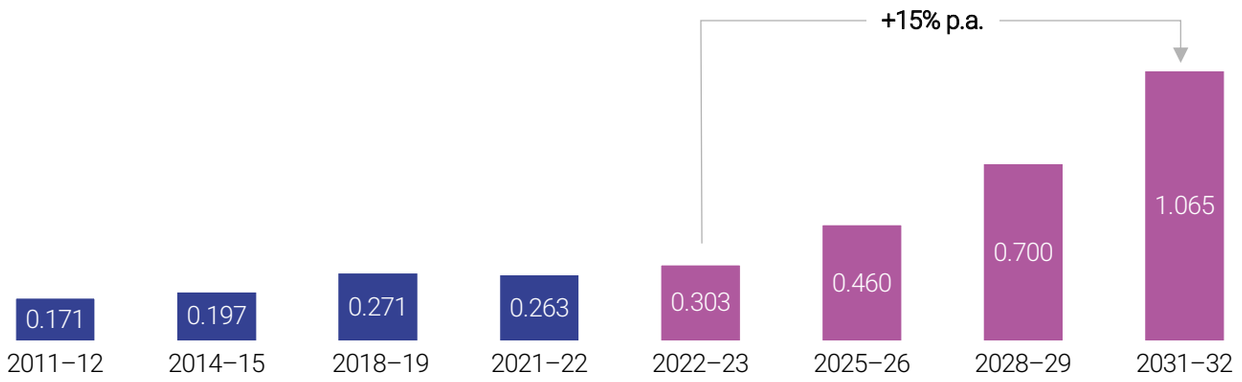
A dedicated focus on the textile industry in Bangladesh has seen the industry increase its annual revenue from $19 billion to $34 billion – a 79 percent increase over seven years, growing at a CAGR of 9 percent.[13] The GDP of textiles and apparel manufacturing for Karnataka was nearly $3.7 billion in 2021 to 2022.[ii] Over the past decade, an essential strategy for the sector's growth in Bangladesh has been diversifying customer countries and moving to more complex products and value-added services. Bangladesh's ready-made-garment (RMG) sector has made progress in broadening its customer portfolio to manage risk and adapt to changing demand patterns in the global fashion market. Some of the key factors driving the industry growth include labour availability (cheap and vast workforce with lower daily wages; and nearly 40 national universities that can provide skilled human resources), favourable government policies, financial facilities, lower tariffs enabling duty-free access to many countries, and compliance with international standards of global brands.[14]

[13] Safety first: Bangladesh garment industry rebounds, IFC
[14] What makes Bangladesh — A hub of garment manufacturing?, Stitchdiary

Exhibit 19

Textile sector performance and forecast[1]

INR lakh crore



1. GDP performance and forecast

As China's living costs skyrocket, so do its labour costs. As a result, labour-intensive industries like garments and apparel are slowly starting to shift elsewhere in Asia.[iii] Currently, economies in South and Southeast Asia, like Bangladesh, Indonesia, and Vietnam, are capturing this shift. Karnataka could build excess capacity and boost exports to capture the markets.

Challenges facing Karnataka's textile sector

Karnataka's textile sector faces several challenges to overcome for growth. These include:

- Karnataka's textile sector has stagnated due to the underperformance of RMG cotton, including accessories. However, other segments like cotton fabrics, made-ups, and RMG of other textile materials (such as silk), have shown faster growth than national CAGR over the past five years.
- A renewed focus is required to develop and build on existing cotton fabrics, accessories, cotton yarn, and RMG of other textiles-based industries across regions such as Ballari, Bengaluru Rural, Chamrajanagar, Chitradurga, Mandya, Raichur, Ramnagara, Shivamogga, and Yadgir.
- Karnataka's textile exports have also remained stagnant over the past few years with minimal or no growth (Exhibit 20).
- Small and medium-sized companies dominate the industry, and few prominent players exist. This is leading to fragmented supply chains and poor cost competitiveness.
- The textile industry has immense job creation potential, and the availability of a trained workforce is a crucial challenge to the industry's growth. The industry traditionally grew around Bengaluru, where labour was available, but when this commodity became scarce, the industry spread to other parts of the state. Today Karnataka is heavily dependent on migrant labour, which necessitates the development of large pools of trained labour within the state.

Opportunities and possible actions for growth

Potential areas to drive growth for Karnataka's textile industry of Karnataka's have been identified:

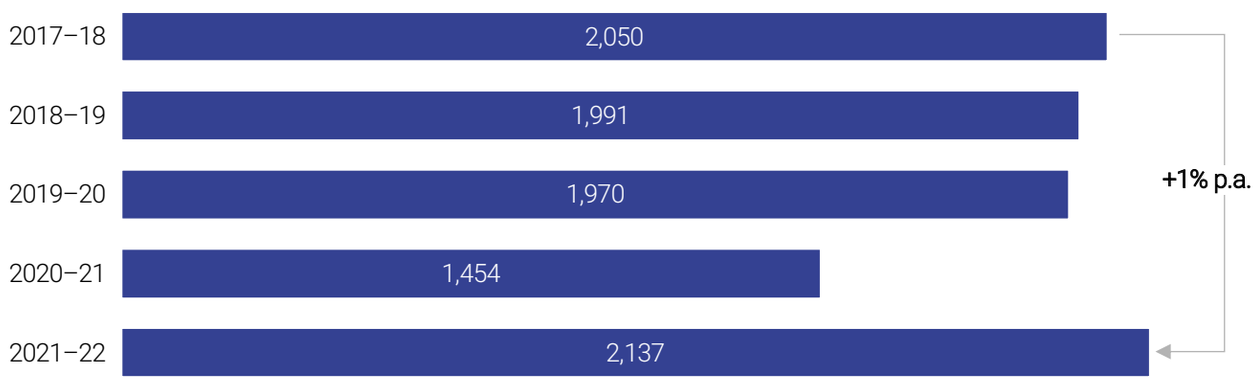
- **Scaling up companies and facilitating large-scale production.** Strategising for scaling up and facilitating large-scale production is vital to achieve the sector targets. This could be done by attracting new players or encouraging existing players to grow.
- **Offering digital solutions for small business integration in the ecosystem.** Private companies could offer solutions to enable small businesses to integrate with the Open Network for Digital Commerce and the Government e-Marketplace, personalise the customer experience, and optimise their operations, including inventory planning and supply chain management.

  Integration through a unified approach or developing clusters in strategic locations with good port connectivity and ample labour supply could significantly boost the sector.

Exhibit 20

Karnataka commodity exports – textile

$ million



Source: District-wise export data

- **Addressing labour requirements:** The textile industry has immense job creation potential, and the availability of a trained workforce is a crucial challenge in the industry's growth. A renewed, focused effort may need to be made to develop large pools of trained labour within Karnataka to reduce the dependence on migrated labour while improving the state's employment rates. This could have a multi-pronged impact of driving the industry's growth, migrating people out from agriculture, and improving the state's and nation's per capita income.

To promote faster skilling of the workforce, Karnataka could curate employee capability-building programmes. For example, at-scale manufacturers could upskill or reskill their employees with the latest manufacturing technologies through tie-ups with academic institutions and digital training platforms. This could help produce an industry-ready workforce for direct absorption into the organisation.

- **Improving female labour participation:** There could be a concerted effort to attract more female employees into the industry.[iii] Research has found that textiles and garments, healthcare services, beauty services, and IT-enabled services already draw a relatively large proportion of women. At the same time, growth sectors such as leisure and hospitality (tourism services), and electronics assembly and manufacturing also hold promise. [iii] Research has further revealed that almost three-quarters of the vocational courses women choose in India relate to textiles and garments, computers, healthcare, and beauty services.

Driving double-digit growth

A strong focus on Karnataka's key pain points could help build momentum for the state and drive double-digit growth for the textile and apparel manufacturing industry, which already has a robust set-up. There is considerable potential for the industry to grow.

Setting up an advisory panel with adequate representation from the industry and government could be an initiative that can help the government understand the ground realities better. Adequate infrastructural developments could also focus on facilitating businesses to be set up in rural areas. These measures could help the industry achieve its desired growth rate of 15 percent compounded annual growth.



Food processing

The food-processing industry plays a pivotal role in strengthening all three critical sectors of the economy simultaneously – agriculture, manufacturing, and services. Karnataka, a richly endowed state, has immense potential to develop a robust and thriving processing industry with a well-established infrastructure of food parks and cold chains.

Over 65 percent of Karnataka's geographical area[iii] is under cultivation, which amounts to 12.40 million hectares. It is home to ten agro-climatic zones and six soil types, making it an agricultural heaven. Cereals account for 49 percent of the state's total agricultural cropped area, pulses 24 percent, oilseeds 15 percent, cotton 6 percent, sugarcane 5 percent, and tobacco 1 percent.

Furthermore, Karnataka[iii] is:

- The coffee capital of India, producing 70 percent of India's total output;
- The largest producer of tamarind, sunflower, green chili, silk, and gherkins;
- The only producer of rose onions in India;
- Among the top producers of pomegranate, grapes, mango, lime, lemon, and orange – creating opportunities for manufacturing products like juice, pulp, squash, and jams;
- A significant producer of millets like jowar, bajra, and raji. Around 60 percent of ragi in India is produced within the state;
- The third-largest state in certified organic produce; and
- the third-highest state for poultry meat production.

Food parks have been a part of Karnataka's strategy to grow farmer income by increasing processing to promote value-added products. As per the latest estimate, the state has more than 4,700k MT[iii] of market surplus across essential fruits and vegetables, and the capacity for processing and storage for most surplus produce is unavailable. The state houses more than 150 operational cold storage units[iii] with 300k+ metric tonnes capacity. The state also has built 110 acres of integrated mega food parks. Thus, the food-processing industry is well placed for necessary strategic interventions and attaining significant growth in Karnataka, contributing to the development as seen in other geographies.

ASI data shows 39,748 food-processing enterprises in India in the organised[i] sector in 2016 to 2017, with nearly half of these in just three states – Andhra Pradesh, Tamil Nadu, and Telangana. However, in terms of value generated in the organised sector, three states, Maharashtra (17.3 percent), Uttar Pradesh (11.6 percent),[i] and Karnataka (11.3 percent), together contributed around 40 percent. Thus, Karnataka boasts great potential to attract a more significant number of food-processing enterprises and boost further growth.

The food-processing sector could enhance per capita income for agriculture workers and correct the extant socio-economic imbalance. It could also contribute to growth in the industry sector, which is growing at 8.8 percent, behind agriculture at 13.2 percent and services at 14.8 percent.[i] This could, in turn, positively impact job creation. Among all sectors, food-processing generates the highest average per capita employment, 8 per crore[iii] of investment. The average goes up to as high as 21 per crore of investment in the value-added segment.

Karnataka's food-processing industry is growing at around 6.1 percent. The current percentage of value addition,[iii] because of processing in India, is about 3.5 to 5 percent. This is abysmally low compared to countries such as China and the United States, where the percentage of value addition is approximately 20 to 25 percent, [iii] and in some countries, the rate is as high as 40 to 50 percent. Top agri-export economies like China, Germany, the United Kingdom, and the United States[iii] balance their exports of natural products with processed products that are higher value-add. These products are efficient to make at scale, are less perishable than fresh produce, and fetch higher prices.

Thailand[i] has already seen the impact of food-processing on its economy. The sector contributed about $75 billion, 15 percent of the nation's GDP, employing nearly 5.7 million people. The value of Thailand's food exports was $34.6 billion in 2021 (an 11.8 percent increase from 2020), while its food ingredient imports' value was $3.2 billion. The food-processing sector contributed to $19.4 billion of Thai processed foods exports in 2020. Thai food and beverage exports are expected to reach $35.8 billion in 2022, a growth of 8.4 percent. The packaged food industry, however, is highly fragmented. The top ten companies control about one-third of the sales value, indicating a vast potential for MSMEs to flourish in this sector. Opportunities in Thailand's food-processing sector continue to grow as domestic sales of processed foods rise due to a significant shift in consumption patterns towards convenience food.

In its formative years, China's[iii] food-processing industry showed a strong growth of nearly 14 percent for 16 years from 1981 to 1997. This was firmly pushed by the rapid urbanisation in China. Since 2013 to 2017, the industry has achieved scale, showing a CAGR of close to 7 percent.

The gaps and challenges for Karnataka's food-processing sector

When looking at how other countries have managed their food-processing sectors, it is evident that there is great potential for Karnataka to develop its food-processing industry (Exhibit 21).

However, both gaps and challenges exist here that may need to be addressed.

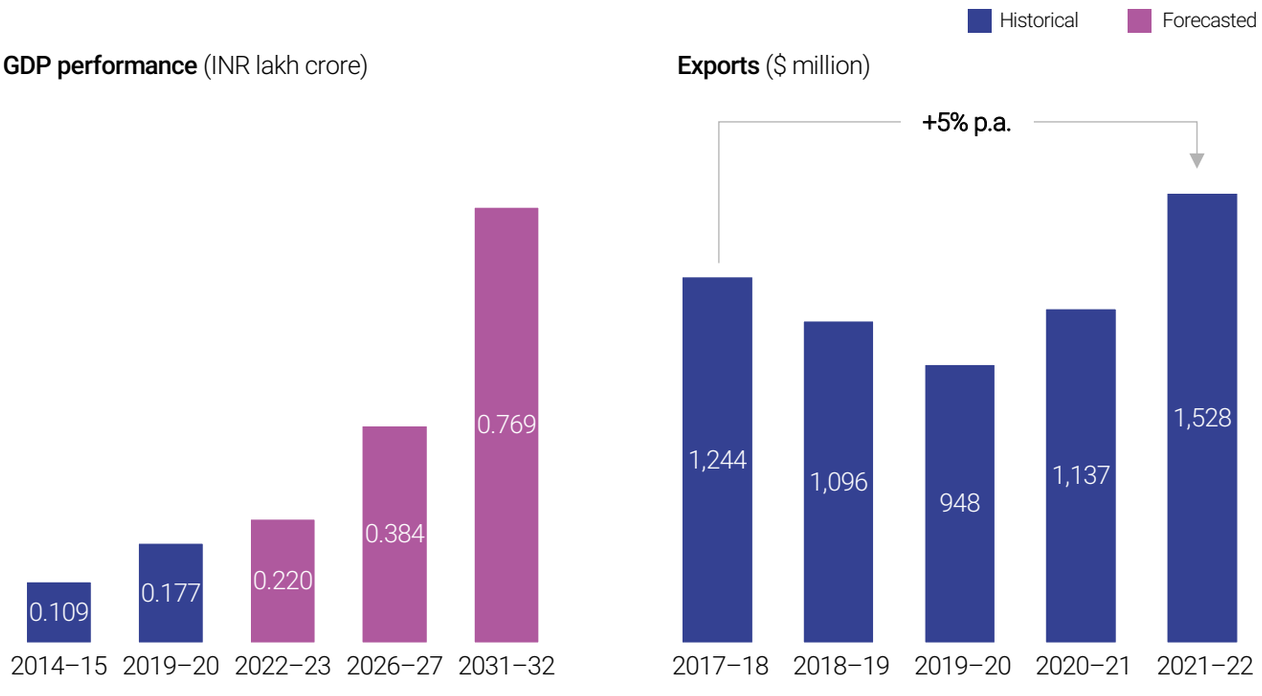
Managing surplus: There is a surplus supply of milk [iii] in the state, creating opportunities for the production of cheese, butter, ghee, yoghurt, and a large variety of value-added products. Given the high yield of various products, Karnataka could look at food-processing as an essential sector to create value-adding products while simultaneously capturing the product's export potential, which has high global demand.

Instigating post-harvest management: Since horticulture produce is highly perishable, efficient post-harvest management is vital. It is also essential to effectively exploit the export potential of fruits and vegetables. In Karnataka,[iii] only 1 to 2 percent of the total production of fruits and vegetables is processed into different products. About 25 to 30 percent of the produce is lost due to improper post-harvest management. Among post-harvest management practices, cold storage and refrigerated transport are the most important. A chain of cold storage, processing, and marketing facilities could be created to avoid post-harvest losses.

Diversifying products: Fruits and vegetables or other horticultural crops that frequently cause surplus production or have the potential for value addition could be processed into various products. Product diversification adds value besides helping them to be preserved for a long time. Here cold storage units provide a vital link between the production and marketing of perishable horticultural produce. They help store the horticultural produce during a glut and make them available in the off-season with the least degradation in quality. Maintenance of the cold chain is the best way to maintain the quality of a product and minimise all forms of deterioration after harvesting – including weight loss resulting in wilting and limpness, softening, bruising, unwanted ripening, colour changes, texture degradation, and development of rot and mould.

Exhibit 21

Food-processing sector GDP and export performance[1]

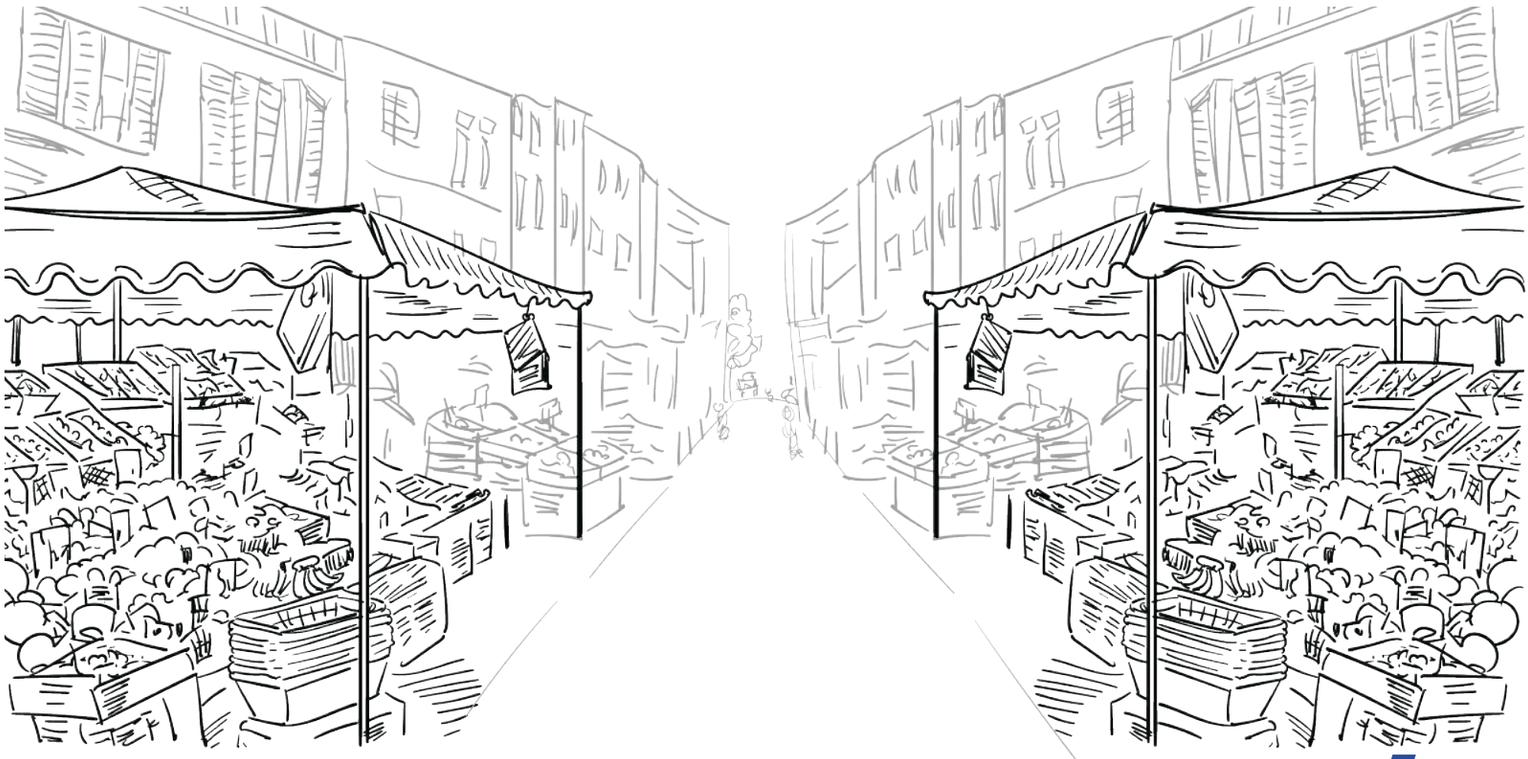


1. Manufacturing committee

Attracting investment: The state has been a laggard in processed food exports despite having a significant share of the national exports in cashew, coffee, processed fruits and juices, and processed vegetables, where national growth seems to be higher or on par. Karnataka may need more investment in food-processing to capture local and global markets. Based on a cluster approach, India's mega food parks' initiative aims to maximize value and minimize waste. In this regard, Karnataka may need more investment for it to enhance the capabilities of currently operational food parks and to build more in the state. With targeted efforts, Karnataka may be positioned to be globally competent in food-processing, potentially driving a sectoral growth of nearly 15 percent.

Aspirational challenges:
To achieve the sector's aspirations, numerous challenges may need to be surmounted. These can be grouped in four categories:

- **Farms:** Karnataka ranks [iii] 12th in the country regarding irrigation, falling behind states like Punjab at 98.8 percent, Haryana 90.4 percent, Puducherry 82.3 percent, Uttar Pradesh 80.3 percent, and Bihar at 69.8 percent. However, the state has large amounts of small and fragmented pieces of land that make improving irrigation challenging. The state also faces [iii] low productivity in agriculture, as almost 16 out of the 31 districts are drought-prone. Other issues include gaps in infrastructure, good quality seed, inadequate transport and logistics, and more. And even when states have abundant resources, many struggles to capitalise on this. For example, Bihar has a food-grain yield[iii] of about 2,300 kilograms per hectare, whereas Punjab has almost double, at about 4,500 kilograms per hectare. Cold-storage capacity can also be a struggle, with most states unable to meet demand, which increases spoilage and reduces the quality of produce for downstream food-processing.
- **Policies:** Incentive policies could be benchmarked with other states considering significant upfront investments and low asset turns (turnover-based subsidies are estimated to recover[iii] only about 20 percent of investments compared to more than 45 percent in many other states). No power-related benefits or subsidies exist in Karnataka, such as electricity duty exemption or concessional power tariff, which are available in almost all other states.
- **Renewable-energy framework:** Renewable energy regulations are extremely restrictive: for example,[iii] year-round energy banking is prohibited, and the banking period has been reduced from 12 months to one month (currently sub judice). The unused banked energy can be treated as deemed sale to distribution licensee at 85 percent of the generic tariff. Other issues include uncertainty in regulations such as net metering and absence of inter-state banking.
- **Supply chain and availability of raw material:** Dependency on raw materials such as wheat and potato from the northern part of the country leads to higher costs. There may need to be a focus on developing end to end robust supply chains to improve connectivity and support industry growth.



Focus on execution: Measures to consider

The food-processing sector could enhance per capita income for agriculture workers and could significantly correct the extant socio-economic imbalance. Food-processing could contribute to growth in the industry sector, which is increasing only at 8.8 percent, behind agriculture at 13.2 percent, and services at 14.8 percent.[i] This will in turn can have a positive impact on job creation. Among all sectors, food-processing generates the highest average per capita employment, 8 per crore of investment, with the average[iii] going up to as high as 21 per crore of investment in the value-added segment.

Currently, there are a reasonable number of ideas to address the situation, but execution is slow. To realize this potential, Karnataka could focus on efficient execution by considering the following measures:

Leveraging the state's structural advantages. The digital or start-up ecosystem could revolutionise the agri-food value chain. Karnataka is home to 15,000 start-ups[iv] and more than 50 unicorns or inherently strong companies in IT services. Karnataka could look at partnering with technology companies and developing AI-powered subscription products or services, such as:

- Scientific warehousing that builds on data compiled via the Internet of Things (IoT).
- Remote sensors to customise the right solutions at the right time – such as ideal sowing windows, crop disease prevention, and storage mechanisms.
- Considering analytics-based solutions to optimise facility usage, and improve supply chains to utilise buffer processing and cold storage capacity across Hassan, Dakshin Kannada, Ballari, and Mysuru-supporting production in Tumkaru, Mandya, Chikkamangaluru, Kopal, Kodagu, Mandya, Udupi, and Dharwad.

Focusing on crops to create opportunities for manufacturing products. Karnataka could focus on crops that have scope for value addition like millet, organic produce, dairy products, pomegranate, grapes, mango, limes, lemons, and oranges, thereby creating opportunities for manufacturing products such as juice, pulp, squash, and jams. The state could create clusters to unite farmers, processors, and the entire ecosystem to enhance food-processing.

Promoting research and development: The state could promote research and development for developing alternative varieties of crops, such as potatoes, to address raw-material-availability issues and partnering with agriculture R&D institutions, such as the Indian Agricultural Research Unit (ICAR), to provide incentives and commercialisation support. Possible research areas include precision-farming technologies (including AI and IoT-driven robots), climate resilience and water efficiency (for example, optimal crop varieties), and organic solutions for crop protection.

Building "Brand Karnataka": The state could consider building a strong brand across India and the world, focusing on value-added exports. Karnataka may need a brand makeover, which could capitalise on global food trends.[iii] Thailand is an excellent example. It has a well-known national brand – Thai restaurants worldwide subscribe to this brand and exclusively procure unique spices, vegetables, and rice from the country. Karnataka could build a cohesive brand in such a way to fuel its exports and increase its standing as an exporter of unique Indian products.

Creating end to end value chains: Karnataka could create end to end value chains for items such as fruit, vegetables, milk, and spices by setting up export-oriented food parks and infrastructure (for example, pre-processing and cold-chain), harmonising export standards, educating farmers, establishing commodity-specific digital export platforms, and leveraging public-private partnership (PPP) models.

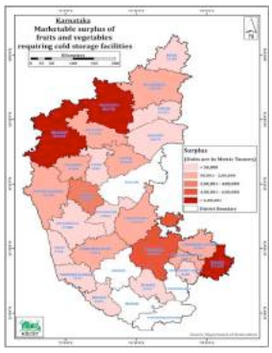
The state could set up food-processing and cold storage units in, for example, places such as Vijayapura, Belagavi, Bagalkot, and Kalburgi, which have a high yield. It could also consider partnering with industry players to develop analytics-based solutions to optimise facility usage and improve supply chains. Buffer processing and cold storage capacity could be established across Hassan, Dakshin Kannada, Ballari, and Mysuru, supporting production in, for example, Tumkaru, Mandya, Chikkamagaluru, Kopal, Kodagu, Mandya, Udupi, and Dharwad (Exhibit 22).

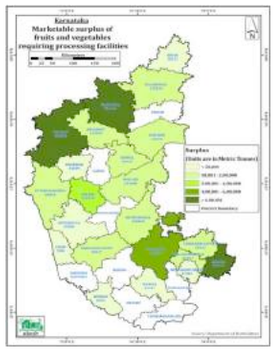
The state could also consider promoting floriculture and commercial flower industries by setting up processing and handling centres. Plants that show high yield and value across Chikkaballapura, Chitradurga, Udupi, and Vijayapura are the tube rose and chrysanthemum, for example, or aromatic plants like lemon grass and citronella grass. Processing centres could also be set up at Shivamogga, Belagavi, Dharwad, Haveri, and Ballari for spices like ginger, turmeric, garlic, clove, paprika, pepper, and betelvine, which all have a high yield and value generation capacity.

Exhibit 22

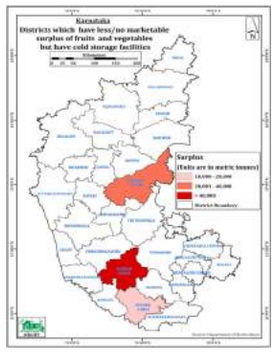
View of surplus produce and available capacity[1]

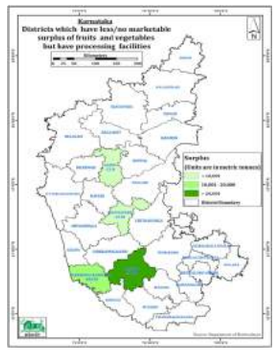
Marketable surplus requiring processing and cold storage





Districts with surplus processing and cold storage capacity





1. Karnataka economic survey

Renewable energy: Consider revamping renewable energy regulations – for further details, please see section "Renewable energy" at the end of this chapter.

Reviewing agricultural regulatory frameworks: APMC, ease of doing business regarding licenses, etcetera. It supports farmer producer organisation schemes (FPOs) by giving farmers agricultural start-ups or micro, small, and medium enterprises (MSME) status. This would help improve access to benefits like tax exemptions, credit guarantees, and priority-sector lending–farm-side reforms to combat climate change, enhance productivity, and build better linkages with the market.

Setting up task forces for state case studies: Lastly, the state could set up a task force to study states such as Maharashtra as a case study. The state[iii] attracted $158 million of investments, 17 percent of India's food-processing, 15 percent of national food exports, and all 36 districts contribute to food-processing.

Fast growth in the food-processing sector and simultaneous improvement in the value chain development are also essential to achieve favourable terms of trade for Indian agriculture both in the domestic and international markets. The sector is of crucial importance, and the impact which an efficient food-processing industry could make on the nation's food security for instance, the post-harvest losses of selected fruits and vegetables are about 25 to 30 percent in India; marginal reductions to these numbers will give better returns and improve the income levels of farmers too. A greater thrust on food-processing could help Karnataka bring more affluent, more convenient food options to the world, increase farmer income, and create thousands of jobs.



Automotive and automotive components

Karnataka holds the fourth position in automobile production in India[iii] and contributes nearly 8.5 percent ($3.1 billion) of the national output in this sector. The state is home to over seven original equipment manufacturers (OEMs), more than 50 automobile component manufacturers, and several research and development (R&D) centres. The sector employs as many as 55,000 people.[iii] Recognising its potential to drive the state's economy, Karnataka identified the automotive sector as the focus in its '"Industrial Policy for 2014–2019".

Over the years, the automobile sector has witnessed the constant emergence of new technologies and breakthrough innovation, and Karnataka has been at the forefront of these in India. The state is home to the country's first indigenously[iii] built electric vehicle (EV) and more than 45 EV innovation start-ups. The state is also one of the leading states in the production of two-wheelers and commercial and passenger vehicles.

India's industrial sector is particularly well positioned to capture export opportunities in sectors such as automotive, electronics, semiconductors, chemicals, and medical devices. Its manufacturing sector could also ramp up capacity, drawing on the comparatively high number of STEM graduates (2.1 million) annually[iii]. The state could additionally set up colleges and industrial training institutes (10 to 15) close to Tumkaru, Hubbali, and other identified clusters to develop large pools of trained labour for absorption across industries in the region.

With its fair share of the graduate pool, Karnataka is well poised to contribute to the overall growth of the state, with the right focus exhibiting a potential of 15 to 17 percent CAGR over the next decade. The segment has the potential to become a significant contributor to export. The exports in the auto component segment in Karnataka have shown a 14 percent CAGR over the last five years, compared to 7 percent for India. These segments have a high potential to generate jobs and foreign exchange for the state while contributing to infrastructure development (Exhibit 23).

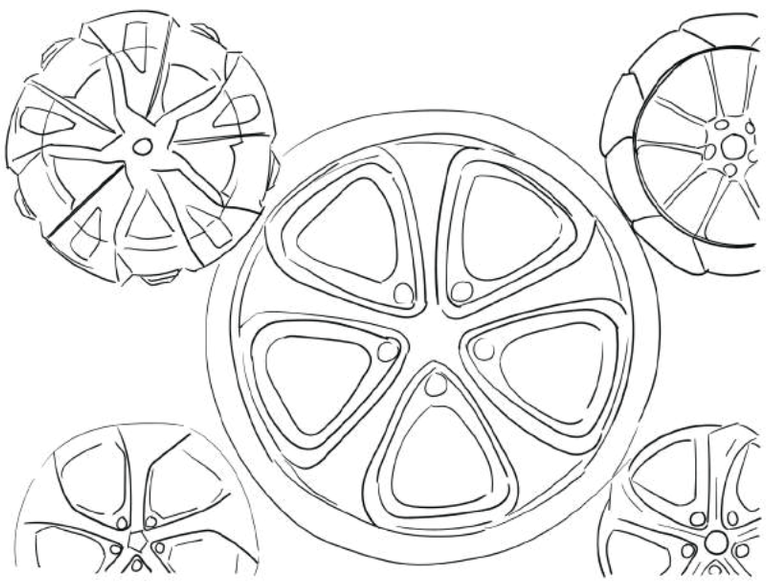
Currently, numerous constraints exist with regard to the ease and cost of doing business in the state.

The property taxes charged by the state for industrial establishments has increased by 200 percent,[iii] which is a red flag for businesses. While MNCs and other larger companies can afford such business costs, the MSMEs – the backbone of the economy – find it challenging.

There is a lack of coordination between KIADB and Local Panchayat/Corporation. Conflicts often arise due to a lack of clear demarcation of residential and industrial areas, which impedes smooth business operations.

The lack of a trained or skilled workforce is also troubling, as the unavailability of a skilled workforce is a deterrent for industries.

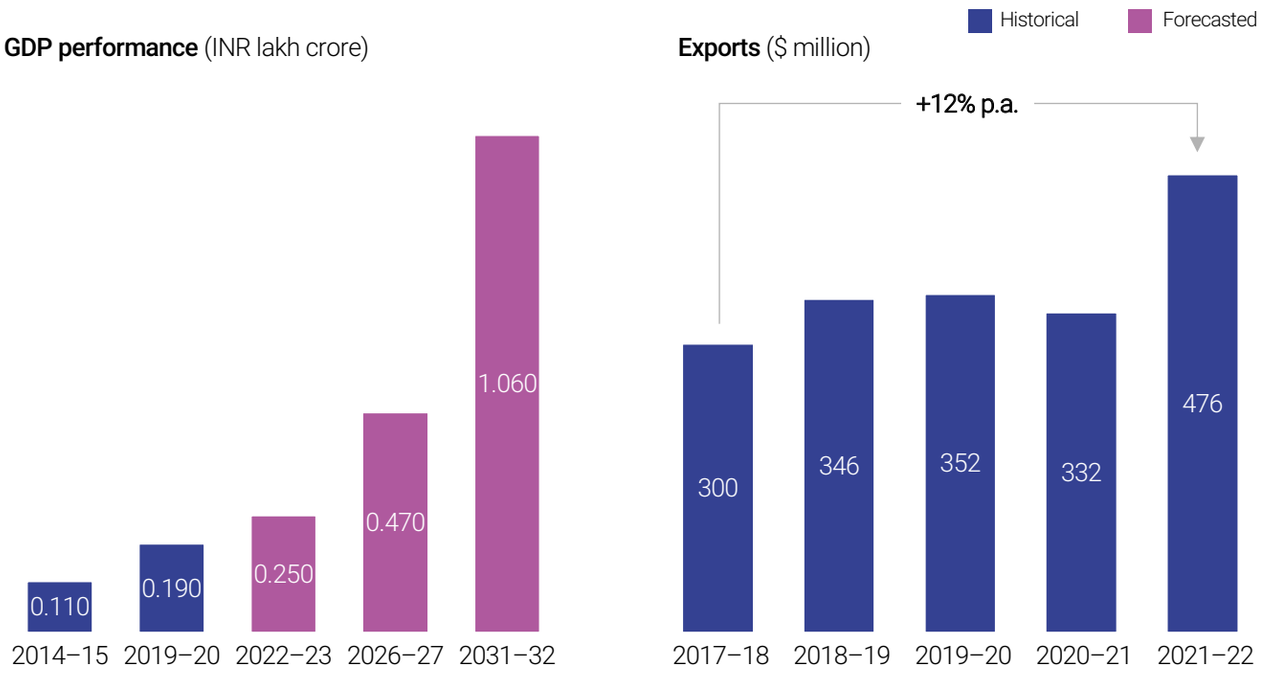
There is immense scope for further advancement of the sector with the tailwinds in supply chains. Global supply chain shifts could result in $4 trillion to $5 trillion change in global trade flows by 2030, and India could capture an increased market share of between $800 billion and $1.2 trillion in 2030 as a result.[15]



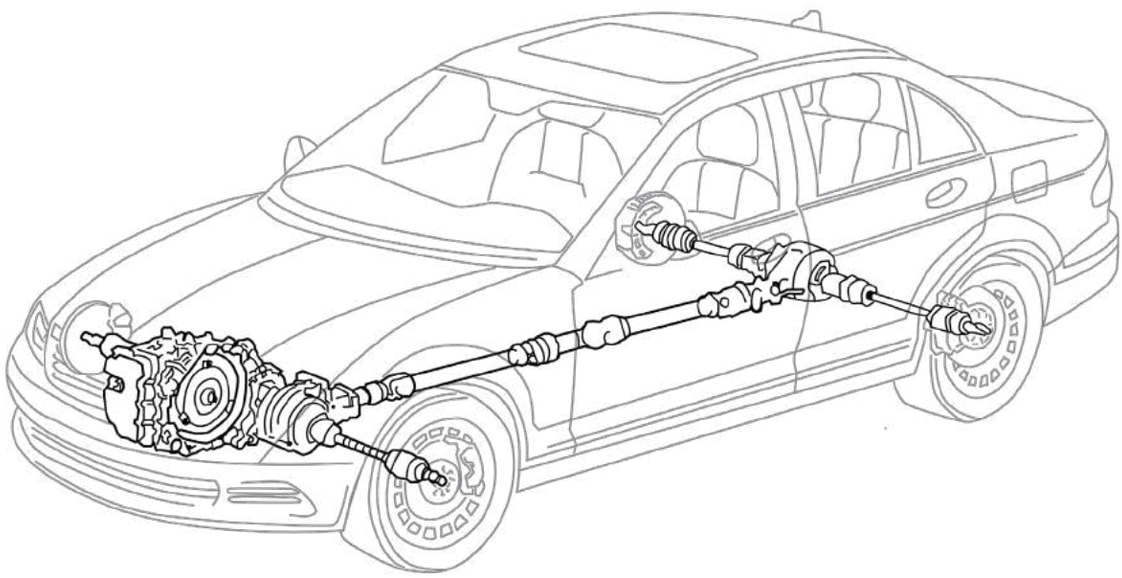
[15] India's century – Achieving sustainable, inclusive growth. A roadmap for India.Inc, FICCI

Exhibit 23

Automotive: GDP performance and exports[1]



1. Manufacturing committee



Opportunities for Karnataka's automotive sector

India has a high potential to capture the shifts in the auto sector, and Karnataka, with its strategic positioning, could capture a healthy share by focusing on strategic initiatives and creating a favourable environment attracting investments:

Set up townships focused on the auto industry with good connectivity, health, and education facilities, suitable housing, the correct skill set availability, power, water availability, among others. The state could evaluate industry leaders such as Toyota, Tata, Volvo, and TVS to see how they could support substantial investments while trying others. It could evaluate regions in Bagalkot and Gadag, both of which already have automobile, auto-ancillary, engineering, valves, and the metal industry and a land bank of 600 acres to focus on the integrated township of the auto sector.

Karnataka can learn from successful and not-so-successful clusters such as Manesar or NCR, Chennai, Pune, and Sanand (Gujarat)[iii]. These are all supported by anchor OEMs and supplier bases, except for Sanand, where suppliers followed. All three of these clusters are close to a city with good connectivity, health and education facilities, suitable housing, the proper skill set availability, power, water availability, and more. Many attempts in Alwar-Rajasthan, Bhandara-Maharashtra, Halol-Gujarat, Zahirabad-Telangana, and Pithampur-Madhya Pradesh have not seen significant success primarily due to lack of similar facilities as the successful clusters. Another unsuccessful cluster is Zahirabad, which had a connectivity issue from Hyderabad and a water scarcity.[iii] A cluster should have all basic facilities of an integrated township for good, secure quality of life to attract and retain talent.

Aim for seamless connectivity and accessibility to international markets to ensure high import and export volumes. In addition to modernising the supply chain and developing industry corridors to ease connectivity with Tier 2 and Tier 3 cities, the sector could create major shipbuilding infrastructure around Mangaluru (like the infrastructure developed in Gujarat) by inviting significant players. Karnataka possesses a geographical trade advantage here as well – its proximity to the Suez Canal[iii] and access to high-volume markets like Europe and the east coast of the United States (compared to Southeast Asia) means that, with excess capacity, it can easily capture these markets. The Mangaluru port is the deepest inner water harbour on the west coast and could be developed to handle large trade volumes that could complement the growing industry ecosystem. The state could also operationalise the container-handling facility in the Mangaluru port to facilitate movement of inbound and outbound cargo, thereby reducing reliance on the Chennai, Tuticorin, and Cochin ports and associated logistic costs.[16]

Make decisions to attract new investment, especially in high-growth areas like green technology (with a focus on EVs) or electronic hardware assemblies. There is immense potential to drive MSME growth in this sector. The state could focus on measures to enhance the productivity of the MSME ecosystem in various ways: supplier grants for breakthrough innovation, sharing technology licenses and know-how, mentorship opportunities, capital availability, and partnerships in manufacturing value-added offerings linked to the core product (for example, EV companies could help MSME suppliers develop informatics, safety systems, and battery-management systems).

Attract manufacturers in the sustainability industry who could help drive green initiatives in the state including solar modules and EVs. Karnataka has the potential to become a green manufacturing hub by supplying green products and technologies, and low-carbon and sustainably-produced goods across sectors. It could boost its global competitiveness by prioritising circularity. This could be achieved by creating recycling hubs of excellence and leveraging shared infrastructure to reduce waste. Furthermore, Karnataka could also scale manufacturing setups by investing in high-volume gigafactories that adhere to international quality standards.

[16] Opportunity in the times of COVID-19, Positioning Karnataka as a preferred investment destination. Deloitte

Promote indigenous R&D centres: Along with the existing R&D centres, indigenous R&D centres could be promoted to enable Karnataka to remain the leader in research and innovations. The state could plan and set up R&D incubation centres along with industry participation to accelerate EV rollouts.

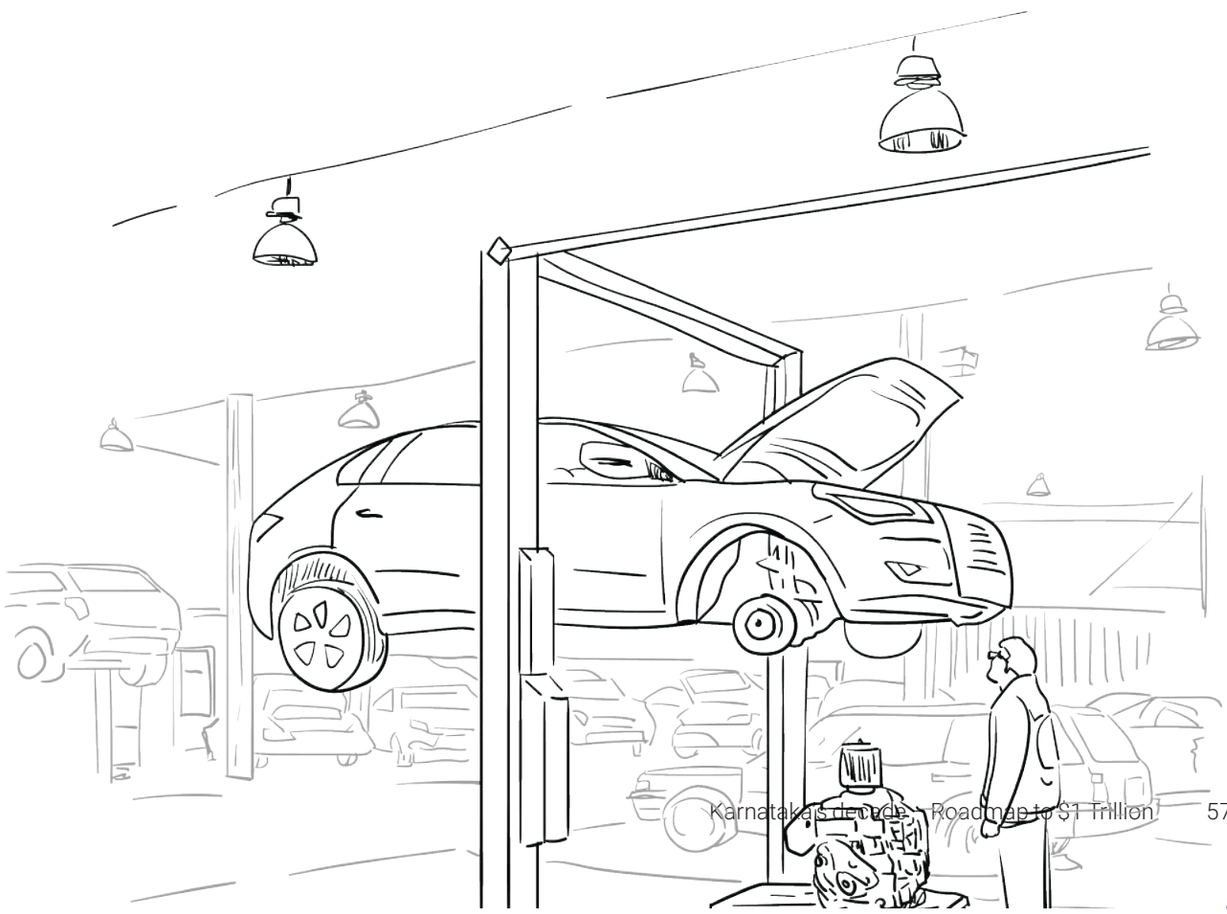
Create EV clusters with various anchor OEMs. It is possible to have a strong EV-specific component industry with large on-scale (electric motor, battery pack, invertor, controller, for example) and feed the EV industry in India and its export sector. This component industry can support machine manufacturers, capital goods, and the electronic hardware industry as well. Today's sector needs software power to support product development, a strength of Karnataka's in an already flourishing EV ecosystem.

Leverage partnerships between large industrial promoter groups and global OEMs. Though the state is home to numerous OEMs, there is a lack of high volume-high growth ones, therefore the state could increase its focus on tapping their growth potential and accessing technology and capital to establish local manufacturing capability. To support these efforts, industry bodies such as the Federation of Indian Chambers of Commerce and Industry (FICCI)[iii] could establish a national manufacturing technologies mission to identify technology gaps across sectors and facilitate acquiring and transferring key manufacturing technologies through international joint ventures and alliances. For example, industry bodies could facilitate joint ventures with specialised prominent auto players in South Korea and the United States.

Focus on improving productivity: Karnataka could develop industry-institute panels to create skills development and aim to match China's productivity levels to remain competitive on the world stage. Relaxing specific labour policies concerning the employment of women, with adequate consideration of social and safety aspects, could also prove to be helpful in a better utilisation of the available workforce.

Benchmark other states' best practices and examine which could be emulated in Karnataka. This could be a rewarding exercise for supporting the growth of the auto-components subsector, for example. Additionally, the government could support enabling and incentivising the use of renewable energy by businesses in the state, which can help the Karnataka achieve its climate and sustainability targets.

Concerning automobile components, India ranks only sixth[iii] or seventh in terms of export quality and reliability compared to other countries. Karnataka has immense potential to assist the country in improving its export scenario. However, strong support from the state government is crucial.



Capital goods

With regard to machine tools manufacturing, India produces around 9,500 crores [ii] worth of machine tools, nearly 50 percent of which is from Karnataka – mainly in Peenya and surrounding areas. The imports of machine tools amount to about 11,000 crores in value, and exports total up to 1,300 crores.[iii] Domestic consumption amounts to nearly 19,300 crores. The machine tools industry has grown at 8 to 9 percent CAGR. The COVID-19 pandemic, however, attributed to sluggish growth in the sector over the past few years. It is estimated that without the pandemic-induced slowdown, the growth rate may have been around 12 to 15 percent. Interestingly, the growth in 2022[i] was as high as 30 percent in the state.

This sector can potentially contribute significantly to Karnataka's export capacity, with machinery, electronic components and instruments, and machine tools contributing to the majority of exports. Currently, the state contributes 17 percent to the nation's exports and has shown strong growth of 12 percent over the past five years (Exhibit 24). The segment showed a significant resilience to the COVID-19 pandemic.

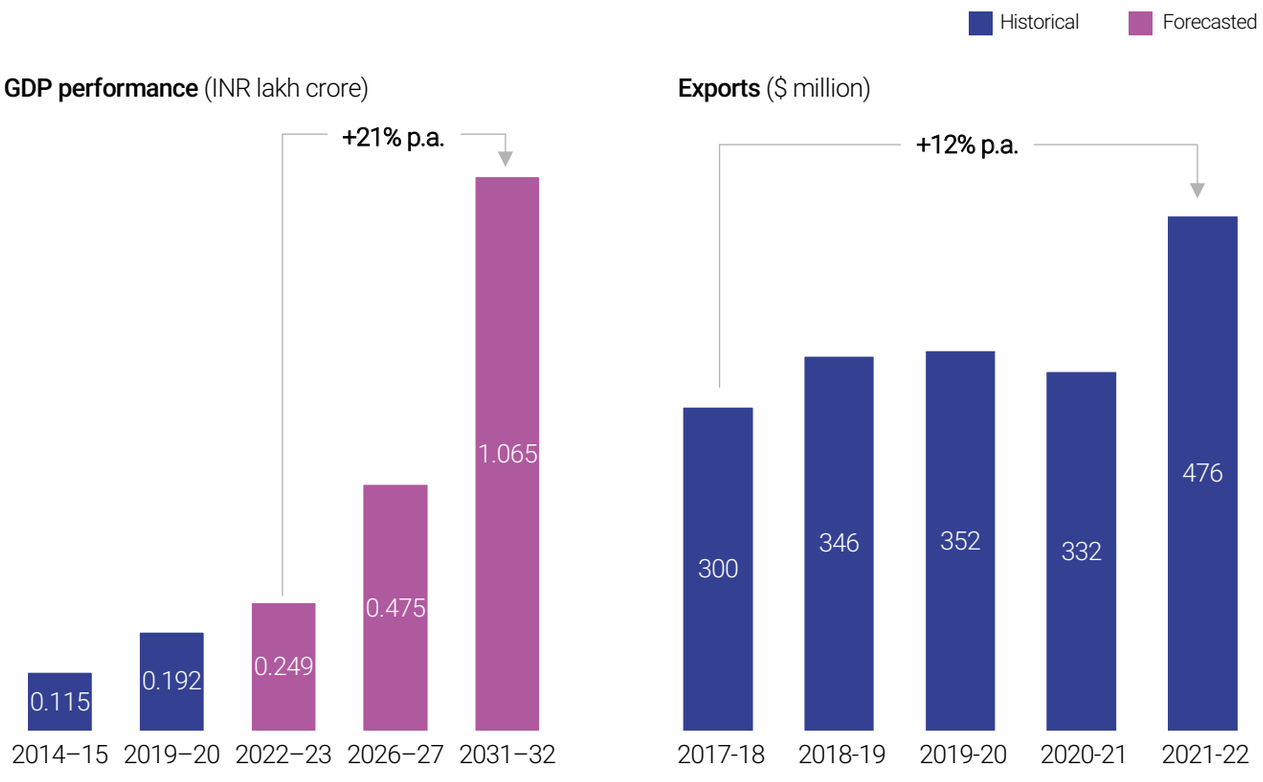
Focused initiatives could address challenges within the sector

Various challenges face the capital goods sector, which could have a much higher growth rate if the specific gaps were identified and addressed. Possible levers that could help include:

Reducing dependence on imports and plan for exports. Currently, up to 40 percent[iii] of machine tool consumption comes from imports – mainly high-end machines produced in smaller quantities. India also imports subsystems for machines such as CNC systems, ball screws, and LM guides. Karnataka has reasonable scope to set up local manufacturing centre for these tools and discourage dependence on imports. In addition, the exportation of capital goods may need to be promoted; this currently comprises as low as 7 percent[iii] of total consumption.

Exhibit 24

Capital goods: GDP performance and exports



Source: GDP performance and export data

Operationalising and setting up industrial clusters: Industry clusters are recognised to be key growth accelerators – Karnataka may need to focus on evolving machine tool clusters. The best way to achieve this could be to encourage OEMs. The state could prioritise the development of clusters around the present OEMs. Recently, the government[iii] set up a machine tool applications park on the outskirts of Tumkur, a model which perhaps Karnataka could adopt. However, the state needs to ensure seamless functioning and a conducive production ecosystem to attract the necessary growth in the sector. Additionally, the state could consider establishing additional clusters focused on the iron and steel product industry in Ballari and the neighbouring regions of Raichur, Koppa, or Chitradurga to capitalise on the iron ore production in the area. Iron and steel exports account for 14 percent[iii] CAGR in Karnataka versus 7 percent in India.

Driving modernisation with Industry 4.0. At-scale manufacturers – with annual revenues of more than $50 million – could enhance local manufacturing and supply chain setups with Industry 4.0 technologies by: [17]

- **Partnering with domestic technology firms:** These partnerships could incorporate IoT-based assembly-line and distribution productivity enhancements, such as digital twins, analytics-based process automation, chatbots, robot process-automation-based maintenance, and 3D printing. These could enable operational efficiency across key metrics, including yield, quality, and cycle time.
- **Digitising end to end value chains:** Digitisation could improve reliability and value-chain resilience. For example, by leveraging advanced analytics such as telemetry, manufacturers could optimise their delivery networks and better forecast demand at the stock-keeping and distributor levels.
- **Developing employee capability-building programmes:** At-scale manufacturers could upskill or reskill their employees with the latest manufacturing technologies through tie-ups with academic institutions and digital training platforms.
- **Backward integrating of developing clusters in strategic locations.** This could happen in locations like Tumkur that have good connectivity to ports to give the sector a significant boost.

Driving the adoption of government-launched digital technologies and initiatives. This could include campaigns and initiatives to increase the adoption of government-launched digital capabilities aimed at large companies and at-scale manufacturers to support digitisation. The government's GeM portal, a one-stop online platform for public procurement projects, is just one example.[18]



[17] India's century – Achieving sustainable, inclusive growth. A roadmap for India. Inc, FICCI
[18] "Cabinet approves expanding the mandate of Government eMarketplace – Special Purpose Vehicle (GeM – SPV) to allow procurement by cooperatives as buyers," Cabinet, June 01, 2022.

Developing human capital. While companies contribute to developing a skilled workforce that could be smoothly absorbed into the industry, the government could impart industry- relevant skill-based learning across diploma schools and ITIs. Engineering colleges could develop large pools of trained labour for absorption across industries across Karnataka.

Collaborating with industry bodies. Industry bodies such as the FICCI could provide support for the above measures by promoting a "tech-enabled lighthouse culture" through industry forums, aligning a standardised framework for digital-maturity assessments, creating grants and awards programmes. They could also collaborate with government to establish incentive programmes. This could be done by:

- **Establishing free-trade zones and port-proximate clusters:** The government could facilitate globally competitive manufacturing hubs in high-potential sectors, such as electronics and capital goods, chemicals, textiles, and apparel.
- **Strengthening infrastructure:** State and central governments could strengthen infrastructure in vital manufacturing hubs through public-private partnerships (PPPs) and with special-purpose vehicles and expand smart-city coverage. They could also use new technologies to provide essential utilities, such as off-grid rural market electrification via solar infrastructure.
- **Simplifying compliance requirements:** The central government could create a one-stop shop for clearances and industry queries through an e-governance platform to avoid delays and costs. It could digitise the compliance process by, for example, implementing business-reform action plans, and expanding the use of e-signatures.

Improving consumption demand for indigenously produced machine tools. The central government has already taken various positive measures in this direction; for instance, the Ministry of Heavy[iii] Industries provides support to encourage more local manufacturing of machines to reduce dependence on imports. Many tie-ups with educational institutions such as ITIs to locally develop such machines have also been incorporated.[iii] Countries like China have already proven that tie-ups with educational institutions can also help develop competitively priced machine tools. For instance, China was able to produce a gear-cutting tool at 3.5 crores, approximately 8 crores in India. This was made possible by targeted efforts from academic institutions. Similar engagements with universities and relevant institutions in India can aid in developing cost-competitive tools.

Contracting manufacturing. Companies in select value chains – particularly in engineering, chemicals, and machine tools – could help boost Indian manufacturing by adopting contract-manufacturing models to increase capacity use to more than 80 percent.

Another strategy could be to allow higher depreciation levels for indigenously produced capital goods, which could encourage more investments. Also, placing adequate emphasis on attracting FDI into machine tool manufacturing could grow the sector significantly.

The desired growth rate for machine tools over the coming ten years could be 25 percent CAGR or 40,000 crores. The measures suggested, if implemented, could help the subsector reach its growth aspirations.



Fast-moving consumer goods

India is one of the top fast-moving consumer goods (FMCG) markets in the world and is pinned to be the fifth largest by 2025[i], with an expected growth rate of 14.9 percent CAGR reaching $ 220 billion. In India, FMCG is the fourth largest sector in the country and, notably, in CY21, the sector grew at 16 percent, a nine-year high, despite nationwide lockdowns (Exhibit 25).

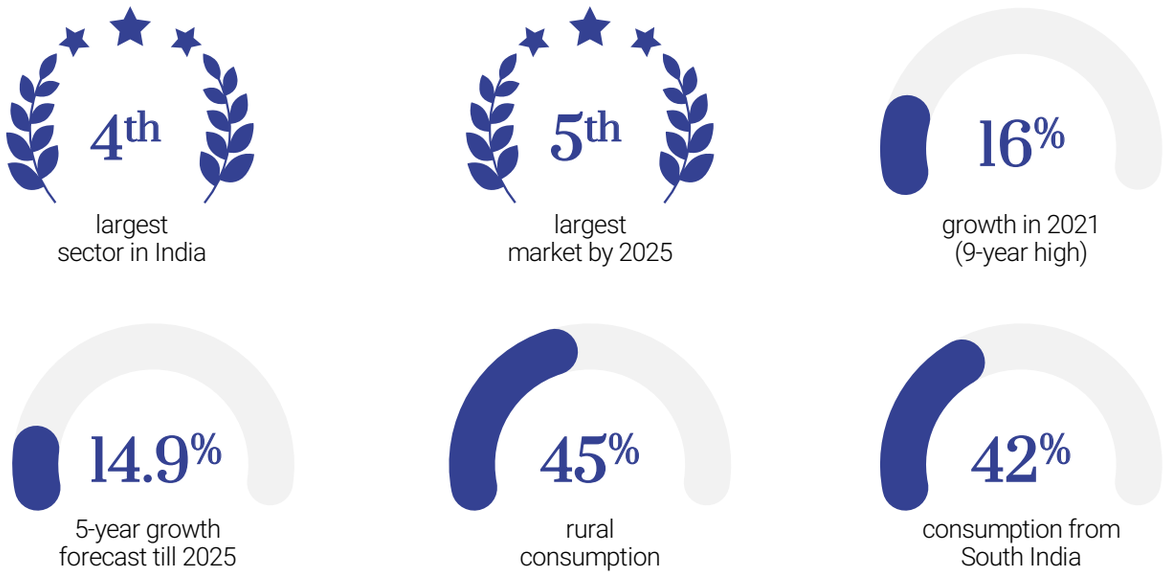
Currently, the urban and rural consumption of FMCG products stands at 55 percent and 45 percent, respectively.[iii] Interestingly, in the last few years, the FMCG market has grown faster in rural India compared to urban India. The semi-urban and rural regions now offer great opportunities for further market penetration.

Since the economic reforms (LPG) in 1991[i], FMCG product manufacturing has been primarily concentrated in Pondicherry, Silvassa, Jammu, Himachal Pradesh, Uttaranchal, and Assam. This is due to the numerous incentives such as sales tax exemptions, excise duty-related benefits, and IT holidays provided in these regions by the central and state governments. At present, more than 50 percent of FMCG production in the country[iii] take place in such tax-free zones. However, these incentives are expected to last up to 2027, unless extended by the union government.

To spur FMCG sector growth and increase production, Karnataka could consider the initiatives below.

Exhibit 25

FMCG sector overview



1. Manufacturing committee

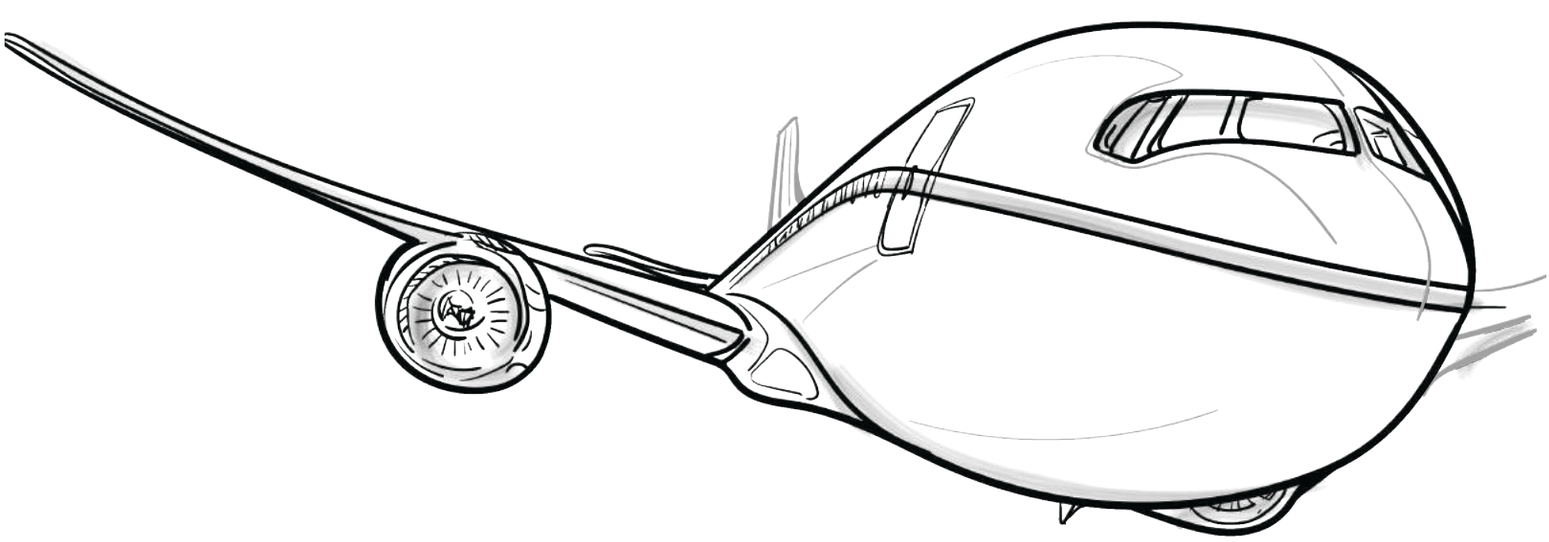
Implement new cluster setup: Setting up one more FMCG park, like the Hubbali-Dharward FMCG cluster park, in the Mangaluru region, and with the same incentives as the park in Hubballi-Dharward region, for a period of ten years could aid industrial growth in the state and help it evolve into an FMCG manufacturing hub in the country. This could lead to sizeable economic growth and extensive job creation.[iii] It is estimated that for every investment worth ten lakh, the sector generates one direct and three indirect jobs.

Lower logistic costs: As one of the current issues plaguing the sector, costs for logistics in the state remain considerably high and need correctional measures. Rising diesel costs are the most significant contributor to high transportation costs and state-wise tollgate expenditures. Subsidies in fuel and tolls for an initial period for transportation of indigenous goods can add an incentive to attract manufacturers to the state.

Focus on sustainability: There is no doubt that the FMCG sector has contributed to environmental degradation, and there is a need to act responsibly and engage in sustainable and environmentally sound activities. For instance, reducing the use of plastic, consciously eliminating waste, adopting alternate packaging methods, sustainable sourcing, and plant alternatives are just some of the methods that FMCG companies can adopt to reduce their carbon footprints and reduce pollution substantially. The state government could play a role in fostering such sustainable practices and encouraging environment-friendly changes.

Historically, the FMCG sector has seen a GDP growth rate of more than 5 percent.[ii] It is expected to grow at 12 percent CAGR over the next ten years (a conservative estimate). Rural consumption is expected to grow faster than urban consumption in a relationship of 1:1.25.

With due emphasis on resolving the key challenges mentioned and with conducive policy initiatives, the state can support the sector to exceed these indicated growth figures.



Aerospace

Karnataka is undoubtedly the hub of the aeronautics industry in India.

It accounts for over 60 percent[iii] of all the aerospace exports[iii] from India and 65 percent of the investment. The state houses many important PSUs involved in the aerospace industry, including, among others, ADA, NAL, Bharat Heavy Electricals Limited (BHEL), Gas Turbine Research Establishment (GTRE), Bharat Earth Movers Limited (BEML), Indian Space Research Organisation (ISRO), and Aeronautical Development Establishment (ADE). Companies are also operating in key industrial belts on the outskirts and in north of Karnataka. Karnataka is also home to India's first private aerospace, SEZ.

Furthermore, the state provides exceptional proximity to the vendor base. Almost 70 percent of India's supplier base is in Karnataka,[iii] including a network of over 2,000 SMEs that service PSUs and large private sector companies. There is also a significant presence of global OEMs and other supply chain players.

However, the sector faces various challenges to its growth that would need to be addressed. Generally, the aerospace and defence (A&D) ecosystems are concentrated in the hinterland worldwide, with Bengaluru being an exception. It has, however, reached saturation point and its capacity to support further growth is limited. While India's aerospace policy has set a target of adding 60,000[iii] more workers to the sector in Karnataka, the availability of industry-ready talent is a significant issue – despite there being an abundance of technical human resources available in the state.

Options for growth

Karnataka could consider the following options to stimulate growth in the aerospace sector:

Develop a skilled workforce: The sector could focus its efforts to encourage the transfer of technology and take up strategic aerospace programmes for domestic and global markets. The country may also need to develop niche technologies and skill sets in this domain.

There could be an industry-push emphasis on end assemblies for civil and defence aviation, such as aircraft and helicopters, to encourage defence manufacturing in the electronics industry, and developing new age sectors such as 3D printing, drones, composites, avionics, auto-guided vehicles, IoT, robotics, and AI, which could significantly help in achieving the desired growth in the sector.

The state could consider diversification outside Bengaluru: With four international and ten domestic airports within a radius[iii] of 500 kilometres, North Karnataka has potential to emerge as an MRO hub, which can go a long way in encouraging the A&D sector in the region. Establishing clusters and corridors on the Bengaluru Pune Highway to promote Atma Nirbhar projects with plug-and-play industrial parks could also help ease supply constraints.

Develop a robust supply chain ecosystem: The development of, among others, a vendor ecosystem, MSMEs, subcontractors, raw materials, suppliers, infrastructure, a centre of excellence, and shared facilities and amenities, could provide a substantial boost to the aerospace sector. In addition, pressing forward with more focus on cluster approch that the state government has set in motion could be a welcome strategy to facilitate sector growth.

The global aerospace industry is expected[iii] to grow by 4 percent until 2030, and global aerospace sales alone are expected to reach $2 trillion over the next two decades. The Asia-Pacific region is set to be the fastest-growing aerospace region. Karnataka's aerospace and defence sector can keep pace with these figures and surpass the estimated growth rates, provided that the state implements the suggested focus measures. There is a potential for Karnataka to be the front runner in aerospace in India and capture this growth given the existing setup, thereby growing at nearly 15 percent CAGR.

Steel

The steel sector is set to double production in the next five years. Its steel manufacturing facility in Vijayanagar, Karnataka, is the flagship unit with an installed capacity of 12 million tonnes and is currently expanding to handle 18 million tonnes. As India's single largest steel plant location[iii], it plans to set itself up with an ambitious expansion plan to double capacity to 24 million tonnes over the next five years to become the world's single largest location steel plant. Furthermore, to ensure sustainable steel production in Vijayanagar, its aims to diversify into higher value-added products to support India's overall growth and drive exports.

Key options to achieve the desired growth

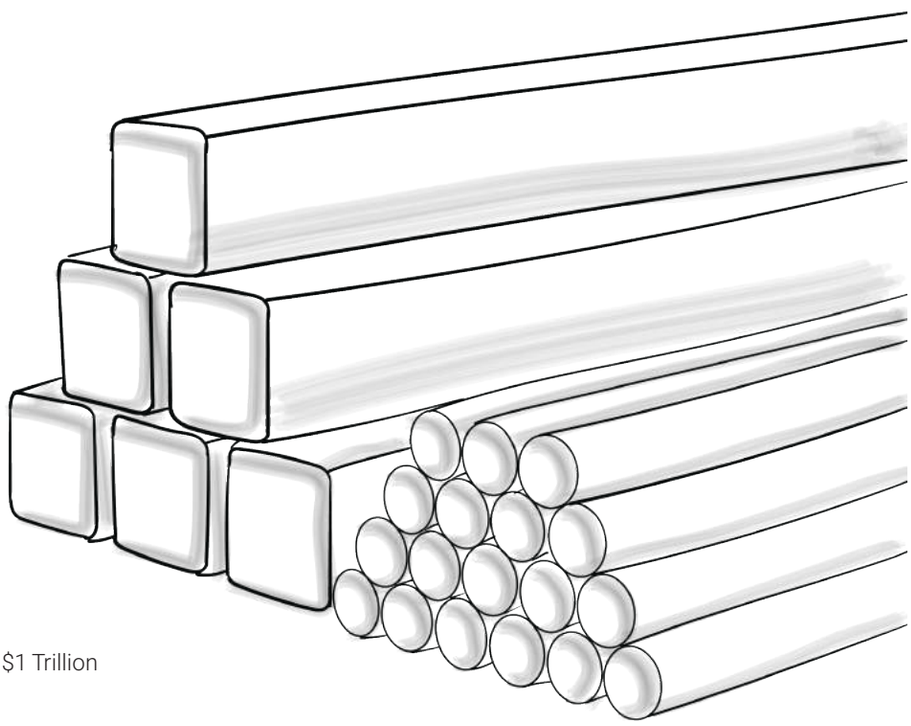
There are various measures that can be considered to drive growth in the steel sector in Karnataka. These include expediting the auction of virgin mines and amalgamated mining leases over the next five years, which can ensure the availability of higher-quality raw materials in sufficient quantities. A sector-level strategy could be framed, which focuses on raw materials and preferential access rights, along with harmonising procedures. Financial incentives could be offered to the industry for further investments under the Karnataka Industrial Policy and tax support, while support for human resources training and development will be necessary.

Infrastructure development of preferential road, rail, and air linkages for efficient transport of raw materials and finished goods may be required in the state, as well as enhanced connectivity to across the state, country, and export market. Land mayl need to be identified for setting up steel projects along the lines of an industrial park for the iron and steel industry in the state.

Financial assistance could be offered to institutions like state laboratories and academic institutions for carrying out research covering utilisation of waste, energy efficiency, and reduction in GHG emissions, while specialised courses on industry requirements for iron and steel could be offered, as well as support for R&D and deployment of newer technologies.

Challenges and gaps to overcome

The major challenge for the steel sector in Karnataka is the availability of iron ore in sufficient quantities and the desired quality to support the smooth operations of the Vijayanagar plant. As a step in the right direction, a benefication plant to process 16 million tonnes of low grade iron ore that enhances the quality of its feedstock and offers cost-effective input has been installed. Sufficient mining capability in the organised sector, however, is vital to support the plant's planned expansion. With the need to reduce greenhouse gas emissions, especially CO_2, there may be a need to improve the quality of iron ore to meet the United NAtions COP27 goals of net-zero emissions by 2050. The endeavour will require that they deploy technologies at scale and ensure significant capital investment in renewable energy and carbon capture, utilisation, and storage (CCUS).



Renewable energy

Karnataka is India's leading state for renewable energy[iii], reaching 15.8 gigawatts (GW)[19] of total installed capacity in October 2022. Around 15 GW of solar and wind plant are currently under construction. Karnataka also constructed the largest solar park, with 2 GW capacity, in Pawgada on about 13,000 acres.

Karnataka has been progressively working on several favourable renewable-energy policies. These include policies for open access; introducing a hybrid wind-solar development policy; battery storage; pump storage to achieve the round-the-clock (RTC) grid availability policy; an EV policy; and taking significant steps to reverse Karnataka's historical reliance on energy imports.

The solar and wind potentials also promises to the investors in Karnataka for the round the clock generation mechanisms.

Karnataka has the potential to move from being a net importer of electricity to a net exporter, though insufficient interstate grid capacity currently constrains this goal.

The state's long-term strategy to diversify and decarbonise its electricity supply in tune with India's central plan has been aided by technological improvements, cost deflation, availability of cheaper financing, and a growing interest from global renewable-energy developers, utilities, and investors. This ongoing transformation offers a sustainable solution to the country's terrible energy-poverty and air-pollution problems, reducing its excessive reliance on imported fossil fuels and coal.

This renewable-energy transformation is a further boost for the government's "Make in India" programme with manufacturing potential in solar, wind, batteries, EVs, and the entire energy efficiency value chain, like, for example, solar irrigation pumps, solar hot water, heat pumps, street lights, and decentralised solar systems.

At the same time, the renewable-energy transformation provides an opportunity to create jobs. Green job creation can be a game changer for boosting the economy, especially for the rural community, with most jobs being available for unskilled and semi-skilled workers. People who are considered ineligible for several permanent and well-paid jobs can obtain jobs in maintenance, operations, installation, and sales.

Not just limited to monetary gains in terms of GDP, the benefits of renewables can go far beyond the traditional and restricted measurements of economic development. The process of generating renewable energy sources mainly takes place in the country's rural areas. In this way, while supplying a fair share of the power generated to these areas, the renewable sector also acts as a catalyst for upliftment of these areas.

Green hydrogen is set to play a leading role in the energy transition, and Karnataka has a high potential for it. It is the fastest-growing economy leading through sustainable and climate-neutral development. The global demand for this renewable energy source and its applications is expected to increase exponentially over the next 20 years, guaranteeing that it can play an essential role in the energy transition. The green hydrogen ecosystem could create a $20 billion green technology market in India and enhance domestic job creation. The country could then be seen as a net exporter of hydrogen in future to Europe, Southeast Asia, and Africa.

Fuel is just one of the uses of green hydrogen, while it can also be used for industrial and domestic purposes. Energy companies are well positioned to lead the transition but to do that, they need to develop new technology and infrastructure to provide an affordable, reliable, greener energy mix. Therefore, they will likely need capital and government support to reduce the process's financial and legal risks.

[19] Total installed capacity of 15.8 GW is made up of wind (5.2 GW), solar (7.9 GW), small hydro (0.9 GW), co-generation (1.7 GW), and biomass (0.14 GW)

Challenges facing the renewable-energy transition

Karnataka still faces a few challenges to overcome while growing its renewable energy footprint, such as the state's poor electricity grid and infrastructure; high transmission and distribution losses and charges; and the high-wheeling and cross-subsidy charges in the state.

Possible solutions

Green Energy Corridor[iii]**:** India's government has initiated the Green Energy Corridor (GEC) in Karnataka and other states like Andhra Pradesh, Gujarat, Himachal Pradesh, Maharastra, Madhya Pradesh, Tamil Nadu, and Rajasthan. The government aims to complete the corridor by 2025 to 2026 under central finance assistance (CFA) for up to 33 percent of the project cost. The CFA can help offset the intrastate transmission charges and keep power costs down. It can contribute to long-term energy security and promote ecologically sustainable growth by reducing the carbon footprint.

Green corridors with state industrial corridors. All the Karnataka Industrial Areas Development Board (KIADB) industrial areas could be powered by a private partnership model with 100 percent round-the-clock green energy. Many investors are ready to supply power at better tariffs than existing rates.

Green hydrogen plants looking for the port connected industrial zones require separate grid corridors for green energy with a few benefits like exemptions in wheeling and banking charges, and cross-subsidy charges, for example.

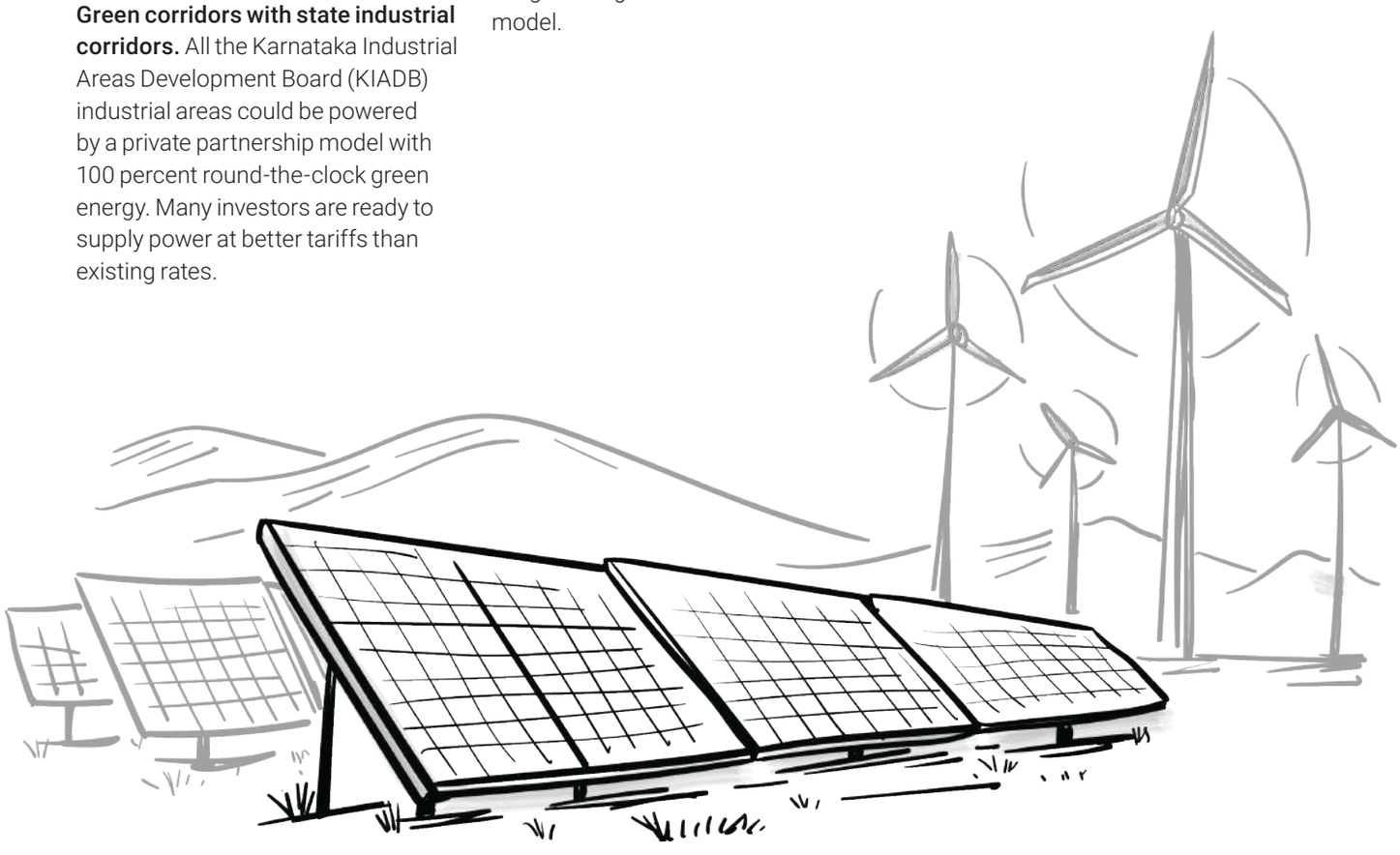
Provide solar pump sets. India's government has launched the Kisan Urja Suraksha evam Utthaan Mahabhiyan (KUSUM)[iii] scheme to financially support farmers by providing solar pump sets. Karnataka could take the initiative to implement this, reduce the pumps' free-power burden on the industrial and commercial consumers, and reduce the cross-subsidy.

Solar parks: The government could declare more solar parks in the state, and future generation could be focused on the RTC renewable energy parks.

Farmer pump feeders: All the farmer pumps feeders in Karnataka could be separated into separate feeders in the corresponding substation and powered by solar power for daytime usage through a PPP investment model.

District-wise RTC renewable energy: The state could consider producing district-wise RTC renewable energy while selling the excess power outside the state.

Waste-energy power generation: All the industrial zones and corridors could have mandatory waste-to-energy power generation, and all the urban cities could be mandated to have it as well.





01 Powerhouse to drive export led growth

Sub-sector focused initiatives could help build export momentum by operationalizing existing clusters, setting up new units and improving facility utilization

02 Modernize supply chain

End to end connectivity across the value chain could optimize transportation, effective capacity utilization and facilitate cargo movement

03 Human capital development

Upskilling and reskilling of employees for effective absorption into the workforce, R&D efforts across identified industries to capture value in sunrise sectors can be considered

04 Partnerships to drive Digital led manufacturing

Leverage the technology ecosystem of the state to drive automation, Industry 4.0 focused solutions could enhance operational efficiency

05 AtmaNirbhar Bharat focused initiatives

Consider initiatives and projects supporting AtmaNirbhar Bharat vision of the nation

06 Establish MSME development programs

Holistic focus on MSME's could enable them grow into formidable competitors for large companies

07 Facilitate ease of doing business

Identifying and alleviate delays related to approvals, grants, procedures could fastrack industry operationalization

08 Integrated townships for sunrise sectors

Evaluate the need and develop business case could be considered setting up industrial township areas can be considered


Eight priorities could help drive
growth
in Karnataka's eleven sectors

Options to drive growth in the manufacturing sector

For Karnataka to drive holistic growth, the state could focus on nine priorities across the eleven sectors.

Become a powerhouse to drive export-led growth

Key sectors in focus: FMCG, telecom, electronic components, food-processing, aerospace, and textiles

For Karnataka to become India's powerhouse to drive export growth, the state could look at operationalising newly instituted clusters, by focusing on its recently developed machine-tool-applications park on the outskirts of Tumkur, and the approved Hubbali-Dharward FMCG cluster park and Favorich Park at Mandya.

The state could consider promoting private sector management of established clusters by industry players in a private-partnership model. Furthermore, it could prioritise and develop clusters around major power-supply units (PSU) setups, such as HAL and DRDO, to drive MSME growth and generate employment opportunities.

The state could optimally utilise 10,200+ acres industrial land across Vijayapura, Ballari, Dharwad, Shivamogga, Hassan, Ramanagara, Tumakuru, and Chikkaballpur districts, to set up sub sector specific plug-and-play industrial parks and clusters in a PPP model pushing MSME growth Beyond Bengaluru.

Promote and enable private MSME clusters by supporting the development of industrial hubs on private owned land, with government to act as a facilitator for land use conversion, based on the Telangana model.

The state could also establish clusters and corridors with a plug-and-play approach around established OEM setups to promote Atmanirbhar Bharat projects, as well as industrial parks for industries showing solid exports of over 10 percent CAGR in the state and nationally.
(Exhibit 26 & 27)

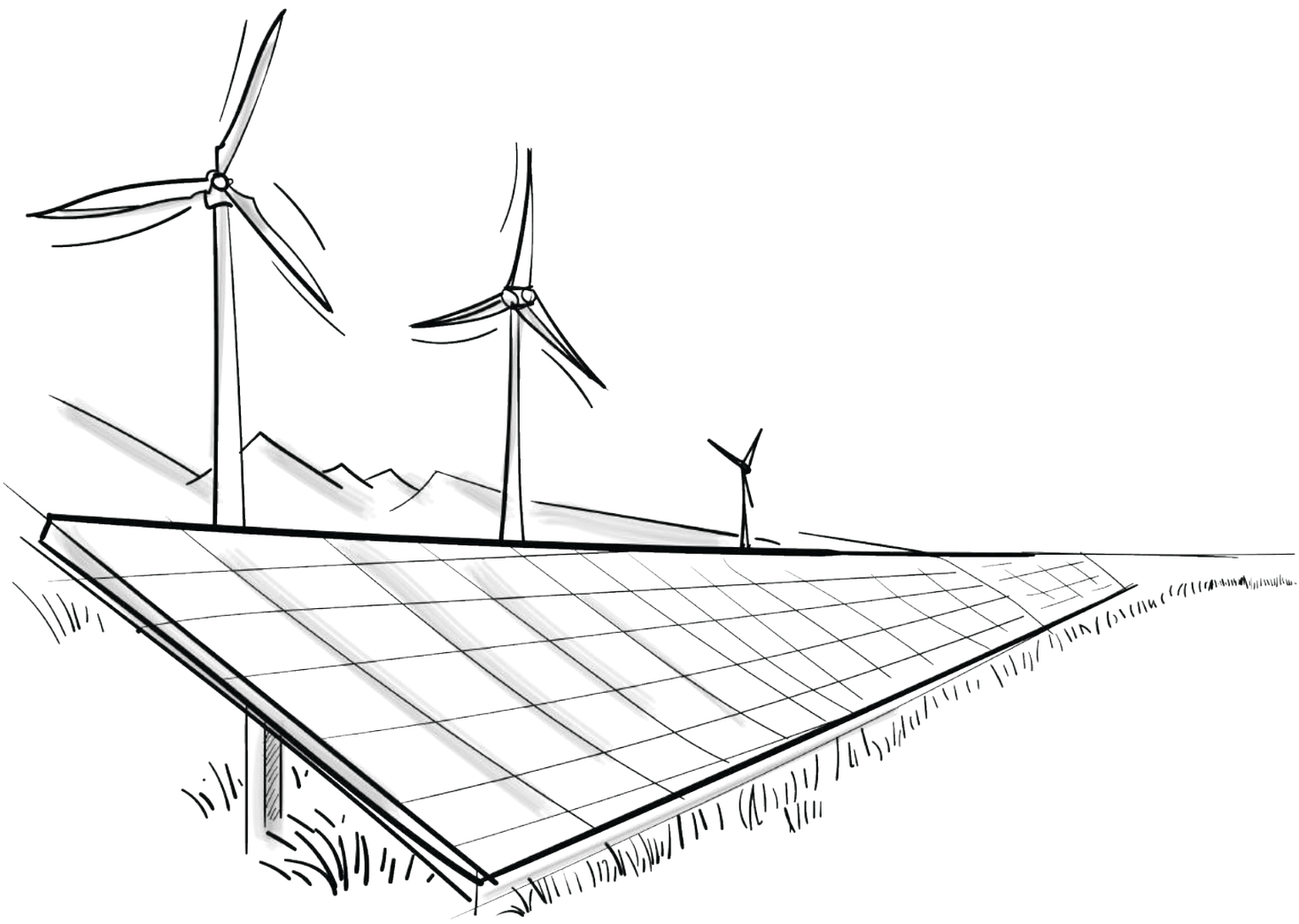


Exhibit 26

How Karnataka could become the driving force for export-led growth

01 **Diversify telecom instrument industries** to neighbouring districts such as Chikkaballapura, Tumkaru, and Ramnagara from Kolara and Bengaluru (99.5 percent share)

02 **Develop a FMCG cluster park** in the Mangaluru region with similar incentives as the cluster park in Hubballi-Dharward

03 **Expand electronic instrument manufacturing capacity** at Mysuru and Tumkaru, while focusing on setting up capacity at neighbouring districts of Hassan, Belagavi, Chikballpur, and Chitradurga, etcetera.

04 **Industrial park to promote auto cluster** suppliers similar to the ones in Manesar/ NCR, Chennai, Pune, and Sanand

05 **Create food-processing and cold storage units** in Vijaypura, Belgavi, Bagalkot, Kalburgi, etcetera, under the AtmaNirbhar Bharat programme with special initiatives

06 **Set up Tier 2 and 3 companies in the Ballari** district

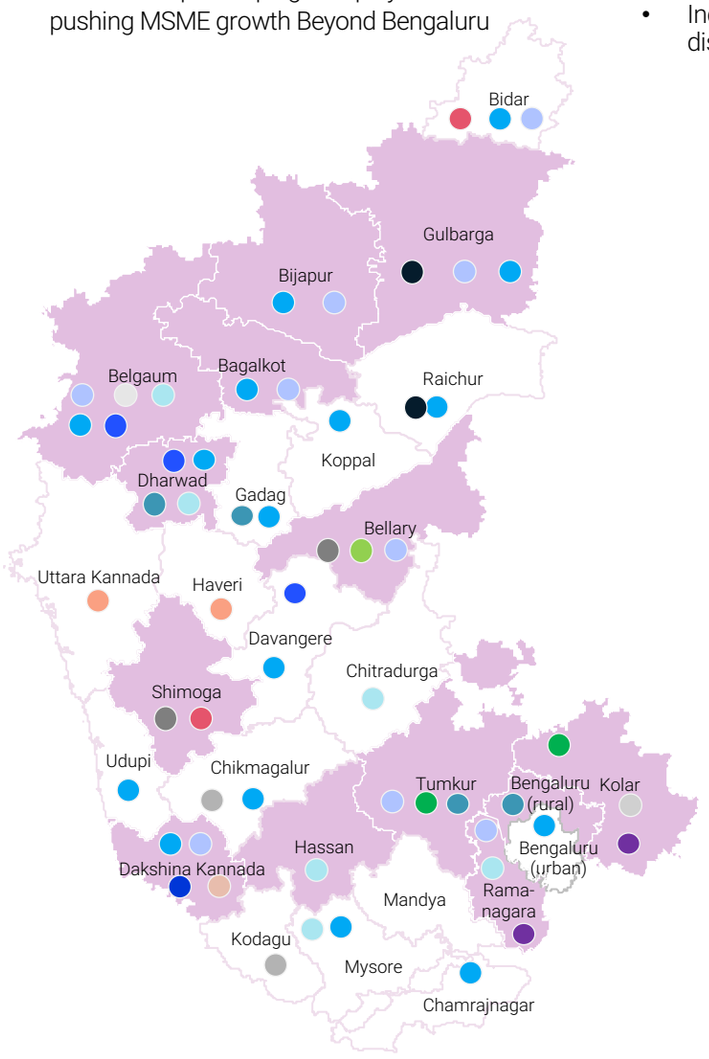
07 **Set-up textile-focused cluster in Bidar**

08 **Build on leadership in the aerospace industry** and develop North Karnataka, where four international airports and ten domestic airports within a radius of 500 kilometres have the potential to set up the region as an MRO hub. Establish clusters and corridors on the Bengaluru Pune highway to promote Atma Nirbhar projects with plug-and-play industrial parks

Exhibit 27

Optimal utilisation of 10,200+ acres of industrial land[1]

- 10,200+ acres of available industrial land (across Vijayapura, Ballari, Dharwad, Shivamogga, Hassan, Ramanagara, Tumakuru, and Chikkaballapur districts) could be optimally utilised to set up sub-sector specific plug-and-play industrial clusters pushing MSME growth Beyond Bengaluru
- Drive industrialisation across districts with identified land parcels and those with high potential
- Expand the current programme of 150 ITI modernisation across all ITIs to develop industry-ready skilled workforce availability
- Industry clusters to be developed in Beyond Bengaluru districts with world-class architecture



- Districts with available industrial land
- Mineral processing
- ITI
- Machinery / Machine tools
- FMCG cluster
- EMC cluster / Electronics
- Auto and Auto components
- Agro-processing clusters
- Aerospace / Drone cluster
- Floriculture
- Coffee
- Spices centres
- Shipbuilding infrastructure
- Textiles
- Telecom instrument
- Steel / Foundries
- Pharma
- Gem and jewellery

1. Manufacturing committee

Modernise supply chains in vital sectors

Key sectors in focus: FMCG, capital goods, auto, food-processing, and electronic vehicles

To drive supply chain modernisation in Karnataka, connecting developed and proposed clusters in strategic locations such as Hubbali Dharwad, Mangaluru, and Tumkur with good connectivity to ports is essential to give the FMCG, capital goods, and auto sectors a significant boost. It is vital to secure end to end connectivity between the auto component clusters across Hoskote in Bengaluru Rural, Bidadi in Ramanagar, at Dharwad, Shivamogga, and Belagavi, and the original equipment manufacturers (OEMs).

Karnataka could also create end to end value chains for items such as fruit, vegetables, milk, and spices, focused on the food-processing industry by setting up export-oriented food parks and infrastructure – pre-processing and cold-chain, for example, for chilli (Byadgi), rose onion (Chickballapur), and coffee (Chikkamagaluru, Hassan, and Kodagu).

The digitisation of end to end value chains could improve reliability and value-chain resilience by leveraging advanced analytics such as telemetry. Manufacturers could also optimise their delivery networks and better forecast demand at the stock-keeping and distributor levels.

Partnering with industry players to develop food-processing-focused analytic solutions to optimise facility use could improve supply chains to utilise buffer processing and cold storage capacity across Hassan, Dakshin Kannada, Ballari, and Mysuru, and support production in, for instance, Tumkaru, Mandya, Chikkamangaluru, Kopal, Kodagu, Mandya, Udupi, and Dharwad.

Karnataka could create major shipbuilding infrastructure around Mangaluru similar to the infrastructure developed in Gujarat, by inviting significant players. Further, the operationalisation of the container-handling facility in the Mangaluru port could facilitate the eases of movement of inbound and outbound cargo, thereby reducing reliance on the Chennai, Tuticorin, and Cochin ports and associated logistic costs.

Lastly, the state could consider setting up EV-charging hubs and stations with charging incentives to promote EV use across the public and private sectors.

Develop human capital

Key sectors in focus: capital goods, pharmaceuticals, food-processing, and electric vehicles

Karnataka could capitalise on the opportunities in sectors such as automotive, electronics, semiconductors, chemicals, and medical devices by drawing on the comparatively high number of STEM[iii] graduates in India. Around 2.1 million STEM students graduate every year in India.

Human capital development could benefit from the curation of employee-capability-building programmes. In addition, at-scale manufacturers and established OEMs could upskill or reskill their employees in the latest manufacturing technologies through tie-ups with academic institutions and digital training platforms.

As a priority across the state, Karnataka could drive female labour participation in the industry with employment-linked incentives and policies to encourage women's employment.

Imparting industry-relevant, skill-based learning across diploma schools, ITIs, and engineering colleges is crucial to developing large pools of trained labour for absorption across industries in the districts and the state.

Further, Karnataka could consider sponsoring stipendiary apprenticeship schemes for three years in every sector with dual-track training, such as the Swiss-German model. The state could also establish tie-ups with educational institutions to develop machines locally.

Karnataka could promote R&D efforts across identified industries to capture value in sunrise sectors such as the auto, batteries, EV, and electronic chip building sectors. For this to happen, the state could have to:

- Setup statewide labs with dedicated R&D funding to promote 3D printing centres for prototype development.
- Establish a working group between the United States and Karnataka to increase pharma-related R&D and drug production.
- Develop incubation centres in R&D, along with industry participation to accelerate EV rollouts.
- Partner with agriculture R&D institutions, such as the Indian Agricultural Research unit (ICAR) to support incentives and commercialisation.

Establish industry partnerships to drive digital-led manufacturing using Industry 4.0

To establish valuable partnerships for digital-led manufacturing to take shape, Karnataka could leverage its structural advantages (digital and start-up ecosystem) and partner with technology companies. This could help drive automation and develop AI-powered subscription products or services, such as scientific warehousing that builds on data compiled by the Internet of Things (IoT) and remote sensors.

The state could also leverage the government's e-portal (GeM), a one-stop online platform for public procurement projects. Karnataka could consider partnering with private companies to develop solutions that can enable small businesses to integrate with the Open Network for Digital Commerce (ONDC) and the GeM. This move could also personalise the customer experience and optimise operations, including inventory planning and supply chain management.

Karnataka could benefit from modernising local manufacturing and supply chain setups with Industry 4.0 technologies by partnering with domestic technology firms. This could assist in incorporating IoT-based assembly-line and distribution productivity enhancements (such as digital twins, analytics-based process automation, chatbots, robot process-automation-based maintenance, and 3D printing) – thus helping to create operational efficiency across critical metrics, including yield, quality, and cycle time.

Furthermore, Karnataka could set up state-wise labs and showcase centres to promote digital manufacturing and act as nodes for MSMEs to fasten prototype development and minimise capital investment.

Establish MSME development programmes

Karnataka could enhance the productivity of the MSME ecosystem with supplier grants to enable breakthrough innovation, sharing of technology licenses and know-how, mentorship opportunities, capital availability, and partnerships in manufacturing value-added offerings linked to the core product. For example, EV companies could help MSME suppliers develop informatics, safety systems, and battery management systems.

The state could also leverage partnerships between large industrial promoter groups and global OEMs, especially in the auto and capital goods sectors, enabling access to the technology and capital for establishing local manufacturing capability.

Industry collaboration with the MSME could support the Micro and Small Enterprises Cluster Development Programme (MSE-CDP) to scale up manufacturing hubs, such as Uttar Pradesh's One District[iii] One Product programme for agriculture, food, and textiles.

Furthermore, technology interventions to promote e-market linkages, digital lending solutions, and faster release of receivables by the government and PSUs could promote financial inclusion and get MSMEs on the journey to success. Support is also needed for resources that MSMEs cannot always afford to hire, such as in-house lawyers and company secretaries.

The government could collaborate with financial institutions to enable easier availability of funds by providing, for example, a dedicated corpus and lower interest rates for MSME organisations with a particular focus on rural areas. It could also consider establishing an MSME grievance redressal forum at the State level with defined timelines to fast track issue resolution.

Another consideration for Karnataka is to partner with management institutes like the Indian Institute of Management in Bengaluru to develop vendor management and marketing programmes for MSMEs that could enable them to achieve higher customer acquisition.

Facilitate ease of doing business

Project monitoring, readying of electrification, roads and water, facility management, staff transportation, APMC, and other considerations could accelerate new land reform implementation and harmonise state-level compliance requirements to avoid delays and costs. Changes in labour laws could also facilitate industry-friendly policies for, amongst others, wages and working hours in textile processing.

For the next five years, the state could consider expanding production-linked incentive schemes beyond centres schemes – worth $25 billion – to promote manufacturing and exports. Another consideration is to fund suppliers, using the hub-and-spoke model from OEM to Tier1 or 2 to promote seamless linkages and dedicated incentives for the capital goods industry. This could be equivalent to lowering the GST rate by 4 percent instead of 18 percent until the industry becomes self-sustainable.

Karnataka could furthermore promote the coordination between KIADB and Local Panchayat Corporation, while ensuring the demarcation of residential and industrial areas.

Integrate townships for the sunrise sectors

Townships could be set up that focus on the auto industry, offering good connectivity, health and education facilities, adequate housing, the correct skill set availability, power, water availability, and more. The regions in Bagalkot and Gadag could be evaluated for the auto sector integrated township with regard to the presence of automobile, auto ancillary, engineering, valves, and the metal industry, and land bank of nearly 600 acres. Leaders in the field, such as Toyota, Tata, Volvo, and TVS, could also be studied to see how they can manage to take big bets and support significant investments.

In addition, Karnataka could consider setting up a task force with government and industry experts to identify potential areas for EV development. It could also prepare a comprehensive regional development plan that could map geographically-inclusive infrastructure augmentation requirements for priority sectors. Karnataka could attract globally renowned industrial park developers by structuring incentives linked to investments grounded in "industrial township areas."

Furthermore, Karnataka could encourage private players to leverage government policies (such as the MoFPI implementing the Pradhan Mantri Kisan SAMPADA Yojana (PMKSY), PM-formalisation of Micro Food Processing Enterprises (PMFME), and a scheme for providing financial, technical, and business support).

Another consideration is that Karnataka could invite global investors with an efficient ecosystem of all component suppliers around the OEM for every sector, including the auto, aero, and machinery industries.

Karnataka could ensure that power-related benefits or subsidies, such as electricity duty exemption and concessional power tariff, is available in other states. In addition, an opportunity exists for setting up EV-charging stations in public places, highways, and key routes.

Finally, the state could institute foreign direct investment (FDI) policies to attract higher investments.

Sector agnostic options for overall growth

While there is a need to have sector-specific strategies and initiatives to drive growth, Karnataka could consider the following sector-agnostic options to drive overall growth and provide a suitable environment for manufacturing to grow:

Establish free-trade zones and port-proximate clusters: The government could facilitate globally competitive manufacturing hubs in high-potential sectors, such as electronics and capital goods, chemicals, and textiles and apparel. State governments could support efforts by creating plug-and-play cluster zones based on their manufacturing strengths. All these clusters could be prioritised around the established OEM and large industry setups. For example, multimodal logistics parks are already set up in several cities under the government's road-development programme, Bharatmala. These could become world-class, efficient logistics zones for manufacturing (for example, electronics and aeronautics in Nagpur).[20] In Karnataka too, the government could focus on export-oriented clusters and industrial with a plug-and-play approach around established OEM setups to promote Atmanirbhar Bharat projects, as well as industrial parks for industries showing strong exports in the state and nationally (over 10 percent CAGR). These could include:

- The diversification of telecom instrument industries (over 60 percent CAGR) to neighbouring districts such as Chikkaballapura, Tumkaru, and Ramnagara from Kolara and Bengaluru (99.5 percent share). This could promote migration of talent and leverage on proximity to promote faster development.
- Electronic-instrument manufacturing (20 percent CAGR) to districts such as Hassan, Belagavi, Bagalkot, Dakshin Kannanda, Mysuru, and Chikballpur to grow existing setups and proximity to industry corridors.
- Industrial parks to promote auto-cluster suppliers like the ones in Manesar NCR, Chennai, Pune, and Sanand.
- Food-processing and cold storage units in, for example, Vijayapura, Belagavi, Bagalkot, and Kalburgi. Crops with the highest scope for value addition could be identified, such as millets or organic produce, dairy products, pomegranate, grapes, mango, lime and lemon, and orange, which can create opportunities for manufacturing products such as juice, pulp, squash, and jams. Clusters to unite farmers, processors, and the entire ecosystem could be considered as a way to enhance food-processing.[iii] Only 1 to 2 percent of the total production of fruits and vegetables are processed into different products, while about 25 to 30 percent of the produce is lost due to improper post-harvest management.
- The PSU setups within the state could be prioritised and Tier 2 and Tier 3 manufacturer bases clusters set up.

All these clusters could be operated in a PPP model with a minor government stake and primary management being driven by the private players. This could drive faster industrial push and setup, as observed in a few setups across the state.

Scale up SMEs to grow mid-sized and small firms into global challengers: There is a dearth of mid-sized firms in Karnataka that typically grow into formidable competitors for large companies.

To grow into global challengers, these firms require easier access to low-cost capital; simpler one-stop processes to start and run their businesses; and support for resources they cannot always afford to hire, such as in-house lawyers and company secretaries.

- Supportive schemes, such as leveraging an account aggregator (AA) framework, could enable financial institutions to build digital lending solutions for MSMEs, focusing on small-ticket loans, in conjunction with the open credit enablement network (OCEN) protocol. Continuing ongoing government credit guarantee schemes for MSMEs could further support these initiatives. In addition, schemes such as the Emergency Credit Line Guarantee Scheme, the Credit Guarantee Fund Trust for Micro and Small Enterprises, and Pradhan Mantri MUDRA Yojana could underwrite risks for lenders.[21]

[20] "35 multimodal logistics parks to come up under Bharatmala project: Gadkari," The Economic Times, October 22, 2021
[21] India's century – Achieving sustainable, inclusive growth. A roadmap for India.Inc, FICCI

- Industry could collaborate with the MSME Ministry to support the Micro and Small Enterprises Cluster Development Programme (MSE-CDP) to scale up manufacturing hubs. For instance, Uttar Pradesh's One District One Product programme for agriculture[iii], food, and textiles could be scaled across other states and promote exports under the "Made in India" brand. China has a similar initiative with professional towns and villages functioning as production hubs for individual products, enabling economies of scale.[22] This could include common facility centres for production, processing, design, and testing, and infrastructure development centres for power, water, transport, and more.
- Moreover, the state lags some of the top states regarding the number of MSMEs and credit availability. Karnataka could create favourable policies to attract MSMEs to establish themselves in the state. However, government collaboration with financial institutions may be needed to enable easier availability of fund. This could be done by providing a dedicated corpus and lower interest rates for MSME organisations with a special focus in rural areas. Due to low capital availability, delayed payments by government, PSUs, and private players only add to the existing financial pressures that MSMEs face. Government can partner with technology companies to drive technology interventions that promote e-market linkages, digital-lending solutions, and faster release of receivables by the government and PSUs to promote financial inclusion and provide the runway to MSMEs for success.
- Government interventions to address structure-based challenges could include setting up a dedicated grievance redressal forum to enable faster resolution of issues where MSMEs are facing delays; partnering with management institutes like Indian Institute of Management in Bengaluru to develop vendor-management and marketing programmes for MSMEs, thus enabling them to achieve higher customer acquisition; supplying e-source support for MSMEs that cannot always afford to hire, such as in-house lawyers and company secretaries; and finally, setting up state-wise laboratories and showcase centres to promote digital manufacturing and act as nodes for MSMEs to fasten prototype development and minimise capital investment.

With these supportive measures, SMEs could scale their GDP contribution from 30 percent to 50 percent to match global standards.[23] These measures could also raise the number of mid-sized firms that could compete with larger companies, especially in sectors such as manufacturing, construction, and trade, which contributed around 19 percent of GDP in 2020. The contribution of the MSME[ii] sector to the country's GDP is about 40 percent, and the MSME sector is the second-largest employer after agriculture, whose SME segments have a high potential to scale up. This segment is pivotal to catapult Karnataka towards its $1 trillion economy vision (Exhibit 28 & 29).

[22] One town one product (OTOP) project in China supervised by Small and Medium Enterprise Administration (SMEA).
[23] All India Management Association

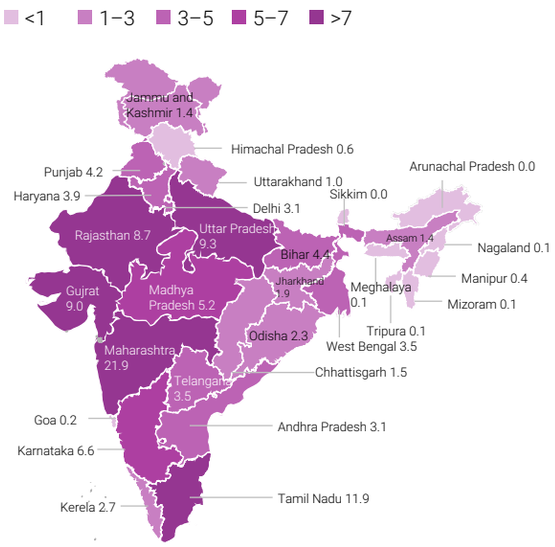
Exhibit 28

MSME overview[1]

Number of MSMEs (lakhs)

# of MSME in lakhs

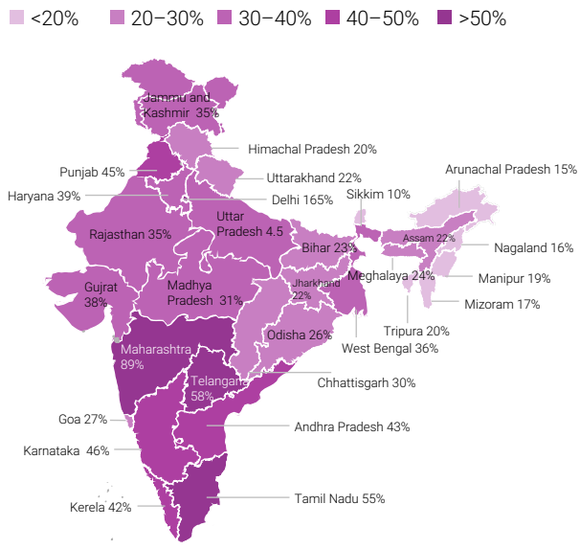
Top 5 states (Maharashtra, Tamil Nadu, Gujarat, Uttar Pradesh, and Rajasthan) together account for ~55% of total MSMEs in India



State-wise credit by SCBs to GDP ratio (FY20)

Credit to state GDP ratio

Only 4 states (Delhi, Maharashtra, Tamil Nadu, and Telangana) have higher credit to GDP ration than the national average (~50%)



1. Manufacturing committee

Labor-intensive industries (LIIs) are the best way to provide gainful employment to a large population that is moving away from agriculture in rural areas. With focused skilling programs, LIIs could offer income opportunities to the transitioning population. Even a lower wage than in cities will go a long way towards quality of life, especially considering that living costs tend to be lower in towns. Women who are less mobile than men can now find employment near their villages and towns, commute, and earn a living. Karnataka's manufacturing employment as a percentage of total employment is only 11.74 percent and can be increased rapidly with a suitable LII mission.[24]

[24] Karnataka 2022 – One Trillion GDP Vision – Mohandas Pai Nisha Holla

Exhibit 29

Priority sectors for MSME[1]

India could prioritise various sectors that have high potential for small and medium-sized enterprises to scale up to large enterprises

High Moderate Low

Sectors	Potential to scale (2030)	Industry size[4] (2020, $)	Industry CAGR (2020–30)	Contribution to India's GDP (2020)	Potential to influence	Priority[5]
Manufacturing[2]	3x	~1,469	12.1%	~14.2%	High	High
Construction and real estate	4.5x	~455	12.1%	~6.8%	High	High
Trade[3]	4.5x	~317	11.7%	~9.0%	High	High
Travel, transport, and logistics	5.5x	~200	121.0%	~3.6%	Moderate	Moderate
Healthcare	11x	~134	12.8%	~2.9%	High	Moderate
Financial services and insurance	1.2x	~244	14.00%	~10.3%	Low	Moderate
Telecom, technology, and media	3x	~182	10.7%	~7.7%	Moderate	Low
Oil and gas	2x	~217	13.2%	~2.2%	Low	Low
Mining	2x	~65	6.9%	~1.7%	Low	Low
Power	2x	~80	13.0%	~1.4%	Low	Low

1. Manufacturing committee
2. Manufacturing includes automotive, auto components and advanced industries, basic materials, cement, chemicals, consumer good manufacturing of electronics, pharmaceuticals and medical products, steel, textiles, and other manufacturing.
3. Trade includes wholesale and retail trade, hotel and restaurant, and entertainment.
4. Industry size and CAGR is based on total sales (gross output), nominal. Contribution to GDP is based on value added, nominal.
5. Determined based on 25 percent weightage to each of the four factors and ability to influence in scaling SMEs.

Initiate Atmanirbhar Bharat-focused initiatives: To reduce import dependency and promote the growth of indigenous industries, the state promotes import localisation efforts towards Atmanirbhar Bharat by driving down manufacturing as a percentage of imports to 10 to 15 percent by 2030 (this was 25 to 30 percent in 2021). This could be applied to strategic sectors (for example, electronics, capital goods, and petrochemical intermediates).[25] The Koppal toy cluster[i], developed in partnership with Aequs Infra, could generate 40,000 jobs and attract investments of around 5,000 crore. Additionally, it can reduce the dependence on imports while providing support to indigenous manufacturers. This is an excellent example of the Atma Nirbhar project in the state. However, there needs to be a focus on driving multiple other such initiatives in the PPP model.

Create a one-stop shop: The state government could create a one-stop shop for clearances and industry queries through an e-governance platform to avoid delays and costs. This can digitise the compliance process by, for example, implementing business-reform action plans and expanding the use of e-signatures. It could also improve speed of approvals, project monitoring, ready electrification, roads and water, facility management, and staff transportation.

Train labour to combat the labour shortage and improve productivity: A growing workforce may require the relevant skills and talent for success in sectors with the greatest scope for employment and growth.

A three-pronged approach could be employed as follows:

- Start by bolstering foundational skills to match the requirements of high-potential sectors, such as banking, healthcare, IT services, and manufacturing.
- Large-scale skilling and reskilling the existing workforce would be vital; therefore industry bodies could set up training academies that provide standard certification programmes across job roles, for example, NASSCOM's[iii] FutureSkills programme that aims to upskill 400,000 IT employees in B2B companies by 2025.
- Creating the future workforce may require modernised teaching methods with a greater focus on practical apprenticeship, such as imparting industry-relevant skill-based learning across diploma schools, ITIs, and engineering colleges to develop large pools of trained labour for absorption across industries. These can be particularly focused on the human capital and education chapters in the districts and across the state.

Leverage the structural advantage of Karnataka (tech, services, and startup ecosystem): A tech and services ecosystem could boost sectoral growth. Furthermore, sector-focused innovation clusters could enhance the environment for innovation, for example, in economic hubs where capital, expertise, and talent collaborate on developing new or nascent technologies, industries, and ways of doing business. By partnering with technology companies to drive automation, these clusters could develop AI-powered subscription products or services, such as scientific warehousing that builds on data compiled via the IoT and remote sensors. Enterprises and consumers are likely to intensify spending on technology from 5.5 percent of global GDP in 2020[ii] to around 7.5 percent by 2030, creating opportunities for India in technology services, software as a service (SaaS), products, and consumer technologies.

Focus on power generation and renewable energy sources: Karnataka offers reasonable infrastructure for industry. However, power consumption continues to stagnate due to the high cost of power for the industrial sector. In financial year (FY) 2017, power consumption[i] was 54,183 million units (MU) which remained at 54,284 MU in FY 2021 with almost stagnant power generation. Industry consumption[iii] has remained small at over 7,500 MU, while agricultural consumption is nearly three times that. This may need a paradigm shift to increase industrial growth. Captive power generations seem to be the preferred source for the industry. Karnataka makes up 20 percent of India's renewable power generation with the country's highest solar installation capacity, which can be capitalised to provide more options for industrial consumption and growth.[26] Additionally, the state could reduce cost subsidies for industrial power given these are revenue generating. By reducing costs, more industrial setup in the state can be encouraged.

Overall, manufacturing could drive the backbone of growth for Karnataka for the state's aspiration to reach $1 trillion in GDP in the next decade. This ambition requires a focus on planning and execution with solid governance to ensure the effective and efficient roll-out of the abovementioned programmes to yield the desired results.

25 "A new growth formula for manufacturing in India", 2020.
26 Karnataka 2022–One Trillion GDP Vision–Mohandas Pai Nisha Holla

References

i Karnataka economic survey

ii GDP performance and value forecast

iii Agriculture committee

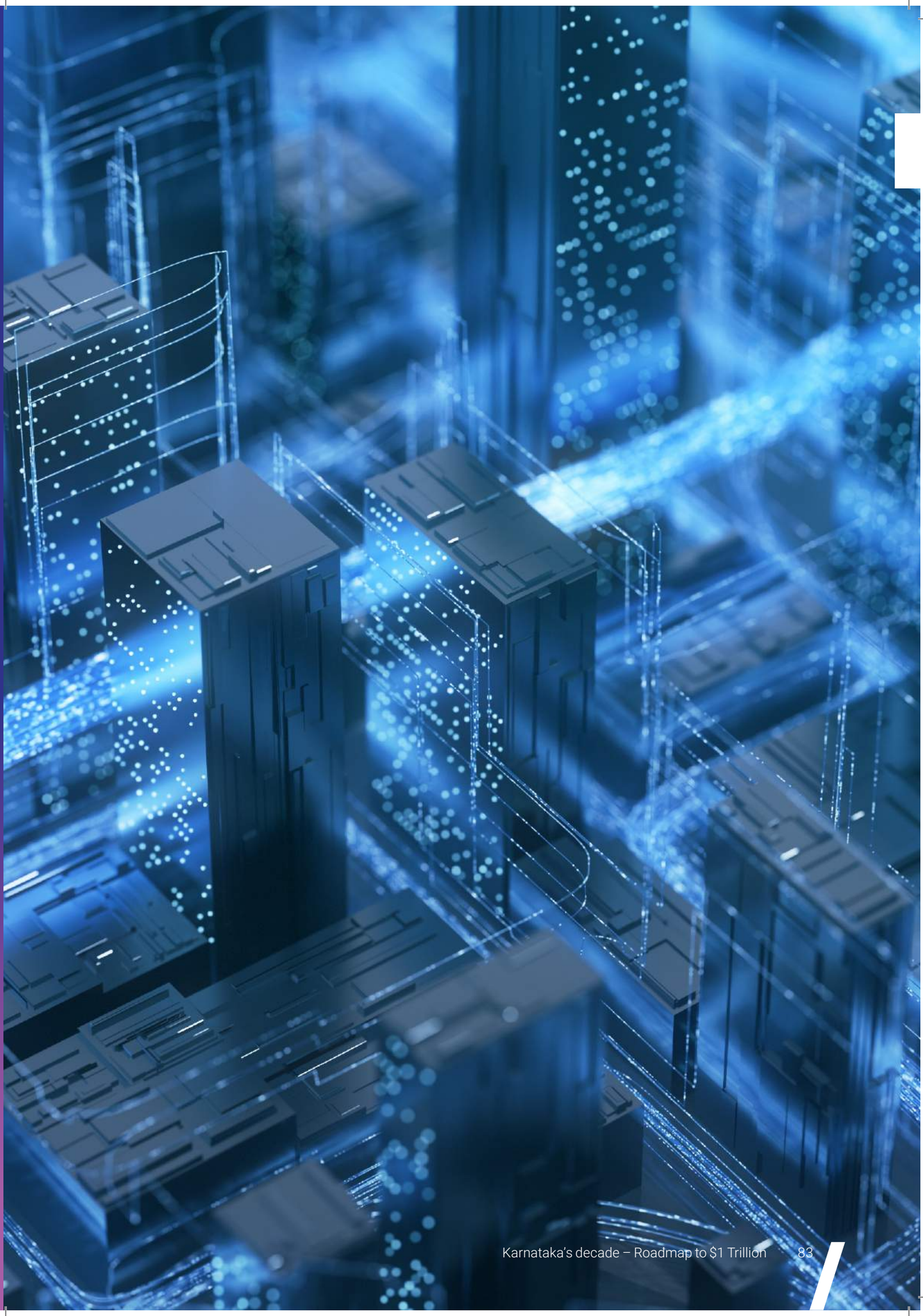
iv ITBT committee

CHAPTER

03

Technology, Research and Innovation





India, with its sizable population and favourable business climate, is well known for its significant potential for growth opportunities. Over the past ten years, Information Technology (IT) and the Information Technology enabled services (ITeS) in the country have emerged as a crucial sector, steering India's leadership position in the global landscape in terms of employment and economic value generation. The sector encompasses a wide range of hardware and software solutions that empower businesses to develop cutting-edge ideas by harnessing the power of data. It has a sectoral turnover of about $230 billion, expanding at 10 percent per annum. With a global market share of 55 percent for IT and business-process-management (BPM) services, India is currently a market leader.[27] Indian IT and ITeS firms have over 1,000 international delivery centres in 80 countries across the globe. The nation further is seen as being the digital capabilities hub of the world, with close to 75 percent of global digital talent available in the country.[28]

Over the past few years, India has established itself as a leader in technology services. The IT industry has emerged as one of the largest employment generating industry in Karnataka. It is now viewed as the IT hub of India and its capital, Bengaluru, is the fourth-largest technology and innovation cluster globally, with over 400 global research and development (R&D) centres.[iii] In addition, there are a significant number of unicorns based in Bengaluru. This city has been named as one of the top ten technology innovation hubs outside Silicon Valley and is renowned for developing disruptive technologies.

Karnataka is India’s largest software exporter, with electronic and computer software and services exports totalling to $78 billion in 2018–19.[29] It has created 21 lakh jobs in Bengaluru alone to date.[i] Over the next five years, the industry, combined with the start-up ecosystem, could create between 2.5 to 3.5 lakh high-skilled jobs.

Karnataka was one of the first states to announce an IT policy, in 1997.[iii] The Government of Karnataka (GoK) has implemented a range of policies and incentives to support innovation and help businesses in this field succeed. These include rental reimbursements, recruitment assistance, and support for quality certifications and patents. These measures are designed to reduce operational costs for companies and allow them to focus on enhancing innovation to compete on the global stage.

The Karnataka Digital Economy Mission (KDEM), a Section 8 organisation, is set-up with the mission to function as the knowledge bridge to become the digital economic accelerator wherein the industry takes the leadership role to determine the strategy for the growth of digital economy in the State.In addition, the Government of Karnataka provides the full support mechanism to run the strategy. According to the Hon. Prime Minister's ambition of a $1 trillion economy, this plan aims to contribute to a $300 billion[iii] digital economy. KDEM collaborates with a variety of stakeholders, including business leaders, government organisations, academic institutions, and entrepreneurs, to promote investments and job creation in the state. Within the digital economy, the organisation concentrates on bolstering and expanding Karnataka's share of IT and ITeS companies, global in-house centres (GICs), global capability centres (GCCs), and electronic system design and manufacturing (ESDM) in the state, as well as start-ups and innovation in the industry.

One area in which India has particularly excelled is in GICs and GCCs. These centres have been established by companies to take advantage of the country's skilled workforce, which is available at competitive pricing, and further to leverage the continual government support and extensive start-up ecosystem. In addition, the GoK has provided ongoing support to these businesses, as well as start-ups, which has helped to create a thriving ecosystem for entrepreneurs. KDEM is an enabling implementation partner of the GoK for policy benefits in the digital economy space. In fact, in recent years, around 35 percent of enterprises have established centres in India, with key drivers for this growth being the availability of a large tech and digital talent pool, the presence of established start-ups, and a strong GCC ecosystem.[30]

Bengaluru leads the pack in the GCC market among Indian cities, with a 34 percent market share. It is the preferred location for platform engineering GCCs as a result of having the largest digital talent pool in India, accounting for around 25 percent of the total skilled workforce, and the highest availability of GCC talent (accounting for about 3 lakh employees or 37 percent of India's GCC talent pool). The combination of an attractive workforce, competitive pricing, and supportive government policies have all contributed to India's position as the preferred destination for establishing GCCs.[31] Many new centres in Bengaluru focus on building or enhancing capabilities in IT services, including digital and software product and platform development.

[27] Karnataka IT Policy 2020–25
[28] Data published by DPIIT, MeITY, GoI
[29] Data published by MeITY and DPIIT
[30] ANSR on big data & analytics
[31] Deloitte-NASSCOM GCC Value Proposition for India, June 2021; Invest Karnataka

In the "hybridisation" movement – where businesses collaborate with service providers to expand specialised business capabilities – GCCs are a crucial player. For large businesses, these locations have developed into "second headquarters," adding to the primary headquarters in a variety of ways. With a common agenda of cost minimisation, assembling a team for specialised abilities on a shoestring budget and achieving operational excellence, small and medium-sized businesses are also starting to take GCCs into consideration as a key strategy. Cost arbitrage served as the primary impetus for businesses to establish GCCs in India in the early 2000s, but as time has gone on, they have evolved into strategic assets that offer a sizeable competitive advantage. Mobile, cloud, and information security are no longer optional capabilities, but essential for enterprises to remain relevant.

Emerging trends in the GCC landscape can have an impact on the IT and ITeS ecosystem in the future

- Global organisations can focus on making their GCCs a true microcosm of the enterprise, with the goal of mirroring the enterprise in the DNA of the GCCs.
- Local GCC leaders can increasingly take on the role of global leaders, managing business-critical efforts, participating in planning and strategy, and interacting with customers, which can reduce the distance between the GCC and the company.
- As the role of the GCC evolves, companies can shift from focusing solely on cost reduction to measuring both tangible and intangible benefits contributed by the GCC.
- Karnataka, and specifically Bengaluru, is expected to remain a global talent hub[iii], with an estimated 8 to 9 lakhs digital talent pool by 2026. The city has emerged as one of the top hotspots for AI and has the second-largest AI talent pool in the world.
- GCCs can increasingly operate in an agile and distributed model to focus on digital transformation and can build digital products and platforms that touch a company's entire value chain.
- The competition for talent has increased the cost of acquiring niche and next-generation tech skills. GCCs can therefore invest significantly in reskilling and cross-skilling their existing workforce in key emerging digital technologies, such as AI, machine learning, natural language processing, cloud, and data analytics.

The most common capabilities built by GCCs in the country

Finance and accounting – the most delivered business process

- Approximately 60 percent[iii] of GCCs provide finance and accounting services for their enterprise. The most supported processes are procure-to-pay and order-to-cash. Many multinational corporations (MNCs) have also established process-specific centres of excellence (CoEs) for areas such as tax, global payments, and financial planning and analysis.
- Within human resources (HR), the most mature processes are talent acquisition, HR operations, and HR analytics. Talent acquisition is a high-touch process that is typically kept in-house, while HR operations are mostly transactional, leading to high adoption of GCC support. HR analytics are also popular, as enterprises use internal data to identify patterns and trends.
- Retail, consumer-durables, and household-and-personal-products GCCs show a high adoption of procurement services. Procurement and supply chain management are core functions in these industries, and companies use their GCCs to address challenges such as cost reduction, process compliance, and process benchmarking and standardisation.
- Marketing analytics and digital marketing are the most mature processes within the marketing function. Analytics help companies identify trends and create content for digital platforms, research competitors, and understand customer interactions with websites. To enhance return on investment (ROI) from campaigns, GCCs in India have built domain knowledge in supporting campaign management across a variety of channels and constructing data models based on consumer profiles and spending behaviour.
- GCCs also support industry-specific processes. The adoption of these processes has grown approximately[iii] 7 percent in the past seven years. Examples of specific processes in different industries include know-your-customer (KYC) and customer due diligence in banking; underwriting, policy acquisition, and servicing in insurance; asset management and corporate banking in capital markets; and merchandising, store design, and operation in retail.

Case studies[iii]

A US-based retailer established a centre in Bengaluru a decade ago with the goal of optimising efficiency and cost. The GCC has since grown to approximately 400 full-time equivalent employees and handles multiple finance processes, including finance operations and controllership, financial planning and analysis, tax and treasury, audit, and compliance. Together with a small strategy team in the United States, the GCC delivers 85 percent of the group's finance operations.

A UK-based retailer opened a centre in Bengaluru in 2010 with an accounts payable team of 80 employees. Over time, the GCC was able to optimise the team with the help of technology, automation, and AI. Today, a team of 15 manages payables to the value of over $35 billion.

Digital services

- Traditional application development and maintenance (ADM) and IT infrastructure services are the most delivered services by GCCs. These services were previously a major source of revenue for IT service providers, leading to a large pool of skilled talent available at low cost.
- In recent years, there has been a significant increase in the delivery of digital technologies from GCCs. Currently, more than 75 percent of GCCs leverage digital technologies such as AI, machine learning, cloud computing, cybersecurity, Internet of Things (IoT), and robotic process automation to build new products and services, expand into new markets, and improve customer experience.
- GCCs are also exploring and investing in emerging technologies such as augmented and virtual reality, blockchain, and quantum computation. These technologies have the potential to further enhance GCCs' products and services and help them stay competitive in the market.

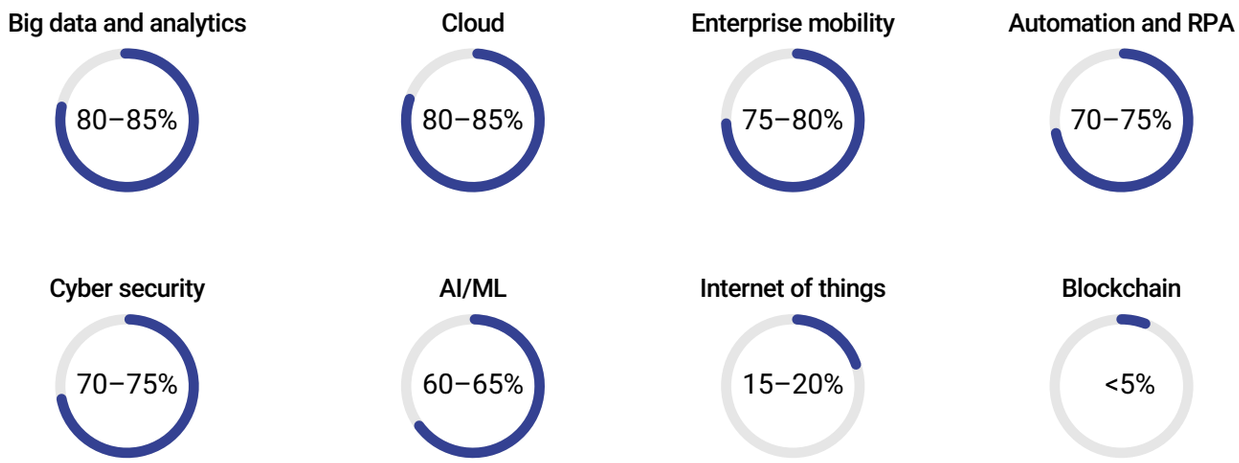
Big data analytics and cloud

- In the early 2000s, cost arbitrage was the main reason for enterprises to set up GCCs in India. However, over time, these centres have evolved into strategic assets that provide a significant competitive advantage for enterprises.
- Mobile, cloud, and information security are no longer optional capabilities; they are vital for businesses to remain competitive in today's market. These technologies are now essential to the operation and success of businesses in a variety of industries. (Exhibit 30)

Karnataka has become a hub for innovation for global enterprises,

Exhibit 30

IT/ITeS



Note: Represents the #GCCs deploying the respective technology stack for incubating/maintenance/upgrading a product/platform/application across software product lifecycle.

Source: ANSR

with **approximately 60 percent of GCCs building products for the global market**.[iii] To maximise the value of their GCCs, businesses have established specialist product development and engineering capabilities centres in Karnataka due to the reduced cost of producing products and the existence of a robust tech ecosystem. For example, automotive and semiconductor GCCs have created centres of excellence for mechanical research and design, and embedded product design.

Via accelerator programmes, GCCs have worked closely with start-ups to develop proof-of-concepts and grow them across several areas in recent years. These collaborations have given GCCs access to innovative concepts and technology while promoting the expansion of Karnataka's start-up ecosystem.
The following endowments make Karnataka the most attractive state for IT and ITeS investments in the country. [32]

Ease of doing business
Karnataka has made improvements to the ease of doing business, including amending the Land Reforms Act to facilitate land procurement and the Facilitation Act to improve overall business operations. The approval process is also transparent and convenient.

Educational Institutions
Numerous educational institutions are located in the state, including 57 medical colleges[iii], 234 engineering colleges, 44 universities, and 16 foreign schools. Notable examples include the Indian Institute of Science Bengaluru (IISc), the Indian Institute of Technology Dharwad (IIT-D), and the International Institute of Information Technology Bengaluru (IIIT-B).

Talent pool
With the highest availability of tech talent in the nation, Karnataka has a solid talent pool. Bengaluru is renowned for its millennial-friendly atmosphere[iii], and 37 percent of its population is between the ages of 15 and 35. The city is home to over 100 engineering schools that annually graduate over 90,000 engineers. Furthermore, Bengaluru has 25 percent of India's skilled labour and 37 percent of the GCCs' entire talent pool.

Landscape and ecosystem
The state has a thriving start-up ecosystem, with a total of more than 15,000 start-ups[iii]. In addition, Bengaluru is home to 40 percent of India's unicorns.

Infrastructure
Karnataka has well-developed infrastructure, including 13 major national highways[iii], two international airports, and six domestic airports. The Bengaluru Airport is the third-largest in India. The state also has a surplus of power and the highest-installed capacity of renewable energy in the country at 18.8 GW. There are 51 notified special economic zones (SEZs), of which 38 are operational.

Collaborative IT policy
The state has a history of supporting the IT industry, having formulated its first IT policy in 1997. A new IT policy has recently been unveiled, with the goal of creating six million[iii] jobs and contributing approximately 30 percent to India's goal of achieving a $1 trillion economy.

All in all, Karnataka has much to offer companies interested in starting operations in the country. It is a desirable site for firms looking to expand or open new operations due to its sizable and skilled population, a favourable business environment, and new supportive government regulations. Karnataka is well positioned to continue to play a major role in the global technology industry, thanks to its strong emphasis on innovation and its robust start-up environment.

The Government of Karnataka has laid out its vision for 2032 in terms of key industry metrics and sectoral revenue projection for IT and ITeS, as detailed below. (Exhibit 31 & 32)



[32] Invest Karnataka; IT Policy 2020–25 (Department of Electronics, IT, Biotechnology, and Science and Technology); Press release Ministry of Commerce and Industry for SEZs in Karnataka; Karnataka Industrial Policy 2020–25

Exhibit 31

ITeS: Vision[1]

Macroeconomic indicators	From (2022–23)	To (2031–32)
Digital economy contribution ($ bn)	61 (FY22)	300+
Growth %	~14%	~17%
SaaS revenues by 2032 ($ bn)	2.05	66
# of Jobs (m)	1.8	4.7
Share of revenue beyond Bengaluru (%)	~2.3%	~4%
Digitally skilled talent pool (%)	9.5% (2.1 m people)	80–100%

Aspirations

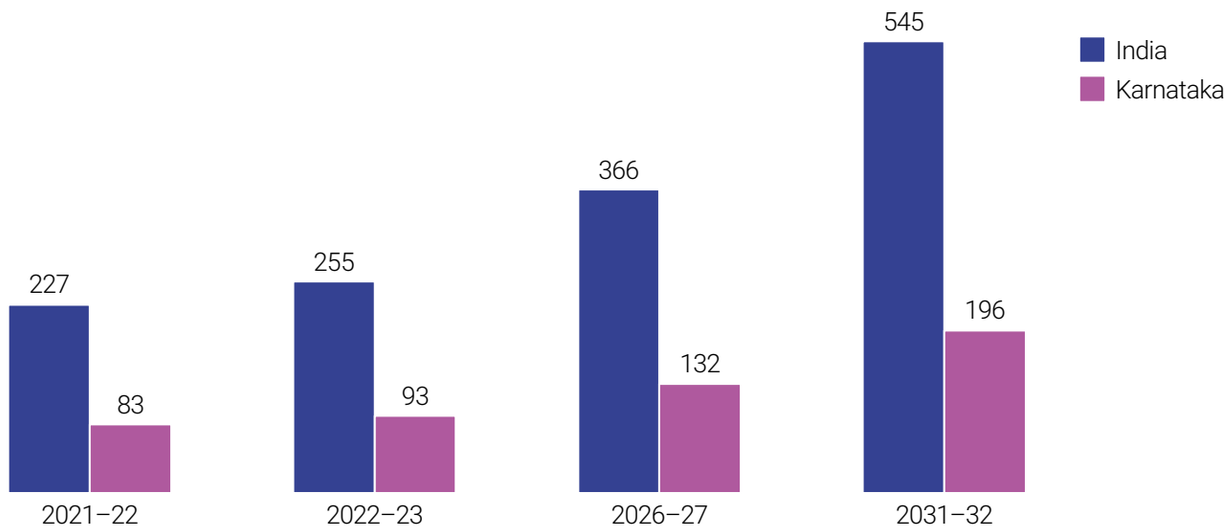
1. Become the **digital economic accelerator** where industry takes the leadership role to determine the strategy for the growth of digital economy and the government provides the entire support mechanism to run the strategy
2. **Destination of choice** for leading IT/ITeS multinational companies and Global Capability Centres
3. **Retain leadership position in innovation and technology** and pace towards sustainable and holistic economic development

1. IT and ITeS committee committee

Exhibit 32

Revenue projections[1] – IT/ITeS sector[2,3]

$ billion



1. GDP projections
2. IT and ITeS committee
3. Includes both IT exports and IT domestic

Key initiatives for Karnataka's growth in IT and ITeS

To move towards the above growth in Karnataka's IT and ITeS sector revenues, and ensure Karnataka can achieve its targets in terms of the key sectoral metrics, the following key initiatives are suggested:

Scale up talent for the future in universal tech literacy and skills in high-growth domains. While building a robust formal education pipeline, Karnataka may need to focus on IT-related education streams. By following training models laid out by Infosys and other IT giants, the students in these courses can be trained to global standards. Inviting industry participation here is crucial.[33]

Develop training programmes

- To develop talent at the ground level, the government can collaborate with GCCs to create industry-specific curricula for universities and colleges that integrate fundamental programming and IT skills. Government skill development projects may require effective implementation strategies to close the demand-supply gap for digital skills, which is predicted to increase by more than three-and-a-half times in India over the next five years.
- In comparison to other states, Karnataka's English language training programmes have a low-participation rate. The government can work with institutions to develop and introduce English language training programmes in all of the state's districts, with a special emphasis on rural areas.
- Develop skill-building initiatives in collaboration with business to create a workforce that is prepared for the BPO and KPO sectors, creating jobs outside Bengaluru.

Establish an industry-wise digital taxonomy and create required training and certification programmes in collaboration with tech businesses, universities, and industry organisations, such as NASSCOM, to attain a workforce that is 100 percent digitally skilled in fields like AI, machine learning, and user interface. For example, Oracle partners with (SCPD) to upskill its staff.

Modernise skill and training infrastructure

- Modernise training and skilling facilities throughout the state to train 25,000 people annually in in-demand industry-relevant skills with tailored training programmes and courses. For example, Telangana Academy of Skill and Knowledge (TASK) has trained and deployed over 180,000 skilled workers in the electronics industry.[34] The industry could be considered when planning the curriculum, content, and distribution method. To achieve this goal and provide these numbers by 2024, KDEM can collaborate collaborate with KSDC and other partners.
- By 2030, scale infrastructure to train talent for software and SaaS, such as product management (grow by three to six times), marketing and sales, and customer success (grow by three to five times). This can happen outside Zone 3, that is in Bengaluru Urban and Bengaluru Rural districts.
- Establish a Skill and Entrepreneurship University in Mysuru, with participation from institutions like Babson College in Boston in the United States.

Set up a taskforce to oversee and ensure effective rollout of government skill development initiatives, such as Pradhan Mantri Kaushal Vikas Yojna by technical institutions, National Employability Enhancement Mission (NEEM), Chief Minister's Kaushalya Karnataka Yojane (CMKKY), and Industry Linkage Cell (ILC), etcetera, to narrow the demand-supply gap of talent.

Foster the innovation ecosystem and move towards cutting-edge innovation, because the IT world is changing rapidly due to rapid advancements in interdisciplinary fields. The state could capitalise on this opportunity to develop CoEs with state-of-the-art laboratories and top talent to become a front runner. This can ensure the states' success and leadership position in IT in the years to come.

- **Partner with industry bodies to set up CoEs** in the areas of AI, machine learning, blockchain, cybersecurity, IoT, enterprise automation, and agritech, and establish state-of-the-art laboratories to lead the changing face of IT. This could be done in association with industry bodies and academic institutions. CoEs can be developed across the three emerging tech clusters (for example, six CoEs in AI and machine learning at Hubballi-Dharwad-Belagavi cluster, a CoE in fintech at Mangaluru, a CoE in cybersecurity and ESDM at Mysuru, and then CoEs in aerospace, medtech, agritech, food processing, and metaverse to be set up in other clusters). These CoEs could be self-sustainable in three years after operationalisation. (Currently, GoK has set up CoEs in Bengaluru district across aerospace and defence, cybersecurity, IoT, semiconductors, animation,

[33] Pai and Holla, 2022
[34] Telangana State IT Policy

visual effects, gaming, machine intelligence, agro-innovation, data science and AI, efficiency augmentation, AI and robotics, and internet of ethical things.)

- **Develop and launch accelerator programmes with GCCs** to identify start-ups to propose Minimum Viable Products (MVP) and pilots for identified civic issues.
- **Earmark funds to accelerate the deployment of sandboxes** to enable free exploration of new technologies such as cryptocurrency, quantum computing, 5G or 6G, for example (by allowing for R&D testing and piloting in new tech under government supervision) and enhance regulatory trust in new technologies.
- **Incentivise global tech players (with tax benefits) to support the scale-up of SaaS companies** by partnering with them to jointly develop offerings (for example, with pilots), provide access to end customers in target segments, enabling Go-To-Market (GTM); opportunity for global leadership in areas such as horizontal infrastructure (cybersecurity, devops and dev tools, data management and observability, etcetera), vertical (e-commerce enablement, healthcare tech, logistics tech, ESG tech), and SMB-focused SaaS.

Develop technology clusters: Karnataka can drive growth in the state's IT industry through the development of ecosystems and working infrastructure across its technology clusters, which are emerging as preferred and attractive destinations for domestic and global investments across several industry verticals like IT and ITeS, BPO, ESDM, and animation, visual effects, gaming, and comics (AVGC), etcetera.[35]

- **Beyond Bengaluru:** Accelerate the development of world-class infrastructure for at least a 5,000-seater technology cluster covering an estimated area of four lakh square feet in emerging technology clusters located at Mysuru, Mandya, Chamrajnagar, Mangaluru, Udipi, Manipal, Hubli, Belgavi, and Dharward, with an approximate investment of INR 100 crore each.
- **Incentivise developers to build plug-and-play buildings and coworking hubs** to provide greater flexibility in working spaces and operational infrastructure, especially to MSMEs. Phase 1 could focus on setting up an operational facility along the lines of Global Technology Centre Mysuru. This facility could be termed as an entrepreneurship-hub (E-Hus) in the Mangaluru and HDB clusters. A budget of INR 100 crore[iii] has already been requested for FY 2023–24. Similarly, hubs can be created in other clusters like Kalaburgi, Tumakuru, and Shivamogga.
- **Set up an emerging technology cluster fund:** Karnataka can be the first to state to set up such fund, allocating it to KDEM to promote emerging technology clusters in the state.

Create a world-class ITeS enablement ecosystem: Karnataka can support improvement in ease-of-doing-business for GCCs and IT and ITeS companies, thus increasing Karnataka's investment attractiveness and spreading awareness of key incentives. The government can provide this through a series of interventions, to help Karnataka maintain its position a leader of India's IT industry. This can be done by:

- The government can work with NASSCOM to address the issue of transfer price markup with the Ministry of Commerce. Further, it could reduce existing transfer price markup (currently 12 to 18 percent), which is higher than other global hubs such as Eastern Europe (5 to 10 percent) and Asia–Pacific (5 to 12 percent), to be more competitive. It can transfer pricing dispute resolutions (with guidance from Indian tax authorities on litigation faced by GCCs on transfer pricing issues); pricing of intra-group transactions; markups that are necessary to secure a higher APA. This remains one of the biggest reasons that many companies not use this option.[36]
- Streamline processes with digital interventions to reduce delays in patent filing and grant process.
- Push for consortia of companies (such as consumer tech and software players) to collaborate with the Karnataka Innovation and Technology Society (KITS), and state government to position the region as a leading digital transformation centre; host conferences, industry conclaves, roadshows at a global scale in areas such as customer experience and Industry 4.0 to showcase technological capabilities and the cutting-edge work that is being done.
- Launch omnichannel campaigns to spread awareness about the financial incentives and benefits being offered to start-ups, MSMEs, and large companies.

[35] Karnataka Startup Policy 2022–27
[36] NASSCOM Policy Roundtable on transfer pricing challenges confronted by technology firms, 2019

- Develop digital platforms to streamline public procurement of IT services, hardware and software products, and cloud-related services to facilitate a greater ease of doing business, while making government services available digitally to citizens (for example, MeeSava 2.0, and T-App Folio).
- Launch awareness, skilling, and digital training programmes for SMEs and provide incentives (for example, better credit scores, subsidies, free subscription up till a number of certain users, etcetera). This will aid the adoption of software solutions built by Indian SaaS companies to drive business digitisation (such as inventory management, customer marketing, and accounting).
- While the Government of Karnataka has policies in place related to innovation, engineering, R&D, IT, and start-ups, it is important to launch awareness programmes and promote policies to ensure that entrepreneurs and GCCs can take advantage of them. Events such as the KDEM conclave, participation in conferences conducted by NASSCOM, and other industry events could be leveraged as platforms to bring attention to existing policies.
- To encourage global enterprises to consider India as a GCC destination, tax authorities could review the expected margins for GCCs under the Safe Harbour Rules (SHR). This could be done based on the experiences of other countries, without limiting the types of services offered.
- **Financial support required**
  - **INR 3,000 crore** towards the emerging cluster scheme.
  - **INR 1,000 crore** to develop tech clusters at Mysuru, Mandya, Chamrajnagar, Mangaluru, Udipi, Manipal, Hubli, Belgavi, and Dharward.
  - **INR 500 crore** for skilling and training facilities across the state at a cost of INR 100 crore each year for next five years, which can enable 25,000 people to be upskilled each year.
  - **INR 300 crore** to set up centres of excellence (CoEs) to be developed across the three emerging tech clusters (this comes to a total of six CoEs).
  - **INR 200 crore** to establish a Skill and Entrepreneurship University in Mysuru.
  - **Financial support of up to 33 percent of the fixed investment** for infrastructure as per the IT Policy 2020, (excluding land cost), with a ceiling of INR 2 crore, whichever is lower.

Unlock urban infrastructure: Develop Karnataka's emerging tech clusters into truly global entities with world-class infrastructure and seamless inter- and intracity connectivity. These can be used to host global companies and attract skilled talent from across the globe.

- Incentivise builders and developers to construct commercial grade A properties in emerging tech clusters. (These would be tailormade incentives for mega projects or enterprises, IT hubs or clusters, such as exemption on stamp duty, power tariff concession, and FSI and FAR concessions.)
- Improve flight connectivity between all tech clusters in Karnataka. While all tech clusters have airports, the limited availability of flights between Bengaluru and other locations is currently a hurdle. Therefore, the construction of new airports or heliports in emerging cities can be initiated – new airports in Shivamoga, Hassan, Davangere, Udupi, and Vijayapura. A new heliport construction has already commenced in Kodagu.
- Improve last-mile metro connectivity and expedite ongoing metro construction projects, while ensuring adherence to timelines. Also, provide and maintain designated parking spaces at metro stations to offer commuters the choice of leaving their cars in a secure location.

Advocate for the adoption of globally recognised infrastructure standards, including roads, electricity, water, and safety measures.



References

i Karnataka economic survey

ii GDP performance and value forecast

iii Technology, Research and Innovation committee

CHAPTER

04

Start-up





India: the third-largest start-up ecosystem in world

The burgeoning Indian start-up ecosystem has evolved dynamically over the last two decades, showing remarkable growth. Since 2018, start-ups have created over six lakh jobs, including over two lakh jobs in 2021 alone.[37] The number of new recognised start-ups have increased to over 14,000 in 2021—2022 from only 733 in 2016—2017,[38] with over 60,000 start-ups across over 50 industries currently registered with Department for Promotion of Industry and Internal Trade (DPIIT).

Today, India is the world's third-largest start-up ecosystem after the United States and China. Since May 2022, India has been home to 100 unicorns with a total valuation of $333 billion.[39] India minted 44 unicorns with a total valuation of $93 billion and 14 unicorns worth $18.9 billion in 2021 and 2022, respectively.[40] According to The National Association of Software and Service Companies (NASSCOM) Tech Start-up Report, 2021 was a year of unparalleled growth in the Indian tech start-up ecosystem, with continued steady growth. Some of the key achievements include:

- Over 2,250 tech start-ups founded, taking the total base to 25,000—26,000;
- Altogether 44 unicorns added.
- Funding increased from $8 billion in 2020 to $24.1 billion in 2021;
- Altogether 58 percent of all tech start-ups funded in 2021 raised the first round of funding – up by 13 percent from 2020.[41]
- In April – November 2021, INR 89,066 crore was raised through 75 IPO issues, much higher than in any year in the last decade.[42]

The Government of India's continuous efforts to boost start-ups and entrepreneurship is the thrust behind this country's start-up ecosystem—poised to grow with continued momentum. Some of the Indian government's initiatives include the following:

- Make in India
- Start-up India
- Stand Up India
- Start-up Accelerator for Product Innovation, Development, and Growth (SAMRIDH)
- Aspire, Atal Innovation Mission
- Start-up India Seed Fund Scheme
- Fund of Funds for Start-ups
- Start-up India Yatra
- Start-up India Showcase; and
- Start-up India Innovation week.

Karnataka: India's innovation hub

Karnataka is well poised to play a pivotal role in reaching India's ambitious aim of becoming a $1 trillion digital economy by 2025, with significant contributions from the state's start-ups. As India's innovation hub, Karnataka has, for the third consecutive year, topped NITI Aayog's India Innovation Index (2019, 2020, and 2021). The government has taken several initiatives to enhance its stature as the leading hi-tech digitalised state and ranks first in software and service exports in the country. Karnataka is spearheading the growth of the Indian industry, particularly in information technology, by contributing more than 40 percent to India's software exports, biotechnology, Electronic System Design and Manufacturing (ESDM), and aerospace. The state is at the forefront of cutting-edge technologies such as blockchain, IoT, artificial intelligence, nanotechnology, machine learning, cyber security, robotics, genetic engineering, and quantum technologies.

Karnataka has one of the most mature start-up ecosystems, with over 15,000 start-ups.[iii] Its vast tech ecosystem comprises an incubation space of 1.25 lakh sq feet with state-of-the-art facilities and R&D infrastructure consisting of innovation hubs, incubators, centres of excellence, technology and business incubators, common instrumentation facilities, New Age Innovation Network (NAIN) institutions, etcetera.

Karnataka was India's first state to proclaim a dedicated Start-up Policy in 2015. The state's government has rolled out several programmes to support start-ups in their business lifecycle — from providing funding at various stages (seed, venture capital, angel investor, and sector-specific funding) to incubation support, mentorship, coworking spaces, and a dedicated Start-up Cell to facilitate start-up growth. Through the Grand Challenges Programme, the Department of Electronics, Information Technology (IT), Biotechnology (Bt), and Science and Technology (S&T) Karnataka has developed a unique platform for start-ups to showcase and present innovative and disruptive ideas to solve social impact issues on environmental, social, and governance (ESG) framework and Sustainable Development Goals (SDGs). Under the New Age Incubation Network programme, they created 40 district innovation[iii] hubs, 60 start-ups, 35 patents, 302

37 Karnataka Startup Policy 2022–27
38 Economic Survey 2021–22, Ministry of Finance, Government of India
39 Inc42's 100 Unicorns Report 2022
40 The Indian Unicorn Landscape, Invest India, May 2022
41 Indian Tech Start-Up Ecosystem – Year of the Titans, NASSCOM and Zinnov, 2021
42 Economic Survey 2021–22, Ministry of Finance, Government of India

prototypes, and over 400 events. Furthermore, the government has enabled market access programmes for start-ups through Global Innovation Alliances (GIA) to engage and collaborate with innovation hubs globally and position start-ups globally. Under the umbrella of GIA, the government has developed international collaboration with over 30 countries. On the back of the above initiatives and policies, Karnataka received recognition as the Best Performer State in DPIIT's Start-up Ranking 2021 and the top performer position for two consecutive years (2018 and 2019).

Bengaluru holds the lion's share of total unicorns in India, as being home to 40 unicorns out of the 104 unicorns ($340 billion).[43] Furthermore, India has seen four decacorns (companies with a valuation of $10 billion and above), and three from Bengaluru. With an estimated GDP of $110 billion, Bengaluru is expected to grow at an average annual real GDP growth of 9.9 percent over 2020–2024.[44] From the $41.7 billion funding raised by the Indian start-ups in 2021, Bengaluru accounted for 62 percent, amounting to $26 billion.[45] The city has been ranked eighth on the Global Start-up Ecosystem Index 2022 by Start-up Blink. It has also been ranked 22nd in the world on the latest Genome Start-up Ecosystem Report 2022, the only Indian city to be featured in the top ten and top 30, respectively. (Exhibit 33)

Despite the pandemic, India's Silicon Valley – Bengaluru, the fourth largest technology cluster in the world – is the fastest-growing city in Asia. Its start-up ecosystem is being compared to ecosystems like New York, Paris, Berlin, and Tel Aviv. With the vision to create a world-class start-up ecosystem in the state, the government, through its policy landscape, has leveraged the tech ecosystem in Bengaluru to develop a culture of innovation and entrepreneurship with the support of industry and academic partnerships.

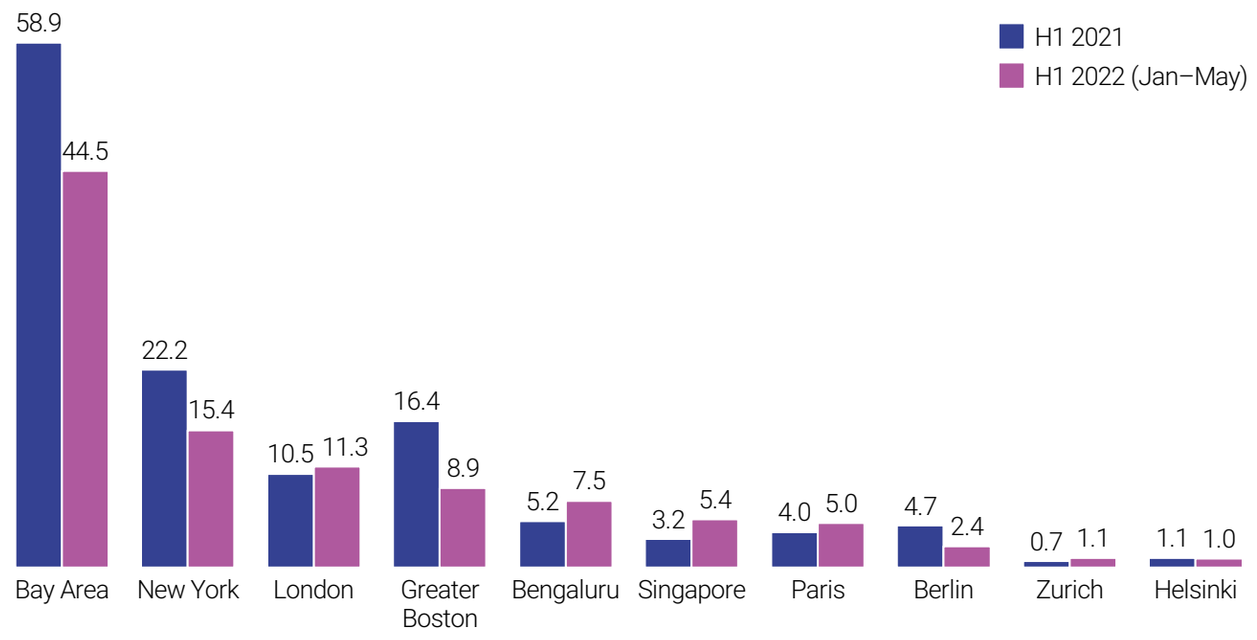
[43] How KDEM Aims To Foster Bengaluru-Like Startup Economy In State's Emerging Startup Clusters | Inc 42
[44] How KDEM Aims To Foster Bengaluru-Like Startup Economy In State's Emerging Startup Clusters | Inc 42
[45] Inc42's 100 Unicorns Report 2022

Exhibit 33

Pecking order

Top 10 global cities, based on VC investments in the first six months

$ billion



Source: Global Startup Ecosystem Report, Dealroom.co May 2022

Karnataka's start-up sector is poised for the next phase of growth by leveraging the existing ecosystem in Bengaluru. Together with the Beyond Bengaluru technology clusters of Kalaburagi, Belagavi, Dharwad, Mangaluru, Shivamogga, Mysuru, and Tumakuru, the state could emerge as one of the preferred and attractive destinations for domestic and global investments across several industry verticals such as IT and ITeS, Business Processing Outsourcing (BPO), ESDM, Animation, Visual Effects, Gaming and Comic (AVGC) AI, EdTech, Agritech, Fintech, and Telecom, being driven by a combination of strategic location, incubation and acceleration infrastructure, connectivity, access to research and educational institutions, coworking spaces, and availability of skilled and talented workforce. These clusters offer lucrative business opportunities for partnerships and collaborations that the state could leverage to achieve inclusive growth.

With a focus on ensuring that the state plays an integral role in energising the start-up community at the national and international level through its inclusive and tech-enabled innovation ecosystem supported by a strong talent base and entrepreneurial spirit, the Government of Karnataka has developed the "Karnataka Start-up Policy 2022" to further develop the start-up ecosystem in the state and foster accelerated growth. The main goal of the policy is to establish Karnataka as the "champion state" for start-ups by taking a comprehensive approach to enhancing the start-up ecosystem through thorough and equitable strategic interventions across key pillars of support, including funding, incubation, infrastructure, mentoring, acceleration, R&D, and industry connections.
The government envisages to ensure that Bengaluru maintains the lead position at global level, while also developing other emerging cities in the state as start-up destination of choice. This could be achieved by developing a robust infrastructure.

Achieving Karnataka's vision

The vision of the Karnataka Start-up Policy is to play a vital role in creating an enabling environment across the state that will nurture start-ups throughout their business lifecycle and develop Karnataka as a global innovation hub for start-ups.

To achieve the above vision, the GoK laid out several objectives and targets to drive the development of the start-up ecosystem in the state. These include:

- Strengthen the infrastructure set up in government institutions and support the ecosystem with a greater thrust on emerging clusters Beyond Bengaluru.
- Inculcate innovation and entrepreneurial skills in students across all streams of learning and provide opportunities where they can nurture and grow to their full potential.
- Stimulate the growth of up to 25,000[i] start-ups by 2027, and 41,000 start-ups by 2031–32[iii]
- Increase the number of high-growth start-ups
- Encourage social entrepreneurship and assistive technology innovations in the state.
- Facilitate innovative technology solutions in social governance sectors to address the existing social challenges in the environmental, social, and governance (ESG) framework and to meet sustainable development goals (SDGs).
- Support the creation and development of incubation and acceleration infrastructure as critical enablers to boost the prevailing start-up ecosystem
- Facilitate funding avenues that lead to investment in start-ups by institutional and angel investors and through government funding. (Exhibit 34)

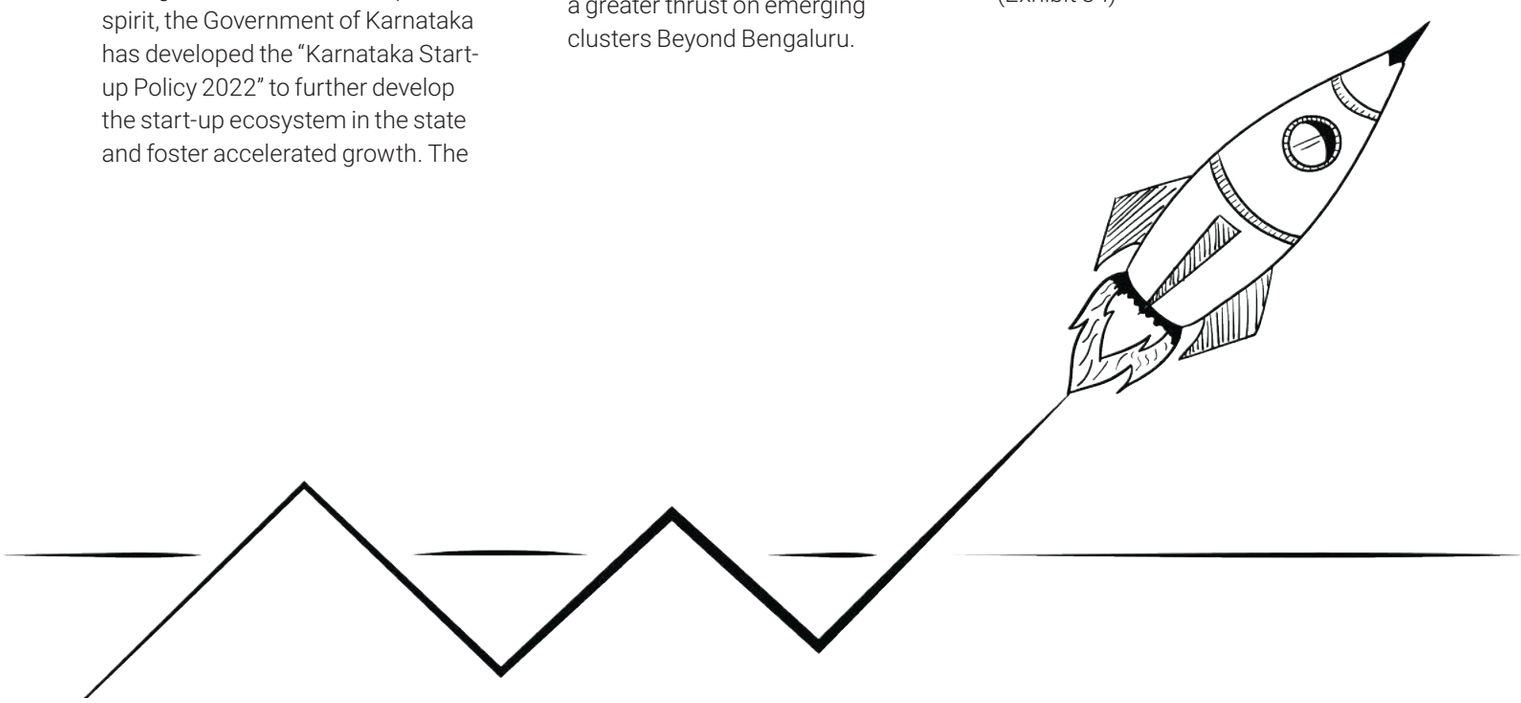


Exhibit 34

En route to achieving the above objectives, GoK aspires to achieve the following targets in the start-up sector by 2031–32[1]

Macroeconomic indicators	From	To (2031–32)
# of Start-ups	15,000[2]	41,000[3]
# of Unicorns	40[4]	129[5]
# of Beyond Bengaluru start-ups	2,955	10,000[6]
Total start-up funding raised ($ bn)	11 (CY 22)	51[7] (FY32)
# of Jobs supported by start-ups	500k+	2,200k[8]
# of Women-led start-ups	1,050[9]	4,100[10]

Aspirations

1. **Strengthen the incubation infrastructure set up** in government institutions and support the ecosystem with a greater thrust **on emerging clusters Beyond Bengaluru**
2. Drive innovative technology **solutions in social governance** sectors to address Environmental, Social, and Governance (ESG) framework and meet Sustainable Development Goals (SDGs)
3. **Facilitate funding avenues** by institutional investors, angel investors and through government funding

1. IT and ITeS committee
2. Karnataka Startup Policy 2022–27
3. Assumption is based on CAGR 11% (growth rate as per Start-up Policy target of 25000 Nos. by 2027
4. Inc42 Report
5. Assumption (12% CAGR) from the presentation made by Mr. Prasanth Prakash during the workshop on Vison 2047
6. Current year data insights from YNOS – Database subscribed by KDEM
7. CAGR of 19%, based on the past 8 years average year on year growth rate (INC 42 Annual Funding Reports)
8. Assumption (23% CAGR) from the presentation made by Mr. Prasanth Prakash during the workshop on Vison 2047
9. IWWAGE Report 2020
10. Assuming a 10% share of women start-ups in lieu of multiple government interventions; 15% CAGR (4 percentage points higher than state average)

The Indian R&D landscape under the microscope

Looking at the R&D landscape in India, the country has seen a significant increase in its R&D expenditure in recent years. However, it still lags behind other countries in terms of the percentage of GDP invested in R&D. India's R&D expenditure as a percentage of GDP is only 0.7 percent[ii], compared to 2.8 percent in the United States, 2.1 percent in China, 4.3 percent in Israel, and 4.6 percent in South Korea. It is also reflected in the low number of researchers per 100,000 people in India, which stands at 25 compared to 441 in the United States, 130 in China, 834 in Israel, and 749 in South Korea. While India is fifth in the world in terms of the number of scientific publications, it ranks 11th in terms of citation impact, with only 15.8 percent of its publications[iii] appearing in the top ten journals, compared to 36.2 percent for the United States and 27.6 percent for China.

Despite these challenges, India is progressing in various areas of innovation, including university-industry collaboration, access to the latest technology, and capacity for innovation. However, the impact of these efforts is often limited and does not adequately address local needs and societal challenges.

To improve the effectiveness of the innovation system in India, it is essential to take a systemic approach and consider the relationships between enterprises, universities, research institutes, intermediaries, and governments. This includes understanding the challenges faced by each of these actors and how interlinking mechanisms may be hindering the overall innovation capacity of the system. Currently, the state budget does not directly reflect R&D spending. It would be beneficial to have a separate accounting head for R&D in the state and to allocate more funds for higher education institutions to grow and maintain research and innovation capabilities.

Currently, the research and innovation ecosystem in the country faces the following challenges faced by its actors and shortcomings of interlinking mechanisms that may impede the whole system's innovation capacity. The fundamental challenge is a seamless end to end synergy, focus, and target orientation of the involved entities and individuals. Key challenges include:

- **Segmented governance structure:** Segmented governance structures lack integration or coordination and strategic orientation to evolve into a robust, interconnected research and innovation ecosystem.
- **The untapped potential of universities and HEIs:** The majority of the R&D work in universities and HEIs ends up in labs or as journal articles and reports without creating any social or economic impact. The mechanism needed to orient and connect academic research to end users is missing.
- **Access to the R&D ecosystem:** Small and medium scale industry and start-ups cannot easily gain access to R&D done in HEIs.
- **Affordability of R&D:** Even though universities, MNCs, and high-end R&D centres are available, their cost of engagement is high.
- **The disconnect of actors:** Academic researchers, mentors, public and private R&D centres, and R&D beneficiaries are disconnected from each other because of the lack of a unified forum or platform for interactions and a lack of a value proposition for such interactions.
- **Need for incentive and recognition:** Measurement of outcome needs to be structured, and an incentive is to be provisioned to motivate actors to orient huge demand and supply systematically.
- **Strengthening of innovation management:** Knowledge about how to systematically develop, commercialise, and diffuse innovations needs to be strengthened.
- **Integration of social science research to the overall R& D ecosystem:** There is no systematic research framework that binds social science research to R&D in science and technology.
- **Regional imbalance:** There is an innovation divide, with regions away from major cities significantly lagging in robust research and innovation ecosystems, widening the regional disparities in economic growth.

The quantum computing sector has the potential to revolutionise many industries and has attracted significant investment from governments worldwide. India has recognised the importance of quantum computing and has prioritised it as a technology in which the country could play a leadership role.

According to a recent report from the World Economic Forum, China has announced $15.3 billion in government funding for quantum, the European Union has invested $7.2 billion, and the United States has committed $1.9 billion.[iii] In India, the government has allocated $1 billion to set up the National Mission for Quantum Technologies and Applications (NMQTA) to advance research and development in this area.

Quantum computing represents a significant opportunity for India, given the country's strong technology talent base. However, developing the necessary skills and expertise in quantum technologies requires considerable effort and investment. This includes building up the intellectual capacity and research technology across the tech stack and providing learning materials and training to prepare a future-ready workforce. To make the most of this opportunity, it will be necessary for academia, industry, and government to work together to advance quantum research and bring it to real-life applications.

One example of this kind of collaboration is the partnership between Tech Mahindra and Mahindra University,[iii] which has established a Makers Lab to provide training in quantum technologies.[iii] Similarly, Amazon Web Services (AWS) has partnered with the Ministry of Electronics and Information Technology (MEITY) to set up a quantum computing applications lab, which will provide credits for its quantum simulation system to selected quantum research proposals from academia and industry, with mentorship and guidance provided by MEITY and other partner organisations including Mphasis and Fractal.

Overall, it is clear that quantum computing represents a significant opportunity for India to lead in a rapidly evolving and essential technology. By investing in research and development, building the necessary skills and expertise, and fostering partnerships between academia, industry, and government, India can position itself at the forefront of the quantum computing revolution. Karnataka owing to its large base of digitally skilled talent and IT sector dominance is well poised to develop a leadership position in quantum technologies.

Bengaluru is leading the way in several new revolutionary technology sectors through significant innovation capabilities and capacity investments. For example, with regards to the industry of artificial intelligence (AI) and robotics, an AI and Robotics Technology Park (ARTPARK), a research and development facility, has been set up in Karnataka's capital city Bengaluru with seed capital of INR 230 crore ($31 million)[iii] from the state and central governments. ARTPARK is promoted by a not-for-profit foundation set up by the Indian Institute of Science (IISc) in Bengaluru.

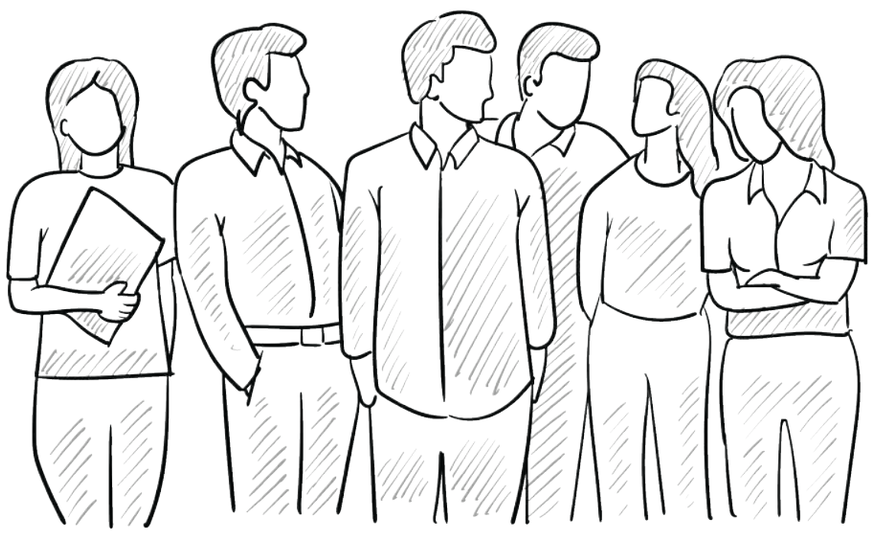
One of the primary goals of ARTPARK is to create a globally leading AI and robotics innovation ecosystem in India by working with technical teams from multiple labs at IISc, as well as other technical institutes and bodies such as the Indian Institute of Technology (IIT) Kanpur, IIT Jodhpur, the University of Aalto in Finland, the Indian Council of Medical Research, and the All India Institute of Medical Sciences, and launching a $100 million venture fund to support AI and robotics innovations in the country. The government, private companies, and venture capital firms will back the fund, which aims to channel innovations into creating a societal impact by executing ambitious mission-mode R&D projects in sectors such as healthcare, education, mobility, infrastructure, agriculture, retail, and cybersecurity.

By undertaking similar proactive initiatives focused on innovation and R&D in emerging sunrise sectors, Karnataka is ideally placed on maintaining its leadership in the start-up and technology ecosystem.

To support the growth and development of the start-up ecosystem in Karnataka, the GoK is implementing a nine-pillar strategy within its current start-up policy 2022–2027.[iii] The nine pillars are:

- Creating and strengthening the New Age Innovation Network (NAIN)
- Fostering strong partnerships between academia and industry and encourage research activities Beyond Bengaluru
- Funding for start-ups
- Supporting mentorship and creation of incubation and acceleration infrastructure
- Building an inclusive and equitable start-up ecosystem
- Fostering social and rural entrepreneurship
- Channelling innovation for societal impact
- Enablement and facilitation; and
- Providing state support in the form of incentives and concessions.

This includes creating and strengthening an innovation and entrepreneurship network at technology institutions Beyond Bengaluru, the state capital, through the "New Age Innovation Network 2.0". It also involves fostering partnerships between academia and industry by establishing Technology Business Incubators (TBIs) in institutions of higher learning outside the Bengaluru Urban district. The government is providing access to finance through various stages of funding, including seed funding, venture capital funding, angel investor funding, and sector-specific funding, to support the growth of start-ups. Additionally, it assists globally and nationally renowned incubators and accelerators to set up new and strengthen existing infrastructure in the state. The government is embracing diversity, equity, and inclusion to promote an inclusive and equitable ecosystem. It also promotes innovative start-ups from Tier 2 and Tier 3 cities, helping them scale up and grow. The government is exploring new tech-driven business models and disruptive innovation technologies to address social impact issues related to environmental, social, and governance frameworks and sustainable development goals. It is adopting a trust-based governance approach and providing support through critical enablers, such as the Start-up Cell and Start-up Portal 2.0, to facilitate the growth of start-ups and ease of doing business.



Implementing the nine pillars for Karnataka

The detailed initiatives to implement the nine pillars are set out in more details below:

Create and strengthen the NAIN
The GoK can build on the NAIN developed under the 2015–2020 start-up policy. They can do this by adding additional capacity in the form of new NAIN centres, while extending financial support to ensure the maintenance of quality operations of the new and existing centres as follows:

- Under the NAIN, the GoK can establish 100 new NAIN 2.0 centres during the period 2022–27, in technology institutions of higher learning focused on IT, electronics, and biotechnology, located outside of Bengaluru Urban district and prioritising the government engineering colleges. Currently, the 41 NAIN centres are in 18 districts outside Bengaluru. During the policy period, the focus could be to establish the NAIN centres in the remaining 11 districts of the state, namely Chamrajanagara, Chikkamagalur, Chitradurga, Gadag, Haveri, Kodagu, Kolar, Koppal, Raichur, Yadgir, and Bengaluru Rural.
- The government can set up an acceleration network programme to facilitate region-wise connections between NAIN centres and external incubators/accelerators to offer industry connect support. Each NAIN centre can be mapped to the selected incubator and accelerator to provide handholding.
  The hundred new NAIN centres could be facilitated under the acceleration network programme.
- Financial provisioning support of 121.5 crore for NAIN centres could be allocated as follows:
  - INR 10 lakhs per NAIN centre per year to external incubators under the acceleration network programme;
  - INR 5 lakhs per student project to be given for a maximum of ten projects per year for each NAIN 2.0 centre, with a clause that a minimum of two funded projects per NAIN 2.0 centre could be related to SDGs, including circularity/RE/sustainability, etcetera;
  - Support the existing 41 NAIN 1.0 centres by extending financial support of 25 percent of the total cost, up to a maximum of INR 45 lakhs for three years, with the colleges bearing the rest, going towards costs incurred towards student projects, maintenance of labs and incubation spaces, and operational expenditure; and
  - Annual financial support of up to INR 12 lakhs towards the operational expenditure of each NAIN 2.0 centre.

Develop a favorable startup ecosystem in the state by creating and rolling out several support, mentoring, incubation, and acceleration infrastructure. This can help more start-ups to grow into successful organisations and bring the benefits of economies of scale to the state. The proposed actions could include:

- Establish the "Acceleration Network" in a hub-and-spoke-model in collaboration with industry partners, where existing accelerators act as a hub to extend the benefit to start-ups through strategic support, mentorship, and networking opportunities, especially outside the Bengaluru Urban district. Currently, three accelerators are being set up in three Beyond Bengaluru clusters — one each in Mysuru, Mangaluru, and HDB. A programme fund is required to augment the capacity of incubators into accelerators.
  To support deep tech throughout Karnataka, the aspirational goal is to set up one accelerator in every district.
- Collaborate with industry, industry associations, and research institutes having the requisite capacity, and any leading academic, technical institution of the state to set up mini fab labs in six clusters in Beyond Bengaluru, such as Mangaluru, Mysuru, Hubballi-Dharwad, Kalaburagi, Shivamogga, and Tumakuru. Setting up these could enable the fabless design ecosystem in various fields of applications such as aerospace, defence, agritech, medtech, IoT, and telecom in each cluster.
- Launch campaigns to promote public-private collaboration, encouraging CSR fund channelisation towards incubators funded by the central or state government to ensure liquidity and ongoing support of existing activities to ensure the initiatives do not halt due to lack of financial assistance.
- Set up incubation centres such as:
  - Government centres that provide subsidised seats for start-ups up to INR 3,000 per seat per month across each district of Karnataka. This can ensure small scale start-ups especially from Beyond Bengaluru to work in a professional environment with minimal outlay.
  - Facilitate the set up of a NAIN by private entities, by providing a one-time capital grant (50 percent of cost or INR 50 lakhs) to support the establishment of state-of-the-art private incubation centres outside the Bengaluru Urban district. Provision of INR 50 lakhs to set-up one incubator each in six emerging technology clusters

in Kalaburagi, Dharwad, Mangaluru, Shivamogga, Mysuru, and Tumakuru.

  - Augment capacity of the established incubation centres located outside the Bengaluru Urban district by providing one-time capital grant of 50 percent of fixed cost investment (excluding land and building), with a ceiling of INR 25 lakhs. Ten incubation centres to be provided with funding a support-one-time capital grant of maximum 50 percent or INR 25 lakhs (whichever is less) for fixed cost investment (excluding land and building) to scale up technology infrastructure upgradation or expansion of the facility's workstations, interiors, or labs.

- Accelerate the set up of 15 proposed Karnataka Technology Innovation and Entrepreneurship (K-TIE) Group 2 Centres (G2C) which can provide deep support and networks to local ecosystems to enable many aspiring entrepreneurs and students to build high-quality start-ups.
- Empanel established entrepreneurs as mentors in incubators and accelerators by providing them with honourary degrees to help effectively guide start-ups on their journey.
- Establish technology and innovation clusters such as:
  - Cluster innovation centres (CICs) to drive the competitiveness of SMEs at the national and global levels. These CICs can have state-of-the-art design/product/prototype development and validation facilities and expertise to provide services to the MSMEs in the region.
  - Research clusters to promote collaboration among academia, research labs, industry, and the government; share ideas, knowledge, and talent and act as a regional growth engine. Institutions can be encouraged to sign memoranda of understanding to cross-list courses for credit for students and facilitate greater collaboration and travel of researchers across institutes. Islands of excellence to be spread across academia, research labs, industry, and the government can unite, leverage complementary strengths and create a collaborative and flexible environment that accelerates technological innovation and entrepreneurship.
  - Beyond Bengaluru technology clusters in Kalaburagi, Belagavi, Dharwad, Mangaluru, Shivamogga, Mysuru, and Tumakuru which are emerging as attractive destinations for domestic and global investments across several industry verticals such as IT/ITeS, Business Processing Outsourcing (BPO), ESDM, animation, AVGC, AI, EdTech, agritech, fintech, and telecom.

Foster strong academia and industry partnerships

The academia-industry partnerships could bridge the gap between R&D/product development and commercialisation, and maximally utilise the academic network in the state to accelerate the growth of the start-up ecosystem in the following ways:

- Encourage research activities Beyond Bengaluru by setting up nine Technology Business Incubator's (TBI) – six for IT or electronics and three for biotechnology – with the funding support of INR 12.5 crore per TBI over five years. The TBIs can forge a strong link between R&D and the commercialisation of technologies in academic/technical/R&D institutions. TBIs in emerging areas like Information and Communication Technology (ICT), Internet of Things (IoT), software products manufacturing, including electronics systems design, robotics and 3D printing, manufacturing 4.0, nanoscience and engineering, healthcare and BioPharma agriculture, and allied fields clean-tech energy, water and education can be promoted;
- Extend ongoing support (funding and assistance towards operational expenditure) to TBIs that have successfully created the infrastructure for promoting new technology/knowledge/innovation-based start-ups and facilitated speedy commercialisation of innovative ideas or products and IPs. All the existing TBIs could be prioritised during the policy period.

Facilitate the availability of a sufficient skilled workforce, trained in various future technologies to bolster the creation and scale-up of start-ups in the state as follows:

- Set up innovation labs/centres focused on AVGC, AI, edutech, agritech, fintech, and telecom in identified colleges across districts such as Kalaburagi, Belagavi, Dharwad, Mangaluru, Shivamogga, Mysuru, and Tumakuru which are emerging as one of the preferred and attractive destinations for domestic and global investments;
- Set up vocational training centres and modernise existing ones to impart industry-relevant skills needed to work in the semiconductor industry (digital skills encompassing namely, AI, ML, Deep Tech, Web 3.0, etcetera); and
- Committee of digital-native organisations, SaaS companies, and government colleges to link curriculums to industry-demanded skills via apprenticeships and through gamified or live projects and internship programmes.

Bolster the digital ecosystem of the state through the creation of several digital platforms aimed at connecting various parties of the start-up ecosystem, enabling access to crucial information at each step of the journey, and increasing the overall ease of doing business for start-ups. These platforms include:

- Create digital platforms to promote collaboration, such as:
  - The Karnataka R&D Innovation Platform (e-KRDIP) to bring together stakeholders involved in, for example, R&D, business, and entrepreneurial initiatives and help in the translation of innovation and R&D into useful technologies and products, which may benefit people in all parts of the state;
  - The investor network platform connecting angel investors/ HNIs/venture capitalists/ government departments through the GoK's e-governance department.
  - GoK to also develop virtual incubation platforms as per global standards, in collaboration with ecosystem partners to provide start-ups services such as incubation, mentorship, and seed financing, access to labs, production facilities, outreach, and investor connect, detailed analytics, etcetera. The government can call for expression of interest to collaborate with external incubators and accelerators.
  - Platforms for start-up founders, leaders, and students to connect and nurture innovation and entrepreneurial skills in students across all streams of learning and provide opportunities where they can nurture and grow to their full potential.
- Set up the Grassroots Innovation Enabling Network (GIEN) to link grassroots innovators, civil society organisations, industry, academia, and the public administration and support the identification, development, validation, recognition, and diffusion of grassroots innovations.
- Develop and launch accelerator programmes with GCCs and facilitate partnerships between GCCs and technology institutions. Identify start-ups to propose MVPs and pilots focused on solving societal challenges like civic issues, governance, and traffic management, for example.
- Design Startup Portal 2.0, which can be dynamic and bilingual and equipped with enhanced features to unify the entire start-up ecosystem and resources; and
- Create organised annual start-up festivals (national and international) by providing a platform for start-ups to showcase their products and solutions to angel investors, HNIs, venture capitalists, government departments, and incubators.

While accelerating the start-up ecosystem in the state, focus can be given on ensuring inclusive and equitable social growth in the state, through facilitating an increase in participation of women, other minorities, and other SEDGs in the start-up landscape, and by developing the rural innovation and entrepreneurship landscape:

- To nurture and accelerate growth of women entrepreneurship in the state, the following initiatives could be considered:
  - Set up an exclusive Idea2Poc and early-stage seed fund for women entrepreneurs from Beyond Bengaluru;
  - Earmark 25 percent of the INR 100 crore venture capital fund for women start-ups;
  - Reserve 20 percent of seats at government-supported incubators for women start-ups;
  - Accelerate women start-ups through the Elevate WomEN acceleration and incubation programme.

- Set-up rural Innovation centres Beyond Bengaluru, with INR 15 crore funding, partnering with local ecosystem players like incubators to strengthen the rural ecosystem such as Beyond Bengaluru's tech clusters of Kalaburagi, Dharwad, Mangaluru, Shivamogga, Mysuru, and Tumakuru.
- Set-up a dedicated research centre with INR 50 lakh funding to support the circular economy focused on start-ups, such as Beyond Bengaluru's tech clusters of Kalaburagi, Dharwad, Mangaluru, Shivamogga, Mysuru, and Tumakuru.
- Conduct acceleration programs with funding support – INR 40 lakh per annum – for start-ups working on SDGs, ESG, the circular economy, RE, etcetera.
- Continue ongoing support of social inclusion through:
  - Establishing a centre of excellence for Assistive Technology (AT) with a grant or funding support of INR 15 crore to develop innovative products and solutions for differently abled community and senior citizens in the Beyond Bengaluru's tech clusters of Kalaburagi, Dharwad, Mangaluru, Shivamogga, Mysuru, and Tumakuru.
  - Grant-in-aid scheme of up to INR 50 lakhs, to support SC/ST entrepreneurs-built start-ups across the idea to proof-of-concept stage for 125 start-ups during the policy period.
  - Setting up dedicated programmes to support start-ups founded by entrepreneurs in the OBC or minority category, and for start-ups from aspirational districts of Kalyana-Karnataka. This includes unique elevate calls like Amrita Start-ups 2021 and calls for OBC and Minority category start-ups.
- Organise competitions around existing social challenges such as ESG, SDG, and e-governance in collaboration with government departments, to promote start-up activity in these sectors with potential rewards and funding opportunity.

Apart from the above enabling ecosystem, government could drive interventions targeted at providing additional incentives, increasing the ease of doing business, and increasing the monitoring and governance of the start-up sector in the state through the following interventions:

- Designate at least 250 acres of land in Bengaluru, Mysuru, and Dharwad to set up fabrication units and provide support for the entire semiconductor ecosystem, including assembly, testing, marking, and packing (ATMP) and design-linked incentives;
- Set up a governance body for government incubation centres in the state to ensure effective and efficient utilisation of funds, and ensure maintenance of incubation quality;
- Provide state-specific PLI schemes to boost domestic manufacturing of high-tech products, including semiconductors in the state;
- Provide state support in the form of incentives and concessions for GoK incubated start-ups, such as:
  - Reimburse state GST for early-stage Beyond Bengaluru start-ups
  - Reimburse marketing cost, patent filing cost and quality certification fees;
- Open data access under the banner of The Karnataka Open Data Initiative (KODI) to enable start-ups to build products, solutions, and commercial applications by leveraging the Karnataka state open data portal;
- Permit and facilitate start-ups to file for self-certification under acts, such as the Factories Act or Wages Act to improve the ease of doing business for start-ups;
- Leverage GIAs with leading innovative economies such as Germany, Australia, Finland, and Japan to promote innovative start-ups across the state;
- Provide support for resources to start-ups who cannot always afford to hire, such as in-house lawyers or company secretaries. During BTS 2022,[iii] the government launched the Booster Kit in partnership with Google, Paytm, HDFC, Razorpay, Microsoft, and other ecosystem partners to provide a gamut of pro bono services to assist the start-ups in their growth journey. The service provided by these ecosystem partners is intended to promote entrepreneurship and to create a nurturing ecosystem for the Karnataka Start-up Cell registered start-ups with financial, business, incubation, and acceleration support;

- Develop a campaign to spread awareness about multiple platforms, resources, tools, and templates – for HR, legal, financial, etcetera – available for start-ups to leverage, assisting them through their journey; and
- Develop and launch accelerator programmes with GCCs and identify start-ups to propose MVPs and pilots focused on solving societal challenges like civic issues, governance, and traffic management.

Across all the above initiatives, actions, and propositions, the total government funding support required is broken down as follows:

- INR 5,000 crore Fund-of-Funds (FoF) to invest in and grow start-ups. The FoF could focus on sectors like IT, fintech, deep tech, and logistics;
- Establish an INR 1000 crore Beyond Bengaluru growth fund as a FoF to be invested in angel funds and other funds promoting start-ups from emerging tech clusters;
- A R&D fund of INR 1000 crore to be invested in to set-up R&D facilities across the clusters for MSME and others start-ups to innovate on new products and services, complete globally, and get access to global markets;
- INR 300 crore to set up 30 accelerators (one in each district) by 2026;
- INR 100 crore venture capital fund to support emerging innovative and deep tech start-ups in AI, ML, EV, medtech, robotics, and other such disruptive technologies;
- INR 100 crore Beyond Bengaluru cluster seed fund to support growth stage start-ups in Mysuru, Hubbali-Dharwad, and Mangaluru, enabling scaling and transformation of these emerging technology clusters into Beyond Bengaluru start-up destinations;
- INR 120 crore Mini Fab Lab fund to establish six Fab labs in Beyond Bengaluru districts;
- INR 120 crore to create a Karnataka Science and Technology Innovation Fund;
- INR 120 crore to set up 100 NAIN 2.0 centres in the state; and
- Grant-in-aid scheme of up to INR 50 lakhs, to support the idea to proof-of-concept stage of start-ups.

References

i Karnataka economic survey

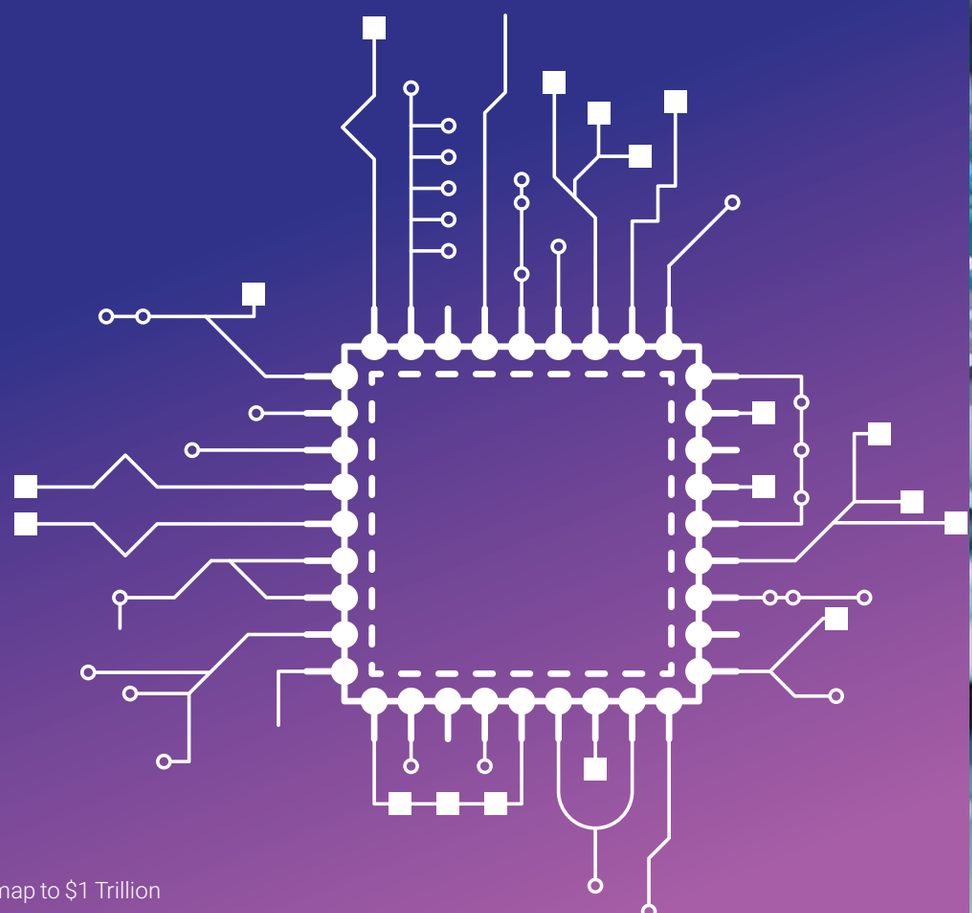
ii GDP performance and value forecast

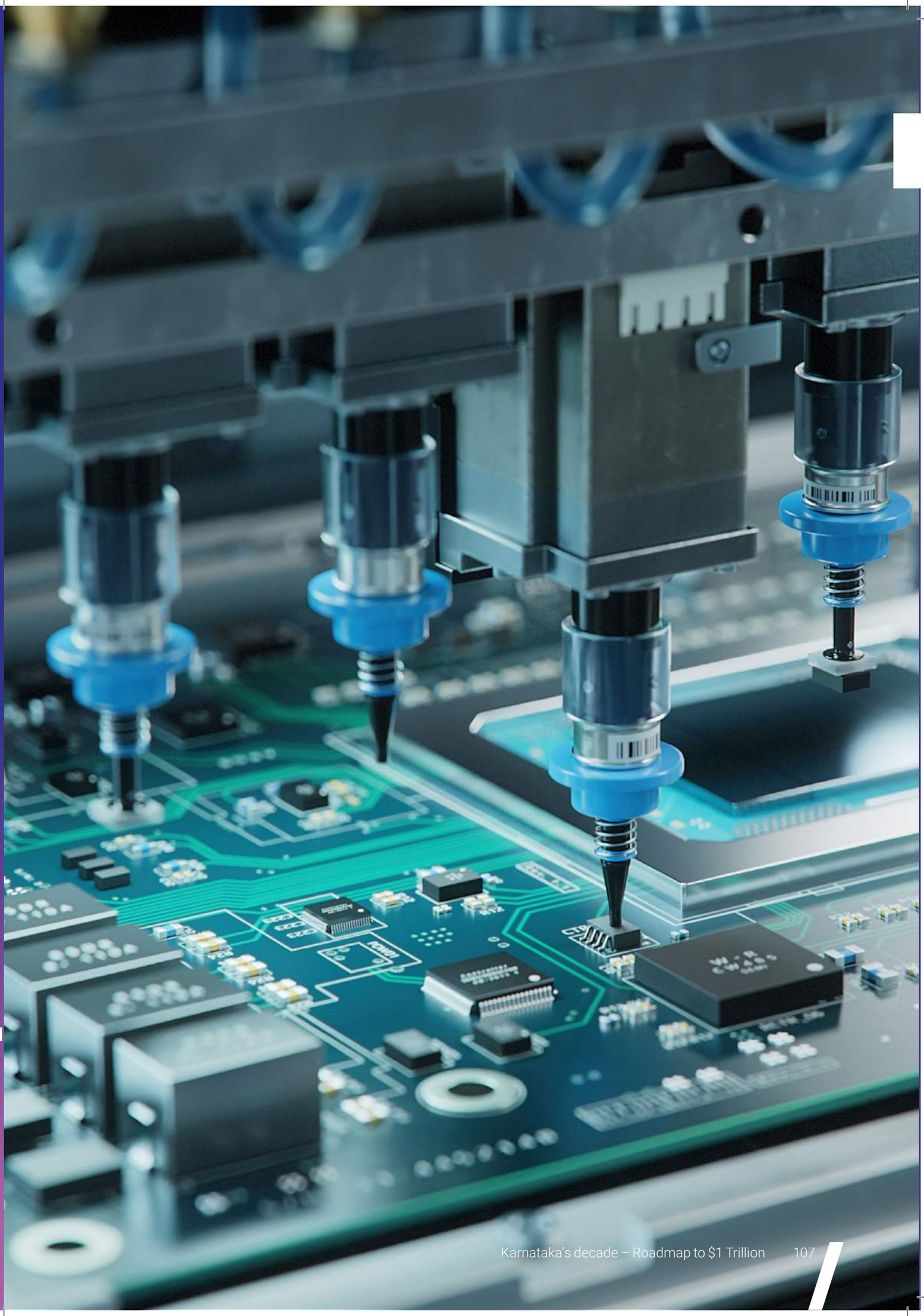
iii Start-up committee

CHAPTER

05

ESDM





Electronics manufacturing in Karnataka is set for significant growth

India's electronics manufacturing industry is valued at $70 billion to $75 billion, compared $10 billion in 2014.[iii] The Indian government aims to grow this industry to $300 billion by 2026 and expects to export $120 billion worth of electronics to meet the exponentially growing global demand. This has the potential to position electronics as one of India's top three export categories by 2025–26.

In 2014, India imported 92 percent of mobile devices consumed, and close to 100 percent of computing. By 2022, in contrast, India manufactured almost 97 percent of mobile devices consumed in India, and about INR 74,000 crore worth of globally competitive electronic products were exported from this country.[46] India's goal is to produce one billion mobile handsets worth $190 billion (INR 13,00,000 crore) by 2025, with 600 million handsets worth $110 billion (INR 7 lakh crore) targeted for exports.[47]

India is poised to capture a large share of the global electronics system design and manufacturing (ESDM) and electronics manufacturing market owing to its various endowments and advantageous position, including a large consumer base (the fifth -largest electronics consumer base by 2025),[iii] the second-largest manufacturer of mobile phones in the world, and the third-largest start-up hub in the world. In addition, there is strong support from the Indian government through the production linked incentive (PLI) scheme for large-scale electronics manufacturing and information technology (IT) hardware. It also has a 100 percent FDI allowance under the automatic route, and several aspirational and supportive policies in the form of the National Policy on Electronics of 2019.[48]

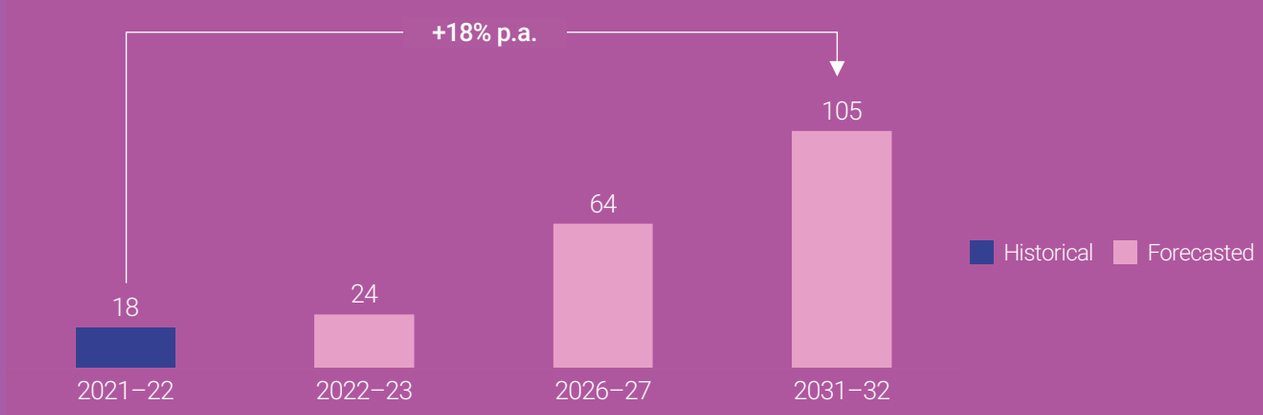
Karnataka is known as the centre of the hi-tech industry in India, contributing significantly to the country's revenues from IT, biotechnology, ESDM, aerospace, and other technology sectors. The state is the fourth-largest contributor to industrial electronic output in the country – it contributes to 10 percent of the India's electronic industrial output with a recorded growth rate of 18 percent CAGR during 2008–13.[49] It has the second-fastest growing start-up ecosystem in the world and is home to many billion-dollar Indian start-ups. Karnataka is also the country's second largest chip design hub and home to 85 chip-designing companies. It was the first state to roll out initiatives for innovation centres, skilling centres, and dedicated ESDM clusters. Around 3,000 personnel are trained annually in Karnataka's ESDM sector.[50]

46 India's target is to make electronics industry worth $300 billion by 2025–26: Rajeev Chandrasekhar – Indian Express
47 Electronics system design & manufacturing, IBEF
48 IBEF – Electronics System Design and Manufacturing Report – November 2022
49 Invest Karnataka 2016 – ESDM report – Government of Karnataka
50 Karnataka ESDM Policy 2017–22

Exhibit 35

Revenue projections ESDM sector[1]

$ billion



1. ESDM committee

Karnataka aims to affect a quantum jump in the overall manufactured values of its ESDM companies to $60 billion by 2026, creating more than 20 lakh[iii] new jobs in the ESDM industry by 2026 (ten times the ESDM workforce in 2017). The state aims develop into a global ESDM hub and a hotbed of innovation through focused interventions and encouragement to local companies in the sector. Karnataka has been a leader in enabling India to achieve its electronics manufacturing target in terms of investments and exports.[51] (Exhibit 35)

Karnataka's ESDM sector is projected to grow at 20 percent per year from $18 billion in 2021–22 to $105 billion by 2031–32.[ii] Additionally, the state expects to drive increased value addition from this sector, growing the value addition currently at 17 percent to 35 percent. (Exhibit 36)

Five macro-level pillars for Karnataka

An analysis of Karnataka's preparedness for attracting new investments and creating new employment opportunities in the ESDM sector has been done in partnership with the India Electronics and Semiconductor Association (IESA). IESA has completed a pan-India study and evaluated the ESDM sector preparedness of states using various parameters. The IESA report, State Preparedness Index – ESDM Industry – Karnataka focuses on comparing Karnataka with 145 parameters that were categorised under five key pillars. Karnataka's standing was as follows:

Using information from the IESA report, the five macro-level pillars are analysed below. (Exhibit 37)

ESDM – current and future potential: This pillar evaluates the state's performance on multiple parameters contributing to a thriving ESDM ecosystem that is prepared for the future. Karnataka has a stronghold concerning the readiness or availability of ESDM players in India. The state comes second on the ESDM pillar, after Tamil Nadu.

Infrastructure and geographical advantage: This pillar highlights the importance of infrastructure availability for corporates, primarily for their logistics. Most companies form part of global value chains and require the seamless movement of goods across state and international borders.

[51] Electronic System Design and Manufacturing, Invest Karnataka

Exhibit 36

Karnataka ESDM landscape and endowments[1]

100+	40%	50%	10%	300+	400+
Chip design house	National share in electronic design	National share in electronic product companies	Contribution to India's electronics output	Export oriented manufacturing units	R&D centres

Established ESDM R&D and start-up ecosystem

Semiconductor Fabless Accelerator Labs

Leading fabless accelerator lab in the country enabling fabless start-ups, encouraging creation and development of products/ IPs from India

Lahari

Houses one of the country's first advanced electronic test facility (funded by GoI, GoK) to help create an ESDM base in India

MINRO Centre

A "best-in-class" centre of excellence for Machine Intelligence and Robotics focusing on AI, data science, ML and MI, robotics

Strong policy support from GoK

Karnataka Electronics System Design & Manufacturing Policy 2017-2022

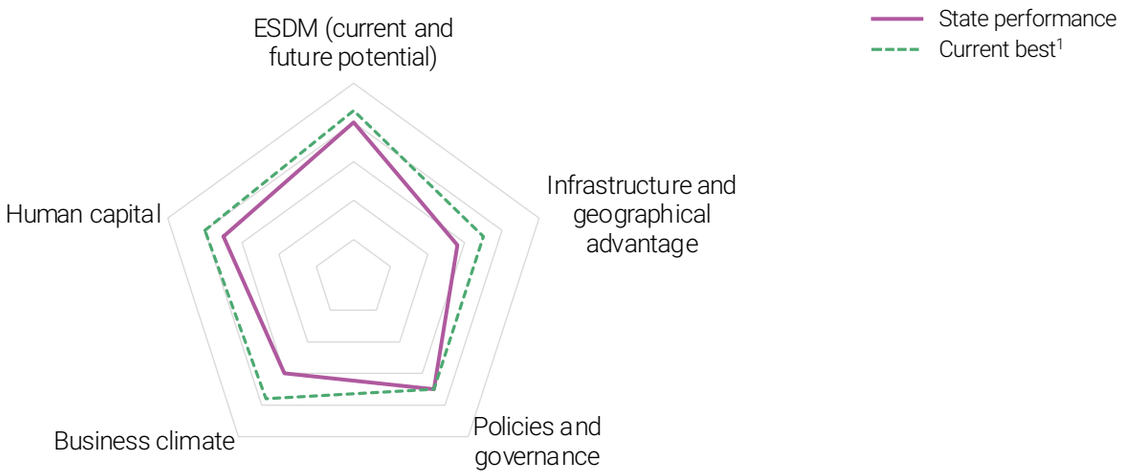
$60 bn	20 lakh+	50%
ESDM market size by 2026	ESDM workforce by 2026	Value addition boost

1. ESDM committee

Exhibit 37

ESDM

Performance of the state on key pillars



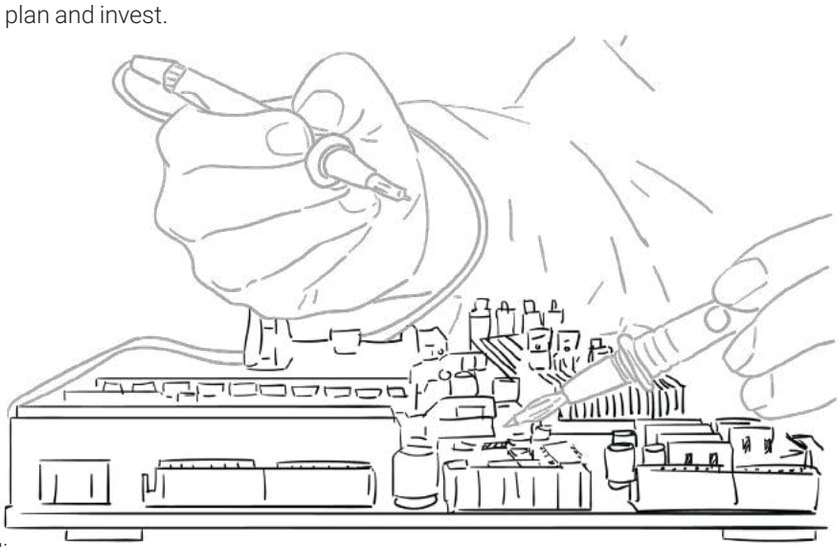
Note: The above graph clearly depicts that the immediate improvement areas for Karnataka are the "business climate" and "infrastructure and geographical advantage" pillars. While there is work to be done on the other pillars, the above 2 are immediate

1. Rating of the best performing state in each pillar

Policies and governance: Policies and governance play a vital role in the ESDM sector, and Karnataka scored the highest in this pillar. This is because Karnataka has contributed to a great extent to tech start-up support, the innovation index, and preferential market access (PMA) implementation.

Business climate: The business climate in the state is essential to stimulate investment for business-led growth. Implementing investment climate reforms requires the coordinated effort of many line ministries and agencies. A good investment climate reduces the costs and risks of corporate activity, thus facilitating investment project creation and implementation. A poor investment climate discourages businesses to plan and invest.

Human capital availability: Karnataka scores relatively lower in this pillar than Maharashtra, Tamil Nadu, and Uttar Pradesh. The parameters of "Number of Electronic Skill Council Centres" and "Knowledge Workforce" pull the state down in the competition for human capital availability.



Karnataka is aspires to have 50 fabless design companies

Karnataka aspires to have 50 fabless[iii] design companies and 500 successful start-ups in embedded electronics or Internet of Things (IoT) and AI applications, considering the current mortality rate of almost 1,000 such start-ups in Karnataka. The state can link all incubation centres and provide proper mentoring to ensure their success. Furthermore, to achieve sectoral value addition growth from 17 percent[iii] to 35 percent, the government plans to focus on improving two critical aspects of the ecosystem: the component manufacturing ecosystem and local IP or technology creation. The Government of Karnataka (GoK) also plans to establish an ecosystem of 50 supply-chain partners in the state supporting the ESDM sector, to ensure logistics and connectivity do not become roadblocks to the sector's development.

Key focus areas

To achieve the objective of growing the output of Karnataka's ESDM industry to $64 billion by 2026–27 and $105 billion[i] by 2031–32, the state has identified various key focus areas for its share of India's production and the overall sector's growth rate. Karnataka has identified semiconductor production, which includes wafer manufacturing and packaging (FABs, OSAT, and Display FAB) as an emerging sector (low share, high growth rate), and the semiconductor and systems design, PCB manufacturing, electronic components, and automotive electronics as growing sectors (high share, high growth rate). The state has focused on the following key focus areas for growth.

ESDM task group

The Government of Karnataka and the Karnataka Digital Economy Mission (KDEM) constituted an ESDM task group comprising nine key thought leaders from the ESDM and semiconductor industry. The ESDM task group proposed key strategic initiatives to achieve the vision of establishing Karnataka as India's major ESDM hub. The task group identified the following key levers for growth:

Building intelligence through available data: A clear view of the state's strengths and limitations is required to understand the current market and identify the areas which could be prioritised. Market data can help identify the strength and weaknesses of the ESDM ecosystem and devise a strategy to overcome the drawbacks.

Branding Karnataka's electronics manufacturing: The state could highlight its existing, robust ecosystem by publicising the government's policy and supportive intent through various communication mediums. This can position Karnataka as a preferred destination for electronics manufacturing in India.

Facilitating interested companies for grounding the projects (EoDB): A critical part of landing a project is to provide a smooth facilitation process to the interested companies by making them aware of the "ease-of-doing-business" process. In addition to successfully handholding and grounding the project, it is essential to work towards ensuring that these companies succeed. This can help attract other companies in the ecosystem to consider operating Karnataka, because of the various interventions of the government that create a favourable environment in which companies can grow and prosper.

Building ESDM sector-focused infrastructure: For rapid growth, it is necessary to have proper infrastructure that can act as a catalyst for setting up and growing ESDM companies in the state. The GoK initiated several such projects.

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fabless design companies

ESDM sector-focused infrastructure

Karnataka could build ESDM sector-focused infrastructure Beyond Bengaluru to enable the rapid growth of the ESDM sector over the next decade. Aligned with the vision of driving growth Beyond Bengaluru to promote job growth in districts, the industry also needs to be developed Beyond Bengaluru. The GoK is promoting semiconductor chip fabrication and its allied services through advanced testing, marking, and packaging (ATMP) and outsourced semiconductor assembly and test (OSAT) units. Karnataka is the first state in the country to sign a memorandum of understanding with ISMC for setting up India's first commercial semiconductor analogue fab in Mysuru. The GoK has already committed financial incentives and issued a government order. It is believed that the ISMC project could write a new chapter in Karnataka and India's semiconductor journey, which to date has been restricted to fabless design. The project's viability was strengthened after Indian conglomerates like HCL and Reliance industries joined the consortium.[iii] This has given a solid push to establish Mysuru as the semiconductor cluster in India, and Belagavi as the engineering and R&D hub. Based on this, a robust infrastructure development effort may need to be planned in the region. This could be achieved as follows:

Working on developing the semiconductor and electronics manufacturing infrastructure at Mysuru, a major technology cluster Beyond Bengaluru in the state. Also, considering investing in developing the ESDM ecosystem to establish Mysuru as India's semiconductor cluster. This could be done in various ways, including:

- An electronics manufacturing cluster (EMC) could be set up spread over 250 acres. This could bring in an investment potential of INR 1,700 crore and generate direct employment of over 18,000 people. Letters of intent from seven interested companies have already been received.
- A 150-acre PCB park in Mysuru could be established with the support of the Karnataka digital economy mission (KDEM). In the presence of the largest printed circuit board (PCB) manufacturing company, AT&S, Mysuru already has an existing PCB ecosystem. The proposed PCB park is expected to host four more PCB manufacturing companies with a cumulative requirement of 80 acres of land. The park can be instrumental in attracting international high-end PCB manufacturing companies that supply OEMs in Karnataka.
- A 100,000 square foot plug-and-play vertical factory could be built to address the issue of land availability and drive effective utilisation of cluster space. This could be modelled on the mature ESDM manufacturing destinations in China, South Korea, and Taiwan. Government agencies, a public-private partnership (PPP) model, or private players could own the factories.
- A 45,000 square foot multi-tenancy clean room facility could be set up in the Mysuru ESDM cluster – as a shared facility – to improve the quality of the available infrastructure and develop the Mysuru ESDM ecosystem.
- A common facility centre (CFC) at the Mysuru PCB park could address the zero-liquid discharge (ZLD) policy. This infrastructure could be instrumental in wastewater management during the manufacturing process. In addition, it can bring down the cost of PCB manufacturing plants in the proposed PCB. The estimated budget is INR 75 crore, and the industry can contribute at least INR 15 crore of this. The government may need need to invest INR 60 crore in such a shared facility.
- A robust local supply chain ecosystem at the intra- and inter-cluster (rapid connectivity through surface, sea, air, warehousing, and quick clearance) and at the ESDM clusters can enable manufacturers to bring down product cost (by reducing warehousing and inventory carrying costs), and reduce lead time, which can result in a more competitive final product. The total budget required to establish a local supply chain could be INR 100 crore over five years.

Including the following in the infrastructure development at the Hubbali-Belagavi cluster:

- Electronics manufacturing clusters (EMCs), which could be spread over about 222 acres, with an investment potential INR 1,400 to INR 1,500 crore and employment potential of over 18,000 people (direct and indirect).

- 100,000 square foot plug-and-play vertical factories in clusters to address the land availability issue and drive effective utilisation of cluster space. Government agencies, a PPP model, or private players could own this ZLD.
- Intra cluster supply chain ecosystem (rapid connectivity through surface, sea, air, warehousing, quick clearance) at the ESDM clusters could help manufacturers to bring down product cost (reduced warehousing and inventory costs) and reduce lead time, resulting in a more competitive final product.
- A 500-acre electric vehicle (EVs) and drone manufacturing cluster at Belagavi, which has historically been an automobile, engineering, and design centre in the country. It has the skill set required to take this industry to the next level, and many ESDM start-ups are developing products around EVs and drones. The cluster can dedicate 300 acres for the EV cluster and 200 acres for the drone cluster, bringing together the component industry, testing, and certification organisations of the EV and drone ecosystem.

Setting up a global emerging technology design centre, with infrastructure including an innovation lab, centres for rapid prototyping, smart manufacturing, product validation, and training. This can support the "idea-to-product" journey of private ESDM players and reinforcing the "Make in India" vision. GETDC can be established at Belagavi under the 2022–23 Budget in partnership with enterprises at an estimated cost of INR 150 crore.

Rolling out more semiconductor fabless accelerator lab (SFAL) centres in leading Beyond Bengaluru clusters, like Belagavi, Dharwad, and Mysuru to provide fabless start-ups access to facilities, architectures, testing support, mentorship, and business connects, thus working towards improving the start-up ecosystem.

Establishing a robust local supply chain ecosystem at the intra- and inter-cluster at the ESDM clusters can help address the high demand for electronic components movement or shipping (inward and outward). This can enable manufacturers to bring down product cost (by reducing warehousing and inventory carrying costs), and to reduce lead time, resulting in a more competitive final product. An end to end value chain may need to be established with road and rail links to the nearest airport or inland container terminal. The state has identified the Mysuru and Huballi–Belagavi clusters as focused clusters. In 2022, the GoK and central government announced the expansion of the Mysuru airport over the next couple of year to handle cargo operations.

Emerging opportunities in the ESDM sector

These opportunities could be accessed by establishing R&D infrastructure and boosting emerging-sector capacity or capabilities to capture a large share of the national pie. These opportunities include:

- Establishing six to seven research development labs, a centre of excellence catering to emerging technologies (drone, EV, ATMP, AI, deep tech, Industry 4.0, and cybersecurity). Karnataka already has existing centres of excellence in aerospace and defence, cybersecurity, animation and gaming, AI, IoT, machine intelligence, and robotics. Under the GoK's Start-up Policy 2022–2027, the state can establish the "acceleration network" in a hub-and-spoke model in collaboration with industry partners. The existing accelerators can act as hubs to further augment and develop the network of accelerators across Karnataka and extend the benefit to start-ups, especially from outside the Bengaluru urban district.
- Promoting indigenous design and development activities to improve value addition by setting up more than a 100 embedded, independent design houses (IDHs) in Karnataka. These IDHs can create global electronic product designs as a service like other big players do, such as Wipro, Infosys, HCL, TCS, and Mahindra, all of which develop global electronic design. Tying up these design houses with EMS companies in Karnataka and starting to offer original design and manufacturing (ODM) services to global customers, could help Karnataka drive its $60 billion goal and contribute to India's goal[iii] of $120 billion export by 2025–26.
- Setting up a digital economy-focused export promotion council between KDEM and the Visweswarya Trade Promotion Council (VTPC) to:
  - Promote and help maximise the utilisation of the new GoK's remission of duties and taxes on exported products (RoDTEP) export promotion scheme.
  - Organise training in Beyond-Bengaluru clusters on export requirements and documentation.

— Attract global OEMs and component manufacturers to Karnataka to partner with local EMS, or to set up their own facilities in Karnataka.

— Reach out to global markets for the organisations from the ESDM sector to Africa, Europe, the Far East, and the United States.

Promoting solutions developed by Karnataka design start-ups to global companies under the GoK's Start-up Policy 2022–2027. The government aims to nurture Karnataka's start-up ecosystem by adopting a nine-pillar approach for start-ups with the following strategies:[iii]

- Creating and strengthening a new-age innovation network.
- Fostering strong partnerships between academia and industry and encouraging research activities Beyond Bengaluru.
- Funding start-ups.
- Supporting mentorship and the creation of incubation and acceleration infrastructure.
- Building an inclusive and equitable start-up ecosystem.
- Fostering social and rural entrepreneurship.
- Channeling innovation for societal impact.
- Allowing for enablement and facilitation.
- Providing state support in the form of incentives and concessions.

Boosting the ESDM startup ecosystem

The ESDM start-up ecosystem may need to be boosted to drive accelerated research, development, and growth by providing sufficient opportunities for start-ups to grow. A robust ESDM start-up ecosystem may need to be established in the Belagavi, Dharwad, and Mysuru clusters by establishing technology sandboxes. Mentorship programmes will be necessary, as well as connecting ESDM start-ups with international partners and markets.

The existing semiconductor venture fund needs to be strengthened for accelerated investments and the expansion and growth of the KESDM industry, promoted through market development activities and support to local companies.

An INR 500 crore venture fund for ESDM and fabless start-ups could be created in Karnataka. The GoK budget could allocate INR 300 crore to come from the government and the rest can be raised from the institutions.

Developing the workforce of the future

To create a sufficient workforce for the sector, government, industry, and academia may need to drive the development and rollout (both independently and collaboratively), and encourage uptake of the various skills-building programmes and courses. The following actions could be considered:

Develop government-industry-academia partnerships to devise skill development programmes to train engineers on critical skills. KDEM has developed a new age VLSI design training programme in association with the International Institute of Information Technology, Bhubaneswar (IIIT-B), IESA, and leading industry partners. With IIIT-B being a robust research institute, the programme aims to train engineers on VLSI design for mobile, telecom, IoT, healthcare, automotive, EV, and aerospace and defence sectors. The industry can carry 20 percent of the total cost. This type of collaboration can be the key to training the workforce for the future.

Create an action plan to actively roll out skill development programmes (with the industry carrying 20 percent of the total cost) to create[iii] a 50,000 skilled workforce in the next five years.

Provide special incentives to ESDM training agencies working in the Beyond Bengaluru region. High-skilled training in the ESDM sector via industry collaborations could be promoted, such as the following:

The CeNSE is currently training nearly 150 PhD and 20 MTech students, conducting extensive R&D in current and future areas,[iii] such as materials, silicon (SI)-electronics, MEMS, photonics, beyond-SI electronics, nano-enabled, and healthcare.

Karnataka is home to around 30 government[iii] tool-room and training centres (GTTCs). At these centres, training is aimed at specifically enhancing technical skills in, for instance, electronic circuit design, analogue and digital communication systems, wireless communication systems, VLSI designing, embedded C-programming, industrial automation, and PCB designing and fabrication.

Create a network of on-demand specialised domain experts to carry out high-level, technology-oriented tasks (such as semiconductor fab, wireless technologies, or fabless design) on a case-by-case basis.

Encouraging targeted support from the government

The government could play the role of a facilitator, and financer to create a supportive ecosystem for the ESDM sector to develop, while continually monitoring the sector's performance through the following supportive actions:

- Providing a wide range of incentives such as preferential market access to state manufacturers, buy-back arrangements, rebate on duties, and carbon credits, to act as a confidence booster for local ESDM manufacturers and MSMEs.
- Considering electronics R&D as a cost centre and exempting them from any government levies and taxes to encourage organisations to spend more on R&D.
- Establishing an ESDM governance body to ensure time-bound clearance of proposals, land issuance, and information on the availability of land parcels in clusters, parks, and other regions of emerging-technology cluster districts. This would help prospective companies to make faster decisions.
- Providing fiscal support to companies. The GoK announced the Special Incentives Scheme for the ESDM Sector 2020–2025 on 7 September 2020. The scheme provides capital subsidy on land, plant and machinery, reimbursement of stamp duty and registration charges, land-conversion fee, power-tariff reimbursement, production-linked incentives, and exemption from electricity duty.
- Setting up a free-trade warehousing zone (FTWZ), like those in Maharashtra, Tamil Nadu, and Andhra Pradesh, to encourage component distributors to set up local warehouses that can support manufacturers with "just-in-time" component deliveries.
- Developing more common infrastructure facilities across the state and providing their services at subsidised rates. The state could also consider developing more COEs for "cutting-edge" technologies in clusters to help in rapid turnaround time on products and Ips.
- Marketing the Karnataka Electronics brand across the globe – brand Karnataka as India's semiconductor and electronic systems design capital, counting among the top three globally by 2026. Strengthen relationships with the ESDM industry associations and ensure co-branding during international events. In addition, the state could participate in international trade shows and visits as part of the industry and government delegation to attract overseas investments. This may require that KDEM continually market the industry worldwide for the next three years. The state could hire a global outreach agency, do road shows, and attend international events.
- As a financer, the state could be expected to provide the following financial support:
  - INR 300 to INR 350 crore government investment to set up Mysuru, Hubbali EMC clusters.
  - INR 250 crore to set up six to seven R&D labs and COEs catering to emerging technologies.
  - INR 100 crore to set up SAFAL centres in clusters like Belagavi, Mysuru, and Dharwa.
  - INR 100 crore to set up plug-and-play vertical factories at Mysuru and Belagavi.
  - INR 50 crore for a period of five years to set up supply chain solutions at new EMC clusters.
  - INR 45 crore to set up a multi-tenancy clean room facility in the Mysuru ESDM cluster.

Consolidating Bengaluru's position as a global hi-tech centre

Investments for technology development

Technology has established itself as the leading global growth driver in the 21st century and will continue to power socioeconomic development in the coming decades. To maintain technological leadership and autonomy, it is crucial that India develops a nation-first technology imperative. Karnataka is India's leading state in technology development, and Bengaluru is indisputably India's innovation and hi-tech capital, hosting a strong technology R&D and human capital base. To continue leading the country in technology innovation and to consolidate its position in the global innovation ecosystem network, Karnataka could invest in and incentivise the growth of Bengaluru's R&D capabilities.

Sectors crucial to Karnataka's socioeconomic development

- **Semiconductors and electronics:** The use of semiconductors has revolutionised the field of electronics and continues to enable the development of smaller, faster, and more powerful devices. Semiconductors have a wide range of utility: They are the key components of computer chips and mobile phone processors, enabling these devices to process information quickly, run software applications, and connect to the internet. They are also crucial to multiple renewable energy modes, like in solar cells to convert sunlight into electricity and in wind turbines to control the flow of electricity. Semiconductors are used in medical devices such as pacemakers and insulin pumps, where these devices rely on semiconductors to control their functions and provide precise doses of medication. Another application base is in transportation where semiconductors are used in automotive electronics to control engines, regulate fuel injection, and manage emissions. They are also used in navigation and entertainment systems. In addition, semiconductors play a crucial role in enabling the advancement of AI, machine learning (ML), neural networks, and quantum computing.

  Bengaluru already hosts more than 300,000 chip designers, testers, and embedded software engineers, the highest concentration worldwide. Karnataka can build on this human capital advantage by incentivising R&D in semiconductor design, fabrication, chip design, electronics component and hardware design, and manufacturing.

- **Communications:** Communication architectures of the future can prioritise speed, reliability, and security, which can enable the development of new applications and services that were not possible with previous technologies. Accordingly, they require a significant investment in R&D to lead in the field. Some potential architectures for Karnataka to focus its efforts on are 5G and 6G networks, edge computing, quantum communication, and mesh networks. 5G networks offer faster download and upload speeds, lower latency, and improved reliability compared to previous generations of wireless networks. 5G networks will be crucial for the development of the Internet of Things (IoT) and autonomous vehicles, which require fast and reliable connectivity.

  Edge computing is a distributed model that brings data processing closer to the source of the data, thereby reducing latency and improving real-time decision-making. Edge computing will be essential for applications that require real-time data processing, such as autonomous vehicles and industrial automation.

  Quantum communication uses the principles of quantum mechanics to transmit information securely. Unlike traditional encryption methods, which can be hacked with brute-force methods, quantum communication is fundamentally secure. This technology could be used to create unhackable communication networks for financial transactions, military communication, and other sensitive applications.

- **Transportation, electric vehicles, and mobility:** There are multiple new technologies that promise to change the current paradigm in transportation, particularly in India where the number of people per unit land is higher. Some of these technologies include electric vehicles (EVs) and autonomous vehicles, high-speed rail, hyperloop, drones and delivery robots, magnetic levitation, and vertical takeoff and landing vehicles. Apart from the development of new and efficient transportation modes, the use of novel materials to improve the efficiency and reduce the carbon burden of transportation is also a cutting edge field. So too is the development of smart infrastructure, such as intelligent traffic management systems and connected vehicle technology, which can improve safety and efficiency on the roads. These technologies use real-time data and advanced algorithms to optimise traffic flow and reduce accidents.

- **Energy and renewables:** Similarly, there are multiple new technologies at the edge of energy innovation that require deep research and development. Energy storage technologies, such as batteries, pumped hydro, and thermal storage, can help to overcome the challenge of the intermittent nature of renewable energy by storing excess energy when it is available and releasing it when needed. Advanced nuclear technologies, such as small modular reactors and fusion, could provide a reliable source of low-carbon energy. Advances in hydrogen production from renewal sources and storage technologies could make it a more viable option for decarbonising sectors like transportation and industry. Artificial photosynthesis, which mimics the natural process of photosynthesis to convert sunlight and water into fuel, such as hydrogen or methane, could offer a way to produce renewable fuels using only sunlight and water. Carbon capture, utilisation, and storage technologies (CCUS) aim to capture carbon dioxide emissions from industrial processes and power plants and either store them underground or convert them into useful products, such as fuel or building materials – thus reducing the greenhouse gas burden. Other leading research verticals in these areas include perovskite solar cells, smart grids, bioenergy, ocean energy, and green hydrogen.

- **New materials innovation and 3D printing:** Innovation in materials feed forward into many crucial sectors including construction, renewables and energy, semiconductors, healthcare, space, defence, and transportation. Some exciting new dimensions to materials research include utilising graphene across applications; meta-materials that are engineered materials tailored to specific applications, additive manufacturing and 3D printing that promise to transform manufacturing and construction; biomaterials; and self-healing materials that can repair themselves when damaged, potentially extending the lifespan of products and reducing the need for replacement. Nanomaterials is another exciting field of research – nanomaterials can have unique physical, chemical, and biological properties due to their small size and high-surface, area-to-volume ratio, and are used in a wide range of applications, including electronics, medicine, energy production, and environmental remediation.

- **Genomics, DNA medicine, and biotechnology:** The state of health technology is advancing rapidly. Advances in genomics are allowing doctors to tailor treatments based on an individual's unique genetic makeup, and can lead to more effective and targeted therapies with fewer side effects. For example, advances in gene editing technologies[iii] such as CRISPR-Cas9 may allow doctors to correct genetic mutations that cause disease. Genomic profiling of tumours can help doctors identify the specific genetic mutations that drive cancer growth, leading to more targeted therapies and better outcomes for cancer patients.

Genomic testing can also help doctors determine how a patient's body is likely to respond to different medications and so avoid adverse drug reactions and improve treatment outcomes. It can help identify individuals who are at increased risk for certain diseases, allowing for early intervention and prevention strategies. Advances in gene therapy allow doctors to treat diseases by introducing healthy copies of genes into a patient's cells.

Nanoparticles and other nanomaterials can be used for targeted drug delivery and other medical applications, while ML and other AI technologies can help doctors diagnose diseases more accurately and develop personalised treatment plans. Augmented reality and virtual reality technologies are being developed for medical training, patient education, and even surgical procedures.

Medical devices have been advancing rapidly over the years and there are many exciting developments on the horizon. For example, advances in materials and miniaturisation allow for smaller, more powerful implantable devices such as pacemakers, insulin pumps, and neurostimulators. Many medical devices are now connected to the internet, allowing for real-time monitoring and data collection, which can help doctors make more informed decisions about patient care. While wearable devices such as smartwatches and fitness trackers are already common, even more sophisticated ones may emerge soon that will be able to monitor vital signs, detect diseases, and even administer medication.

Robotic devices are already being used for minimally invasive surgeries and other procedures, but more advanced robots may be created that can perform more complex surgeries and other medical tasks. Advances in 3D printing and other manufacturing technologies may allow for more customised medical devices tailored to an individual's unique anatomy and needs. Biotechnology and biomanufacturing techniques are also continually advancing with the availability of new materials, biologics, and methods.

- **Artificial intelligence, machine learning, big data, and the metaverse:** AI is advancing rapidly and has the potential to revolutionise many areas of society, including healthcare, finance, and transportation. This is because AI can analyse vast amounts of data and provide insights that would be difficult, or impossible, for humans to identify. This can lead to better decision-making in many areas, including healthcare, finance, and business.

  AI can also be used in a predictive manner to analyse data and identify patterns that can help predict future events. This can be useful in healthcare for predicting disease outbreaks, identifying at-risk patients, and predicting the effectiveness of different treatments.

  Advances in natural language processing are allowing machines to understand human language better than ever before – this can lead to more natural interactions between humans and machines, making it easier to use AI in everyday life. AI can also be used to create autonomous systems that can operate with minimal human intervention, which can be useful in transportation, manufacturing, and other industries where automation can improve efficiency and safety.

  Similarly, advances in ML have the potential to greatly improve the ability to make predictions and identify patterns in data, with exciting possibilities with improved prediction accuracy, faster processing speeds, automated feature engineering, transfer learning, and explainable AI. The accelerated development of data analytics and large datasets is significantly driving advances in AI, ML, and the metaverse, which provide new opportunities for social interaction, economic potential, technological advancements, democratisation of access, and sustainability.

- **Automation, robotics, and humanoids:** Advances in automation are transforming industries like manufacturing, healthcare, defence, and transportation, thus creating new opportunities for efficiency, productivity, and safety. Greater integration with AI is leading to improved real-time decision-making, and better human-robot collaboration to improve productivity and reduce the risk of workplace injuries. In addition, some of the other exciting dimensions in automation include more autonomous robots and the creation of digital twins for simulations and testing (both of which reduce the need for physical prototypes and wastefulness).

  Similarly, the field of robotics is bursting with a number of advancements. Collaborative robots, or cobots, for example, are designed to work alongside humans, often performing repetitive or dangerous tasks. Soft robotics involves creating robots made of flexible, pliable materials that can move and adapt to their surroundings. These robots are particularly useful in applications that require delicate or precise movements, such as in surgical procedures or picking and packing tasks in warehouses.

  Swarm robotics involves creating large groups of small robots that work together to perform a task – each robot is programmed to perform a specific function, and the swarm as a whole can accomplish complex tasks that would be difficult or impossible for a single robot to complete.

  Further, autonomous vehicles, such as self-driving cars and drones, use sensors and software to navigate and make decisions without human intervention. Autonomous vehicles, therefore, have the potential to improve transportation safety, efficiency, and accessibility.

Humanoid robots are designed to resemble and function similarly to humans. They can walk, talk, and even express emotions; as such, humanoid robots have applications in healthcare, education, and entertainment.

- **Space and avionics:** Space is an essential economic frontier for communications, terraforming, mining new materials, and extended national security operations. There have been many significant advances in space and avionics technology in recent years that are pushing the envelope of space technology and improved air travel. Some examples include reusable rockets that significantly reduce the cost of spaceflight and make it more accessible; CubeSats, which are small, cube-shaped satellites that are significantly smaller and cheaper than traditional satellites; electric aircraft, powered by electric motors rather than traditional fossil fuels; and autonomous systems that use artificial intelligence and advanced algorithms, reducing delays and increasing safety.

There are many other sectors where technology advancements are crucial. Some of these include water and sewage treatment, food and agriculture, and defence equipment design and manufacturing. Advances in capacity and sustainability of these technology verticals rely on multiple and intersectional fields.

It is crucial for Karnataka to continue developing deep expertise in multidisciplinary and interdisciplinary fields that will feedforward into broad-based technology advancement.

The Karnataka government can focus on building vertically integrated innovation-to-productisation ecosystems

Deep funding grant systems: Karnataka may need to set up comprehensive grant systems to stimulate R&D in all major technology sectors. For example, non-lapsable grants and follow-on funding for promising ideas and prototypes have been very successful in the United States' DARPA and NSF funding systems. Karnataka's research grants must strive to extend the depth of funding similarly and aggressively support dual-use R&D.

University funding: Universities tend to hold the greatest critical mass of talent and can be mobilised towards national research goals with adequate funding. Advanced economies have successfully harnessed this intellectual might by allocating a significant amount of grant funding to professors and research students at universities. Institutions also require adequate funding to build world-class laboratories and stay updated with the latest technologies to allow their researchers to be able to access to the world's best tools.

Research facilities and centres of excellence (CoEs): As well as universities, government and private research facilities can be hotbeds of innovation. For example, the United States has a string[iii] of top-notch national laboratories like Sandia National Laboratories and the Lawrence Livermore National Laboratory that continually upgrade to support their research and innovation output. Karnataka could establish CoEs for each major technology sector to advance its research output significantly.

Innovation hubs: Academic research must go hand in hand with comprehensive productisation and go-to-market pathways to successfully deploy technologies. Innovation hubs have proven to be very useful in providing these ecosystems. Domestic innovation hubs like the Centre for Cellular and Molecular Platforms (C-CAMP) have helped scientist-entrepreneurs and academic researchers take their technologies to market. India could establish innovation hubs for every economic vertical and deepen existing hubs' capacity and capabilities to provide an innovation backbone.

PhD scholarships: India has lost many of its bright minds to Europe and the United States for lack of scholarships and world-class facilities. In 2018 to 2019, only 169,170[i] students were enrolled in PhD programs across the country – amounting to less than 0.5 percent of total enrolment in India's higher education system and a minuscule fraction of the population. Karnataka could increase exponentially increase the number of PhD positions, especially in core technological and science fields so the students' academic research can be channelled towards economic growth.

Government research organisations: Karnataka houses some of India's prominent government research organisations that are developing world-class technology in space, defence, aerospace, biological sciences, and health. These organisations can appoint dedicated chairs for specific research verticals within their organisations to focus on key innovation that could result in practical dual-use technologies. The government can pursue targeted IP portfolios that benefit Karnataka's (and India's) citizenry while furthering the nation's economic interests.

Start-up clusters and scale-up spaces: As well as academic and research institutions and corporates, start-ups are crucial to pushing the technological frontier further. Karnataka is steadily growing its number of deep science start-ups in several verticals, including material sciences, biosciences, and computing. Ample provision of early-stage government funding and assured continuity of follow-on funding can ensure that start-ups don't have to suspend operations while raising capital and can quickly ramp up their activities. Further, deep technological innovation requires scale-up spaces as activities ramp up from ideation to productisation. Instead of start-ups wasting precious time procuring land and other amenities, the Government of Karnataka's provision of grow-out space can speed the go-to-market process – such as China's National High-tech Zone model.

Investment suggestions for the Government of Karnataka

It is suggested the state government allocate INR 3,000 crore towards a hi-tech and deep technology fund that can invest in start-ups in Karnataka that are working to further India's technological capabilities. In addition, this could include innovation hubs that provide support and scale up infrastructure to deep tech start-ups.

It is further suggested the state government allocate INR 2,000 crore towards developing R&D. This fund can provide funding to university and other research laboratories, as well as to private companies conducting deep tech research that will be beneficial to Karnataka and India. This fund can also provide scholarships to PhD students working in deep tech areas.

References

i Karnataka economic survey

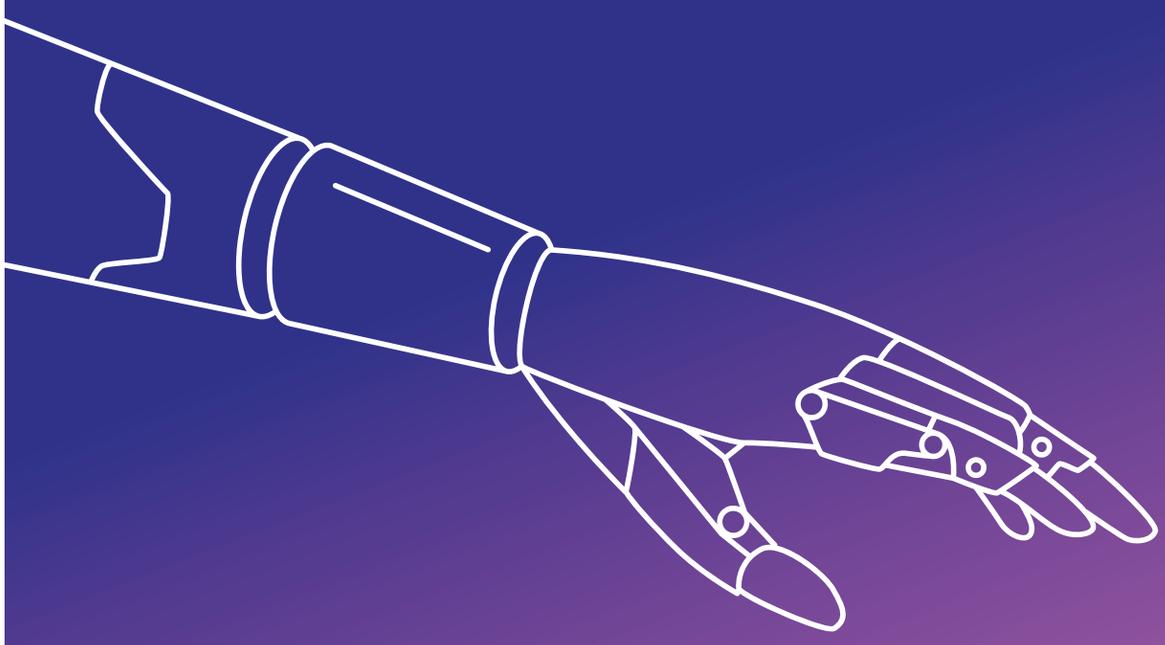
ii GDP performance and value forecast

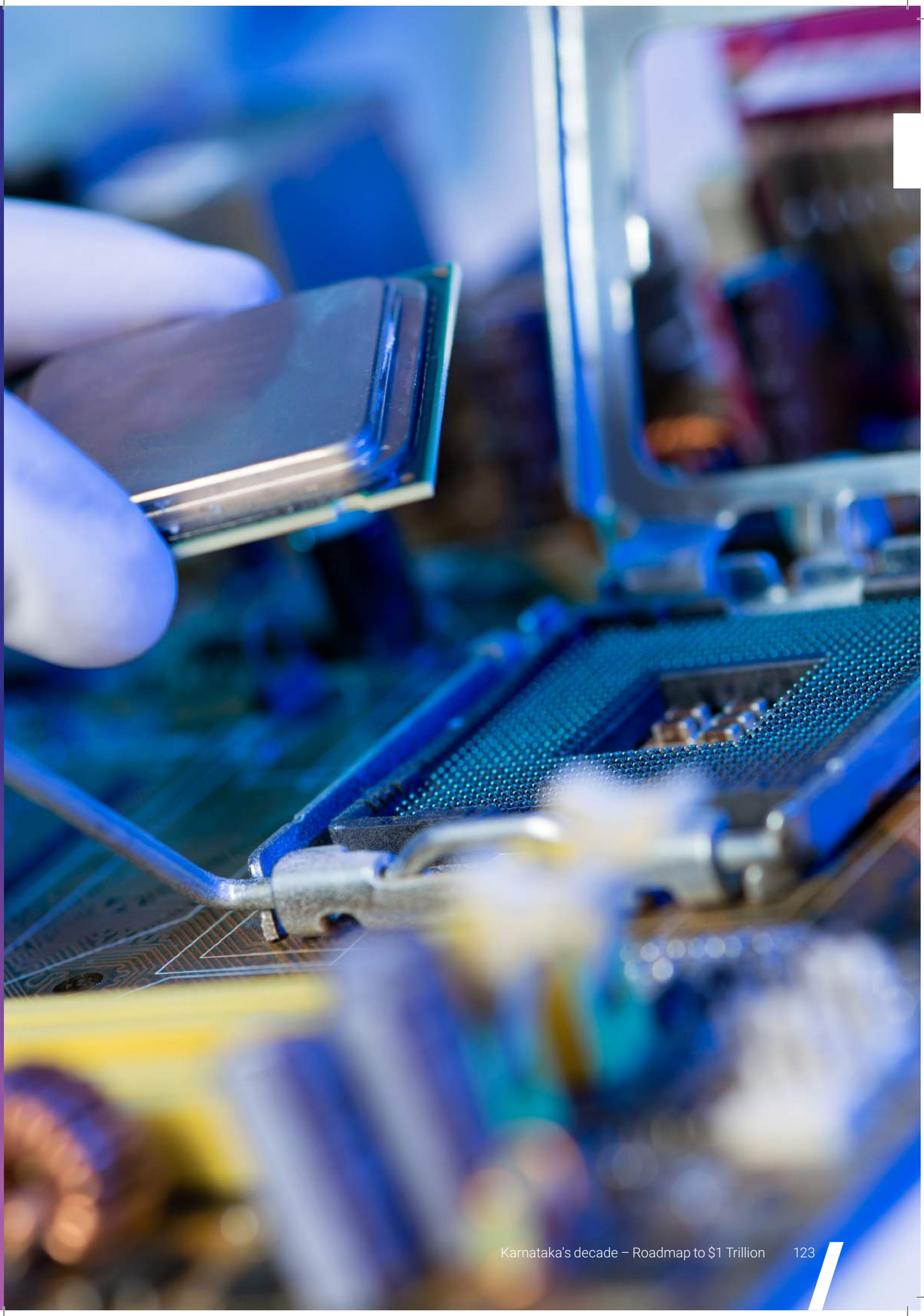
iii ESDM committee

CHAPTER

06

Hi-tech Industries





Karnataka's hi-tech opportunity: The winds of change

The information technology (IT) industry has changed both India's and Karnataka's economies – one of the primary reasons being that Karnataka and Bengaluru are regarded as being world leaders in the IT space because of the state's proactive government policies.

Research bodies unequivocally agree that the artificial intelligence (AI) wave is going to be exponentially larger than the IT wave was, with data being the new gold. In fact, PwC estimates[iii] that AI will likely add an additional economic value of $15.7 trillion by 2030 – larger than the United States' GDP and six times greater than India's current GDP.

Furthermore, the ability of AI to multiplex human thinking is going to transform other major verticals and create disruptive science, which can be used to achieve sustainable growth globally. The combination of deep science and accelerating technology innovation is leading to a "hi-tech revolution", which can help power Karnataka to a $1 trillion economy, in which 90 percent or more value can be created in digital-physical assets spread across multiple sectors.[iii] (Exhibit 38)

Future shift – the rise of intangible digital-physical assets

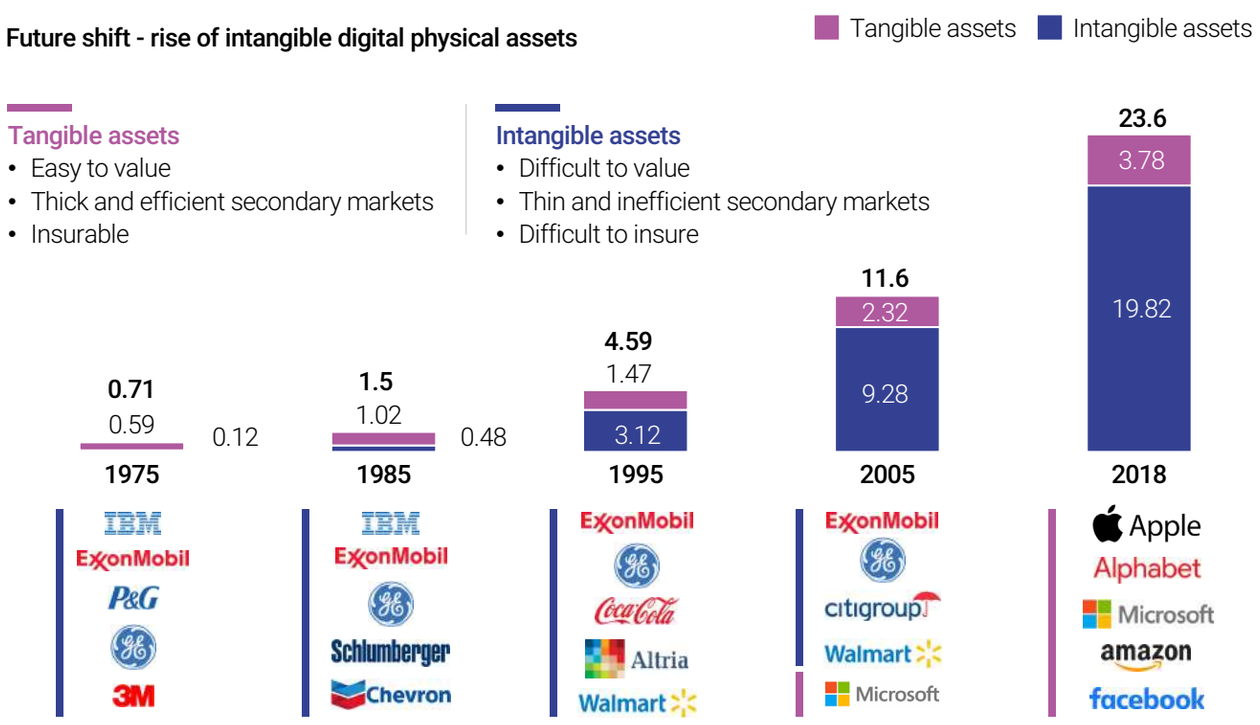
This massive value will be created with two major drivers of change: intelligent and pervasive automation, and extreme personalisation.

Karnataka is uniquely positioned to leverage the AI revolution, with its long legacy of excellence in technology research, innovation, and talent. Its impact across science and vertical sectors will help craft its desired future as a global leading hi-tech hub. Bengaluru is referred to as India's "Silicon Valley" and as the country's technology and start-up capital. As a result, entrepreneurial talent is drawn to the city, attracted by the infrastructure, innovative culture, and proactive government policies, as well as the need for talent in the hi-tech field. However, to enable such a future, Karnataka may need to adopt a focused approach on well-chosen emerging areas, together with smart technology-led governance and critical ecosystem enablers.

Exhibit 38

Tangible assets vs. intangible assets for S&P 500 companies, 1975–2018[1]

($ trillion)



1. Hi-tech committee

Seven hi-tech areas that Karnataka can address over the next seven years for hyper growth towards its $1 trillion economy vision

AI- and robotics-driven change

AI refers to the ability of machines to perform cognitive tasks such as thinking, perceiving, learning, problem solving, and decision-making. The transformational impact of this technology revolution has been compared to that of electricity, leading to the "Fourth Industrial Revolution" (4IR).

Initially designed as a technology that could mimic human intelligence, AI has evolved in ways that far exceed its original conception. With incredible advances made in data collection, processing, and computation power, intelligent systems can now be deployed to take over a variety of tasks, enable connectivity, and enhance productivity. AI's capabilities have dramatically expanded in multiple waves over the years in a growing number of fields.

First-wave AI systems are usually based on clear and logical rules. As a result, these systems find it difficult to tackle new situations, as they are very brittle if the conditions change. They also have a hard time abstracting – that is, taking knowledge and insights derived from certain situations and applying them to new problems (called "new learning"). An example of such a rule-based, first-wave AI system is the early chatbots that respond to questions based on a clear predetermined logic.

Second-wave AI systems, based on deep learning, develop statistical models for certain types of problems, and then "train" these models on many various data samples to make them more precise and efficient. Statistical learning systems are highly successful at understanding the world around them. They can distinguish between two different people or between different vowels. They can learn and adapt themselves to different situations if they're properly trained. However, unlike first-wave systems, they have limited logical capacity.

The Achilles' heel of second-wave systems is that nobody is certain why they work so well. Artificial neural networks succeed in doing the tasks they are given, but it is not understood how they do so – this is called the problem of explainability. This presents challenges as current physical systems in the real world depend a lot on their explainability for human beings to accept them in a wide area of understanding.

In the third wave, called humanlike AI, the AI systems themselves will construct models to decipher the world. They will even be able to programme themselves and potentially develop abstract thinking, mimicking humans deeply across domains. When third-wave AI systems are able to decipher new models to improve their function on their own, they will essentially be able to programme new generations of software. This wave poses a massive challenge to current perspectives in society (which is currently man to man) and its transition to true man-machine society. The purpose of work and its relationship to society will have to be examined deeply, for people might not work for economic gains anymore, rather only to express themselves. ChatGPT (an AI chatbot) is an early example of such system, though it is not yet reliable across the problem space.

Artificial general intelligence (AGI), the fourth wave, is a massive work in progress and currently still belongs in the realm of science fiction. AGI would enable machines to be completely autonomous in any kind of tasks and most probably would also involve completely new techniques that have not yet been discovered.

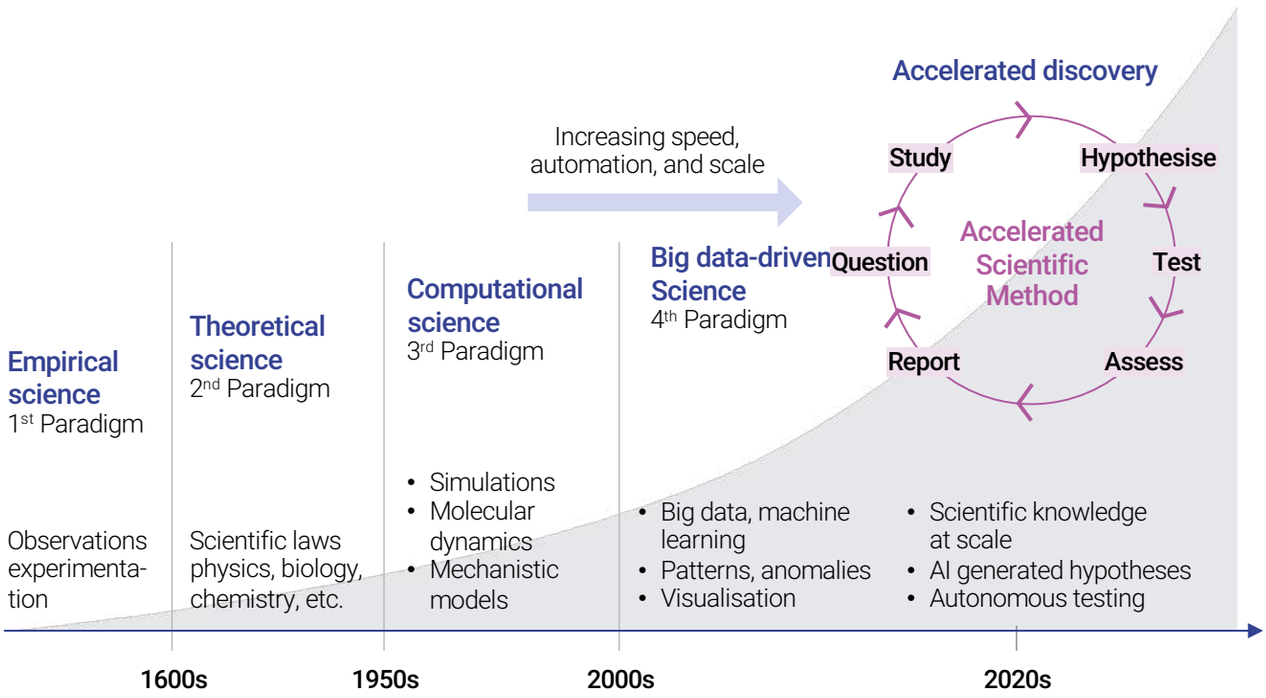
Overall, AI is the chief underlying factor in the Fourth Industrial Revolution. As an example, ChatGPT has shown its applicability[iii] across multiple industries and is being used by many people, however it is still in its early stages. What is definite is that humanlike AI will change and disrupt most verticals, including science, making the next ten to fifteen years one of the most disruptive times in our history. As such, it is going to be a significant horizontal force across the hi-tech sector. (Exhibit 39)

To harness the power of AI to positively impact Karnataka's GDP, and society at large with enablers for businesses, Karnataka could to adopt a five-pillar, tightly-knit approach by learning from and adopting to various best approaches that are finding success globally. These include:

- **Data foundry:** Critical to making Karnataka a Data Swarna State, data foundry is the creation of the largest databank and data testbeds to spur innovation in AI. This data foundry can allow a privacy-preserving collection, sharing and analytics of data to drive AI and machine learning (ML) research for robotics, autonomous systems, and their various applications in mobility, healthcare, agriculture, smart cities, etcetera. This data foundry could consist of industry-leading "data setup" in six major areas:
  - Healthcare data setup
  - Nutrient data setup
  - Language data setup
  - Agriculture data setup
  - Mobility data setup
  - Smart city data setup
- **Computing facility:** For globally leading research and innovation, large high-performance computing running into thousands of nodes is critical to reduce training time and to address the challenging problems.

Exhibit 39

Accelerating material discovery using AI, high performance computing, and robotics



Source: NPJ computational material 2022

- **Talent training:** Talent will need to be trained to address the deep technology needs. This can be talent from diverse backgrounds (electronics, computer science, mechanical), both young and experienced. It also includes entrepreneurial and interdisciplinary talent to help spin out the developed technologies. There may need a separate fund to enable the acceleration of talent development from K-12 onwards in the AI and robotics ecosystem.
- **Innovation ecosystem for AI and robotics:** Achieving AI in a safe, secure, and reliable manner could lead to the development of many innovative technologies, which will provide the necessary fuel to create deep tech start-ups.
- **Capital:** A funding pool of INR 1,000 crore may need to be created for research grants, research translation, and for pioneering start-ups and companies over the next ten years. Of this, INR 500 crore can be used for research grants. This funding pool can also be utilised to create a specific fund-of-funds, which could help to build "AI Innovation Studios" or "AI Studios" that work as venture studios, funding, and help build ventures in AI and robotics. To aid further development, a debt fund-of-fund for INR 10,000 crore can be planned to enable low interest funds to AI and robotics start-ups.

Given that 11 percent[iii] of all AI talent currently comes from India, Karnataka stands a good chance of becoming the global AI cluster.

Clean and smart mobility systems

Mobility and transportation form the backbone of the modern economy due to their links with other sectors and their importance in both domestic and international trades. Today's society demands various kinds of mobility to enable the efficient and safe transportation of both people and goods. As a major contributor to overall emissions, this sector can be also be sensitive to environmental sustainability.

In India, the majority of both passenger and freight traffic is carried through roads and railways. As of 2007–08, roads and railways accounted for almost 87 percent of total freight traffic[i] in the country and almost 90 percent of total traffic as of 2011–16. However, these modes of transport are expensive and particularly pollution-intensive compared to shipping and air transport, which further increases the need to implement smart practices in their deployment.

About 40 percent of Karnataka's population now lives in urban areas, increasing the importance of tackling the related problems of congestion, traffic deaths, and lack of adequate public transportation infrastructure. Further, since a large share of the total requirement of greenfield infrastructure has only just started being addressed, the benefit of hindsight can play a role here and account for efficiency and sustainability, where AI can power multimodal integration. In addition, AI can take into account assisted-vehicle technologies, which are taking small but sure steps as precursors to fully autonomous vehicles and are currently more relevant.

Various major transformative transport themes

Autonomous trucking, drone, and autonomous shipping integrated multimodal transportation
Safety and hauling efficiency can be improved through intelligent platooning and optimal road-space utilisation. In addition, by integrating drones and autonomous shipping in the multimodal transportation ecosystem, unlimited skies and Karnataka's long shoreline can be leveraged for both transportation and logistics. This would not only increase the efficiency of transportation, but also reduce the overall cost of logistics.

Green mobility
A green hydrogen ecosystem, coupled with the intelligent electrification of rail, road, water, and sky transportation, can have a substantial impact on improving mobility, while reducing the carbon footprint. Currently storage, transportation, and the usage ecosystem of green mobility is in its infancy and could be impacted by Karnataka's innovation ecosystem that is being built.

Intelligent traffic management
AI could help to design sophisticated urban traffic control systems to optimise signal timings at intersection, zonal, and network levels, while facilitating services such as automatic vehicle detection for extension of red or green phase, or providing intermittent priority.

Intelligent transportations systems, and travel and route flow optimisation
Real-time dynamic decisions on traffic flows can be made using AI such as lane monitoring, access to exits, toll pricing, allocating right of way to public transport vehicles, enforcing traffic regulations through smart ticketing, and so forth. Accident heat maps could be generated using accident data, as well as driver behaviour at specific locations on the road network related to topology, road geometric design, speed limit, etcetera. Suitable measures could be preemptively taken to prevent possible accidents. Also, AI could help to design sophisticated urban traffic control systems that could optimise signal timings at the intersection, zonal, and network level, while also facilitating services such as automatic vehicle detection for extension of red or green phase or providing intermittent priority.

Community-based parking
AI can help optimise parking, likely by minimising vehicle downtime and maximising driving time. With the advent of electric vehicles (EVs), AI could help to mediate the complex vehicle grid interactions(VGI) as well as for charging optimisation.

Integrative intelligent healthcare with a focus on genetics and next-generation pharmaceuticals

Healthcare is one of India's largest sectors in terms of both revenue and employment, and the industry is projected to reach $372 billion[i] by 2023. In terms of public healthcare, Karnataka currently stands eighth among 21 states in the Health Index released by the NITI Aayog. The quality, accessibility, and affordability of healthcare are the major challenges that AI has the potential to address. AI combined with robotics and the Internet of Medical Things (IoMT) could present solutions to address these issues. In addition, the aging population in the EU and the United States creates an opportunity to spread home-grown innovations around the world. A healthcare innovation cluster with IISc, C-CAMP, NCBS, and ARTPARK, together with the industry and start-up ecosystem, can be created to be driven deeply, very similar to the global healthcare[iii] hub in Boston in the United States. To enable integrative intelligent healthcare, three critical areas may need to be addressed with innovation capacity.

Early screening and diagnostics
By 2022, the diagnostics market in India was expected to grow at a CAGR of 20.4 percent to reach $32 billion from $5 billion in 2012.[iii] Here, AI solutions can augment the scarce personnel and lab facilities – through early detection, diagnostic decision-making, and treatment to help overcome the barriers to access. For example, NITI Aayog[i] is working with Microsoft and Forus Health to roll out technology as a pilot project that will help with the early detection of diabetic retinopathy. 3nethra, developed[iii] by Forus Health, is a portable device that can screen for common eye problems and integrating AI capabilities to this device using Microsoft's retinal imaging APIs enables operators of the device to get AI-powered insights, even when working at eye check-up camps in remote areas with no or intermittent connectivity to the cloud. The resulting technology solution also solves the quality issues with image capture and has systems checks in place to evaluate the usability of the image.

SigTuple and Niramai are prime examples of two ground-breaking AI start-ups based in Bengaluru[iii]. While SigTuple builds intelligent screening solutions to aid diagnosis through

AI-powered analysis of visual medical data, Niramai has developed a novel, non-invasive software to detect breast cancer at early stages.

The shortage of qualified healthcare professionals and services can also be addressed to some extent by AI-enabled tools that help less-skilled people make difficult decisions regarding medical care. If the AI tool concludes that the confidence in a decision will be low, this allows highly-skilled experts to devote their time only to important cases. An example is a mental-health assistant application[iii] such as Wysa, which is a chatbot that allows certain cases to be escalated to a human assistant depending on need.

AI also provides tremendous scope for targeted large-scale interventions for cancer screening and treatment. In 2018[iii], there were a total of 168,122 cases of common types of cancer diagnosed at state-run NCS clinics. Of these, 20,084 cases were detected in Karnataka alone. NITI Aayog is in an advanced stage for launching[iii] a programme to develop a national repository of annotated and curated pathology images. Another related project under discussion is a cancer imaging biobank.

Preventive healthcare and focus on well being

AI can also be applied to preventive health programmes. ML can be used to predict the likelihood[iii] of developing a disease, which can then be addressed through timely interventions such as preventative therapy. AI can soon help gain insights into diet, nutrition, and health through alternative knowledge systems for humans. With a sharp increase in the sheer amount of health data connected via multiple health apps and technologies, there is a new opportunity not only to truly test the efficacy of alternative knowledge systems (including diets and treatments), but also to provide tailor-made diets and treatments for individuals based on their unique health, demographics, and other data. This is an opportunity to take a fresh look at the body of knowledge in alternative medicine – India already has a rich heritage of practice in Ayurveda, yoga, naturopathy, Unani, Siddha, and homeopathy (AYUSH). AI can finally provide quantitative evidence on the efficacy of this traditional knowledge, which could lead to a wider acceptance and understanding of these methods. There is already growing interest in these in light of the concern with allopathic medicines' side effects, and the need to practice more environmentally sustainable systems. In 2018 itself, the AYUSH market was valued[iii] at about $10 billion and is estimated to be on a steady upward trajectory. A number of start-ups that are leveraging the internet and seek to tap into this market have increased in the past few years.

The fact that the AYUSH knowledge systems, despite sparse documentation, have survived the test of time indicates that they have evolved – learned from errors and improved with time – just like a ML algorithm does. It is, in fact, an outcome of years of iterations and could be used as an advanced starting point to train AI systems on the best of health and nutrition for the human body. Further, these knowledge systems are an integral part of India's "cultural heritage", so any robotic systems that are built, including healthcare systems, can be distinguished by their ability to incorporate the centuries-old wisdom, still relied upon by millions of Indians. Constructing an AI database that codifies and documents AYUSH knowledge systems is an important step to keeping them alive. Culture-aware robots could act as repositories of ancient knowledge along with the ability to apply the same judiciously.

Improved drug discovery with genomics and personalised medicines

AI has powerful applications in the pharmaceutical industry[iii], helping speed up drug discoveries by handling large amounts of data that would otherwise have to be done manually to arrive at any insights. AI helps accelerate the process at each stage of research, and reduces time and cost by providing valuable input – even in reduced sample sizes and shorter clinical studies. In January 2020[iii], a drug molecule was invented by AI start-up Exscientia, in collaboration with Sumitomo Dainippon Pharma, that used AI to treat obsessive compulsive disorder. This will soon be entering human clinical trials for the first time. What would have taken humans four-and-a-half years to develop took the AI algorithm just 12 months. Further, the algorithm is agnostic to the disease, so it can be used for diseases ranging from cancer to heart disease.

Next-generation space economy

With the presence of the Indian Space Research Organisation (ISRO), Karnataka has emerged as a major hub for the space industry in India. Now with several private space companies coming out of India like Bellatrix, Agnikul, Skyroots Aerospace, and Dhruva Space, the future of aerospace is taking off. The Bank of America forecasts[iii] that space economy is going to reach $1.1 trillion. By augmenting its ISRO heritage and start-up innovation ecosystem, Karnataka can grow its space economy by 2030 in various ways.

- **Encourage private-sector participation:** Karnataka could encourage private sector participation by creating an enabling environment for private players to invest in space-related activities. This can be done by providing tax incentives, subsidies, and other financial support for all areas of the emerging space economy.
- **Develop a skilled workforce:** Karnataka could focus on developing a skilled workforce for the space industry by investing in education and training programmes specially focused on aerospace and future space applications. By leveraging eminent institutions such as the India Institute of Science and private universities like the Manipal Institute of Technology, the state can create a talent pipeline together with a life-long learning practice. This can help create a pool of talented professionals who can contribute to the growth of the space industry in the state.
- **Invest in R&D:** Karnataka could invest in R&D activities to develop cutting-edge technologies that can be used in space missions, satellite manufacturing, and other space-related activities. This could be done by enabling centres of excellence to focus on frontiers of space technologies, such as the use of 3D printing and digital twins to enable faster developments. This can help the state stay ahead of the competition and attract more investment by becoming globally relevant.
- **Creating global partnerships:** Karnataka could foster international partnerships with nations and industries around the world to share knowledge, expertise, and resources. This can help the state develop its space capabilities and expand its reach in the global space industry, while deepening the talent and innovation pool.
- **Focus on space applications:** This could be particularly with regard to 6G telecommunications. Karnataka could focus on developing space applications that can be used in various sectors, including agriculture, disaster management, and climate change. Given the speed of innovation in 6G and the merging of satellite and terrestrial networks, this area is a hotbed of global innovation. This can help create new opportunities for businesses and entrepreneurs, leading to inclusive economic growth. This will be not just in urban areas; it will also aid digital mobility in rural areas, leading to lower migration for work into urban areas.
- **Create a supportive ecosystem:** Karnataka could create a supportive ecosystem for the space industry by developing infrastructure such as a space start-up park, providing regulatory support, and promoting entrepreneurship. This can help attract investment and create new opportunities for businesses and entrepreneurs.

By focusing on these areas, Karnataka can grow its space economy by 2030, create new jobs, and contribute to the state's overall economic growth.

Learning for AI age: Education 4.0

Nearly half of Karnataka's population is below the age of 25. The education sector assumes immense importance for capitalising on this demographic dividend and realising the full potential of the economy. Low retention and poor learning outcomes have posed challenges in the Indian education system for a significant period of time. As pointed out in the NITI Aayog[iii] discussion paper, AI has the potential to bring about changes in the education sector by supplementing pedagogy and establishing systems to inform and support decision-making across stakeholder and administrative levels. However, AI implementation can be preceded by efforts to digitise records of teacher and student performance, and the curriculum. Several AI tools are being successfully used in other parts of the world, and they can be adapted to the Indian context to target specific challenges.

Edutech start-ups in India raised $1.1 billion in 2018[i] and 2019 and Bengaluru alone houses 734 edutech start-ups. However, the opportunity in the learning space as the world goes through a AI-led transformation is massive. There are various ways that edutech is being used:

- **Adaptive learning tools for customised learning:** AI has the potential to greatly assist teachers to efficiently and effectively manage multilevel or multigrade classrooms by judging the learning levels of individual students – and using automation to develop customised educational content adapted to each child's class and learning level. Assessing the time spent by a student on each part or page of the learning material, for example, would allow real-time feedback on student performance to help

teachers appropriately tailor their guidance to the child.

- **Intelligent and interactive tutoring systems:** Various start-ups have dramatically altered students' interactions with course content, making it not just more engaging but also customised to each student's learning level. For example, in-built pop-up questions can pique interest and help assess a student's level of attention and comprehension so that solutions can be designed accordingly.
- **Predictive tools to inform pre-emptive action for students predicted to drop out of school:** A wide range of student information including performance, gender, socioeconomic factors, school infrastructure, teacher skills, and more can be, and have been, used to predict the likelihood of a student dropping out – for example[iii], pilots on this area have been conducted in Andhra Pradesh. This information can be used to advise vocational studies or interventions that enable student retention.
- **Automated teacher rationalisation:** AI tools can be used to develop automated teacher postings and transfer systems, using analytics based on demand-supply gaps across schools in Karnataka, a candidate's prior postings, candidate preferences, etcetera. This can help close the gaps in teacher distribution.
- **Customised professional development courses:** To tackle issues of badly designed professional development courses with poor coverage, adaptive AI tools can be used to design automated, customised professional development training content for teachers based on their performance, identification of their knowledge, and skill gaps. This could then be continually adapted as the teacher's skills and concepts improve.

While the above modes list ways in which to improve learning outcomes within the current curriculum, this very curriculum may need to be rethought. As opposed to the traditional focus on STEM (science, technology, engineering, and maths), an alternate STEAM (science, technology, engineering, arts, and maths) approach is necessary to prepare individuals for the AI age – as suggested in the National Education Policy (NEP). The current education system focuses on logic and reason, whereas all tasks based on logic and reason will likely eventually be automated. Therefore, by eliminating standardising students, the unique potential and inherent creativity of India's young population can be embraced and the most talented human resource pool created.

The three most important skills identified for the future by the World Economic Forum are critical[iii] and creative thinking; complex problem solving, and collaborative planning. Mechanisms to nurture these particular, intangible skills in the next generation need to be developed and nurtured. The experience economy (whereby you create, buy, sell, or barter digital experiences) is going to be the key enabler of future jobs and India's school education system may reflect that. Creating a technology-led, inclusive educational framework based on the new educational policy is vital and can form the bedrock of the transformation of education.

With the growing AI industry, demand for AI talent has increased but supply has not yet matched it. According to reports, 2,500[iii] AI jobs were left vacant last year due to the lack of technically-skilled people. To bridge this gap and to increase the employability of graduates, it is imperative to make available the required courses in AI at the higher education level. An AI-driven online platform providing comprehensive training in the AI domain can help fill the gap, enable large scale employment, and help offset existing unemployment.

Thus, intervention may need to occur at three levels: schools, colleges, and continual life-long learning systems outside of current systems. By creating a systemic approach that enables the focus on "learning to learn", India can create the talent needed for Industry 4.0 and beyond.

Agrifood 2.0 (a fully-linked supply and demand ecosystem)

In India, 49 percent of the workforce is engaged in agriculture, while it contributes[iii] only 16 percent to the country's GDP. On the other hand, in Karnataka, farmers, food, and agricultural labourers formed 41 percent of the workforce but contribute 15 percent to the GDP.

Digital and AI technologies are helping solve issues in the agriculture value chain across the world, addressing agricultural productivity, bringing down the cost of agriculture, and making crops less drought-prone. Further, horticulture, floriculture, food processing, and other allied agricultural activities (that have contributed significantly to the growth in the agricultural sector), stand to benefit from AI adoption. The impact of technology is already visible[iii] in countries like Australia, China, and the United States, which have yields that are more than double that of India for most of the country's major crops.

In 2019, Indian agricultural food tech start-ups raised $1.3 billion and numbered nearly 300[iii]. AI impact in agriculture can be seen across the value chain from the agricultural inputs and procurement stage to the processing and retailing stage, including:

Crop selection
Complex parameters like soil type, monsoon dates, availability and affordability of seeds, etcetera, along with historical data, can be addressed by AI-based solutions when selecting crops. In addition, by linking real-time demand data with existing supply, shortages can be forecast and allow farmers to grow crops that give much higher value.

Soil-health monitoring and restoration
Image recognition from satellite or drone data and deep learning models have enabled distributed soil-health monitoring without the need for laboratory testing infrastructure. AI solutions integrated with data signals from remote satellites, as well as local image capture on the farm, have made it possible for farmers to take immediate actions to restore soil health.

Crop health monitoring with real-time action advisories to farmers
AI can be used to predict advisories for sowing, pest control, disease control, and input control to help in provide stability for the agricultural community. For example, many agronomic factors (such as vegetation health and soil moisture) can be monitored up to the farm level through remote sensing. Using remotely sensed data, high-resolution weather data, AI technologies, and AI platforms, it is possible to monitor crops holistically and provide additional insights to the extension workers and farmers when required.

Increasing farm-mechanisation efficiency
Image classification tools combined with remote and local sensed data can bring a revolutionary change in the utilisation and efficiency of farm machinery, such as weed removal, early disease identification, produce harvesting, and grading. Horticultural practices require a great deal of monitoring at all levels of plant growth and AI tools provide round-the-clock monitoring of these high-value products.

Increasing share of price realisation
Current low levels of price realisation to farmers (as low as 20 percent in fruits and vegetables) are primarily due to ineffective price discovery and dissemination mechanisms, supply chain intermediary inefficiency, and local regulations. Predictive analytics using AI tools can bring more accurate supply-and-demand information to farmers, thus reducing information asymmetry between farmers and intermediaries, while also informing production. As commodity prices are interlinked globally, big data analysis becomes imperative here. Further, image processing to assess crop quality can help in price estimation.

Automation in food processing
Currently, food processing is done on a large scale, requiring a minimum quantity of production for scale to work economically. Automation can help make the process more flexible and cost-effective.

Major bottlenecks that have been identified include a lack of data for agricultural produce, processing, transport, and demand; low-cost access to satellite data and linking supply to demand digitally; and a lack of platforms or apps to link demand-side data with produce data. The challenges identified could be a starting point for action, leading to increased agricultural productivity and sustainability, and higher farmer incomes.

Quantum technology, shifting the sense and compute

Quantum is the next big revolution and might end up impacting most scientific foundations. Quantum computers can, in principle, solve certain problems exponentially quicker than their classical counterparts. Quantum computing, quantum sensing, quantum communications, and simulation of quantum systems are some of early application areas of ground-breaking quantum research. There imay be a need to create a global research park focused on quantum that will explore both theoretical quantum computing as well as applied quantum computing focused on four major thrust areas.

Quantum computation and simulation
Harnessing the quantum behaviour of atoms, molecules, and nanoelectronic circuits for a new way of computing for security, optimisation, simulation of physical, chemical, and biological processes, and lastly, drug and material design.

Quantum sensing
Using quantum mechanics for new sensors with significant increases in sensitivity, selectivity, and efficiencies. Potential quantum sensing applications include early cancer detection and improved cancer treatments; improved geological exploration on land and in water and structural biology and innovations around them; and defence applications for air, water, and land.

Quantum communication
Developing ultra-secure communication channels and global quantum networks by leveraging the power of the quantum world. Physical quantum systems can neither be monitored nor copied without being detected. If someone tries to gain access to information, it is changed by the system. Quantum encryption can be exclusive and costly to start

with, and can mainly be used by sectors such as banking, finance, healthcare, insurance, and defense. Potential quantum communication applications could be in security, privacy, and cryptography, as well as in satellite-based global quantum networks.

Quantum material
Engineering materials with unique quantum properties for the development of advanced quantum processors and devices are critical for the growth of next-generation infrastructure. Potential quantum materials applications are estimated to be in the foundation of practical quantum devices, high-capacity energy storage, and zero-loss electricity transportation.

By focusing on core research in quantum and its emerging applications in associated areas, Karnataka can become a major force in quantum on the lines of "Quantum Valley" in Canada.

Accelerator for high tech: Technology-led innovation governance

Karnataka has been a pioneer in moving towards smart governance, having established the Centre for Smart Governance as a non-profit society in 2019 and by working in tandem with the Centre for e-Governance. The use of AI offers potential efficiencies and costs savings for the government. For example, Deloitte[iii] has estimated that automation could save US government employees between 96.7 million to 1.2 billion hours a year, resulting in potential savings of $3.3 billion to $41.1 billion a year.

The use of AI and automation in the public and private sectors has been researched in a Harvard study. The potential use cases in the public sector mirror common applications in the private sector. Some of the uses include:

Assisting public interactions with the government
An AI interface between the government and public can play out in multiple ways, including the use of virtual assistants and chatbots that answer questions, help citizens navigate systems by directing questions to the appropriate government department, form-filling, searching for documents, appointment scheduling, and so forth. Some examples of such uses are found in Australia and the United States,[iii] with their virtual assistants, "Alex" at the Australian taxation office, and "Emma" at the US Department of Homeland Security's citizenship and immigration office. The range and complexity of the experience offered by the AI interface can further deepen the relationship between the public and government.

Improving government efficiency
AI could be used to improve administrative processes by informing resource allocation, simplifying and automating tasks such as translation, and mining volumes of data to reveal insights that can be acted upon.

Enhanced security
AI can be used to secure the volumes of personal data that the government handles, and detect fraud attempts by hackers trying to access the data. The Centre for Development of Advanced Computing (CDAC),[iii] in collaboration with IIT-Patna, is already undertaking a project that seeks to develop cyber-forensic tools driven by AI for law enforcement, government, and other intelligence agencies.

Forecasting and real-time analytics
Currently, the government does not use real-time or predictive data. Data, even though large volumes of it exist, can be leveraged much more deeply to monitor or predict programme outcomes with real-time dashboards.

Critical enablers for growing a hi-tech ecosystem

Apart from enablement focus on seven critical hi-tech areas, key ecosystem interventions could be considered to bring India on a par with the leading global ecosystems. These fall into two major categories, one to enable innovation, and the other to create the markets for such innovation. Four major enablers could be considered for growth of this ecosystem.

Building an institutional framework for hi-tech innovation

- Define a framework to continually identify key R&D areas and domains.
- Institutionalise the "lab-to-market" mechanism, where early examples like ARTPARK (AI and Robotics Technology Park) bringing academia, industry, and government together. This idea can be enabled for other sectors as well.
- Adopt globalisation 2.0 with connected innovation ecosystems across the world, so that speed of innovation and impact is maximised.

Innovating rainforest model with decentralised funding ecosystem

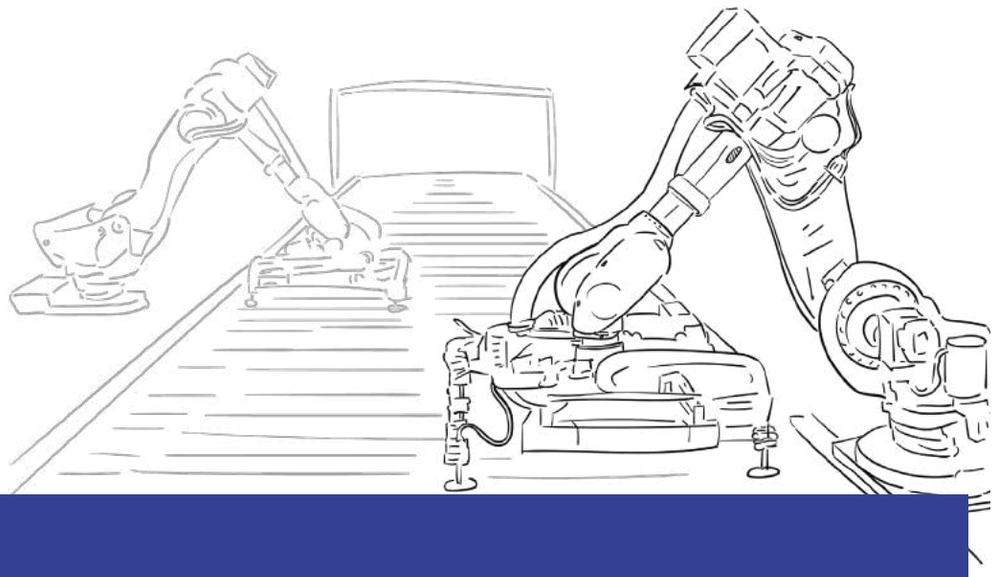
- Consider alternate models, such as a research-linked incentive scheme built on the lines of PLI, a public-private model for funding research, and a model like the US Defense Advanced Research Projects Agency (DARPA) for defence innovation.
- Enable the creation of a public-private partnership (PPP) fund-of-funds for the sunrise sectors (to the order of $1 billion) for venture capital and debt funds to grow the innovation ecosystem.

Engaging global talent

- Attract global Indian talent for basic and applied R&D early on by creating a public-private global university ecosystem focused on hi-tech clusters.
- Move from attracting talent to engaging talent globally gradually by creating open innovation networks.
- Build start-up clusters and link them globally to promote innovation talent flow.

Public procurement of innovation

- Streamline public procurement to seed innovation by combining ELEVATE 100 and iDEX models.
- Increase innovation buying by government from 1–2 percent to 20 percent (the global norm). Early examples from the iDEX ecosystem can be replicated at state and national level.
- Create an early life-cycle procurement by government ecosystem.



References

i Karnataka economic survey

ii GDP performance and value forecast

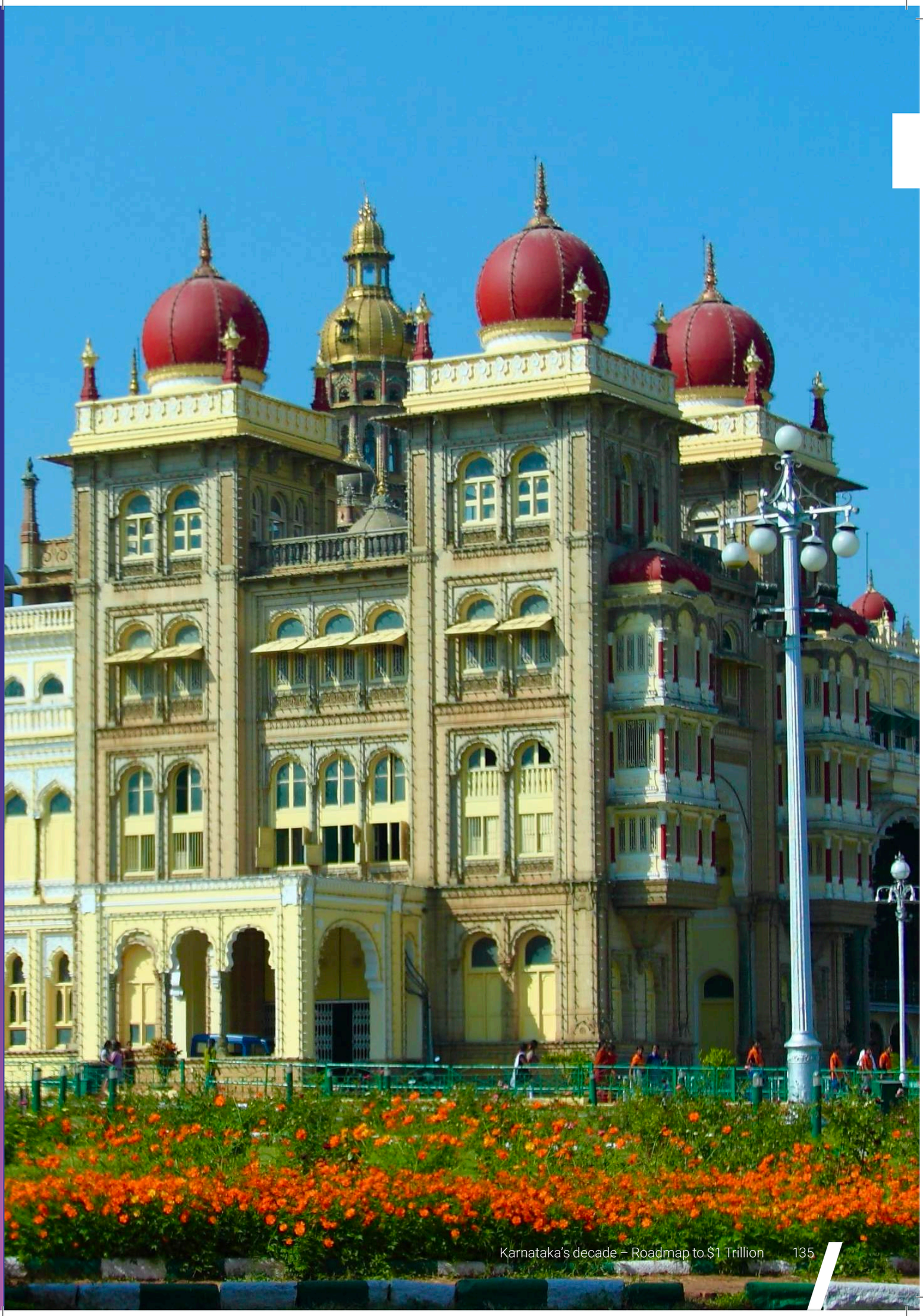
iii Hi-tech Industries committee

CHAPTER

07

Tourism





Karnataka's tourism sector: A key driver for growth and job creation

Globally, tourism has emerged as one of the largest industries and a key economic driver for creating jobs and wealth, contributing to sustainable development, and providing infrastructure and stability. Tourism has a highly positive and desirable knock-on economic effect on other sectors such as travel, hospitality, arts and crafts, and food and beverages. In its annual research, the World Travel and Tourism Council (WTTC) revealed that in 2018, travel and tourism accounted for 10.4 percent of the global GDP and 319 million jobs – 10 percent of total employment worldwide.

Similarly, tourism and its allied sectors of travel and hospitality have emerged as key drivers of growth among the service sectors of India, with travel and tourism contributing 9.2 percent of India's total GDP positioning the country as third among 185 countries in terms of the sector's overall contribution to the economy.[52] Over the next decade, India's travel and tourism GDP is expected to grow at an average of 7.8 percent[ii] annually, compared to 6.7 percent of India's overall economy, to reach almost INR 33.8 trillion ($457 billion). The forecast also reveals that the sector could create over 24 million jobs over the next decade, averaging more than 2.4 million new jobs yearly.

The Government of Karnataka (GoK) has identified tourism as a priority sector of the state. Karnataka has seen immense growth in domestic tourist visits, from 36.7 million[i] in 2006 to 215 million in 2018. The state attracts nearly 12 percent of overall domestic tourist visits in India, placing it third among Indian states. Karnataka also saw over 5.4 lakh foreign tourist arrivals in 2018, ranking the state 11th for foreign tourist arrival (FTAs) in India. In 2019, Karnataka's tourism sector contributed 14.8 percent of the state's GSDP and provided for over 30 lakhs jobs through direct and indirect employment.[53]

Karnataka is a land with a rich cultural heritage and many natural gifts. The state hosts three UNESCO World Heritage Sites – Hampi, Pattadakal, and the Western Ghats of Karnataka. Additionally, four other sites – Aihole-Badami-Pattadakal, Kalaburagi-Bidar-Vijayapura (Deccan Sultanate), Srirangapatna, and Belur-Halebidu are on the tentative list of World Heritage Sites.[54] Karnataka has over 600 Archaeological Survey of India (ASI)-protected monuments, over 840 state-protected monuments, and several holy sites[iii] of spiritual and cultural importance. The state has the most significant tourist destinations in India, at 319.

Furthermore, Karnataka has an abundance of flora and fauna, with five national parks, and more than 30 wildlife sanctuaries[iii] and tiger reserves. Karnataka's natural beauty extends to about 17 picturesque hill stations and 40 magnificent waterfalls, making the state one of India's best ecotourism destinations. Karnataka's 320-kilometre-long natural coastline covering Uttara Kannada, Udupi, and Dakshina Kannada districts has some of the best beaches in the country, and the state has immense potential for the development of coastal tourism. Lastly, to bring tourists to this state, Karnataka is home to India's third-largest airport, a capital city of global importance, and a large cosmopolitan population.

[52] As per WTTC's Economic Impact 2018 – India report
[53] Karnataka Tourism Policy 2020—2026
[54] Karnataka Tourism Policy 2020—2026

Karnataka's tourism dream

Karnataka's tourism vision is to position it as the country's most preferred tourism destination, providing a safe and memorable experience for tourists through diverse, high-quality tourism offerings. These would be developed in collaboration with tourism stakeholders and local communities to create sustainable and inclusive socioeconomic development for all. The government of Kanartaka (GoK) plans to make the state one of the top two states in the country in terms of domestic footfalls and in the top 50 in the world, increase tourism contribution to GSDP from the current 14.8 percent to 20 percent, and provide about 65 lakh tourism industry jobs in the state.[55] The GoK plans to double the revenue generation through tourism associated earnings in the state every five years.

Addressing challenges towards becoming a world-class destination

Karnataka's tourism sector faces several challenges, listed below. Addressing these challenges could accelerate the sector forward and define the state as a world-class tourist destination.

- The most significant operational challenge that any ambitious tourism goal faces is that the tourism department rarely owns the assets (land and buildings) it wishes to develop, repurpose, or promote, which limits the rate of acceleration. Typically, these are owned by government departments such as arts and culture, archeology (state and national), forestry, horticulture, sports and youth affairs, PWD, road authorities, corporations, panchayats, etcetera. To overcome the challenge, tourism could work in tandem with these different departments and manage the various actors that control the assets – the ability to build consensus and a coalition of the willing is vital to achieving its goals.
- There is limited foreign tourist inflow in the state. Despite Karnataka ranking third in India in terms of domestic tourism, it only ranks 11th in terms of number of FTAs, behind Bihar, Delhi, Goa, Gujarat, Kerala, Punjab, Rajasthan,Tamil Nadu, UP and West Bengal.[56] Foreign tourists spend several times more than domestic tourists and bring in attractive foreign exchange earnings that can drive sector growth and the overall economy. The key roadblocks in increasing FTAs include improving infrastructure quality, connectivity infrastructure, branding, and ease of visibility in the key tourist areas of the state.
- **On-site and off-site infrastructure deficiency:** Frequently, on-site infrastructure is inadequate in most of Karnataka's tourist destinations. Insufficient road width, poor road conditions, and difficulty in connecting to a tourist destination affect the number of higher-spending tourists travelling to Karnataka. Most tourist sites lack the basic infrastructure such as parking, signage, and en route facilities. Furthermore, several nature tourist destinations like Nagarhole Sanctuary, a major attraction of the state, have lost their charm over time due to poor maintenance and a lack of diversified tourist activities.
- **Lack of publicity:** Karnataka's districts attract many religious and other tourists from the southern states of India, but it is not well known in other parts of the country. Many famous attractions within each district have not been sufficiently publicised, with most tourists unaware of their existence. With infrastructural development and good marketing, these attractions could catch the attention of domestic tourists all over India. As an example,[iii] Madikeri, the only hill station in the state, has not been publicised within India's domestic market, which results in only home tourists visiting the site – and usually for picnic purposes only. Similarly, places like Mulliyanagiri, Baba Budan Giri, and Kemannagundi have not been publicised in the domestic market within the country.
- **The dominance of a weekend tourism model in the state:** Karnataka has now become a weekend destination where tourists prefer to wrap up most of the destinations within the circuit over a few days. This is because most destinations only offer sightseeing. By increasing focus on identifying new tourism products that can be complementary to the existing resources, and developing transverse tourism circuits linking district destinations with the other major tourist spots in other districts, tourists can travel longer and cover more regions in the state. By clubbing together lesser-known destinations in circuits with popular destinations like Mysore or Chikmagaluru, Karnataka could improve the overall tourist footfall across its lesser-known destinations.

[55] Karnataka Tourism Vision 2025, as mentioned in "Presentation on Karnataka Tourism to Hon. Chief Minister" – August 4, 2019
[56] India Tourism Statistics 2021

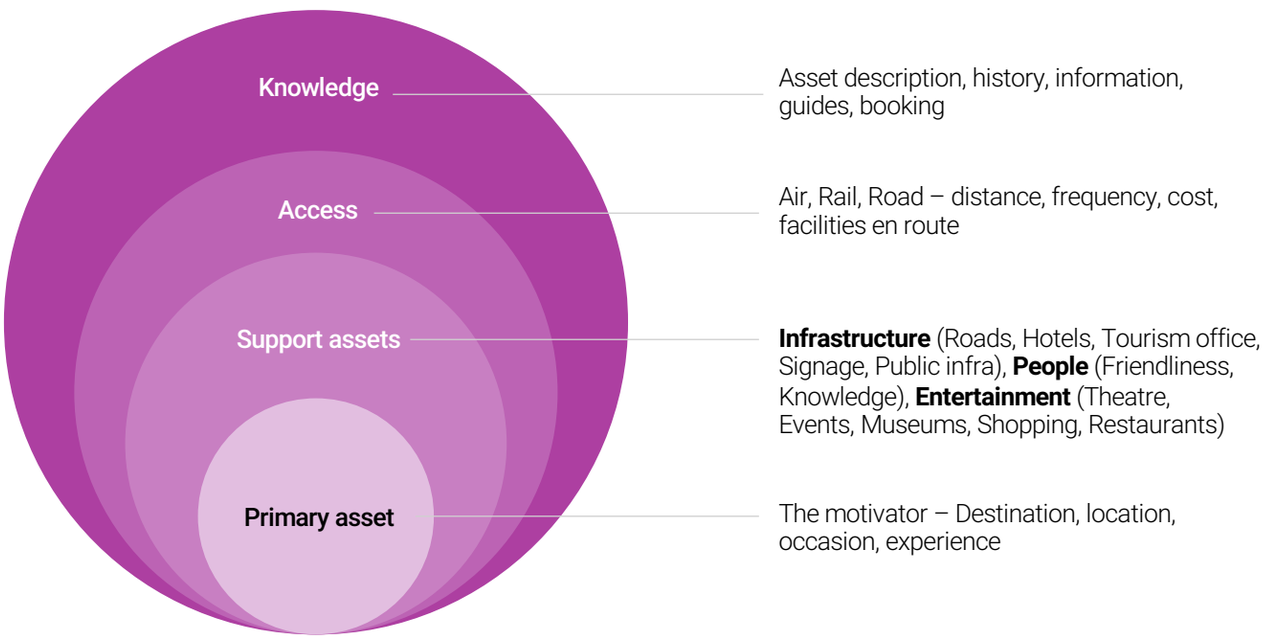
Guiding principles to support new initiatives

To achieve its ambitious goal, Karnataka could consider a set of principles that guide, decision-making, and implementation in the tourism sector. These principles can become the guide to introducing new initiatives. They could include the following:

- **Customer-centricity:** Karnataka could focus on a holistic customer experience with "wow" moments, including stakeholder consultations, audience feedback, social media monitoring, and expert input.
- When handled within limits, **a tourism experience** is personal, enjoyable, and memorable. It is essential to remember elements that reduce the stress of a tourism asset, such as "carrying capacity" and "sustainable" tourism.
- **Being sensitive to the local community's culture and practices** is vital. Understanding local sensibilities and acting with inclusivity and sensitivity will go a long way in garnering local support. Balancing the needs of residents and visitors is important to ensure that tourism benefits everyone.
- **The tourism infrastructure ladder** in the graph below is a good framework to consider while building out and promoting destinations. The range of needs covering, for instance, information search, seamless connectivity, transit halts, stay places, safety, hygiene, narratives, signage, and alternative leisure options, could all come together. (Exhibit 40)

Exhibit 40

Guiding principles[1]

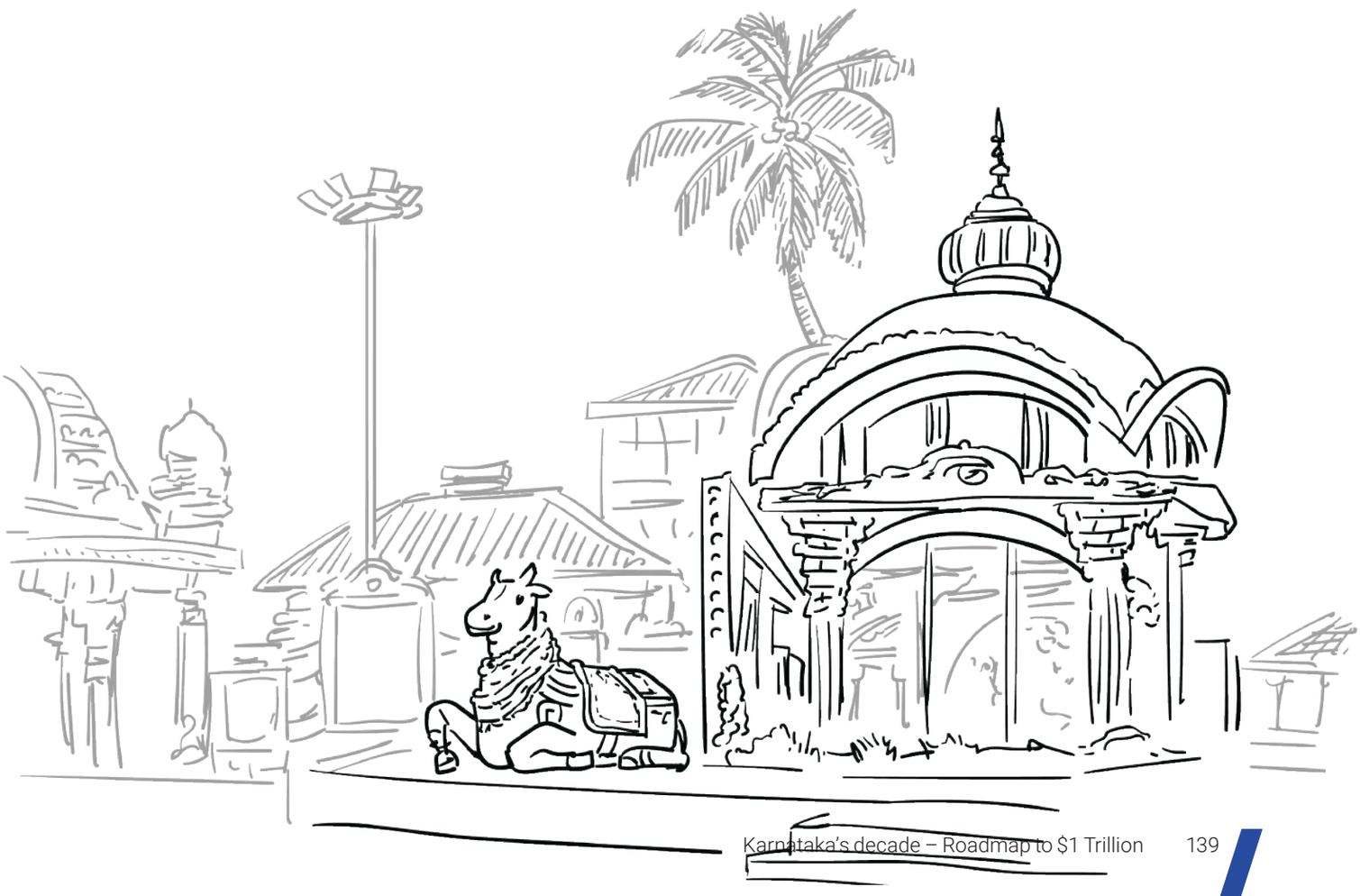


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A strong foundation and supportive environment

To achieve Karnataka's tourism goals, the industry may need a strong foundation and supportive environment:

- Government could become an enabler, ensuring inclusive development and regulating where necessary. This could be done through progressive policies, incentives, development guidelines, SOPs, fast-track clearances, appropriate partnerships, or inter-agency coordination.
- Thematic circuits and geographic possibilities for tourism could be created. Themes could include coastal, wildlife, heritage, adventure, medical and wellness, and spiritual, where each department develops the circuits. Geographic possibilities imply all tourism options in a particular area where the primary driver is attracting the tourist interested in one of the themes – this would include experiencing homestays, local culture, cuisine, and folk art, apart from other kinds of tourist destinations.
- Target segmentation regarding local, national, international, and tiered offerings at different price points is par for the course. The cross subsidy could result in overall inclusive tourism growth.
- The state could consider budgetary support for regular tourism activities and for kickstarting new initiatives that can be a force multiplier in the future.
- Karnataka could invest in building capacity among the relevant local populace and guides and narratives to enhance the tourist experience.
- The state could consider embarking on a refreshing, new branding and positioning exercise that captures the target audience's imagination. The "One State, Many Worlds" slogan could be credible, though it is static. A simple teaser, something like "Live Your Dream", could result in a more direct connection.
- A digital presence for Karnataka tourism built with ML and AI (ChatGPT) capabilities is imperative to meet the target segment's information needs.
- In terms of governance, the state could consider setting up an entity akin to "English Heritage" but covering all key tourism assets in Karnataka. It could be done with private and public players, private investments with government support, and spell out that it is "not a government department".

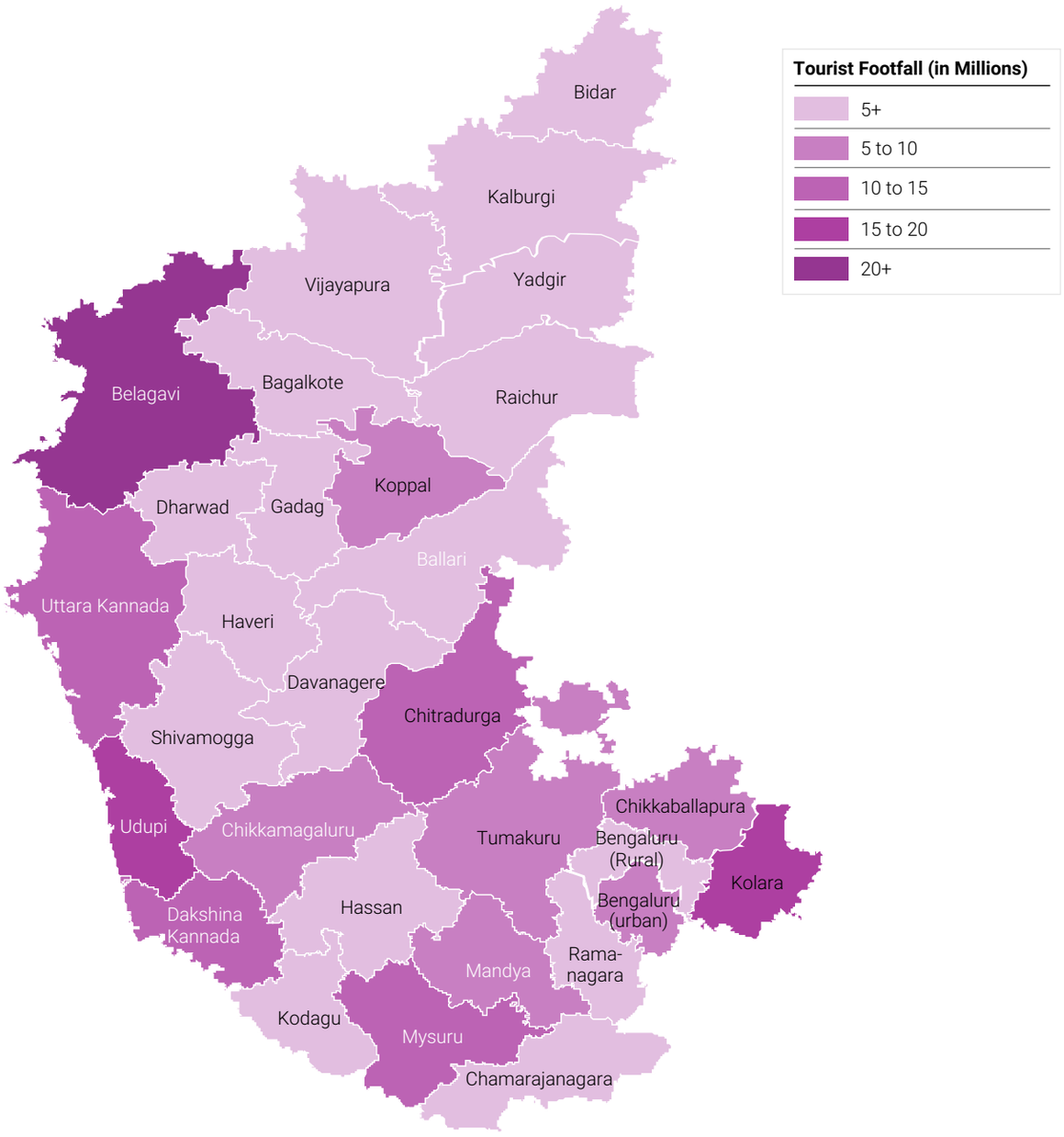


Karnataka's tourism industry – some proposed ideas

It is vital for any work to be based on the guiding principles and the foundation blocks. This involves detailing microelements; however, this is what is needed to achieve the overall goals spread across the state. Below are some proposed ideas for tourism in Karnataka – a few of them have a Bengaluru bias and build on the city's brand recognition and strengths. (Exhibit 41 & 42)

Exhibit 41

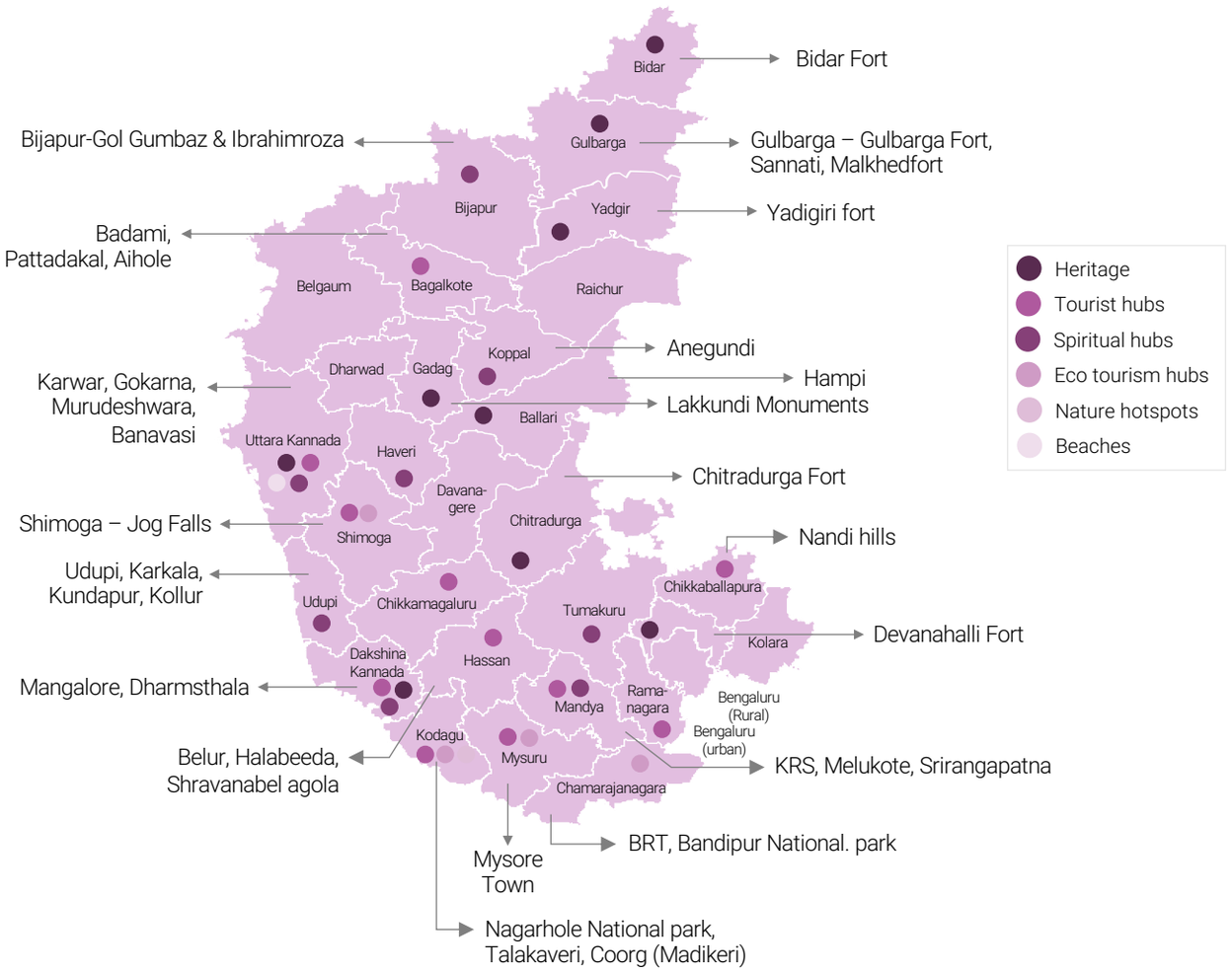
Karnataka district-wise tourist foot footfall[1]



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Exhibit 42

Areas of focus[1]



Key takeaways

- Focus Tourism Destinations identified for prioritized development based on following footfalls, Tourism Potential (Infrastructure, Captive Markets, Product Diversity) and prioritized under Tourism Policy
- Formulation of Destination Master Plan with focus on 3-5 days Packaging, Infrastructure, and Tourism Products encompassing the development and management aspect of the tourism destinations in Karnataka

Proposed infrastructure interventions

- 50,000 new hotel rooms across different segments
- 170 Wayside Amenities across National & State Highways
- Development of thematic circuits with focus on heritage, culture, adventure, wildlife, & coastal

Proposed ecosystem interventions

- Private sector participation for development of products and experiences
- Promotion & branding activities to be taken on bigger scale
- Skill development and training to meet emerging industry needs

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The first idea is to develop state-of-the-art infrastructures across the various tourist destinations to boost capacity and to accommodate the increase in tourist footfall, as well as improve the quality of infrastructure available. To make this idea a reality, the following actions are proposed:

- **Undertake mega-tourism projects** such as establishing convention centres, amusement parks, film cities, and ropeways across the state.
- **Create sufficient hotel infrastructure** to absorb the increased tourist inflow on Karnataka's path to becoming one of India's top two tourism states. The quality of available hotel infrastructure across its tourist sites may need to be improved to attract a more significant foreign tourist inflow. To support this, Karnataka has given industry status to hotels in the tourism sector instead of their prior positioning as commercial units, which gives hotels access to subsidies and levies to which industry units have access.[57] GoK could further incentivise leading hospitality chains — such as the Taj and Marriot — to set up resorts and nature camps around national parks and sanctuaries (like Nagarhole, Kabini, and Bandipur) to attract domestic and foreign tourists. Furthermore, the state could consider providing overhaul services and facilities at each heritage site to offer the highest quality customer experience at all price levels. Karnataka could also drive the development of 50,000 new hotel rooms across the different segments in prioritising Hampi, Mysore, Pattadakal, Badami, Aihole, Belur-Halebidu, Srirangapatna, Shravanabelagola, Bidar, and Vijayapura.
- **Develop the 320-kilometre coastline.** Coastal tourism is still in its infancy in Karnataka. Its coastline is 320 km long, with eight main rivers draining into it. Karnataka is home to two major ports — Mangaluru port and Malpe fishing harbour — and six minor ports. To develop its coastline, the state could consider setting up infrastructure, such as resorts and water-sports facilities, while simultaneously improving road, rail, air, and waterway connectivity to promote the region as a preferred seaside destination (similar to destinations like Goa and Thailand). Furthermore, the state could prioritise towns around the Nethravathi River and Gurupur and give strategic importance to Mangaluru – where two riverfronts drain and create a long scenic riverfront – as a gateway to the state's coastal tourism.[58]
- **Provide overhaul services and facilities** at each of the tourism sites to provide the highest-quality customer experience at all price levels, including developing end to end connectivity (railways, highways, airports, buses, and intracity transportation). This includes 170 wayside amenities (such as restaurants, fuel stations, station lounges, and bus terminals) along primary tourist circuits through franchisee, greenfield, or brownfield project models. Providing these overhauled facilities could ensure seamless comfort and elevated experience for tourists throughout their journey.
- **Support Karnataka Exhibition Authority (KEA)** in setting up exhibition grounds with round-the-year facilities for cultural activities; repurpose NGEF land to develop a shape-shifting, multi-dimensional space that could host global gatherings based on a seasonal calendar on domains that dominate public consciousness, such as climate change, AI, and genetic modelling. Akin to the successful Kochi Biennale,[iii] the nature of the warehouse and factory spaces would be flexible to host a variety of events including arts and culture.
- **Create a world-class facility for meetings, incentives, conferences, and exhibitions (MICE) and getaway destination near Bengaluru airport.** By doing this, the state could:
  - Promote and develop the upcoming convention centre at the airport as a world-class MICE destination for corporates nationwide.
  - Monetise the 300-acre land adjacent to the upcoming MICE centre to develop an arts and crafts museum and leisure village (to promote local Karnataka culture on the lines of Chokhi Dhani in Rajasthan), making the MICE centres a destination of choice by driving local tourist traffic to it.
  - Promote a theme park in partnership with entertainment players, such as adventure tourism in Nandi Hills, heritage trails around the Devanahalli Fort, and wine tours for local and outstation visitors.

[57] https://www.deccanherald.com/state/karnataka-gives-industry-status-to-hotels-in-tourism-sector-953462.html
[58] Karnataka Tourism Vision Group suggestionss

This could act as a good attraction for locals and foreign business travellers spending the weekend in Bengaluru, who could catch a glimpse of the rich heritage and the flora and fauna the state offers, while giving a preview into the Kanada culture, cuisine, history, and heritage.

The second idea is to accelerate the development of new, emerging tourism sectors such as agri, heritage, medical, spiritual, eco, and rural by adding capacity for trained tourist guides in these emerging sectors, improving the infrastructure quality, and promoting and market these nascent sectors to accelerate rollout to the masses. To realise this idea, Karnataka could consider the following actions:

- **Develop thematic circuits, such as coastal, wildlife, heritage, adventure, medical and wellness, religious and spiritual, eco-tourism, and rural tourism,** highlighting the diversity of the state, which include experiencing homestays, local culture, cuisine, folk art, apart from other kinds of the tourist destination. Two thematic circuits, the Mysuru Circuit (Belur, Halebeedu, Somanathapura, etcetera) and the Hampi Circuit (Vijayapura, Badami, Hampi, etcetera) have recently been made functional, with future focus on Temple Circuits (Shravanabelagola, Udupi, Mookambika, Halebeedu, etcetera) and Nature Circuits (Nagarhole, Bandipur, Bannerghatta, etcetera).
- Develop **weekend getaways or short trips to local tourist attractions** (no longer than three days) for each district to boost their local economies, drive revenue from a higher domestic tourist footfall, and take advantage of the higher spending power of NRIs compared to local tourists. Prioritise Karwar, Gokarna, Maraca, Udupi, Mangaluru, Hampi, Mysore, Pattadakal, Badami, Aihole, Belur-Halebidu, Srirangapatna, Shravanabelagola, Bidar, and Vijayapura. To develop these getaways, Karnataka could consider the following:
  - Altogether 78 percent of international tourist arrivals in 2021 were non-resident Indians.[iii] Almost all of them have a deep emotional bond with their motherland, particularly with their place of origin. The state could develop getaway destinations that can be preferred places for these international visitors during a visit to their homeland. Given their higher spending power compared to the local populace, the state could stand to provide a significant boost to the local economy of the region while correspondingly contributing to the GSDP; and
  - Given the large numbers of ex-pats who hail from Karnataka, a well-curated short trip of local tourist attractions (no longer than three days) for each district or region can be an excellent way to boost local economies by taking advantage of their greater spending power compared to domestic tourists.
- Karnataka is a significant producer of coffee, with multiple processing facilities. Key coffee plantation regions similar to Coorg and Chikkamagaluru already resonate with the local population. It is worthwhile to promote **coffee plantation tourism** in regions such as Coorg, Kodagu, and Chikkamagaluru by developing experiential plantation stays with immersive experiences and promoting coffee tourism packages like, for example, tea tourism packages[iii] offered by the government of West Bengal. These will provide the tourist with more experiential options for their short trips.
- Karnataka could consider **building on the growing agri-tourism trend** that targets the urban crowd who seek newer thrills to rejuvenate by experiencing the slow pace of a rural setting and getting acquainted with farming activities and various aspects of rural life in Karnataka, such as the local cuisine and culture. Promote agri-tourism by building capacity – for instance, local farms with farmers qualified to host tourists – by providing them training and skills development in agri-tourism through the Department of Agriculture. Karnataka could leverage the expertise of tour operators and travel agents to generate awareness regarding the benefits of agri-tourism and promote agri-tourism projects to create retail facilities to market their food products and local goods, like arts and handicrafts. The state could focus on agri-tourism throughout the area, ranging from silk farms of Ramanagara to paddy farms in Mandya and Ballari, areca plantations of central Karnataka to coffee plantations of Malnad.

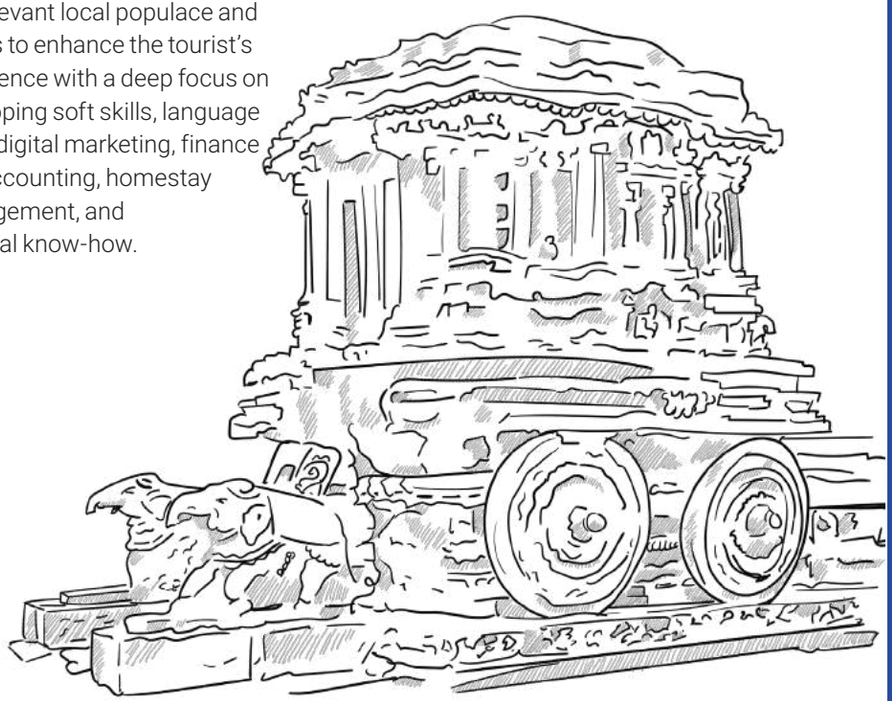
- The state could strengthen rail tourism by introducing rail circuits prioritising hot spots **around the Western Ghats and coastal Karnataka.**
- Mysuru is considered the cultural capital of the state, with Dasara being its flagship event. The region was under the rule of the Wodeyar dynasty, who contributed immensely to the place's art, architecture, culture, heritage, society, and tradition. The district is one of the most visited destinations by domestic and international tourists, owing to the magnificent palaces, proximity to the historical city of Srirangapatna, traditional handicrafts, cultural and health tourism facilities, and reasonable tourist infrastructure. It offers some popular religious and recreational destinations. Despite this, the Mysore district attracts, on average, about 15 percent of the total tourists coming to Karnataka. Hence, GoK could focus on developing **Mysuru** as a premier tourist destination globally by:
  - Brand Mysuru as a **"World Yoga Destination"** given its popularity with foreign tourists on the same lines as Varanasi and Rishikesh; and
  - Support the **Karnataka Exhibition Authority (KEA)** in setting up exhibition grounds with round-the-year cultural activities and recreation facilities.

The third idea focuses on the ambitious goal of driving accelerated growth in tourist footfall. The tourism sector may need to be bolstered with sufficient skilled labour and several human capital development initiatives could be considered, such as the following:

- Undertake **skill-gap study to map the industry needs for various travel, tourism, and hospitality skills,** understand local requirements for key tourism destinations, and launch initiatives in collaboration with the state development corporation to introduce a tourism hospitality skill development and certification programme. Explore additional collaboration with National institutes like IHM, IITTM, IIFM, and KITTS in priority tourism themes like agri, cultural, eco-, heritage, and coastal tourism;
- Setup **national level institutes or an international standards institute for skill development and management training** in priority tourism themes like agri, cultural, eco-, heritage, and coastal tourism; and
- Invest in **creating short-duration training programmes (30–45 days) to build capacity** among the relevant local populace and guides to enhance the tourist's experience with a deep focus on developing soft skills, language skills, digital marketing, finance and accounting, homestay management, and regional know-how.

The fourth idea focuses on improving "Brand Karnataka" on the national and global stage, publicising the rich culture, nature, and heritage of Karnataka's tourist destinations, and increasing awareness of the wide variety and quality of destinations that the state offers. Actions could include the following:

- **Create a campaign and refreshing teaser** to spread awareness of Karnataka as the only state in India offering a range of experiences including heritage, wildlife, nature, spirituality and wellness, arts and culture, adventure, highlands, coastal, and modern urban experience. Each year a subset of Karnataka's focused tourism destinations could be selected for prioritised promotions, with all prominent and upcoming destinations of Karnataka showcased by 2026;
- **Identify and collaborate with digital channels and travel and tourism thought leaders** and/or journalists to promote locations of significance on social media. These campaigns can substantially impact the 20–35 age group with high spending power. Conduct regular familiarisation tours to create strong B2B linkages;



- **Set-up strategic partnerships** with, for instance, tour operators, agents, online aggregators, and foreign offices, to promote Karnataka as a preferred tourist destination; and
- **Improve the customer experience** through the co-development of innovative solutions (interactive maps and 3D virtual tours) with start-ups focused on emerging technologies (VR/AR, metaverse, etcetera) in collaboration with Karnataka Innovation and Technology Society (KITS); showcase and promote strong local narratives (for example, success of KGF, Kantara), responsible tourism stories, and niche experiences for a unique positioning of Karnataka.

As a final idea, GoK could undertake several actions and interventions to develop the overall tourism ecosystem, improve access to information, and ensure active governance of the tourist sector and its initiatives to push the Karnataka tourism sector forward in a measured and reliable way. To improve the customer experience, Karnataka could consider the following actions:

Kerela has positioned itself as a tourist destination[iii] since a few decades. The state has resolved to strong marketing since the 1990's when it used the tagline "God's own country" while promoting the hidden gems of the state through different multimedia channels. Despite the strong marketing efforts, where the different sights and flora and fauna of the state have been promoted, some other factors which have contributed to the sectors growth include:

- Decentralised decision-making – active local level participation, as opposed to a top-down model – making local stakeholders invested in developing local tourism.
- Wellness and Medical Tourism: Kerala has succeeded in branding and marketing 'Ayurveda' to the world; Karnataka has similar strengths for wellness and medical tourism, for example, Jindal and Soukhya.
- Kerala plays to its strengths – and Karnataka needs to do the same, for example, Karnataka (Mangaluru and other coastal areas) has immense potential in adventure tourism.
- Furthermore, the organisational method of JLF can be emulated in Karnataka for its state events. Government needs to see its role as an enabler while leaving Asset Managements to experts in the field. (Heritage assets management in the UK is a model that can be referred).

- **Tourist Mitra Cell to focus on customer feedback,** internet posts, tourist support, and grievance redressal and take up the management and coordination of the existing tourist policy and cascade it to relevant teams to work on an elevated customer experience. With the proliferation of social media across age groups, this media has become a key driver in spreading awareness about tourist destinations and giving a preview to prospective visitors about the site, activities, attractions, and infrastructure. To ensure the state scores well on the social media index, this team could **focus on customer feedback** and posts, cascading it to relevant teams to work on an elevated customer experience. This can act as a feedback loop to capture customer experiences in near real-time and plan for targeted interventions.
- The aspiration is to position Karnataka state as a preferred tourist destination in India and worldwide. This could result in a good influx of foreign business travellers who might be looking for weekend getaways within the state. It might be worthwhile for the state to impanel international experts to get insights on specific interventions to develop state of the art infrastructure to attract international tourists like the African national parks do. The state could prioritise destinations within the proximity of Bengaluru as a start.
- Given the rich cultural heritage and diversity the state has to offer, it is imperative that Karnataka creates proper awareness. The state could create a **database mapping Karnataka's cultural assets**, which also acts as a repository of skilled workforce for cultural tourism (performers, artisans, etcetera). This could be publicised across different channels to end-customers while encouraging tourism service providers to utilise Karnataka tourism's repositories to develop tourism packages
- The state could leverage the technology ecosystem to harness the power of data to drive evidence-based decision-making. The state could evaluate setting up a **Tourism Analytics Division under the DoT**, to focus on the collection of tourism data, tourism statistics, and market research activity to assess Karnataka's tourism performance of the department. This could help identify the fault lines across destinations and help drive targeted interventions.
- Set up a **Tourism Investment Facilitation Cell** within the department to act as a nodal agency for enabling investment. It can act as a one-stop facilitation centre to extend assistance for approvals, and clearances, organise global tourism investor meets, and encourage CSR investments in tourism. This can also help as a node for resolving international tourist queries, assist them in planning their journey, and clarify any visa requirements they might have.
- Set up a focused **team of experts with representatives to work with arts and culture, archaeology (state and national), forestry, horticulture, sports and youth affairs, PWD, road authorities, corporations, and panchayats** to plan and implement the above-listed initiatives; and
- Utilise impanel **industry experts to develop frameworks and drive the adoption of sustainable practices** to reduce the stress on tourism assets.

References

i Karnataka economic survey

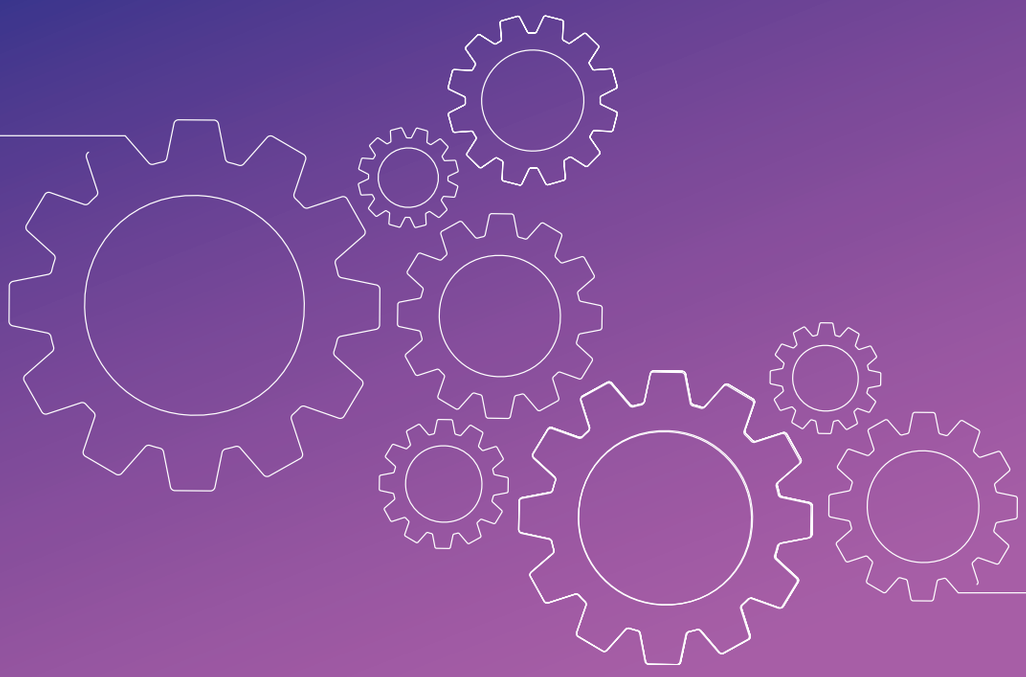
ii GDP performance and value forecast

iii Tourism committee

CHAPTER

08

Micro, Small, and Medium Enterprises (MSMEs)





The Micro, Small and Medium Enterprises (MSME) sector is a significant contributor to the Indian economy, particularly in creating jobs and promoting innovation across various industries. However, the majority of MSMEs in India belong to the micro subsector. Karnataka has over 7.68 lakh MSMEs, which face both legacy challenges as well as new disruptions, including demonetization, GST implementation, the COVID-19 pandemic, competition from MNCs and start-ups, inability to attract talent, and technology upgradation among others. Karnataka has been a torchbearer for many first-of-its-kind initiatives in the IT, BT, start-ups, and EV sectors, and can bring the same radical out-of-the-box thinking to bear to transform the MSME sector.

Way Forward

Finance/Capital: By implementing measures like improving ease of access to credit, leveraging digital technologies, creating an MSME Exchange and Fund-of-Funds, providing collateral-free credit, reclassifying non-performing assets, clearing MSME dues, amending the Insolvency and Bankruptcy Code, classifying MSMEs into gold, silver, and bronze categories based on performance, and creating a HealthScore™ (to be trademarked) tool to assess an MSME's financial and operational health, the state could address the challenges faced by MSMEs, improve their access to finance, and promote faster economic growth.

Marketing: Prioritize purchasing goods and services from MSMEs,[iii] while the Government e-Marketplace (GeM) provides a platform for MSMEs to promote their products and reach new customers through e-commerce.Greater market access, decreased transaction costs, increased efficiency, and increased competitiveness can be achieved using the proposed ONDC platform. Government can help MSMEs to access new markets, enhance exposure, and learn from industry experts through export incentives and state-sponsored trade fairs and exhibitions.

Technology upgradation: The government is creating 20 hubs and 100 spokes[iii] in the form of tool rooms across the country to promote technology upgradation. The MSME Champions Scheme (Erstwhile CLCS-TUS) is being implemented to support Lean Manufacturing, Design improvement, awareness on Intellectual Property Rights, ZED Scheme, digital empowerment through Digital MSME, and promoting adoption of latest technologies and knowledge-based innovation through incubation. The scheme aims to reduce wastage, promote creativity, and enhance the competitiveness of MSMEs. The Govt of Karnataka has proposed deploying an Online Technology Platform and establishing a Centre of Excellence for managing the platform setup to provide strategic guidance to MSMEs, help them identify gaps in their capabilities, and equip them to adapt to changing market and business environments. The government has also proposed infrastructure support such as reserving land for MSMEs, constructing multistoried/ flatted factories, and developing rural industrial areas exclusively for MSMEs.

Skill Development and Training: Government has implemented various initiatives to promote skill development and training, which can benefit MSMEs. The Scheme for Promotion of Innovation, Rural Industries, and Entrepreneurship (ASPIRE) provides funding support to start-ups in the agro-rural sector, and can be a great way to skill the youth. The Pradhan Mantri Kaushal Vikas Yojana (PMKVY) encourages youth to enroll in skill training programs and find employment. The government plans to launch PMKVY 4.0[iii] to skill lakhs of youth within the next three years. Vocational and part-time schools for adults offer opportunities for working adults to acquire new skills. The Prime Minister's Employment Generation Programme (PMEGP) provides financial support to MSMEs. Government can generate employment opportunities by conducting job fairs, internship programmes, and mentorship programmes in collaboration with MSME. Government can provide financial support to MSMEs in the form of a partial reimbursement of employee wages of new employees.

Development of One district One Product/Clusters: The One District One Product (ODOP) initiative aims to promote traditional and indigenous products of different districts, with a focus on micro, small, and medium enterprises (MSMEs) that operate in rural and semi-urban areas. Under ODOP, each district identifies a unique product or cluster of products, and the government provides financial and technical assistance to develop the infrastructure and capacity of MSMEs to produce, market, and export these products. The initiative has the potential to create employment opportunities, promote entrepreneurship, and improve the socio-economic status of people living in rural and semi-urban areas. The government could give MSMEs the necessary financial and technical assistance in the form of training programmes and access to credit facilities.

Regulatory Laws/Compliance: Only registered MSMEs can access benefits such as credit, financial assistance, tax benefits, and training programs. The government can offer tax concessions, tax holidays, longer periods for carrying over losses, and wider deductions to MSMEs.

The government can create a single-window system at the district or zonal level to coordinate all MSME-related activities, such as connecting MSMEs with various government

programmes, marketing platforms, adhering to GST regulations, approving and disbursing loans, rehabilitating sick units, disseminating MSME-related information, and assisting them in becoming more digital.

India has numerous labour laws that regulate factory and manufacturing establishments. It may be necessary to combine all of these laws into a single labour code that would include all main areas, making it easier for businesses to comply with each monthly legal requirement.

Online think tank mentor/advisor Group: Online think tank group can be a useful platform for industry leaders, experts, and mentors to connect, exchange knowledge and ideas, and network with each other. The group can have regular meetings through video conferencing platforms, moderated by a facilitator, where members can engage in productive debates and discussions on relevant topics. In addition, members can collaborate on projects and initiatives that align with the group's mission or interests. This can be an excellent opportunity for professionals to expand their network, exchange information, and contribute to the growth of their industries.

Women entrepreneurship: by providing them with access to finance and resources is crucial to creating more inclusive economies. . Government can have tie-ups with banks to introduce schemes offering collateral-free loans at a debt equity ratio of 5:1, low interest rates, and long moratorium periods can help to level the playing field and encourage more women to start and grow their own businesses, ultimately driving economic growth and development.

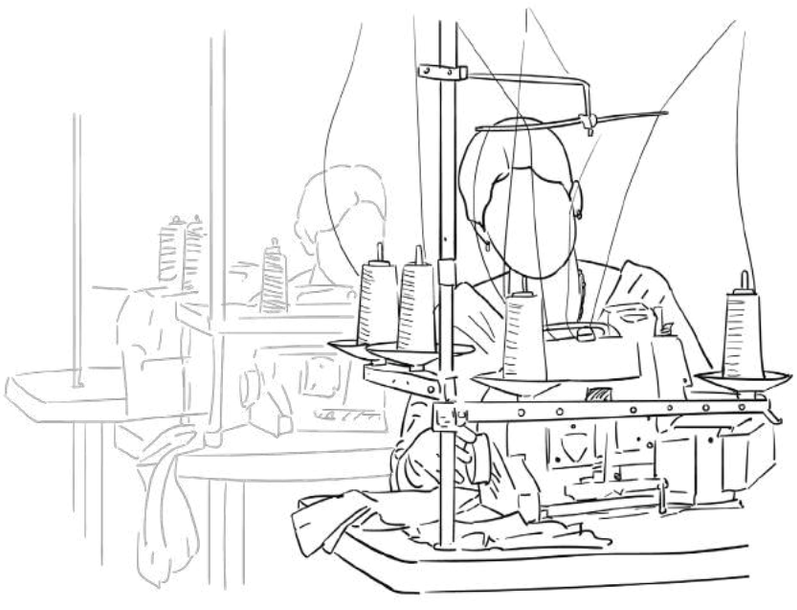
MSME Portal: Creating a MSME portal exclusively for Karnataka could be a valuable resource for entrepreneurs and business owners in the state, providing a centralized platform to access information about the MSME sector, key statistics, industry trends, government initiatives, and available resources. The portal could include a comprehensive database of MSMEs operating in each district, along with a directory of service providers who cater specifically to MSMEs.

Miscellaneous: Renovation and maintenance of industrial areas and parks by the government can benefit businesses by improving infrastructure and facilities. A maintenance fee system can be implemented to ensure ongoing upkeep of the park's facilities.

CSR activities by corporations can offer support to MSMEs through business development, technology access, market linkages, and supporting social enterprises. Corporates could mention CSR initiatives towards MSMEs in their annual reports.

Industrial parks can foster collaboration and knowledge-sharing among businesses located in the park, leading to innovation and increased competitiveness. They can also provide cost-effective storage and distribution solutions for businesses.

Conclusion: By addressing the critical issues faced by MSMEs and providing timely support in areas such as finance, marketing, technology, skilling, training, and infrastructure, the MSME sector can contribute significantly to the economy of Karnataka and India as a whole. The measures can lead to increased employment opportunities, competitiveness, productivity, efficiency, and ease of access to finance, ultimately helping MSMEs thrive and compete effectively in the market. Karnataka's vision is to achieve $1Trillion GSDP by 2032' and the MSME sector can undoubtedly play a significant role in achieving this goal.



MSMEs in India

The Micro, Small & Medium Enterprises (MSMEs) have been contributing significantly to the expansion of entrepreneurial endeavours through business innovations. The MSMEs are expanding their sphere of influence across economic sectors and creating a variety of goods and services to satisfy the needs of both domestic and international markets. The MSMEs in India are playing a crucial role by, among other things, industrialising rural and backward areas, reducing regional imbalances, and ensuring a more equitable distribution of national income and wealth. They also provide significant employment opportunities at comparatively lower capital costs than large industries.

As per the National Sample Survey (NSS) 73rd round, conducted by National Sample Survey Office, Ministry of Statistics & Programme Implementation during the period 2015-16, there were 633.88 lakh unincorporated non-agriculture MSMEs in the country engaged in different economic activities (196.65 lakh in Manufacturing, 0.03 lakh in Non-captive Electricity Generation and Transmission, 230.35 lakh in Trade and 206.85 lakh in Other Services) excluding those MSMEs registered under (a)Sections 2m(i) and 2m(ii) of the Factories Act, 1948, (b)Companies Act, 1956 and (c) construction activities falling under Section F of National Industrial Classification (NIC) 2008.

Micro sector with 630.52 lakh estimated enterprises accounts for more than 99% of total estimated number of MSMEs. Small sector with 3.31 lakh and medium sector with 0.05 lakh estimated MSMEs accounted for 0.52% and 0.01% of total estimated MSMEs, respectively. Out of 633.88 estimated number of MSMEs, 324.88 lakh MSMEs (51.25%) are in rural area and 309 lakh MSMEs (48.75%) are in the urban areas.[59]

The report's emphasis and suggestions are on small and medium-sized businesses.

[59] Source : MSME Annual Report 2021–22

MSMEs in Karnataka

As per Karnataka Economic Survey 2022-23, Karnataka has 7.38 lakh MSME's. MSMEs promote entrepreneurship and create a significant amount of employment possibilities, which contribute significantly to economic growth. MSMEs provide support to large firms as suppliers of input goods and services, thereby contributing to industrial development. There are numerous regulations, initiatives, incentives, and concessions in place to support MSMEs.[60] (Exhibit 43)

Due to the lockout and stalled exports brought on two years ago by the outbreak of the contagious virus Covid-19, the state's many industries are still suffering losses. Some industries no longer exist. The state and federal governments have offered some aid in the interim. However, it will take some time for these industries to reach their former level.

The major industries in Karnataka are food processing units, engineering units, readymade garments manufacturing units, foundry units, automobile units, chemical plants, handicrafts units, etc. In addition, Karnataka has lineage industries like handicrafts and small-scale industries such as handicrafts, khadi and rural industries.

Bengaluru's Peenya industrial area is one of Asia's largest industrial areas and is home to many MSMEs. The products produced here are internationally renowned.

The state of Karnataka is famous for its many vantages

i. Aerospace capital of India
ii. Apparel and Silk Hub of India
iii. Automobile Hub of India
iv. Bio tech capital of India
v. Silicon Valley of the East
vi. Startup Capital of India
vii. Renewable Energy

Categorisation of MSMEs

As the definition of MSME is amended since 01/07/2020, Under the amended Act, Micro, Small and Medium Enterprises (MSMEs) are classified based on two factors - investment and annual turnover as shown below: (Exhibit 44)

[60] Source : Karnataka Economic Survey 2021–22

Exhibit 43

Number of MSME units registered and employment generated

Month	# of units	Employment	Month	# of units	Employment	Month	# of units	Employment
Apr–20			**Apr–21**	9,495	83,998	**Apr–22**	20,160	1,66,069
May–20			**May–21**	13,985	1,71,147	**May–22**	27,506	1,94,661
Jun–20			**Jun–21**	25,507	2,78,180	**Jun–22**	30,796	2,94,494
Jul–20	8,030	1,13,526	**Jul–21**	28,368	3,47,187	**Jul–22**	33,379	3,44,331
Aug–20	12,964	1,68,050	**Aug–21**	26,297	2,59,909	**Aug–22**	32,855	3,10,655
Sep–20	18,488	2,36,842	**Sep–21**	29,087	4,25,848	**Sep–22**	37,048	2,77,735
Oct–20	17,879	2,31,218	**Oct–21**	24,468	2,05,376	**Oct–22**	32,154	2,64,724
Nov–20	15,093	1,73,942	**Nov–21**	22,112	2,21,744	**Nov–22**	42,435	3,00,218
Dec–20	16,668	2,12,521	**Dec–21**	31,746	2,83,367	**Dec–22**	45,495	3,04,507
Jan–21	17,590	2,06,558	**Jan–22**	26,152	1,96,939	**Jan–23**	40,852	3,77,183
Feb–21	19,449	2,42,779	**Feb–22**	34,775	2,82,059	**Feb–23**		
Mar–21	26,772	3,78,418	**Mar–22**	38,224	3,11,623	**Mar–23**		
TOTAL	**1,52,933**	**19,63,854**	**TOTAL**	**3,10,216**	**30,67,377**	**TOTAL**	**3,42,680**	**28,34,577**

Source: Department of MSME, GoK

Exhibit 44

Categorisation of MSMEs[1]

Manufacturing and service

Category	Investment on plant and machinery	Annual turnover
Micro	Up to INR 1 crore	Up to INR 5 crore
Small	Up to INR 10 crore	Up to INR 50 crore
Medium	Up to INR 50 crore	Up to INR 250 crore

1. MSME committee

Challenges faced by MSMEs in recent times

MSMEs in India have faced various challenges during demonetization, Goods and Services Tax (GST) implementation, and the COVID-19 pandemic. Let's take a closer look at each of these perils:

Demonetization: In November 2016, the Indian government[iii] announced the demonetization of high-value currency notes, which had a significant short-term impact on the economy. MSMEs, which largely operate on cash transactions, were hit hard by the demonetization as it led to a severe liquidity crunch. Many MSMEs had to shut down their operations or reduce their workforce due to the liquidity issues.

Goods and Services Tax (GST)[iii]: The GST was introduced in India in July 2017 to replace various indirect taxes, such as excise duty, service tax, and value-added tax (VAT). While the GST has streamlined the tax system, it has also posed several challenges for MSMEs. One of the main challenges is the complexity of the GST compliance process, which has led to increased costs and administrative burden for MSMEs. In addition, many MSMEs have faced liquidity issues due to the delayed refund process and high input tax credit (ITC) accumulation.

COVID-19 pandemic: The COVID-19 pandemic has been one of the biggest challenges faced by MSMEs in recent times. The pandemic has disrupted supply chains, reduced demand, and led to a cash flow crisis for many MSMEs. The lockdowns and restrictions imposed by the government to contain the spread of the virus have also led to a decline in production and revenue for MSMEs. Many MSMEs have struggled to pay their employees and meet their financial obligations, leading to job losses and closures. Cancellation of export orders added to their financial stress.

Competition from MNC's and large domestic companies: MNCs typically have more resources, economies of scale, and established brand recognition, which can make it difficult for MSMEs to compete on price and visibility. MNCs may also have established relationships with key suppliers and customers, making it more difficult for MSMEs to access these networks.

Competition from Start-ups: Start-ups may be able to compete more effectively with MSMEs in terms of innovation, agility, and adaptability. Start-ups can also disrupt the marketplace in both the B2B and B2C segments. Start-ups often have a strong focus on technology and digital marketing, which can give them a competitive advantage in certain markets. New age start-ups generally focus on customer acquisition and revenue rather than on profits during the initial phase which hurt MSMEs.

Lack of Professionalization: Lack of succession planning in MSMEs can hinder efforts to professionalize the organization. Professionalization refers to the process of making an organization more structured, efficient, and focused on achieving its goals using best practices and standardized procedures. Professionalization can lead to increased competitiveness, improved performance, and greater long-term sustainability.

A lack of clear succession planning can make it difficult to professionalize MSME because it creates uncertainty about the future direction of the company. Without a clear plan for how the business will continue to operate and grow in the future, employees may feel less motivated to adopt best practices and standardized procedures, and the company may struggle to attract and retain top talent.

Consolidation - merger and acquisition: The consolidation of Micro, Small, and Medium Enterprises (MSME) through mergers and acquisitions can be a challenging process. MSMEs are often characterized by limited resources and lack of access to financing, which can make consolidation a daunting task. However, there are several potential benefits to MSME consolidation, such as increased efficiency, improved market penetration, and access to new markets.

One of the main challenges of MSME consolidation is the lack of information available on potential targets. MSMEs often operate in niche markets, making it difficult to find suitable partners for consolidation. Additionally, many MSMEs lack the necessary expertise to conduct due diligence and negotiate deals.

Cultural differences can also be a challenge in MSME consolidation.

Overall, MSMEs face several challenges relating to operational efficiency making it difficult for MSMEs to sustain their operations and grow their businesses. These challenges can be addressed through the measures suggested in this report.

Forging the path ahead

MSMEs play an important role in economic growth by fostering entrepreneurship and generating large employment opportunities. MSMEs provide support to large firms as suppliers of input goods and services, thereby contributing to industrial development. MSMEs face many challenges that can be addressed through the following measures.

Finance/capital

In the Indian economy, access to finance has always been an issue for smaller firms and businesses. This is a significant barrier for both enterprises and the MSME sector. The fact that just 16% of SMEs have timely access to financing is what is most concerning, as this forces small and medium-sized businesses to rely on their own resources.[61]

The ratio of India's bank credit to GDP increased from 25% in FY 92 to 58% in FY21, but in contrast,[ii] Karnataka's bank credit to GSDP was only 40.5% in FY21. Despite being a state with high deposits and savings, its savings are being utilized in other parts of the country. Therefore, there is a need to examine this situation and take measures to boost bank lending within the state to promote faster economic growth.

Due to the credit constraints faced by many MSMEs, businesses in Karnataka receive less proportion of bank credit than would be expected given the size of the economy. Karnataka's[ii] share of loans sanctioned under CGTMSE during FY 2020- 21 is 9.2%, which is greater than its share of GDP. This demonstrates that banks are willing to extend loans to limited businesses if the government assumes some of the credit risk. Karnataka's share of credit provided under ECLGS, however, is less than its share of GDP. Through SLBCs, the State Government could encourage banks and NBFCs to extend credit to companies impacted by Covid under the ECLGS. The state government can also create a credit-linked subsidy programme to promote borrowing by small and medium-sized firms in particular industries that have been recognised as having a severe lack of credit.[62] (Exhibit 45)

[61] Major challenges faced by the MSME sector & their impacts', LendingKart, 2022
[62] Karnataka Economic Survey 2021–22

Exhibit 45

NPA rate by MSME segments

Year	Micro (%)	Small (%)	Medium (%)	Large (%)
FY16–17Q1	8.40	10.30	14.50	12.10
FY16–17Q2	8.60	10 .60	15.20	12.90
FY16–17Q3	9.20	11.30	15.80	14.70
FY16–17Q4	8.90	11.40	16.30	15.30
FY17–18Q1	8.90	11.20	15.90	16.40
FY17–18Q2	8.70	11.20	16.70	16.90
FY17–18Q3	8.70	11.50	16.50	18.00
FY17–18Q4	8.40	11.10	16.60	19.90
FY1819Q1	8.70	11.50	16.60	19.50

Source: TransUnion CIBIL, MSME Pulse, Sep 2018

NPA rates for large enterprises has been on an increasing trend as mentioned in the above tables, Post covid **NPA rates for large enterprises has increased substantially. However, NPA rates for FY21-22 have been on an average 16.5%**[63] for MSME in line with earlier trends.

However, despite the lower levels of NPAs in MSME lending, access to finance for MSMEs can still be limited. This is because banks and other financial institutions often view MSME lending as riskier than lending to larger, more established businesses. This makes it more difficult for MSMEs to obtain financing, even if they have a strong business.

To address this issue, it is important for bankers and other lenders to take a more nuanced view of MSME lending. Rather than simply viewing it as a high-risk category, they could consider factors such as the size of the business, its market niche, and its customer relationships. To finance MSMEs the government of Karnataka (GoK) could consider paying the processing cost for MSME loans to banks. By doing so, they may be able to give preferential lending to MSMEs that may have been overlooked in the past.

Setting up a separate bank in each district with the sole purpose of lending to MSMEs could have several benefits. A dedicated bank for MSME lending in each district could improve access to finance for these businesses. A district-level bank could have a better understanding of the local economy, market conditions, and the needs of MSMEs in the region. This could result in more informed and localized decision-making on lending. A dedicated bank for MSME lending could provide targeted support to these businesses through specialized loan products, customized repayment schedules, and tailored financial advice.

Ease of access to credit[64]

- The RBI has set a time restriction of 15 days for term loans or working capital to be approved or enhanced.
- MSMEs with a solid payback history can be given interest rate breaks.
- MSMEs with no defaults can gradually get discounts on the "regular" margin requirements, similar to the "no claim bonus" insurance discounts.
- There could be a separate credit rating system for MSMEs.

Leverage digital technologies: Government could create a digital platform for MSME where an option is offered to discount invoices and raise short-term credit from banks to support their delayed payment issue temporarily. MSMEs could be nudged to go digital and raise all invoices in digital platform to ease liquidity pressure on their working capital.

The Trade Receivables Discounting System (TReDS) is an electronic platform created by the Reserve Bank of India to make it easier for numerous financiers to finance or discount the trade receivables of MSMEs.There are three platforms: M1xchange, RXIL, and Invoicemart. The receivables may pertain to the public sector, the commercial sector, or even specific government agencies. MSEMs can sign up on the platform if they have a 500-crore annual revenue. The facility needs to be made more widely known.

Under section (18) of the MSMED act of 2006, the Indian government has made provisions to help micro and small businesses receive their overdue payments from their customers. Four Micro and Small Businesses Facilitation Councils (MSEFCs) have been established by the Karnataka government which are located in Bengaluru, Mysore, Belagavi, and Kalaburgi. There are around 6000 petitions pending before these Councils and the cases are due from Jan 2022.[iii] Hence Government of Karnataka has set up councils in all districts.

The state could set up independent MSEFCs by availing the services of retired Judges and other officers to faster the disposal of petitions.

Resource from capital market: The lack of access to capital markets by MSMEs is a major challenge for these entities. Despite the need for capital, to remain competitive, many MSMEs are discouraged by the rules, regulations, and formalities of the capital market. To address this challenge, the government could create an MSME Exchange and a Fund of Funds, worth INR 1,000 crore to start with, to buy up to 15% equity in MSMEs with high credit ratings that want to raise capital from the capital market. Additionally, the government may consider increasing the corpus of this fund in the future, to support more MSMEs, subject to a review of the scheme's efficacy. Furthermore, the proposal to buy 10% of the bonds issued by export oriented MSMEs can be expanded and the limit of 10% can be raised. The government may also consider creating a corpus of MSME Benefit Fund through various options like tax-saving MSME bonds, to provide various forms of assistance to the sector.[65]

[63] Source: TransUnion CIBIL, MSME Pulse, Aug 2022)
[64] Source : TaxGuru, "Suggestions to Strengthen Eco-system of MSME's", Dated : 11 Jan 2019
[65] Source : The Institute of Cost Accountants of India, "Suggestions to assist rehabilitation of MSME sector seriously impacted due to onslaught of COVID-19", Dated: April 2020

Credit Guarantee Trust Fund for MSE's (CGTMSE) - Provision of Collateral Free Credit for MSMEs: This is a scheme that provides collateral-free credit to micro and small enterprises in India. The credit facility offered under the scheme can be in the form of term loans or working capital and can be up to INR 200 lakh per borrowing unit. The guaranteed cover provided by the scheme varies between 50% to 85% depending on the loan amount and the type of beneficiary. An annual guaranteed fee of up to 1.80% p.a. is charged on the outstanding loan amount, with a minimum of 1% p.a. The fund allocation for this scheme is INR 9,000 crore for the whole country and INR 900 crore for Karnataka.[66]

The central government in its 2023 budget has announced infusion of additional collateral-free guaranteed credit of Rs 2 lakh crore and reduce cost of credit by 1%.

Reclassification of non-performing Assets: It is suggested that RBI can develop new NPA classification standards because many MSMEs will not be able to satisfy repayment commitments for no fault of their own. It is suggested that the current NPA criteria for overdue principal or interest payments be increased from 90 days to 180 days for a set period of time, with the option of progressively restoring it to its prior position when the situation improves.

Clear MSME dues, incentives on urgent basis: The MSME ministry has emphasized the urgent need to clear pending dues owed to MSMEs by various government departments, units, and agencies. This includes payments for goods and services supplied to PSUs, GST refunds, and various state and central government incentives for MSMEs. The blocking of legitimate payments to MSMEs by PSUs and other corporates is a common problem that creates significant liquidity issues for MSMEs and contributes to the liquidation of many of these entities. To address this, the government could issue strict guidelines for the repayment of all dues within 15 days and form a monitoring cell under the MSME ministry to ensure compliance. This cell can also be responsible for addressing various complaints raised by MSMEs and ensuring prompt resolution. The government has already acknowledged the importance of this issue, as demonstrated by the Honourable Union Finance Minister's statement in October 2019 that the government would ask big corporates to expedite the clearance of dues worth INR 40,000 crore to MSMEs.

Classification of MSME into gold, silver, and bronze category based on performance

The following are some possible categories that could be used for this purpose:

- **Gold-High performing:** MSMEs that have consistently demonstrated strong financial performance, such as high profitability and growth rates.
- **Silver–Average performing:** MSMEs that have stable financial performance and have not experienced significant growth or decline in recent years.
- **Bronze–Underperforming:** MSMEs that have consistently demonstrated weak financial performance, such as low profitability and growth rates.

Specific schemes and support system can be devised based on above categories for example, high-performing MSMEs may be eligible for more advanced or specialized support, such as access to capital, mentorship programs, or opportunities to participate in global trade shows. Average-performing MSMEs may be eligible for more general support, such as access to training programs, business advice, or low-interest loans. Under-performing MSMEs may be eligible for support to address specific challenges or weaknesses, such as technical assistance, marketing support, or financial management training.

It is estimated that, from collective experience, out of the above, 20% might fall in gold category, 40% in silver category and 40% in bronze category. This classification needs a detailed study. Financial assessments based on health score (elaborated below) may be useful in identifying categories of MSME. (Exhibit 46)

[66] Source : Ministry of Micro, Small, and Medium Enterprises, "Annual Report 2021-22"

Exhibit 46

HealthScore™ categories[1]

Category	Criteria	Percentage of MSMEs falling under the category
Gold	High-performing – MSME's having good profits and regularly repay the loan	**20%**
Silver	Average-performing – MSME's having Less profits but regular in repaying loan	**40%**
Bronze	Underperforming – MSME's having losses and defaulting to loan repayment	**40%**

Proposed idea

Critical lens for MSME

HealthScore™ for MSME

The concept of a HealthScore™ for MSMEs (Micro, Small, and Medium Enterprises) is a tool to assess the overall financial and operational health of an MSME. The proposed system, which involves a collegium of District Commissioner, Chamber of commerce, District MSME Director, Local Institute of Chartered Accountant of India (ICAI) Branch, a representative from an educational institution and a lead bank, aims to provide a comprehensive and reliable evaluation of the MSME.

The first step in the process would be for the local ICAI branch to engage a local Chartered Accountant (CA) to audit the MSME. The CA would review the MSME's financial statements, operations, and other relevant factors to provide a detailed analysis of its current financial and operational status. Based on this audit report, the MSME's health score would be issued, which would provide a summary of the MSME's performance and creditworthiness.

A scoring system out of 10 can also be implemented to assess the creditworthiness and overall health of the MSME. The scoring system will be based on the above audit.

- If an MSME receives a score of less than 5, it may not be eligible for financial support from the government or other financial institutions. The MSME may need to take corrective measures to improve its financial and operational health before being considered for financial support.
- If an MSME receives a score between 5 and 7, it may be eligible for some financial support, such as loans or grants, to help it address its challenges and improve its financial health.
- If an MSME receives a score above 7, it may be eligible for not only financial support but also marketing support, such as assistance with branding, marketing, and sales. This additional support can help the MSME grow and expand its operations.

The appointment of a lead bank for MSME loan disbursement and the use of the HealthScore™ by the lead bank are both measures aimed at improving the effectiveness and efficiency of MSME loan disbursement in Karnataka. The government's Strategic Investment Plan exercise is part of a broader program, Raising and Accelerating MSME Performance (RAMP), which aims to support the development of MSMEs in the state through evidence-based and holistic approaches. By coordinating and aligning these efforts, the government, banks, and other stakeholders can better support the growth and success of MSMEs in Karnataka.

The HealthScore™ can also be used by investors and other stakeholders to assess the MSME's

Creditworthiness and make informed decisions. It can also help MSMEs identify areas for improvement and take corrective measures to strengthen their financial and operational health.

Overall, the HealthScore™ for MSMEs can be a valuable tool to promote transparency and accountability in the sector and facilitate access to credit and investment opportunities.

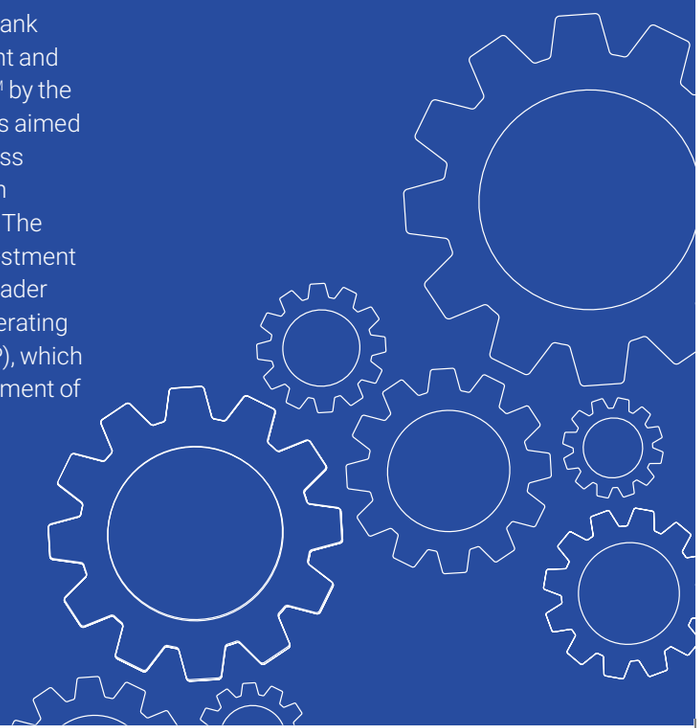
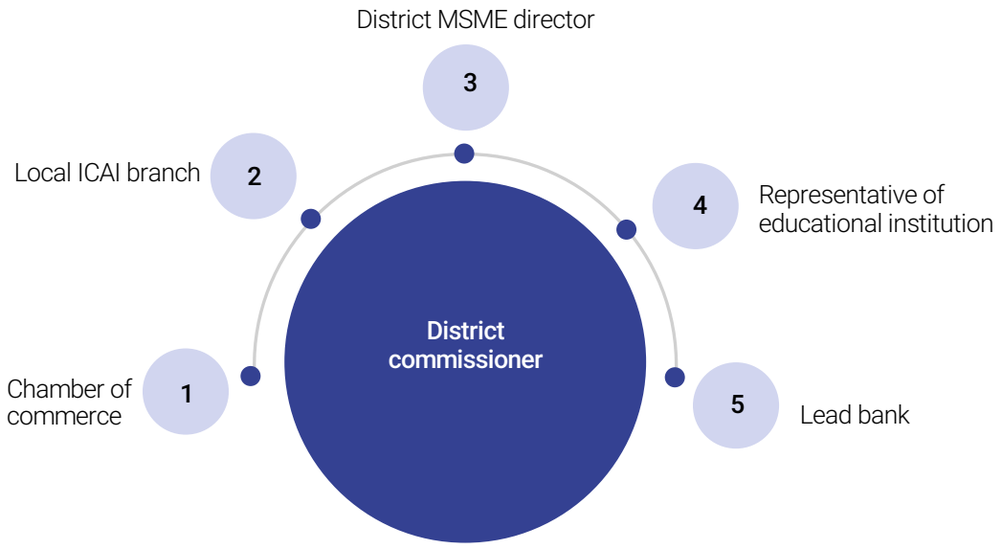


Exhibit 47

Representation of the collegium[1]



1. MSME committee

Role of Chamber of Commerce

Chambers of commerce can play a vital role as the voice of the industry, troubleshooter, and intermediary between industry, government, banks, and rating agencies. (Exhibit 47)

Here are some ways that chambers of commerce can engage proactively with MSMEs and promote their growth:

- **Advocacy and representation:** Chambers of commerce can advocate for policies and regulations that benefit the MSME sector. They can also represent the interests of the MSME sector in various forums, including with government, banks, rating agencies, and other stakeholders.
- **Support and facilitation:** Chambers of commerce can provide support and facilitation services to MSMEs, such as providing market intelligence, access to finance, mentoring, training, and networking opportunities.
- **Information dissemination:** Chambers of commerce can disseminate information to MSMEs on various topics, such as best practices, new technologies, industry trends, and government policies and schemes.
- **Funding:** The government can provide funding for the functioning of chambers of commerce, including nominal grants for infrastructure and hiring talented professionals. This can help to enhance the capacity and effectiveness of chambers of commerce in supporting the MSME sector.

Chambers of commerce work closely with MSMEs in their region to understand their needs and concerns. They could provide district-wise management and assistance to ensure that MSMEs are able to operate in a conducive environment, which includes aiding with regulatory compliance, access to finance, and business development services. They can also monitor the performance of MSMEs within their jurisdiction to identify potential challenges and opportunities. Chambers of commerce provide regular reports to the government on the performance of MSMEs in their region. This helps the government to understand the challenges faced by MSMEs and design policies and programs that are responsive to their needs.

Pilot Project for HealthScore™

To test the effectiveness of the health score and scoring system for MSMEs, a pilot project can be implemented in three centres for two years. The first centre can be in Mysore, with the participation of the District Commissioner, District MSME Director, Local ICAI Branch, a representative from an educational institution like JSS Management Institute, Mysore chamber of commerce, and lead Bank. The Federation of Indian Chambers of Commerce and Industry (FICCI) can play an important role in supporting the pilot project by providing technical assistance and handholding.

The second centre can be in Mangaluru, with the participation of the District Commissioner, District MSME Director, Local ICAI Branch, a representative from an educational institution like NITTE Management Institute, Canara chamber of commerce, and lead Bank.

The third centre can be in Hubli, with the participation of the District Commissioner, District MSME Director, Local ICAI Branch, a representative from an educational institution like KLE, Hubli chamber of commerce, and lead Bank.

During the pilot project, the health score system can be implemented to assess the financial and operational health of MSMEs in each centre. The data collected can be analysed to determine the effectiveness of the system in improving the creditworthiness and financial health of MSMEs.

The pilot project can also help identify any challenges or issues that need to be addressed to implement the health score system effectively. The results of the pilot project can be used to refine and improve the system before it is rolled out on a larger scale.

Marketing

Marketing is a major challenge for MSMEs in the global arena. Due to limited resources and lack of exposure, they often struggle to develop effective marketing strategies and reach their target customers.

Preferential Purchase from Government and Public Sector Undertakings (PSUs) is a policy aimed at promoting the growth of MSMEs (Micro, Small, and Medium Enterprises) by providing them with a larger market for their products and services. This policy requires government departments and PSUs to prioritize the purchase of goods and services from MSMEs. By providing MSMEs with a stable and reliable source of income, this policy can help them to grow and create jobs.[67]

To be eligible for preferential purchase from the government, a vendor must be registered and meet certain criteria set by the government. This is typically done to ensure that the products and services being provided meet certain standards of quality and safety. The goal of preferential purchase programs is to support small businesses and encourage diversity in government procurement, while also ensuring that high-quality products and services are being provided to the government and its citizens. In addition, it is important to have systems in place to assess the quality of the products and services being provided. This helps to ensure that all transactions are transparent and fair, and that vendors are held accountable for meeting the standards set by the government.

We put forward a scheme, to place MSMEs under a separate category for assigning tenders for vendor selection. The rationale behind such scheme is that MSMEs face several challenges while competing with larger enterprises in procurement processes, such as lack of access to finance, limited technology, and inadequate infrastructure. Making them a separate category and offering them price preference can help level the playing field and enable them to participate in procurement processes.

A higher margin of at least 5% of the cost of the project assigned when compared to large enterprises. The criteria for margin would depend on various factors, such as the nature of the project, the market conditions, and the financial capabilities of the procuring entity.

While providing higher margins to MSMEs can incentivize them to participate in procurement processes. A balance between the interests of both parties should be struck, keeping in mind the objective of promoting MSMEs and ensuring value for money for the procuring entity. MSME can work towards reducing gap with larger enterprises.

Government of Karnataka as per the New Industrial Policy 2020-25[iii] has offered 15% price preference to MSME in public procurement arena. Government of India is insisting MSMEs to produce quality products and there by obtain "Zero Effect Zero Defect" certificate, Government of Karnataka can give preference to MSMEs having ZED certificates to participate in the tenders.

An innovative platform for marketing

Government eMarketplace (GeM) is another tool that can help MSMEs to promote their products and reach new customers. This can take many forms, such as an e-commerce platform that allows MSMEs to sell their products online, a business-to-business (B2B) marketplace that connects MSMEs with buyers, or a marketing and advertising platform that helps MSMEs to reach potential customers. By providing MSMEs with a cost-effective and efficient way to market their products, these platforms can help them to grow and become more competitive. As our Hon'ble Prime Minister emphasized, it should be reviewed whether all public sector undertakings of the Union Government have been a part of GeM and whether they also get their vendors registered on GeM.[iii] Here we like to highlight the idea of creating MSME marketing platform, like Alibaba or Amazon, conceived by MSME ministry to give a worldwide coverage of our MSME products.[68]

[67] Source : The Institute of Cost Accountants of India, "Suggestions to assist rehabilitation of MSME sector seriously impacted due to onslaught of COVID-19", April 2020

[68] Source : The Institute of Cost Accountants of India, "Suggestions to assist rehabilitation of MSME sector seriously impacted due to onslaught of COVID-19", April 2020

ONDC[iii] has the potential to be a game changer for MSMEs in India. Here are some potential benefits of ONDC for MSMEs:

- **Increased market access:** ONDC can provide MSMEs with access to a wider customer base, both within India and internationally, through its digital platform. This can help MSMEs expand their businesses and increase their revenue.
- **Reduced transaction costs:** ONDC can reduce transaction costs for MSMEs by eliminating the need for intermediaries and providing a more efficient and streamlined process for e-commerce transactions.
- **Improved efficiency:** ONDC can help MSMEs improve their efficiency by providing access to advanced technology and data analytics tools. This can help them make better decisions, optimize their supply chain, and improve their overall business operations.
- **Enhanced competitiveness:** ONDC can help MSMEs improve their competitiveness by providing access to a wider range of customers and markets, reducing transaction costs, and improving efficiency.

Government of Kerala[iii] has developed its own website, which will provide e-market for the products produced by the MSMEs located in the Kerala. Government of Karnataka can develop a website to provide market for the products produced by the MSMEs of Karnataka.

Export incentive

Export incentives are financial or non-financial benefits provided by the government to encourage the export of goods and services by Micro, Small, and Medium Enterprises (MSMEs). The objective of these incentives is to help MSMEs overcome the challenges they face in the global market, such as high competition and high costs.

"Without boosting exports especially from MSMEs, the idea of MSMEs powering India is half-hearted," says Sahai of FIEO. The government has set a goal of increasing the MSME sector's contribution to exports from its current level of over 40% to 60%. But there are many obstacles in the way of reaching this goal.

Aside from China's rivalry, we are gradually losing market share to rivals like Vietnam and Bangladesh in the apparel industry and Sri Lanka and Kenya in the tea industry.

The incapacity of enterprises to promote their products in foreign markets is the main issue afflicting the MSME industry. In light of this, tax breaks for MSMEs' could be made available.[69]

State government could sponsor both inward and outward trade fairs and exhibitions every year for MSMEs, this can have several potential benefits. Here are some of them:

- **Increased visibility and networking opportunities:** MSMEs can showcase their products and services at trade fairs and exhibitions, which can help them gain visibility and connect with potential customers, partners, and investors.
- **Access to new markets:** By participating in trade fairs and exhibitions, MSMEs can explore new markets and expand their customer base. Outward trade fairs can help MSMEs tap into foreign markets, while inward trade fairs can attract buyers from other regions of the country.
- **Learning opportunities:** Trade fairs and exhibitions can provide MSMEs with the opportunity to learn about industry trends, best practices, and new technologies. This can help them improve their products and services and stay competitive.

Government of Karnataka as per the New Industrial Policy 2020-25 is offering incentives viz., Electricity tax exemption, performance subsidy, reimbursement of Bank charges, reimbursement of ECGC charges, Certification charges, Training charges to the Export oriented units.

Visveswarya Trade Promotion Centre (VTPC) has been conducting awareness programmes by conducting trade fairs, promoting micro and small enterprises to participate in trade fairs.

Technology upgradation

Soon, technology will have the most impact on whether MSME can dominate the market. It is learnt that the government is, for this purpose, in the process of creating 20 hubs and 100 spokes in the form of tool rooms across the country. The state have a pool of skilled engineers, several outstanding educational institutions with high accreditation, and plenty of underutilised resources.

[69] Source: Business Today, "What Needs to Be Done to Strengthen MSMEs, the Economy's 'Backbone'" Dated: 20 Feb 2022

Scheme for technology upgradation and competitiveness at ministry level MSME Champions Scheme (Erstwhile CLCS-TUS)[70]

Ministry of MSME has been implementing credit Linked Capital Subsidy and Technology Upgradation Scheme (CLCS-TUS) for promoting competitiveness amongst Micro, Small and Medium Enterprises (MSMEs) by the way of wastage reduction through Lean Manufacturing, support for Design improvement, building awareness on Intellectual Property Rights, Zero Defect Zero Effect (ZED) Scheme, digitally empowerment of MSME through Digital MSME and to promote & support untapped creativity of individual and to promote adoption of latest technologies in manufacturing as well as knowledge based innovation MSMEs through Incubation across India.

There are 3 components under the new MSME Champions scheme:

- MSME-Sustainable (ZED)
- MSME-Competitive (Lean)
- MSME-Innovative (for Incubation, IPR, Design and Digital MSME)

MSME-Sustainable (ZED): MSME Sustainable (ZED) Certification is an initiative to raise awareness of Zero Defect Zero Effect (ZED) practises among MSMEs and to encourage and urge them to pursue ZED Certification. MSMEs can significantly reduce waste, boost productivity, raise environmental awareness, conserve energy, make the best use of natural resources, gain market share, etc. through the ZED Certification process. The ZED Certification aims at enhancing the competitiveness of an MSME by assessment, modification through guidance, handholding, managerial and technological intervention. The fund allocation for this scheme is Rs. 16 crores for the whole country and at least Rs.1.6 crore for Karnataka.

MSME-Competitive (Lean): The Ministry of Micro, Small, and Medium Enterprises is making a significant effort to improve the competitiveness of MSME Sectors through the application of Lean Tools and Techniques. This effort is known as the MSME Competitive (Lean) Scheme. Lean Tools and Techniques are a tried-and-true way for raising MSME sector competitiveness. The fund allocation for this scheme is Rs. 19.43 crore for the whole country and at least Rs.2 crore for Karnataka.

MSME-Innovative (for Incubation, IPR, Design and Digital MSME): The scheme's primary goals are to encourage and assist individuals' latent creativity, the adoption of cutting-edge manufacturing technology, and knowledge-based innovative MSMEs that are looking for proof-of-concept validation for their ideas. The programme encourages interaction with enablers who can help MSMEs grow their businesses by assisting with design, strategy, and execution. The fund allocation for this scheme is Rs. 23.16 crore for the whole country and at least Rs.2.3 crore for Karnataka.

The Govt of Karnataka has proposed the following in its industrial policy 2020-25:

Deploying an online technology platform:

Under the ambit of the scheme, it is proposed to develop an online technology portal which will have modules targeted at addressing issues faced in specific areas by the MSME sector in Karnataka. The platform is proposed to be equipped with modular mechanisms and structures around Information, Facilitation, Regulatory, and Ease of Doing Business areas, which can help MSMEs efficiently bring their products to the market. The MSMEs will be free to take help of any module they like. Instead of creating new structures, the platform will plug onto the existing ones. Key activities that the platform is expected to perform are:

- **Provide an integrated platform for raw material suppliers** – The platform will provide a one-stop-shop for accessing quality raw material at an affordable price with linkages to e-Mandis, APMC, NCDX, ReMS, market-place aggregators like Udaan, and the elements of the logistic supply chain like warehouses, cold storage facilities, etc.
- **Improve market access** – The platform will provide MSMEs with access to the retail market by on-boarding major brick & mortar and online marketplaces, public sector undertakings, government departments, wholesalers and retailers. This will help provide a one stop gateway to MSMEs for discovering a market for their products, generating supply chain efficiencies for the sector.
- **Disseminate information on quality control standards and certifications** – The platform will provide MSMEs with updated and in-depth information on globally prevalent quality standards and certifications. The platform will leverage existing informational repositories of FSSAI, AGMARK, organic certification, etc.
- **Enhance access to credit** – The platform will integrate the conventional (Banks, NBFCs, MUDRA, etc.) and non-conventional (TReDS, PE/VCs, Funds of Funds etc.) sources of credit supply to MSMEs. The module will also integrate credit enhancement schemes with the financing agencies to provide access to low-cost funds for MSMEs.

[70] Source : Ministry of Micro, Small, and Medium Enterprises, "Annual Report 2021-22"

- **Access to data** – Access to analytics, market research, intelligence, CRM and other IT technology that helps to bring efficiency in operations would be created on the platform.
- **Skill development programs** – The platform will have modules for dissemination of information pertaining to new age skills emerging in different domains required by the MSMEs and will facilitate them in getting trained by collaborating with the public and private agencies delivering the skill development programs. Vide this module, Entrepreneurial Development Programs and domain- specific training would be provided to entrepreneurs in partnership with reputed institutes and trainers.
- **Technology adoption and knowledge transfer** – The platform will have modules for supporting MSMEs with the technicalities of transfer and adoption of new and emerging technology. Further, the platform will also build a repository of case studies domain related best practices, etc. which may be adopted by MSMEs in their operations.
- **Support MSMEs in branding and Advertisement** – The platform will have modules which will support MSMEs in branding, marketing, and advertising related activities.

Establishing a centre of excellence for managing the platform setup

As its second lever, the scheme proposes to establish a dedicated institutional structure to manage the technology platform and provide strategic guidance to MSMEs in aspects such as technical know-how, managerial skill, filling up of the knowledge gap, etc. The Centre of Excellence will identify gaps in the capabilities of the MSMEs and work with them in bridging the gaps, equipping them to adapt to the changing market & business environments. Further, the institutional mechanism will be equipped to assist rural enterprises in addressing issues faced in areas of GST, IT, UAM registration, PAN application, loan document preparation, etc. The mandated activities for the Centre of Excellence are proposed to be aligned along following broad categories:

Technology acceleration programs and practice: This includes activities like promoting technology adoption by firms, providing business advisory services to firms aimed at improving their manufacturing techniques and processes, supporting transfer of technology, performing R&D related services, and facilitating access to technology through inter-firm partnerships.

Connecting firms: Provide platforms for aggregation of firms from both ends of the supply chain – suppliers and consumers, and act as an intermediary to provide support services, host best practice events to facilitate dissemination of information.

Funding assistance: Providing firms with information on latest funding available for different functions - R&D, loans to scale business, fund joint pre-competitive research programs, funding for capital and operating infrastructure etc.

Next generation manufacturing technical assistance: Teach innovation and new product development skills to MSMEs, provide export assistance and training, provide energy efficient manufacturing skills, etc.

Infrastructure support

KIADB can earmark a minimum 30% of allottable land in all their industrial areas for MSMEs. Out of which, KIADB can reserve 22.65% for SC/ ST entrepreneurs, 10% for Minorities/ Physically Challenged/Backward Classes (Category 1 and 2A only)/ Ex-Servicemen entrepreneurs and 5% for women belonging to all categories in industrial areas. KIADB can indicate 15% of the allottable land in industrial areas for MSMEs to be allotted by DLSWCC. The maximum extent of land to be allotted by DLSWCC could be two acres per project. The minimum size of plot to be developed by KIADB can be 0.5 acre for MSMEs.

KIADB can construct multistoried/ flatted factories with plug and produce facilities (wherever feasible) near Bengaluru, Mysuru, Hubballi-Dharwad, Mangaluru, Belagavi, Tumakuru, and Kalaburagi. KIADB can provide these flats on a monthly rental/lease basis.

KSSIDC can earmark entire allottable land in their industrial areas for MSMEs. Out of which, KSSIDC can reserve 22.65% for SC/ST entrepreneurs, 10% for Minorities/ Physically Challenged/Backward Classes (Category 1 and 2A only)/ Ex-Servicemen entrepreneurs and 5% for women belonging to all categories in industrial estates.

KSSIDC can be allotted land in KIADB industrial area, upon request for making industrial plots and sheds of smaller sizes for MSME sector. KIADB may provide land to KSSIDC on absolute sale deed as per KIADB norms to enable KSSIDC to allot plots/ sheds to the industry on lease-cum-sale deed.

KSSIDC may develop industrial estates exclusively for micro and small enterprises. The area to be procured may not be less than 50 acres. 20% of the allottable area can be reserved preferably for plug and play sheds out of which 10% of the area can be earmarked for multi-storied sheds with plug and play facilities (wherever feasible) near Bengaluru, Mysuru, Hubballi-Dharwad, Mangaluru, Belagavi, Tumakuru, and Kalaburagi. KSSIDC will provide these flats on lease / rental basis. Liberal FAR would be considered for flatted development/ industrial sheds/multi-storied industrial units.

Development of Rural Industrial Areas exclusively for MSMEs in the impact area of industrial corridors can be undertaken along with infrastructure, like road connectivity, drainage system, street lighting, and water supply by KSSIDC. Rural industrial areas and estates can have minimum 100 to 150 plots measuring 2,000sq. ft. to 10,000 sq., ft. and can be developed in potential areas.

The maximum contract demand for LT consumers can be increased from present 67 HP to 100 HP.

Additionally, Government of Karnataka had announced the "SARTHAK" scheme in the New Industrial Policy-2020-25, which now, unfortunately has been withdrawn. Competent agencies can consider taking it up for implementation which would be a significant online support system for the MSMEs.

Skill Development and Training

A Scheme for Promotion of Innovation, Rural Industries, and Entrepreneurship (ASPIRE)[71]

Establish a framework for Start-up promotion through creating a Fund of Funds with Small Industries Development Bank of India (SIDBI), thereby providing funding support to early-stage enterprises and start-ups in agro-rural sector to convert these into commercial enterprises.

The funds allocated on a national basis is Rs 15 crore, of which Karnataka has been allocated around1.5 crore.

Pradhan Mantri Kaushal Vikas Yojana (PMKVY)[72]

It is the Ministry of Skill Development and Entrepreneurship's premier programme for developing skills that are based on results. This skill certification and incentive program's goal is to encourage and empower a significant number of Indian adolescents to enrol in outcome-based skill training so they may find employment and support themselves. A supportive framework for registering training providers could be followed, and awareness-raising and mobilisation efforts can be carried out with the support of the local State and district governments. The monetary compensation for different employment responsibilities within a sector would likewise vary. MSMES may employ skilled local youngsters.

In the last three years, the Pradhan Mantri Kaushal Vikas Yojana (PMKVY) has trained 41.3 lakh people. A placement rate of merely 15% means that only 6.15 lakh of them have work.

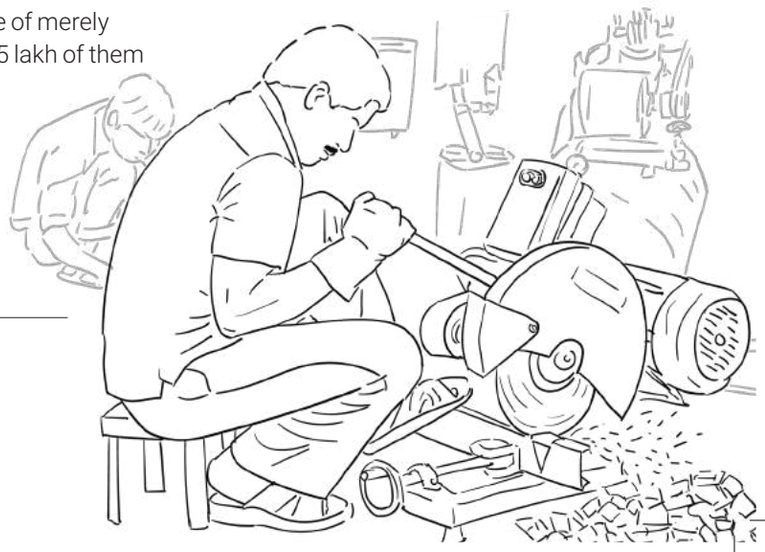
Reasons for lower placements

- A surplus of training partners, however many lack the necessary competence.
- Poor Employment Linkage, the training partner's connections and resources are scarce. They don't carry out detailed market research or requirement assessments.
- Ineffective use of Franchise Model. Only a few training partners utilise the franchise model.
- Insufficient trainers, India needs over 20000 trained trainers annually, though available trainers are 50% of the need.

PMKVY 4.0 will be launched to skill lakhs of youth within the next three years.[iii]

It may cover courses for Industry 4.0, Covid, AI, robotics, mechatronics, IoT and drones.

To help 47 lakh stipend recipients, a pan-India national apprenticeship promotion plan called Direct Benefit Transfer could be implemented. The 30 international Skill India centres, which are centred on developing technologies and strongly emphasise on-the-job training, can add to the nation's growing knowledge capital, putting India in a good position to compete in the digital sphere. With the introduction of a single Skill India Digital portal, the digital ecosystem for skilling will further develop. This platform can enable demand-based formal skilling, connect with employers, including MSMEs, and make access to entrepreneurship programmes easier.



[71] Source: Ministry of Micro, Small, and Medium Enterprises, "Annual Report 2021–22"
[72] Source: TaxGuru, "Suggestions to Strengthen Eco-system of MSME's", 11 Jan 2019

Vocational/part time schools for adults

The National Institute of Open Schooling (NIOS), which offers instruction to adults, is an example of a vocational school in India. A nationwide network of adult education facilities is managed by the Directorate of Adult Education.

Vocational/part time schools give working adults a significant chance to further their education and enhance their employment prospects. They can assist people in developing new abilities and information, advancing in their jobs, and pursuing their objectives both personally and professionally. MSME can collaborate with such schools to create additional skilling opportunities.

Employment generation[73]

Stop Job Losses-Create new jobs

MSMEs have a significant role to play in creating new jobs and preventing job losses, especially in local communities. By leveraging their resources, collaborating with other businesses, investing in employee development, and embracing technology, MSMEs can create new job opportunities and promote economic growth.

Currently, the Prime Minister's Employment Generation Programme (PMEGP) is a state level scheme The Scheme is implemented through state KVIC Directorates, State Khadi and Village Industries Boards (KVIBs) and District Industries Centres (DICs), Coir Board (for coir units) and banks.

MSME can have maximum cost of the project/ unit admissible under manufacturing sector amounting to Rs.25 lakh and under business/ service sector amounting to Rs.10 Lakh.

Allocation of fund for this scheme 2,500 crore and Karnataka gets a share of 250 crore.

Some additional approached could be considered to implement existing schemes and initiatives to support job creation and prevent job losses.

New jobs can be created by connecting job seekers to job creators through proactive engagement between MSMEs (micro, small, and medium-sized enterprises), local colleges, and chambers.

Job fairs: Local colleges and chambers can organize job fairs where MSMEs can showcase their job openings and connect with job seekers. This can provide an opportunity for job seekers to meet potential employers and learn about available job opportunities.

Internship programs: MSMEs can collaborate with local colleges to offer internships to students. The NEP 2020 emphasizes the need for experiential learning, including internships and apprenticeships, to provide practical skills to students. The government can provide financial incentives to MSMEs by contributing 50% of stipends in the initial years, 25% of stipends in subsequent years and 10% in later years. Internships with stipends can create a sense of commitment for both MSMEs and college students. The stipend can motivate the students to take the internship seriously and to perform their best.

Guest lectures: MSMEs can engage with local colleges by organizing guest lectures or workshops for students. This will provide an opportunity for MSMEs to showcase their work and share industry-specific knowledge with the students.

Mentorship programs: MSMEs can collaborate with local colleges to offer mentorship programs to students. This will provide an opportunity for students to learn from experienced professionals and gain industry-specific knowledge.

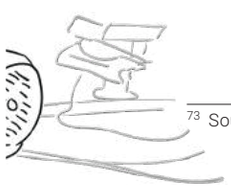
Online platforms: MSMEs can use online platforms like LinkedIn and Facebook to connect with local colleges and job seekers. They can post job openings, share industry-specific knowledge, and engage with potential candidates.

Employment and financial support of Government

Governments can provide financial support to Micro, Small, and Medium Enterprises (MSMEs) in several ways, including contributing to employee compensation. One way to do this is through a subsidy program that provides financial support to MSMEs in the form of a partial reimbursement of employee wages. The government could contribute up to 50% of the compensation paid to employees in the initial years of the MSME's operations, 25% in the subsequent years, and reduce it further to 10% depending on the financial stability of the MSME.

However, it is important to note that such programs require careful implementation and monitoring to ensure that the funds are used effectively and efficiently. Additionally, the government could consider the long-term financial sustainability of such programs.

Conducting periodic meetings with industry experts, academicians, and chambers of commerce can be an effective way to facilitate interaction which shall be unlike anything done in past. By defining the agenda, inviting the participants, facilitating the meeting, following up, and planning future meetings, you can create a platform for meaningful engagement and collaboration. (Exhibit 48)



[73] Source : Ministry of Micro, Small and Medium Enterprises, "Annual Report 2021-22"



Exhibit 48

Higher education enrolment data for year 2019–20

	Male	Female	Total	No. of colleges
Bagalkot	27,860	25,285	53,145	151
Ballari	33,419	27,350	60,769	154
Belagavi	65,285	59,572	1,24,857	369
Bengaluru Rural	13,555	16,835	30,390	152
Bengaluru Urban	3,24,208	2,98,182	6,22,390	1,397
Bidar	21,521	24,104	45,625	269
Chamarajanagar	5,560	6,826	12,386	47
Chikballapur	13,260	13,111	26,371	74
Chikkamagaluru	8,864	10,815	19,679	53
Chitradurga	15,152	17,903	33,055	135
Dakshina Kannada	67,633	83,495	1,51,128	335
Davangere	23,189	26,943	50,132	143
Dharwad	40,034	38,805	78,839	246
Gadag	13,470	13,704	27,174	103
Hassan	19,784	28,450	48,234	121
Haveri	12,855	14,631	27,486	87
Kalaburagi	42,675	40,693	83,368	389
Kodagu	4,745	5,317	10,062	33
Kolar	16,639	21,025	37,664	160
Koppal	11,061	10,721	21,782	82
Mandya	19,594	22,627	42,221	108
Mysuru	67,129	78,126	1,45,255	221
Raichur	23,981	19,128	43,109	197
Ramanagara	18,623	15,903	34,526	64
Shivamogga	24,627	34,103	58,730	122
Tumakuru	36,417	41,361	77,778	183
Udupi	41,730	40,874	82,604	107
Uttar Kannada	14,546	18,512	33,058	97
Vijayapura	39,408	27,233	66,641	230
Yadgiri	13,219	8,123	21,342	130
Total	**10,80,043**	**10,89,757**	**21,69,800**	**5,959**

Source: Department of Higher Education, GoK

As per article dated 10 January 2020 of Deccan Herald, around 5.5 lakh students graduate every year. The government has brought together various departments offering youth and student services on a single platform. MSME can tap the huge potential of youth in Karnataka.

MSMEs have faced challenges like finance, limited market access, competition, and regulations, but have shown resilience and adaptability, becoming critical for national economies. They create jobs through expansion, diversification, and collaboration, and contribute to youth skilling through training. However, achieving goals takes time, effort, and dedication with setbacks and lessons learned. A decade of sustained progress is required, along with a willingness to persist through challenges and maintain a long-term perspective despite short-term obstacles.

Development of One district One Product/Clusters

- One District One Product (ODOP) is an initiative by the Government of India to promote traditional and indigenous products of different districts across the country. The aim is to identify a product or a cluster of products that are unique to each district and support their development and marketing to create employment opportunities and boost the local economy.
- The initiative is particularly relevant for micro, small and medium enterprises (MSMEs) as they form the backbone of the Indian economy and often operate in rural and semi-urban areas. By promoting the production and marketing of traditional products, ODOP can help these MSMEs to scale up and become more competitive.
- Under ODOP, each district is expected to identify a product or a cluster of products that have a unique identity and are in demand in the local, national, or international market. The government provides financial and technical assistance to develop the infrastructure and capacity of MSMEs to produce, market, and export these products.
- The ODOP initiative has the potential to create employment opportunities, increase the income of MSMEs, promote entrepreneurship, and improve the socio-economic status of the people living in rural and semi-urban areas. It can also help to preserve and promote the rich cultural heritage of different regions in India.
- Identifying the best district for the One District One Product (ODOP) initiative may require a thorough analysis of various factors, including the availability of resources, market demand, potential for growth, existing infrastructure, and the level of government support.
- Some of the key factors to consider in identifying the best district for ODOP are:
- **Availability of resources:** The district can have access to the resources required to produce the identified product. This includes raw materials, skilled labor, and necessary infrastructure.
- **Market demand:** The product should have a significant demand in the local, national, or international market. A market assessment could be conducted to understand the potential demand for the product and the competition in the market.
- **Potential for growth:** The product could have the potential for growth and scalability. The district could have the capacity to produce the product in larger quantities and expand its market reach.
- **Existing infrastructure:** The district might need to have the necessary infrastructure such as roads, transportation, electricity, and water supply to support the production and marketing of the product.
- **Government support:** The government could provide the necessary financial and technical support to the MSMEs to develop the product and market it effectively. This includes providing incentives, training programs, and access to credit facilities.

Based on these factors, the best district for ODOP could be one that has a unique product with high market demand, a supportive government, access to resources, and potential for growth. It is important to note that each district has its own strengths and opportunities, and a thorough analysis is required to identify the most suitable district for the ODOP initiative.

Clusters of MSME

Karnataka State is in 5th position in respect of projects approved under MSE-CDP scheme[iii] Karnataka has huge potential for development of clusters under this program. The Clusters can be created in the North Karnataka region, by providing government land on lease arrangements. (Exhibit 49)

Exhibit 49

Cluster of MSME: Number of MSME clusters in India and project cost

Details	Number	Project cost (INR lakhs)
Clusters implemented	11	9,810.93
Clusters finally approved by GoI	01	1,994.09
Clusters to be approved by GoI	02	3,494.00
Cluster proposals in pipeline	11	12,987.00

Source: Karnataka Economic Survey 2021–22, Chapter 10

Scheme of Fund for Regeneration of Traditional Industries (SFURTI)[74]

The objective of the scheme is to organize traditional industries and artisans into clusters to make them competitive and provide support for their long-term sustainability, sustained employment, to enhance marketability of products of such clusters. (Exhibit 50)

Funds Allocated under SFURTI is 170 crores on a national level, state allocation is about 17 crores. (Exhibit 51)

[74] Source : Karnataka Economic Survey 2021-22, Chapter 10

Exhibit 50

Types of MSME clusters

Type of cluster	Per cluster budget limit
Regular cluster (up to 500 artisans)	INR 2.50 crore
Major cluster (more than 500 artisans)	INR 5.00 crore

Source: Karnataka economic survey 2021–22, chapter 10

Exhibit 51

Clusters under MSE-CDP scheme

	Common facility centres			Infrastructure projects			
State	Approved	Ongoing	Completed	Approved	Ongoing	Completed	Total
Tamil Nadu	45	19	26	51	16	35	96
Haryana	10	7	3	28	-	28	38
Rajasthan	2	1	1	35	6	29	37
Maharashtra	29	15	14	5	-	5	34
Karnataka	24	13	11	5	1	4	29
Uttar Pradesh	11	7	4	18	10	8	29
Kerala	16	4	12	12	4	8	28
Madhya Pradesh	3	3	-	25	11	14	28

Source: https://dashboard.msme.gov.in/msme_cdp.aspx

Regulatory Laws/Compliance

Registration

Registration helps the government keep track of the number of MSMEs operating in the country, their location, and their activities. This information is crucial for formulating policies and programs that support the growth and development of MSMEs.

Some of the benefits that MSMEs can avail of by registering with the government include access to credit and financial assistance, tax benefits, training and skill development programs, and priority in government procurement contracts. In addition, registered MSMEs may be eligible for various subsidies and grants that can help them expand their business operations and invest in new technologies and equipment. Government could provide adequate support and guidance to MSMEs during the registration process, such as providing training and assistance in filling out application forms and other required documentation.

Tax mechanism[75]

Concession and postponement of payment of statutory dues: MSMEs are burdened with a significant number of statutory dues that must be paid on time to prevent penal interest and required prosecution. Thousands of sole proprietorship and partnership businesses, which make up the majority of MSMEs in India, are not allowed to take advantage of them.

Concept of single window system[16, 17]

The government could consider making sure that all the organisations in charge of putting these stimulus plans continue to work in perfect harmony with one another. Additionally, it needs to be made sure that all of these programmes' advantages are effectively and rapidly communicated to the general public.

The government might consider creating a single-window system at the district or zonal level to coordinate all MSME-related activities, such as connecting MSMEs with various government programmes, connecting small businesses with various marketing platforms, adhering to GST regulations, approving and disbursing loans, rehabilitating sick units, disseminating various MSME-related information, assisting them in becoming more digital, and so forth.

Ease of doing of business [16,17]

In 2019, Karnataka's position on the ease of doing business index dropped to 17.[iii] A business-friendly climate would be made possible by lowering regulatory load and compliance costs. The application of strict labour rules to enterprises that grow to be medium-sized is another barrier to the expansion of small businesses. The Karnataka government can change the 300-worker threshold for labour regulations, just as other states like Rajasthan and Gujarat.

Pradhan Mantri Jeevan Jyoti Bima Yojana and Social security schemes

The programme is run by enrolling each account holder individually through their own savings account and paying the annual premium. There could be a clause in the plan that allows businesses to sign up their employees for the benefit of the plan by paying the premium amount if it is to be extended to workers of MSMEs. This will be excellent for workers' social security. Through the "auto debit" feature, the premium will be taken out of the account holder's savings bank account in one payment.

The finance ministry's initiative to establish a mission focused at helping MSME employees obtain Jan Dhan Accounts, Provident Funds, and Insurance needs to pick up the necessary steam right away. In this regard, we can bring up the PF obligations of thousands of MSMEs employees, which most businesses with little resources are unable to cover. Here, the government could ostensibly step up and take on the responsibility of PF payment for a predetermined period.

Unified labour code[76]

India, there are numerous labour laws that regulate factory and manufacturing establishments. Many of these laws overlap, making it challenging for businesses to comply with each monthly legal requirement. Additionally, many of these laws' requirements may need to be updated in order to keep up with emerging technologies and business models. In this situation, it may be necessary to combine all of these laws into a single labour code that could include all main areas.

[75] Source: The Institute of Cost Accountants of India, "Suggestions to assist rehabilitation of MSME sector seriously impacted due to onslaught of COVID-19", April 2020

[76] Source: The Institute of Cost Accountants of India, "Suggestions to assist rehabilitation of MSME sector seriously impacted due to onslaught of COVID-19", April 2020

Alternate Dispute Resolution District wise

Alternate Dispute Resolution, refers to a range of processes used to resolve disputes outside of the traditional court system, including mediation, negotiation, and arbitration. The use of Alternate Dispute Resolution (ADR) is a practical and effective approach to resolving issues in a timely and cost-effective manner.

A single window resolution mechanism could be created at district level to make the ADR process more accessible and convenient for individuals and businesses seeking resolution. This mechanism may allow people to submit their disputes through a single point of contact, and the process could be streamlined to ensure that disputes are resolved efficiently.

ADR is that it can be faster and less expensive than traditional litigation. ADR is that it allows for more flexible solutions to disputes. This can help to preserve relationships and avoid the adversarial nature of litigation.

Online think tank group: (mentor/advisor)

An online think tank group can be a great platform for connecting mentors, experts, and industry leaders from various fields. It can serve as a forum for networking and exchanging ideas and knowledge among members.

Professors and industry leaders who are interested in volunteering their time and expertise can play a crucial role in shaping the discussions and contributing to the knowledge base of the group. They can act as mentors and guides to younger members who are seeking to learn from their experiences and insights.

The group can have regular meetings or discussions through video conferencing platforms, where members can share their opinions, present their ideas, and engage in healthy debates on relevant topics. These discussions can be moderated by a facilitator to ensure that everyone gets a chance to speak and that the conversations stay focused and productive.

Additionally, members can collaborate on projects or initiatives that align with the group's mission or interests. This can help members to apply the knowledge they have gained through the discussions and contribute to the advancement of their respective fields.

Overall, an online think tank group can be an excellent opportunity for professionals to expand their network, exchange information and knowledge, and contribute to the growth of their industries.

Women entrepreneurship

Women entrepreneurship in MSMEs is an important driver of economic growth and development. Empowering women entrepreneurs by providing them with access to finance and other resources is crucial to creating more inclusive and equitable economies.

To support women entrepreneurship, it is suggested to offer collateral-free loans at a debt equity ratio of 5:1. This means that women entrepreneurs can access loans without having to provide collateral, which is often a major barrier to entry for women-owned businesses. Additionally, these loans may come with a low rate of interest, making them more affordable and accessible to women entrepreneurs.

To further support women entrepreneurs, they could be offered long moratorium periods. This means that women entrepreneurs can defer their loan payments for a certain period of time, allowing them to focus on growing their businesses without worrying about immediate repayment obligations.

Overall, these measures can help to level the playing field for women entrepreneurs and encourage more women to start and grow their own businesses. By supporting women entrepreneurship, we can create more inclusive and equitable economies that benefit everyone.

MSME portal

An MSME portal could be created exclusively for Karnataka, which would be a valuable resource for entrepreneurs and business owners in the state. Such a portal could provide a centralized platform to access information about the MSME sector in Karnataka, including key statistics, industry trends, government initiatives, and available resources.

The portal could be designed to include a comprehensive database of MSMEs operating in each district, along with their respective industry sectors. This information could be updated quarterly to ensure accuracy and relevance. In addition, the portal could feature a directory of service providers, such as business advisers, financing institutions, and legal advisors, who cater specifically to MSMEs.

Miscellaneous

Renovation and maintenance of industrial areas and parks by the government can be a beneficial strategy for improving the infrastructure and facilities available to businesses operating within these areas. A one-time spending of Rs 10 lakh per acre can go a long way in upgrading the facilities and ensuring that the park is attractive to businesses and their customers.

In addition, implementing a maintenance fee system for enterprises operating within the park can help ensure ongoing upkeep and maintenance of the park's facilities. This could be done through a variety of mechanisms, such as charging a flat fee per acre of land, or by calculating a fee based on the amount of space occupied by each business.

Harmonization of property taxes is another key measure to ensure ease of doing and maintaining businesses. Currently, the MSMEs are required to make payments to government agencies such as KIADB, KSIDC (the bodies responsible for development and maintenance of industrial areas/estates) in the form of maintenance charges and also to the local administrative bodies of the government in the form of property tax. This system of double payment is unfavorable and dissuading the growth of MSMEs and needs to be rectified. Setting up of industrial townships that follow the ELCITA model can have significant positive impact on the growth and development of MSME's. As announced in its 2017-18 budget, the Industrial Township Authorities need to set up townships in Peenya (Bengaluru), Veerasandra (Bengaluru) Hebbal (Mysore), Tarihal (Dharwad) and other industrial areas.

MSMEs can be offered subsidies to invest in pollution control technologies, such as wastewater treatment plants, air pollution control systems, or green energy systems.

Providing ambulance and other safety facilities at industrial areas and parks is an important aspect of ensuring the safety and well-being of workers and visitors within these areas. Industrial activities can often be hazardous, and accidents or emergencies can occur at any time. Having access to emergency medical services and other safety facilities can help ensure that any incidents are handled quickly and effectively, minimizing the risk of injury or loss of life.

In addition to emergency medical services, other safety facilities that may be useful within industrial areas and parks could include fire stations, police stations, and other emergency response facilities. These facilities can help ensure a rapid response to any incidents or emergencies that may occur within the park, helping to minimize the risk of damage to property or loss of life.

Providing ambulance and other safety facilities at industrial areas and parks is an important aspect of ensuring the safety and well-being of workers and visitors within these areas. By partnering with local emergency services providers to establish dedicated response teams or stations within the park, governments can help ensure that emergency incidents are handled quickly and effectively, minimizing the risk of injury or loss of life.

Subsidized bus passes can be provided through a variety of mechanisms, such as partnering with local transit authorities or private bus companies to provide discounted passes to employees of businesses located within the industrial park. The government could also subsidize the cost of public transit for residents living near the park.

In addition to reducing traffic congestion, encouraging the use of public transportation can also have a positive impact on the environment by reducing emissions from cars and other vehicles. It can also help promote a more sustainable and equitable transportation system that is accessible to all members of the community, regardless of their income level.

CSR activities by corporations can support MSME in following ways.

- **Offering business development support:** Corporations can offer MSMEs access to training, mentoring, and networking opportunities to help them build their business skills and connect with potential customers and partners.
- **Providing access to technology:** Many MSMEs lack access to the latest technologies, which can limit their ability to compete in the marketplace. Corporations can help by providing access to technology and training on how to use it effectively.
- **Creating market linkages:** MSMEs often struggle to access markets, especially larger corporate supply chains. Corporations can help by creating linkages between MSMEs and their own supply chains or by providing access to new markets.
- **Supporting social enterprises:** Social enterprises are businesses that have a social or environmental mission as well as a profit-making goal. Corporations can support social enterprises by providing funding, mentorship, and other forms of support.
- Corporates could mention CSR initiatives taken by them towards MSME in their annual reports.

Industrial parks are designed to attract businesses and promote economic growth by providing infrastructure, services, and amenities that support the needs of the industries located within them.

Common areas such as parks, restaurants, and meeting spaces can create a sense of community among businesses located in the park, which can foster collaboration and knowledge-sharing. This can lead to innovation and increased competitiveness among businesses, which can ultimately benefit the local economy.

Industrial areas and warehouses can provide cost-effective storage and distribution solutions for businesses located in the park, which can help reduce operating costs and improve supply chain efficiencies. Additionally, centralized lab facilities and quality control departments can help businesses ensure that their products meet high quality standards, which can improve customer satisfaction and increase brand reputation.

Public-private partnerships can be particularly effective in the development and management of industrial parks, as they can leverage the expertise and resources of both the public and private sectors.

This can help ensure that the park meets the needs of both businesses and the community and can lead to more sustainable and equitable economic growth.

Logistics cost is a significant expense for many enterprises, particularly those that rely on the transportation of goods and services. Sharing logistics services among different enterprises in a business park can help to reduce costs and improve efficiency.

Common Transportation: By pooling transportation resources, businesses can reduce their transportation costs. For example, a shared fleet of trucks can be used to transport goods for multiple enterprises in the park, which can help to reduce transportation costs and improve efficiency.

Shared Labor: Enterprises can share labor resources for transportation and logistics operations. This can include sharing drivers, warehouse workers, and other staff. Sharing labor resources can help to reduce labor costs and improve efficiency.

Unified IT Systems: Enterprises can share IT systems, such as warehouse management systems and transportation management systems. This can help to reduce the cost of implementing and maintaining these systems.

Collaborative Planning: Enterprises can collaborate on planning and scheduling transportation and logistics operations. This can help to optimize routes, reduce empty miles, and improve efficiency.

This section contains several firsts in India that has the potential to be game changers for the state of Karnataka. A summary is presented below: (Exhibit 52)

Exhibit 52

Representation of the collegium[1]

HealthScore™	The HealthScore™ is a tool to evaluate the financial and operational health of MSMEs, involving a collegium of district commissioner, chambers of commerce, district MSME director, local ICAI branch, and representatives from an educational institution and a lead bank. The tool can assess MSMEs based on a scoring system out of 10 and provide a summary of their performance and creditworthiness, which can be used by investors and stakeholders to make informed decisions and help MSMEs identify areas for improvement.
MSME fund of funds	The lack of access to capital markets is a major challenge for MSMEs, but the government can address this by creating an MSME Exchange and Fund of Funds worth INR 1,000 crore to invest in high credit-rated MSMEs that want to raise capital from the capital market.
Online think tank group	An online think tank group is a valuable platform for professionals to network, exchange knowledge and ideas, and collaborate on projects. Industry leaders and professors can act as mentors and guides, while regular discussions and meetings ensure productive conversations moderated by a facilitator.

1. MSME committee

Benefits for MSME

Benefits from implementing the suggested changes

According to MSME registration and employment data, 3.5 lakh MSME have been registered, which have created around 20 lakh jobs in FY 2022-23, Karnataka has about 5.5 lakh students graduating every year. Employment generated by MSME sector can fulfil majority of job requirements of job aspirants. MSMEs have a higher propensity to innovate which in turn, can lead to the creation of additional jobs at a surging trend in the future. (Exhibit 53)

Karnataka, and especially Bangalore, is known as a major hub for IT/ BT (Information Technology/ Biotechnology) industries in India. There is a large ecosystem of start-ups, service providers, and support industries. Karnataka is also home to several renowned hospitals and medical colleges, making it a destination for healthcare-related jobs. Overall, Karnataka offers a diverse range of job opportunities across various sectors, and its cosmopolitan culture and pleasant climate make it a popular choice for job aspirants.

However, we must ensure local population have access to job opportunities in their home state, give preference to local candidates who have the necessary qualifications and skills.

MSME will become more efficient and competitive through a combination of strategies including improving their operations, leveraging technology, marketing effectively, and managing their finances efficiently.

MSME portals offer various services, including networking opportunities, knowledge sharing, and seeking support.

GeM portal will help MSMEs to promote their products and reach new customers and to get competitive advantage.

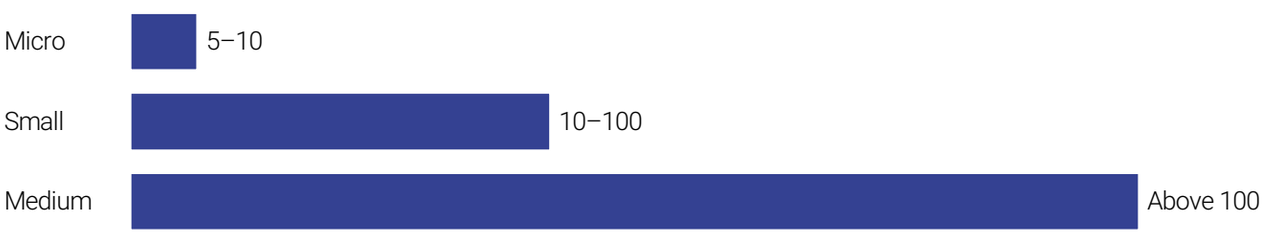
Governments may provide stipends for a period of one year to support interns, graduates, employees. Individuals can pursue educational opportunities or navigate challenging financial circumstances.

On-the-job skilling is becoming increasingly important in today's rapidly changing job market, where technological advancements and shifting industry trends require workers to continuously adapt and learn new skills. It can also be a cost-effective way for organizations to develop their employees' skills and improve their overall performance.

Government could create an environment for MSME that is conducive to entrepreneurship and business growth. Barriers to entry, complex regulations, or inefficient bureaucracies make it difficult for businesses to operate and grow

Exhibit 53

MSME category-wise estimated employment generated[1]



1. Karnataka economic survey

Conclusion (Exhibit 54)

Types of MSME clusters[1]

~5.85L
MSMEs in Karnataka

~5.5L
# of graduates every year

~30%
Contribution to state GDP

20L
# of additional jobs created every year (1,00,000 x 20 jobs/MSME)

1. Karnataka economic survey

Karnataka has been a torchbearer for many first initiatives such as IT/BT/Start-ups/EV its time we do something radical and transformational for MSMEs sector.

MSMEs faced challenges such as lack of finance, limited market access, high competition, and regulatory hurdles. Conflicts were resolved through arbitration, mediation, and conciliation, with MSMEs implementing suggestions aimed at improving competitiveness and growth. MSMEs played a significant role in creating jobs through expansion, diversification, and collaboration, while also contributing to the skilling of youth through training and development programs. MSMEs demonstrated resilience and adaptability, becoming critical components of many national economies. However, there is still much work to be done to ensure their continued success.

MSMEs face several challenges that have been exacerbated in recent times. These challenges include the impact of demonetization, the complexity of the GST compliance process, the COVID-19 pandemic, competition from MNCs and start-ups, and the lack of professionalization. In addition, consolidation through mergers and acquisitions can be challenging for MSMEs due to limited resources, cultural differences, and challenges in finding suitable partners.

It is crucial to address these challenges and provide support to the MSME sector to ensure its continued growth and contribution to the Karnataka economy. By implementing the side measures the government can address the critical issue of lack of finance, marketing, technology, proper skilling training and infrastructure for the MSME sector will have several positive impacts:

Increased contribution to GDP: MSMEs plays a crucial role in the Karnataka's economy, contributing significantly to the country's GDP. Addressing the critical issues which can help the state archive its target of 1$ trillion GDP by 2032.

Increased employment opportunities: MSMEs are major employers in the Karnataka's economy, and addressing the critical issues they face can lead to increased employment opportunities. With better access to finance and support for marketing, technology, and infrastructure, MSMEs can expand their operations, hire more workers, and contribute to overall economic growth.

Increased competitiveness: MSMEs face intense competition, particularly from larger companies. Addressing the critical issues they face, can help MSMEs become more competitive by providing them with access to modern technology, marketing strategies, and training programs. This, in turn, can help them compete more effectively in the market.

Improved productivity and efficiency: Addressing the critical issues of lack of technology, proper skilling training, and infrastructure can help MSMEs improve their productivity and efficiency. This can help them produce goods and services at a lower cost, which can lead to higher profitability and competitiveness.

Improved access to finance: The lack of access to finance is a major challenge for MSMEs. Addressing this issue can help MSMEs obtain the necessary capital to expand their operations, invest in new technology and infrastructure, and become more competitive in the market. (Exhibit 55)

Exhibit 55

Summary of schemes proposed in document[1]

Schemes	India allocation (cr)	Karnataka allocation (cr)
Credit Guarantee Trust Fund for MSE's (CGTMSE)	9,000	900
MSME-Sustainable (ZED)	16	1.6
MSME-Competitive (Lean)	19.43	2
MSME-Innovative	23.16	2.3
A Scheme for Promotion of Innovation, Rural Industries, and Entrepreneurship (ASPIRE)	15	1.5
Prime Minister Employment Generation Programme (PMEGP)	2,500	250
Scheme of Fund for Regeneration of Traditional Industries (SFURTI)	170	17
MSME fund of fund		**1,000 (to start with)**

1. MSME committee

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i Karnataka economic survey

ii GDP performance and value forecast

iii Medium Enterprises (MSMEs) committee

CHAPTER

09

Formal Employment





Summary

Karnataka has one of the fastest growing and largest state economies in India, with a per capita gross state domestic product (GSDP) of INR 3.05 lakh in the fiscal year 2021–22.[ii] The state's increasing economic growth is reflected in high job creation. Karnataka's net formal employment generation from September 2017 to November 2022 was 67.94 lakh, according to an analysis of the Employee's Provident Fund Organisation (EPFO) and the Employee's State Insurance Corporation (ESIC) monthly data. Even though Karnataka holds just 4.75 percent of India's total population, the state accounts for a much higher percentage of net formal jobs added in the last five years. This is reflected in both the EPFO payroll and the ESIC member database, which is the second highest after Maharashtra.

According to statistics, approximately 45 percent of Karnataka's estimated population (6.66 crore in 2022, or 2.99 crore) are employed. Like the rest of India, the majority of workers remain in the informal sector, particularly in agriculture. They lack access to social security benefits, such as the employee provident fund, medical insurance, gratuity, and maternity leave, making them extremely vulnerable to market uncertainties.

This report analyses the formal workforce data for India and Karnataka, based on both EPFO and ESIC monthly or annual reports, while taking into account the number of state and central government employees who are formally employed. A comprehensive analysis is made of job scenarios in India based on age, sector, gender, and states using the EPFO, ESIC, National Pension System, and e-Shram data.

The analysis shows that, of the estimated 2.99 crore people in the workforce in Karnataka, 24.74 percent are employed in the formal sector. This is 4.74 percent higher than the national average of 20 percent. Since 46.6 percent of Karnataka's total workforce is in the agriculture sector, which is informal by nature, the remaining 1.59 crore (53.4 percent) work in the non-agriculture sector. Within the non-agricultural sector, 46.54 percent of workers are employed in the formal sector, 9 percent higher than India's formal sector employment in the aforementioned sector.

An analysis of the EPFO payroll data for the past five years (depicted in Table A below) shows that Karnataka has added 49.94 lakh formal jobs, with an annual addition of an average of 8.32 lakh jobs, linked to EPFO alone. This accounts for approximately 10.49 percent of India's total formal net addition of jobs reflected on the EPFO database. Karnataka is second only to Maharashtra in net EPFO job additions. (Exhibit 56)

Exhibit 56

Net new subscribers on EPFO in India and Karnataka (KA)

In lakhs

Year	India (new methodology)	India (old methodology)	Karnataka (old methodology)	% of KA to India
2017–18 (from Sep)	73.8	15.5	1.48	9.5%
2018–19	112.5	61.1	6.2	10.1%
2019–20	94.7	78.5	8.1	10.3%
2020–21	94.5	77.0	7.5	9.79%
2021–22	138.2	122.3	15.0	12.26%
2022 (Apr to Nov)	112.1	105.4	11.6	11%

Separately, the ESIC data shows that Karnataka added 24 lakh formal jobs between September 2017 and March 2021, trailing only Maharashtra and Tamil Nadu. Assuming that a quarter of these jobs overlap with EPFO, we can deduce that the state has added a total of 67.94 lakh jobs in the formal sector (49.94 lakh EPFO and 18 lakh ESIC), excluding government jobs.

The unemployment rate in Karnataka is 2.7 percent according to the latest PLFS report, compared to 4.2 percent for India as a whole.

Although Karnataka is a prominent, formal job-generating state, there is a need to accelerate formal job creation as well as formalise the existing informal job sector. Bringing unorganised sector employees into the formal sector by removing regulatory barriers and through skilling programmes could have positive economic and social implications.

The report offers several suggestions to the Karnataka government regarding formalising jobs. It could consider the following actions:

- Carry out district-wise data analysis of formal job creation.
- Introduce a scheme to pay employers' contributions to social security benefits for the first couple of years.
- Identify ten impoverished and underprivileged districts and introduce an incentive programme for formal job creation.

The job scenario in Karnataka and India

Karnataka aims to become a $1 trillion GDP economy by 2032, aligning with India's goal of achieving a $10 trillion GDP over the next decade and contributing 10 percent of the national GDP by 2032.

Karnataka is the second-most prominent formal-job-generating state for young people, after Maharashtra. The state's sizeable revenue comes from the service sector, primarily information technology (IT) and start-ups (the services sector contributed 66.1 percent to GSVA in 2021–22), followed by the industrial[i] and agricultural sectors at 19.8 and 14.1 percent respectively. Karnataka is the second-highest goods and services tax (GST) collecting state after Maharashtra – its GST collection in 2021–22 was INR 42,761 crore. The state surpassed Gujarat by collecting INR 59,035 crore in GST in the first six months of financial year 2022–23[iii]. In fact, for the third consecutive month, the state's monthly GST collection surpassed INR 10,000 crore.

In terms of job creation, the Karnataka Employment Policy 2022–25 aims to create 7.7 lakh jobs over the next three years, primarily in the textile and garment industry. Meanwhile, the Karnataka Digital Economy Mission (KDEM) is expected to create 10 lakh jobs by 2025, the majority of which will be in the IT sector.

According to the 2011 Census, 2.78 crore out of 6.11 crore people (45.49 percent) in Karnataka were engaged in work activities. The census report of 2001 showed that 2.35 crore out of 5.29 crore people (44.42 percent) were either employed or were in the working category. After that, there was a 1.07 percent increase in the number of people engaged in work activities between 2001 and 2011. With an estimated population of 6.66 crore as stated by the Karnataka Economic Survey 2021–22, around 2.99 crore people (around 45 percent) may be employed or working in the state.

However, the number of people between the ages of 22 and 60 who are eligible to work could be much higher than the actual number of people working or employed. The analysis of this is given below.

Karnataka's population versus the working population

Of Karnataka's 6.66 crore population, the number[iii] of infants and children below the age of six is 63 lakhs, considering that, on average, 10.55 lakh babies are born in the state every year according to the Civil Registration System data. The Department of School Education data shows that approximately 1.2 crore children go to school (including higher secondary students) in Karnataka. The number of college-going students, most of whom have yet to join the workforce, is 21.82 lakh, as reflected in the Department of Higher Education's (AISHE) report 2020–21. Apart from this, Karnataka has 76.58 lakh people above the age of 60, according to the Karnataka: A $1 Trillion GDP Vision report. Therefore, cumulatively, a substantial 2.82 crore people (42.34 percent) of Karnataka's total population of 6.66 crore remain out of the workforce because of their age and occupation. This implies that the remaining 57.66 percent (3.83 crore) of Karnataka's total population is eligible to participate in the workforce.

That said, the Periodic Labour Force Survey annual report of 2020–21 and extrapolation of the census data of 2001 and 2011 place Karnataka's worker population ratio at 43.5 percent and 46.5 percent, respectively, with an average working poverty rate (WPR) of 45 percent, 2.99 crore. Approximately a 12.5 percent gap exists between the actual population eligible to work (57.55 percent) and those who are in the workforce (45 percent). In other words, around 76 lakh people who could potentially be employed remain out of the workforce. One of the reasons for the gap could be the large proportion of women aged between 22 and 60 who remain out of the workforce, either out of choice, or due to marriage, child bearing, and so forth. The unemployment rate (UR) in Karnataka is 2.7 percent in contrast to the national unemployment rate of 4.2 percent, according to the PLFS report.[iii] Unemployment among women is slightly higher at 2.8 percent compared to men (2.7 percent). The UR in urban areas is higher at 3.8 percent compared to rural areas (2.2 percent).

India's population versus the working population

India's population, according to the 2001 Census, was 102 crores with a working population[iii] ratio of 39.11 percent (39.89 crore). The working population ratio increased by 0.67 percent in 2011 compared to 2001. Applying the same logic to 2022, around 40.45 percent (57 crore) of India's estimated population of 141 crore may be employed or working.

However, the number of people aged 22 to 60 who are eligible to work but have remained out of the workforce is on the higher side, as in Karnataka. The analysis to explain this disparity is provided below.

With an average 2.32 crore infants born in the country every year, according to the Civil Registration[iii] System data, an estimated 13.96 crore of children below the age of six are yet to join the formal education system. The Department of School Education's database estimates that there are 26.25 crore[iii] students nationwide; and the 4.14 crore students who have enrolled and are pursuing higher education, according to AISHE report, can be added to this number. India has an elderly population (over 60 years' old) of 14.24 crore, which accounts for 10.1 percent of the total population. The aforementioned categories make up 41.74 percent (58.86 crore) of India's total population. Essentially, this indicates that the remaining 58.26 percent of the population (82.14 crore) is eligible to join the workforce.

However, the actual workforce figures tell a different story.

According to the PLFS annual report 2020–21, India's worker population ratio (referring to the percentage of people employed) is 39.8 percent. An extrapolation of the census data of 2001 and 2011 puts India's worker population ratio (WPR) at 40.45 percent. The WPR of PLFS and the census data is 40.12 percent. This implies that, of the 58.2 percent of India's total population who are eligible to join the workforce, only 40.12 percent are working. Therefore, a gap of 18.14 percent exists – essentially those who remain out of the workforce although they have the potential to work. Again, a large proportion of this is made up of women who remain out of the workforce for reasons such as childbearing and family responsibilities.

India's unemployment rate (UR), as per the PLFS 2020–21 annual report, is 4.2 percent, with an UR of 4.5 percent among men compared to 3.5 percent among women. The UR in urban areas is higher at 6.7 percent compared to 3.3 percent in rural India.

Formal jobs' estimation for India

Informal jobs dominate the Indian labour market. PLFS's annual report 2020–21 shows that 46.5 percent of India's working population is in the agricultural sector (cultivators and labourers), the largest of the informal sectors. Of the remaining working population, 75.3 percent are engaged in other informal sectors. Therefore, around 86.5 percent of India's working population is engaged in the informal sector, while around 13.5 (7.69 crore out of 57 crore) are estimated to be employed in the formal sector with social security benefits, according to the PLFS report.

However, an analysis of the administrative datasets primarily used to gauge formal job creation and formalisation in India, as well as an estimation of government employees,

indicate that the percentage of formal jobs in India could be higher than projected in the PLFS report. The monthly and annual payroll reports of the Employee Provident Fund Organisation (EFPO), which includes private-trust-run provident funds, and the Employees State Insurance Corporation (ESIC) are used to determine the formal job sector in India. An increase in net EPFO enrolment and new ESIC subscribers indicates a surge in job creation, as well as the formalisation of the existing workforce. Since the EFPO data does not include the provident funds to which government employees contribute, an estimation was made to calculate the number of government employees in the formal workforce based on the publicly available statistics.

According to the available data in the EPFO dashboard as of January 2023, 6.83 crore members have contributed monthly to the EPFO – that is, the number of people on payroll and in the formal sector. Establishments' contributions amount to 7.38 lakh. Separately, the number of ESIC members who paid contributions as of November 2022 is 2.77 crore. Assuming that a quarter of ESIC subscribers are also enrolled in the EPFO (to avoid possible overlap), the unique number of subscribers registered with the ESIC is around 2.07 crore. This makes a total of 8.9 crore contributing to EPFO or ESI. These numbers may differ on a month-to-month basis.

The last category in the formal workforce comprises government employees, including those working full time and on contract in the central and state governments, and parastatals that are funded by the budget.

Official data on the total number of government employees for both states and central is not readily available. It is estimated the number of government employees to be 2.5 crore on the basis of various data sources. The Finance Ministry's Pay and Allowance annual report (2019–20) puts the total number of central government civilian employees at 31.33 lakh. Additionally, a report on defence manpower estimates the number of defence personnel in 2019 to be 14.38 lakh. This puts the total number of central government employees at around 46 lakh. However, the number may well have increased since 2019 as the government has been filling vacancies.

Based on estimates, there are 2 crore state government employees. For instance, India has 61.24 lakh teaching and non-teaching staff in state-run and government-aided elementary, secondary, and higher secondary schools according to data sourced from the Department of School Education and Literacy's Unified District Information System for Education. Accurate data on the number of teaching and non-teaching staff in government colleges and universities is not readily available. However, it is estimated to be 10.3 lakh (21.4 percent of all colleges are government-run and 13.6 percent are aided colleges) out of the total 29.45 lakh teaching and non-teaching staff in private, aided, and government colleges in India, according to the All India Survey of Higher Education (AISHE) report 2020–21. This puts the total number of government teaching and non-teaching staff at 71.54 lakh.

In addition, Indian states have large police forces that report to state governments. According to the Bureau of Police Research and Development, the number of police personnel in India was 20.91 lakh in 2020. Apart from education and home, states have massive manpower in several other departments, including revenue, health, public works, transportation, and power, to name just a few. While Karnataka and Kerala have 5.3 lakh[iii] and 5.1 lakh state government employees respectively, larger states like Uttar Pradesh have 16 lakh government employees. Assuming that there is an average of 7.1 lakh government employees per state, including parastatals and those on contract, the total number of state government employees (in 28 states) is approximately 2 crore. As well as direct employees, governments also deploy a huge number of contract employees who are eligible for social security benefits and fall within the ambit of formal employment.

Working on this calculation, India has an estimated 11.4 crore people employed in the formal sector. This includes 6.83 crore EPFO subscribers, 2.07 crore[iii] unique ESIC subscribers, and 2.5 crore government employees, parastatals, and those on contract. As discussed earlier, if India has a working population of 57 crore, it can be deduced that 20 percent of them are part of the formal workforce. Of the total 57 crore workforce, 46.5 percent of them are informal workers in the agricultural sector. Therefore, of the remaining 30.49 crore (53.5 percent) people in the non-agricultural sector, 37.38 percent of them (11.4 crore) are employed in the formal sector.

Formal jobs in Karnataka

In Karnataka, the net EPFO registration in November 2022 was 49.94 lakh, while 24 lakh employees had enrolled in the ESIC in March 2021. Here the same logic has been applied of assuming that a quarter of the ESIC subscribers have enrolled with the EPFO to avoid any overlap. This means that around 18 lakh unique employees have registered with ESIC (subscribers may have increased since March 2021). Another 6 lakh state government employees, including parastatals and contract workers employees, have been added to the "formal employees" category – cumulatively, the number of formal

employees on payroll in Karnataka is around 74 lakhs, which is 24.74 percent of the working population of 2.99 crore (by taking an average WPR of 45 percent). Karnataka has 24.74 percent of the working population engaged in formal sector jobs, which is 4.74 percent higher than the national average of 20 percent. Considering that 46.6 percent of Karnataka's total workforce is engaged in the agriculture sector, the remaining 1.59 crore (53.4 percent) therefore work in the non-agricultural sector. Of this, 46.54 percent workers are employed in the formal sector, which is 9 percent higher than India's formal sector employment in the non-agriculture sector.

An analysis of formal jobs: EPFO and ESIC

As the country moves towards job formalisation in the sector, it is important for India to develop a comprehensive dataset to analyse and understand the formalisation of jobs that is taking place. This is solely lacking. Data exists to calculate this yet still no analysis has taken place, and it will not be of much use to just rely on brief private sector surveys or the much delayed PLFS.

EPFO is one of the major metrics that can be used to understand the formal job trends in India. An analysis of the EPFO data from September 2017 to November 2022 shows that 6.25 crore net new subscribers joined the EPFO subscription base during this period. The term "net new subscribers" refers to the sum of newly joined subscribers, the number of subscribers who exited, and those who re-joined. Of the 6.25 crore net new subscribers, 6.09 crore are new subscribers, indicating that they have joined the formal workforce for the first time. Out of the 6.09 crore new EPFO subscribers, 3.21 crore are in the 18 to 25 age group, reflecting that first-time job seekers have joined the formal and organised sectors in large numbers. Similarly, 4.13 crore out of 7.64 crore new ESIC subscribers who paid contributions between September 2017 and November 2022 are in the same age group. Assuming that a quarter of the ESIC subscribers are also enrolled in the EPFO, 3.09 crore unique subscribers aged 18 to 25 joined the ESIC exclusively in the last five years. Altogether, therefore, approximately 6.3 crore people who joined the EFPO and ESIC since 2017 are first-time job seekers aged 18 to 25.

Further analysis of the EPFO (September 2017 to November 2022) and ESIC (until March 2021) data shows that Karnataka has approximately 67.94 lakh net EPFO and ESIC subscribers, and that it stands second only to Maharashtra (1.26 crore) and is on par with Tamil Nadu (67.98 lakh) in creating or formalising jobs. These figures were deduced by adding the number of net EPFO subscribers and 75 percent of the ESIC subscribers, taking into account the possible overlap between ESIC and EPFO members.

An analysis of EPFO data shows Karnataka has added on average 8.32 lakh job every year and a total of 49.94 lakh in the last five years. The state accounts for 10.49 percent of the net EPFO new jobs added during the same period.

Jobs in the informal and unorganised sector

The informal job sector includes jobs held by farmers, agricultural labourers, owners of small enterprises, domestic workers, street vendors, construction workers, and the self-employed who have not hired any workers and lack social security and workplace benefits. Around 28.55 crore workers in the informal and unorganised sectors have registered with the Ministry of Labour and Employment's e-Shram portal – a national data base of unorganised sector workers that includes migrant, gig, and platform workers which was launched in August 2022. Of this, around 73.81 lakh workers are from Karnataka. However, the number of unorganised workers registered on the e-Shram portal could be far lower than the actual number of informal workers as the registration on e-Shram is still a work in progress. In addition, the data mentioned above are from January 30, 2023, and it is possible that many workers who have registered on e-Shram could be part of the ESIC and EPFO networks.

In the main section of the report below, the formal job sector trends in India are analysed, with special reference to Karnataka. The analysis comprises four sections using data from EPFO, ESIC, the National Pension Scheme (NPS), and the e-Shram portal. While the EPFO, ESIC, and NPS reflect employment trends in the formal sector, the e-Shram data projects the job trends in the informal sector.

EPFO payroll data analysis

The all-India EPFO net payroll data for the past five years shows that about 6.25 crore net new subscribers joined the EPFO scheme from September 2017 to November 2022. It includes newly added subscribers as well as those who exited, re-joined, and re-subscribed. The number of new EPFO subscribers during the same period is 6.09 crore. Data from the past five years suggests an increase in pension fund enrolment during 2021–22, with 1.38 crore net subscribers. This indicates a higher number of people joining the formal workforce, a trend that is also continuing in 2022–23. (Exhibit 57)

Exhibit 57

Number of new EPFO subscribers and net subscribers from 2017 to 22

As per new methodology

Year	Number of new EPF subscribers	Net new EPF subscribers
2017–18 (from Sep 17)	84,57,404	73,84,814
2018–19	1,39,44,349	1,12,50,214
2019–20	1,10,40,683	94,72,468
2020–21	85,48,898	94,54,119
2021–22	1,08,65,063	1,38,20,141
2022 (Apr to Nov)	81,24,848	1,12,15,403
Total	**6,09,81,245**	**6,25,97,151**

From April to November 2022, 81.24 lakh new subscribers joined the EPFO scheme, making them part of the formal workforce for the first time. The net payroll enrolment during the same period was 1.12 crore, signalling a higher rate of job creation in the formal sector during the first eight months of the year compared to the same period in the last financial year (Exhibit 58).

A state-wise comparison of payroll figures shows that Maharashtra, Karnataka, Tamil Nadu, Gujarat, and Haryana are the top five states with the highest EPFO enrolment in the last five years (Exhibit 59). These states have added 2.78 crore jobs to the formal workforce between September 2017 and November 2022. They account for 44.48 percent of the overall net EPFO payrolls generated since September 2017, contributing more formal jobs and a higher rate of formalisation of the workforce than rest of India. Karnataka has the second highest net EPFO payroll creation at 49.94 lakh, which makes up 7.9 percent of India's overall net EPFO subscription. Karnataka is next to Maharashtra (1.03 crore) in the net subscription. The state is followed by Tamil Nadu (46.81 lakh), Gujarat (41.02 lakh), and Haryana (37.07 lakh).

Karnataka is also one of the fastest growing states, as per the GSDP. An analysis by the Reserve Bank of India shows an annual growth rate of 8.9 percent in Karnataka's GSDP for the last five years (2017–22). Among the four other top formal job-creating states, Gujarat stands second, with an 8.2 percent compound annual growth rate (CAGR).

Exhibit 58

EPFO India data for April to November 2022

As per new methodology

Year	Number of new EPF subscribers	Net new EPF subscribers
April	10,55,578	14,30,336
May	10,45,639	13,83,813
June	11,43,830	15,19,941
July	11,59,350	15,50,435
August	10,52,120	14,15,563
September	10,00,356	14,05,564
October	7,68,643	11,08,592
November	8,99,332	14,01,159
Total	**81,24,848**	**1,12,15,403**

Exhibit 59

The top five states with net EPFO payrolls from September 2017 to November 2022

State	Net EPFO subscribers	CAGR (GSDP real growth last five years)
Maharashtra	1,03,71,812	5%
Karnataka	49,94,712	8.9%
Tamil Nadu	46,81,011	7.1%
Gujarat	41,02,499	8.2%
Haryana	37,07,129	6.9%
Total	**2,78,57,163**	

The annual data of net new EPFO payrolls in the top five states since September 2017 is reflected in (Exhibit 60) below. Maharashtra, Karnataka, Tamil Nadu, Gujarat, and Haryana have consistently topped the chart, except for 2018–19 when Delhi overtook Haryana by adding a higher number of formal jobs. On average, Maharashtra has added 20 lakh employees to the formal workforce every year, while second-placed Karnataka added about 8.32 lakh formal jobs per year.

Since the EPFO state data is published using the old methodology, a comparison of EPFO data for India and Karnataka over the past five years shows that the state accounts for 10.49 percent of the total EPFO net payrolls added in the country. The state has, on average, added 8.32 lakh formal jobs linked to EPFO annually (Exhibit 61).

An analysis of EPFO payroll data for the South Indian states shows that Karnataka and Tamil Nadu are the top formal job-generating states. Karnataka and Tamil Nadu added 49.94 lakh and 46.81 lakh net new EPFO members respectively between September 2017 and November 2022. Telangana is a distant third with 27.82 lakh jobs added in the formal sector. Andhra Pradesh has added 10.49 lakh members, and Kerala 5.04 lakh, the least in the southern states (Exhibit 62).

Exhibit 60

State-wise EPFO net new payroll data from 2017 to 2022

States	2017–18 (from Sep)	States	2018–19	States	2019–20
Maharashtra	4,58,331	**Maharashtra**	15,75,943	**Maharashtra**	17,44,149
Karnataka	1,48,595	**Karnataka**	6,17,989	**Karnataka**	8,12,122
Tamil Nadu	1,38,765	**Gujarat**	5,55,525	**Tamil Nadu**	8,03,634
Gujarat	1,76,328	**Tamil Nadu**	5,02,020	**Gujarat**	7,15,146
Haryana	1,14,166	**Delhi**	3,96,395	**Haryana**	5,91,348

States	2020–21	States	2021–22	States	2022–23 (until Nov)
Maharashtra	14,95,493	**Maharashtra**	29,44,850	**Maharashtra**	21,53,046
Karnataka	7,54,982	**Karnataka**	15,01,013	**Karnataka**	11,60,011
Tamil Nadu	6,64,278	**Tamil Nadu**	14,17,006	**Tamil Nadu**	11,55,308
Gujarat	6,24,237	**Gujarat**	10,98,977	**Haryana**	9,32,448
Haryana	6,20,298	**Haryana**	10,63,809	**Gujarat**	5,78,003

Exhibit 61

EPFO net new subscribers for India and Karnataka in the past five years

Year	India (new methodology)	India (old methodology)	Karnataka (old methodology)	% of KA to India
2017–18 (from Sep)	73,84,814	15,52,940	1,48,595	9.5%
2018–19	1,12,50,214	61,12,223	6,17,989	10.1%
2019–20	94,72,468	78,58,394	8,12,122	10.3%
2020–21	94,54,119	77,08,375	7,54,982	9.79%
2021–22	1,38,20,141	1,22,34,625	15,01,013	12.26%
2022 (Apr to Nov)	1,12,15,403	1,05,42,392	11,60,011	11%

State data is published in the old methodology only.

Exhibit 62

EPF net new payrolls added in the five southern states between September 2017 and November 2022

States	2017–18 (Sep to Apr)	2018–19	2019–20	2020–21	2021–22	2022–23 (until Nov)	Total
Karnataka	1,48,595	6,17,989	8,12,122	7,54,982	15,01,013	11,60,011	**49,94,712**
Tamil Nadu	1,38,765	5,02,020	8,03,634	6,64,278	14,17,006	11,55,308	**46,81,011**
Telangana	94,407	4,04,079	4,38,697	4,17,091	7,57,548	6,70,238	**27,82,060**
Andhra Pradesh	54,286	1,51,024	1,62,166	1,87,086	2,73,104	2,22,147	**10,49,813**
Kerala	18,304	56,620	81,140	74,533	1,40,378	1,34,001	**5,04,976**

A study of industry- and sector-wise EPFO payroll data indicates that the "expert services" category (that includes manpower agencies, private-security agencies, small contractors, etcetera) constitutes about 38 percent of the new formal jobs added in the last five years (Exhibit 63). This category added 2.02 crore jobs to the formal sector in the last five years, whereas the remaining eight major sectors (including trading and commercial establishments, building and construction, engineering, developing electronic, mechanical and general engineering products, textiles, and garment making) added 1.56 crore jobs. Sectors and industries that added jobs in relatively smaller numbers were not considered in this analysis.

Gender-wise analysis of EPFO payroll data shows that male employees clearly outnumber women in terms of new enrolments in the formal job sector (Exhibit 64). Around 4.7 crore new male workers (77.42 percent) joined the formal workforce between September 2017 and November 2022. However, the number of women who newly enrolled in the formal job sector during the same period was only 1.37 crore. (It should be noted that new subscribers are not the same as net subscribers.)

The number of new enrolments among women fell sharply during the pandemic between 2021 and 2021 but picked up the following year. Women accounted for approximately 22.66 percent of the 6.07 crore new EPFO enrolments in the past five years, which is comparable to India's female labour force participation rate of 19 to 30 percent (depending on which survey we refer to).

Exhibit 63

Industry- or sector-wise PF-linked employee data (not all industries are included)[1]

Industry	2017–18 (from Sep 17)	2018–19	2019–20	2020–21	2021–22	2022 (Apr to Nov)	Total
Expert services	9,54,297	27,98,272	35,21,187	37,02,953	51,67,400	41,21,761	**2,029,16,622**
Building and construction	1,54,845	4,52,675	5,13,766	4,66,721	6,03,086	5,72,551	**27,63,644**
Engineers – engineering contractors	2,09,826	4,06,651	4,22,191	3,11,799	6,18,479	5,93,214	**25,62,160**
Trading – commercial establishments	39,335	3,82,623	5,22,641	3,42,805	8,67,423	5,99,670	**28,48,361**
Electric, mechanical, or general engineering products	39,426	3,01,241	3,81,283	3,83,408	4,91,430	5,56,159	**21,52,947**
Establishments engaged in cleaning, sweeping services	60,207	1,39,640	1,78,371	2,50,182	3,32,253	3,09,443	**12,70,096**
Textiles	-686	1,05,941	1,67,123	1,71,866	3,10,216	1,38,201	**8,92,661**
Manufacture, marketing, and usage of computers	50,487	2,13,192	2,70,350	2,01,862	4,36,692	3,03,079	**14,75,633**
Others	25,793	1,08,262	1,51,473	2,18,173	3,35,552	8,29,719	**16,68,972**

1. Jobs committee

Exhibit 64

New additions to EPFO payroll data gender-wise split

Year	2017–18 (Sep to Apr)	2018–19	2019–20	2020–21	2021–22
2017–18 (from Sep 17)	69,23,343	15,32,496	18.1%	1,565	84,57,404
2018–19	1,10,20,080	29,23,962	20.9%	305	1,39,44,347
2019–20	85,18,567	25,20,661	22.8%	274	1,10,39,502
2020–21	66,03,664	19,45,016	22.7%	139	85,48,819
2021–22	81,02,042	27,62,764	25.4%	135	1,08,64,941
2022 (until Nov)	58,49,037	20,94,664	26.3%	82	79,43,783
Total	**4,70,16,733**	**1,37,79,563**	**22.7%**	**2,500**	**6,07,98,796**

However, the percentage of women is increasing year on year, from 20.9 percent in 2018–19 to 26.3 percent in 2022–23. It is a very encouraging sign that an increasing number of women are joining the formal workforce.

Between September 2017 and November 2022, 58 percent of EPFO's net new members were between the ages of 18 and 25. This is consistent with India's demographics, where 52 percent of the population is under 30 years' old. Of the 4.6 EPFO members who entered the labour market formally in the past five years, 2.61 crore are between the ages of 18 and 25. The second highest number of employees to have joined the formal workforce are those aged between 29 and 35. Around 76.67 lakh people in the aforementioned age group are new subscribers to the EPFO since September 2017 (Exhibit 65).

Employees State Insurance Corporation data analysis

The ESIC is another government social security scheme that can be used to measure new additions to the formal workforce. The central government has mandated that all factories and shops with ten or more employees be covered under the ESIC scheme. Around 7.64 crore new members were registered with the ESIC and made monthly contributions between September 2017 and November 2022. Males made up 82 percent of those who contributed during this period, while around 17 percent were female. The gross enrolments of new subscribers with ESIC show that a higher number of enrolments (1.51 crore) was reported in 2019–20, followed by 2018–19 (1.49 crore). Relatively fewer members (1.15 crore) enrolled during the pandemic in 2020–21 (Exhibit 66).

Of the 7.64 crore employees who have joined ESIC since September 2017, many have ceased to pay their contributions over the years. In November 2022, 2.77 crore employees paid their contributions while 1.68 crore members ceased to pay. The relatively low percentage of women in ESIC infers that more women prefer higher paying service jobs.

Exhibit 65

Age band of EPFO net new subscribers from September 2017 to November 2022

Year	18 and below	18–25	26–28	29–35	35 and above
2017–18 (from Sep 17)	51,766	36,21,056	9,65,826	13,50,913	13,95,253
2018–19	1,01,851	56,41,038	13,86,142	19,99,329	21,21,854
2019–20	90,583	50,56,538	10,76,090	15,85,116	16,64,141
2020–21	74,743	48,59,426	11,27,131	16,15,413	17,77,406
2021–22	79,443	72,43,982	18,81,250	23,83,306	22,32,160
2022 (Apr to Nov)	58,339	56,99,111	16,03,762	20,10,465	18,43,726
Total	**4,56,725**	**3,21,21,151**	**80,40,201**	**1,09,44,542**	**1,10,34,540**

Exhibit 66

Number of newly registered employees who contributed to the ESI scheme from 2017 to 2022

Year	Male	Female	% of Female workers	Others	Total
2017 (from Sep 17)	70,40,477	12,95,044	15.5%	408	83,35,929
2018–19	1,24,7`7,559	24,87,796	16.6%	617	1,49,65,972
2019–20	1,24,36,076	27,08,698	17.8%	487	1,51,45,261
2020–21	96,33,468	18,71,494	16.2%	340	1,15,05,302
2021–22	1,21,60,216	27,52,021	18.4%	461	1,49,12,698
2022–23	N/A	N/A		N/A	1,15,36,217
Total	**5,37,47,796**	**1,11,15,503**	**16.9%**	**2,313**	**7,64,01379**

As of March 2021, Maharashtra and Tamil Nadu have registered the highest number of new ESIC members (31.14 lakh and 28.22 lakh respectively), demonstrating the higher share of industry in both states' GDP. (The state-wise data for months post March 2021 is not available). It is followed by Karnataka (23.83 lakh), Uttar Pradesh (18.25 lakh), and Haryana (16.88 lakh). The trend is similar to that of EPFO payroll additions, where Maharashtra, Karnataka, Tamil Nadu, and Haryana top the list (Exhibit 67).

This is a clear indication that these four states generate a higher number of formal jobs in India compared to the rest. Gujarat, which has the fourth highest number of EPFO registrations, does not make it into the ESIC's top five list. Gujarat has added just about 12.52 lakh new ESIC members as of March 2021. Even though industry accounts for a very high percentage of GDP in Gujarat, automation is creating more highly skilled jobs there.

Among the South Indian states, as of March 2021, Tamil Nadu and Karnataka recorded the highest number of ESIC enrolments (28.22 lakh and 23.83 lakh, respectively). This is similar to the trend seen in the EPFO subscription. These two states are followed by Telangana (12.81 lakh), Andhra Pradesh (9.66 lakh), and Kerala (8.15 lakh). See (Exhibit 68) for details. The higher number of ESIC subscribers in Tamil Nadu compared to Karnataka could be an indication of higher industrialisation in Tamil Nadu, with a higher share of GDP in the industrial sector.

The ESIC data for the past five years shows that, of the 6.48 crore new members who joined the social security scheme and paid contributions over that period, more than half of them belong to the 18 to 25 age band (3.5 crore). Overall, 77.7 percent of the new ESIC subscribers are between the ages of 18 and 28, a trend similar to that of EPFO, indicating a larger share of youth in the formal workforce (Exhibit 69).

Exhibit 67

Top five states with ESIC coverage as on 31 March 2021

In millions

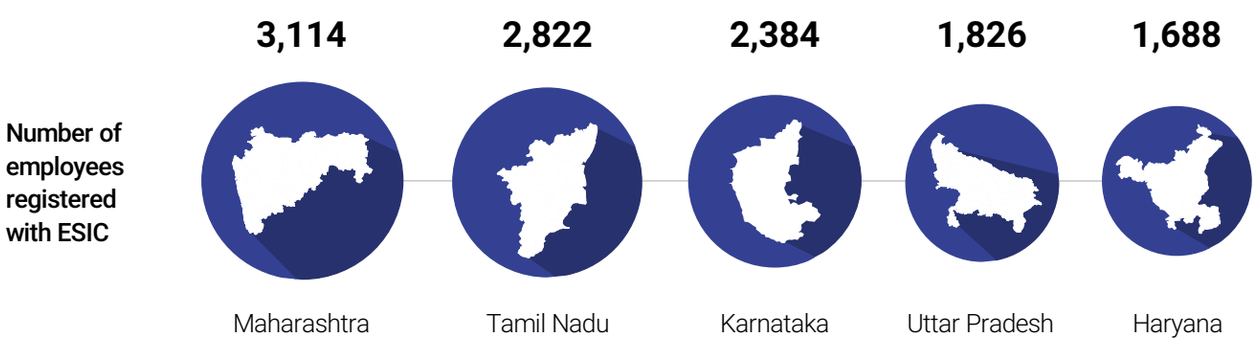


Exhibit 68

ESIC coverage in South Indian states as on 31 March 2021

In millions

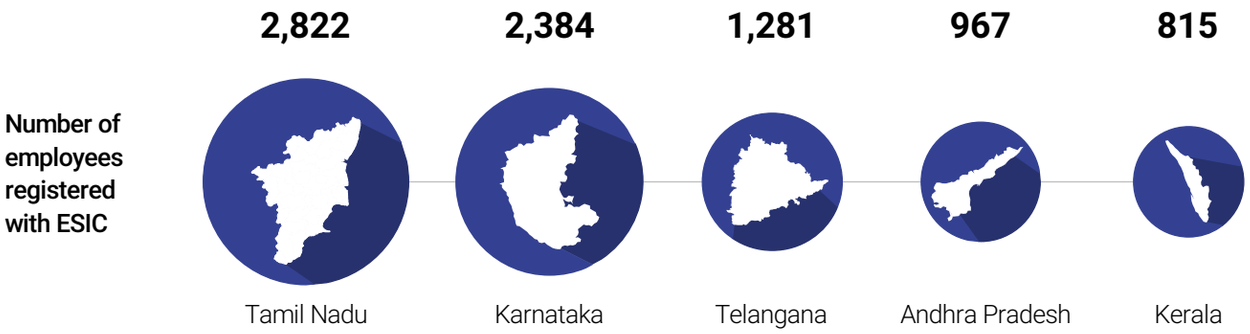
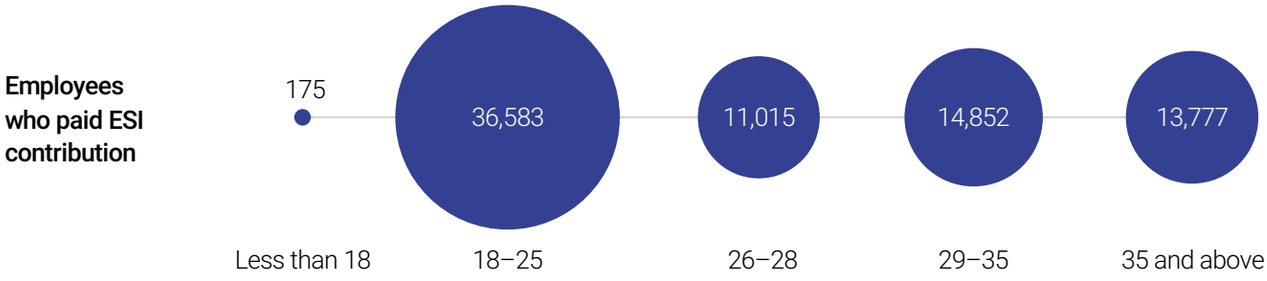


Exhibit 69

Age-wise ESIC data for the last five years

2017 (September) to 2022 (November), in millions



National Pension Scheme data analysis

Similar to the EPFO and ESIC, the National Pension System (NPS) database also reflects the number of formal jobs added to the Indian employment market. As far as the NPS data is concerned, as of September 2022, around 92.6 lakh people had contributed to the NPS from the central government, the state government, and the corporate sector. The formal jobs created under the NPS over the past five years saw a marginal increase, with around 27.8 lakh people joining the scheme between September 2017 and September 2022. A total of 55.7 lakh members have subscribed to NPS through the state government, which is the highest among the three sectors. This is followed by the central government employees (22.8 lakh) and the corporate sector (14 lakh). (Exhibit 70). Atal Pension Yojana is excluded in the analysis.

The gender breakdown of new NPS subscribers over the past five years shows that male subscribers outnumber female subscribers by a large margin. This is similar to the EPFO and ESIC subscriber patterns, indicating that male employees outnumber female employees by a large number in the Indian formal job sector. Exhibit 71 shows that, of the 30.2 lakh newly added NPS members since September 2017, nearly 65 percent of them are men, but the percentage of women here is higher than for EPFO and ESI.

Exhibit 70

The annual cumulative NPS subscriber's data for the last five years

Year	Central government	State government	Government NPS total	Corporate sector	Total
2017–18	19,21,673	38,67,544	57,89,217	6,95,831	64,85,048
2018–19	19,84,564	43,21,325	63,05,889	8,03,015	71,08,904
2019–20	21,01,972	47,53,870	68,55,842	9,73,560	78,29,402
2020–21	21,75,846	51,40,504	73,16,350	11,25,163	84,41,513
2021–22	22,83,671	55,76,986	78,60,657	14,04,569	92,65,226

Exhibit 71

Gender-wise split of new NPS subscribers added in the last five years

Year	Male	Female	% of Female employees	Transgender	Total
2017 (from Sep 17)	3,31,918	1,21,524	26.8%	4	4,53,446
2018–19	5,33,620	2,16,699	28.8%	7	7,50,326
2019–20	5,38,417	2,18,696	28.8%	21	7,57,134
2020–21	4,52,368	1,76,432	28.05%	27	6,28,827
2021–22 (till Oct)	2,98,043	1,35,315	31.22%	46	4,33,404
Total	**21,54,366**	**8,68,666**	**28.7%**	**105**	**30,23,137**

However, the age-wise analysis of the NPS data indicates a reverse trend compared with EPFO and ESIC. A large number of EPFO and ESIC subscribers are aged between 18 and 28. However, in the case of the NPS, most subscribers are aged 29 and above (Exhibit 72).

Informal employment

Analysis of the EPFO and ESIC data places Karnataka among the top five states for generating formal employment in India. However, in the informal sector, about 73.81 lakh workers from Karnataka have registered on the e-Shram portal.

The state does appear on the top five list for the informal sector compared to the formal sector database. At national level, as many as 28.55 crore informal workers have registered on the e-Shram portal as of 30 January 2023.

Exhibit 72

NPS age-wise data of existing subscribers

Age band	2017 (from Sep-17)	2018–19	2019–20	2020–21	2021–22 (until Oct 22)
18–21 years	32,103	36,229	35,049	11,381	15,928
22–25 years	4,31,700	4,37,372	4,08,330	2,67,231	2,80,428
26–28 years	8,44,402	8,64,314	8,55,936	6,73,322	6,17,305
29–35 years	21,43,203	23,21,893	26,14,371	28,26,029	24,79,975
35 years and above	21,14,343	23,63,638	28,61,286	37,44,535	34,21,265

The actual number of informal workers in Karnataka could be a lot higher than the data reflected on the e-Shram portal. As discussed previously, the estimated number of the working population in Karnataka is 2.99 crore, of which 24.74 percent (73.97 lakh) are in the formal sector. The remaining 2.25 crore can be considered informal sector employees, thus estimating that around 1.51 crore informal workers in Karnataka are yet to register on the e-Shram portal.

Similarly, if India has an estimated working population of 57 crore, of which 20 percent (11.4 crore) are employed in the formal sector, 45.6 crore people are likely to be working in the informal sector. Since around 28.55 crore people have already registered on the e-Shram portal, around 17.05 crore employees in the informal sector are yet to register on the e-Shram.

Uttar Pradesh, with an estimated population of 24.1 crore, has registered the highest number of informal workers at 8.3 crore, nearly one-fourth of the total registrations on the e-Shram portal. Simply put, one-fourth of Uttar Pradesh's population has declared themselves to be informal sector workers. Uttar Pradesh is followed by Bihar (2.85 crore), West Bengal (2.57 crore), Madhya Pradesh (1.68 crore), and Maharashtra (1.34 crore) with the highest number of informal workers registered on e-Shram (Exhibity 73).

At national level, the largest number of workers who have registered are from the agricultural sector (14.92 crore), followed by domestic and household workers (2.79 crore), construction (2.58 crore), apparel (1.78 crore), and miscellaneous (1.21 crore). Overall, around 52 percent of the informal job registrations are from the agricultural sector, while 48 percent are from various other sectors in the non-agricultural category (Exhibit 74).

Exhibit 73

Top 5 states to register unorganised workers on e-Shram portal

In millions

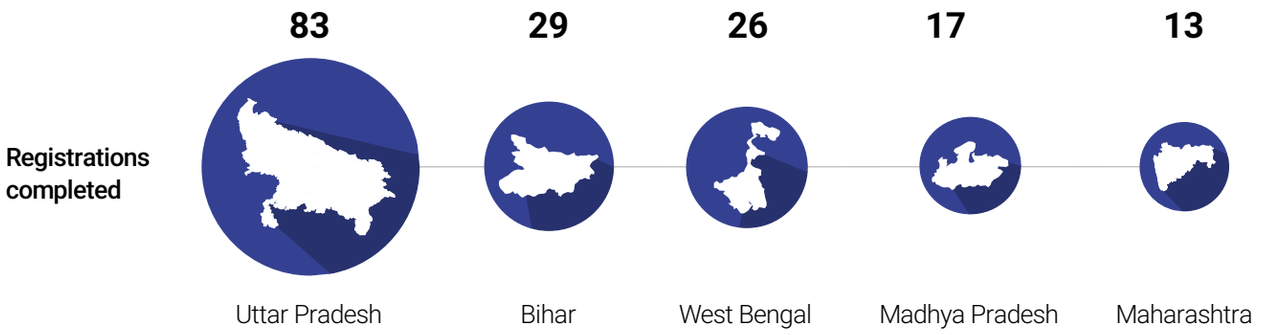
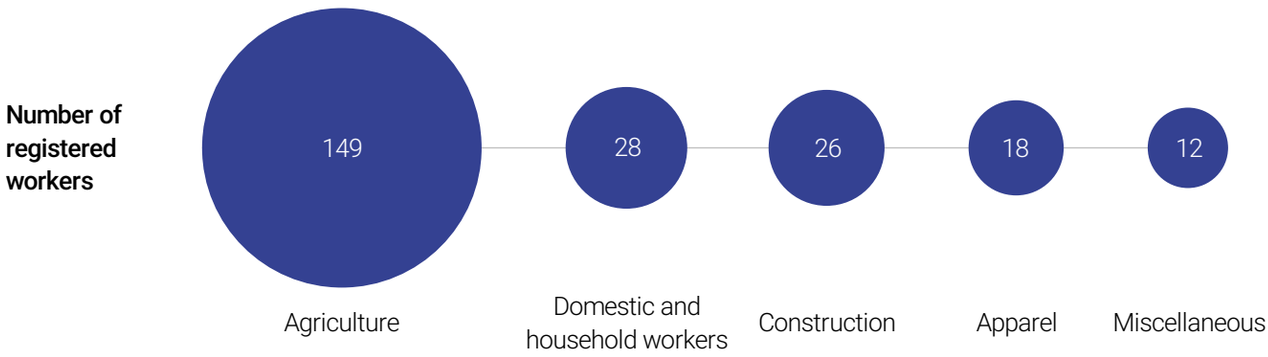


Exhibit 74

Top five informal occupation sectors in India[1]

December 2022, millions



1. Formal employment committee

The sector-wise data for Karnataka shows the highest number of informal workers are also registered in the agriculture sector (30.20 lakh), similar to the trend in the rest of India. Apparel and construction are the two other top sectors, replicating the informal sector employment trends in India (Exhibit 75).

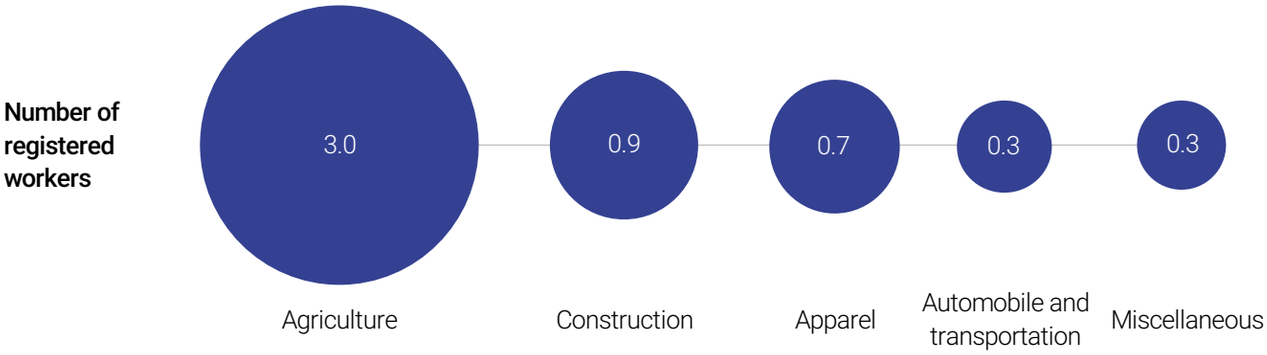
Unlike the formal workforce, where most subscribers are male, among the unorganised workers, more women have registered on the e-Shram portal than their male counterparts. Of the total number of registered unorganised workers, 52.80 percent are women and 47.20 percent are men. But this may not mean that the number of female unorganised workers is higher than male workers in India; the figures only show that women workers have a higher number of registrations than male workers (Exhibit 76).

Of the 28.55 crore unorganised workers registered on the e-Shram portal, the highest number of workers are relatively young, aged between 18 and 40 (62.04 percent), followed by workers in the 40 to 50 age band (22.41 percent), and then those 50 years and above (12.77 percent). Roughly 2.8 percent of the workers are aged between 16 and 18 (Exhibit 77).

Exhibit 75

Top five informal occupation sectors in Karnataka[1]

December 2022, millions



1. Formal employment committee

Exhibit 76

e-Shram registration gender-wise split

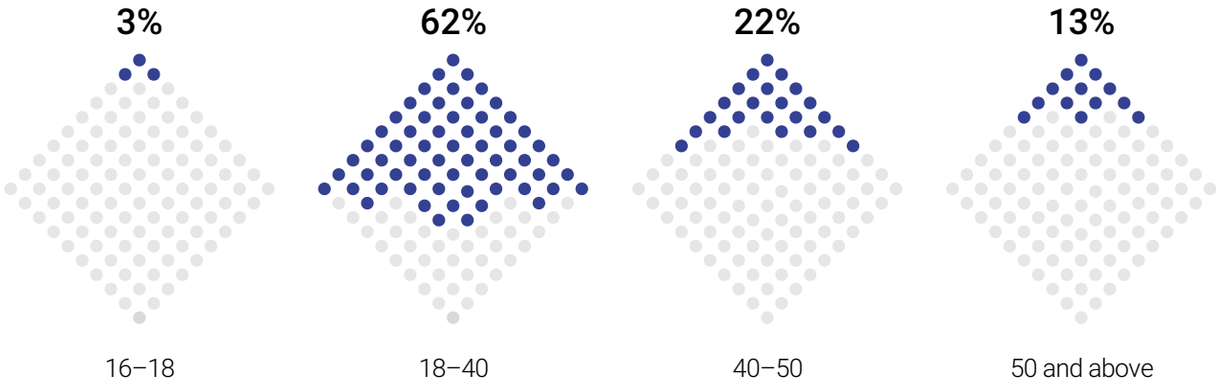
Number of workers registered, millions



Exhibit 77

e-Shram registration age-wise split

Percentage of workers registered



Conclusion

An analysis of the above data shows that Karnataka has a large number of people formally employed, at nearly 24.74 percent, 4.74 percent higher than the national average. Karnataka is one of the country's leading job creators and has accounted for 10.4 percent of net EPFO payrolls additions in India since September 2017. Karnataka created, on average, 13.58 lakh formal jobs every year over the past five years, according to an analysis of EPFO and ESIC data. Karnataka contributed 8.8 percent of India's GDP in 2021–22.

Formal job creation has accelerated in recent years. However, each district needs to perform a detailed analysis of formal job creation. Such microdata can assist in gaining a holistic understanding of formal employment trends in Karnataka and in implementing the necessary interventions to accelerate formal job creation.

In addition, the Karnataka government could identify ten impoverished and underprivileged districts and devise an incentive programme specifically focused on them. In the first few months, the government could pay an employer a monthly incentive of INR 2,000 to INR 3,000 for each job created. If implemented in two years, the incentive programme could help create more formal jobs in poorer districts and have a multiplier effect on the GDP.

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i Karnataka economic survey

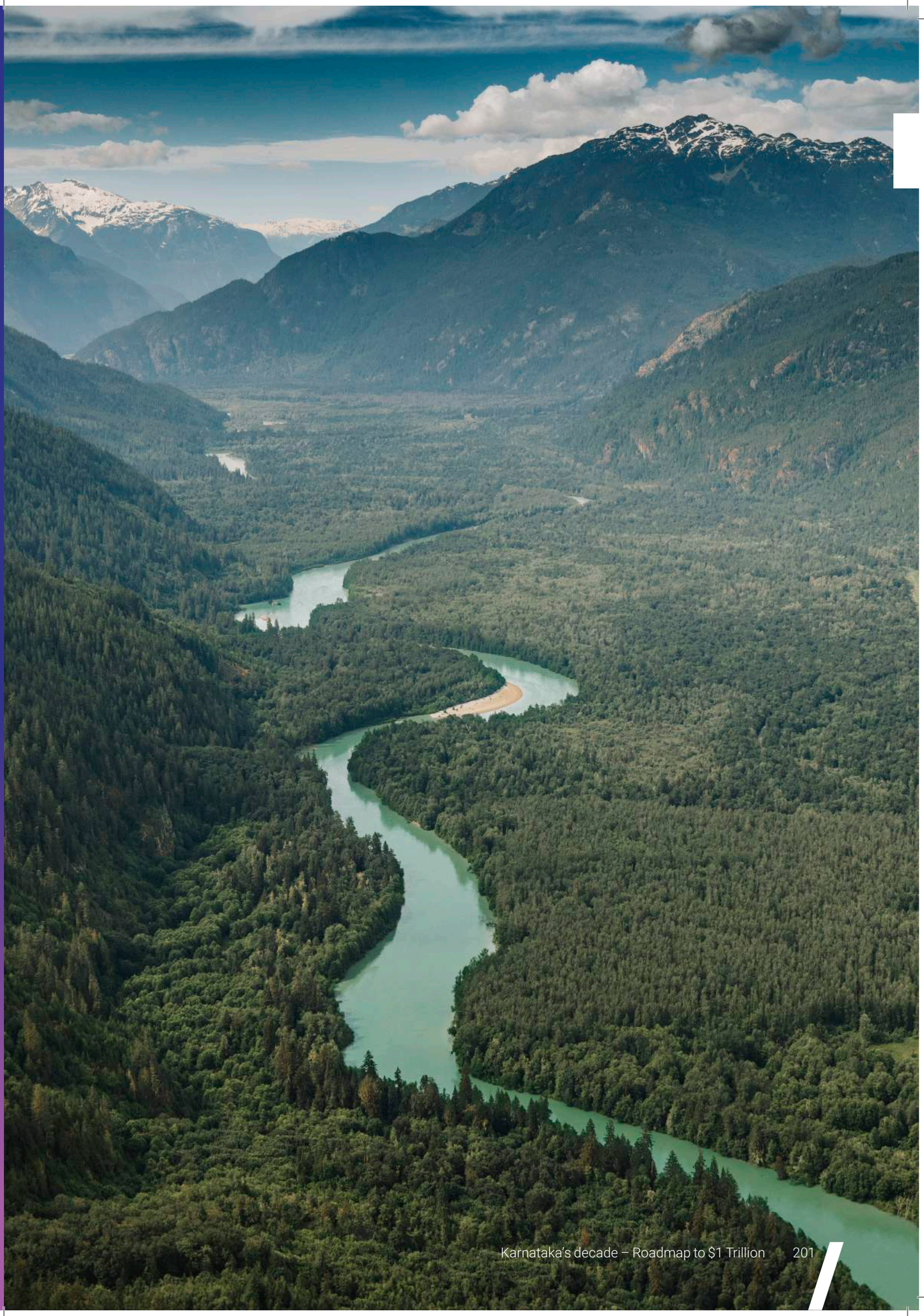
ii GDP performance and value forecast

iii Formal Employment committee

CHAPTER 10

Natural Resource Management





Karnataka is India's sixth largest state by forest cover, with forests covering around 23 percent of its land area.[iii] Forests account for the second largest share of land use after agriculture and play an important role in achieving Karnataka's environmental goals. The state's total forest area is 44,800 square kilometres, accounting for nearly 23.5 percent of its geographical area.

Forest resources contribute significantly to state GDP (SGDP), as they are a substantial source of timber, medicinal plants, and non-timber forest products (NTFPs), and provide grazing, recreational activities, carbon sequestration, watershed provisions, and other goods and services. The indirect benefits of forests far outweigh the direct advantages of their products, such as timber, firewood, bamboo, cane, grass, and NTFPs. The indirect advantages include the preservation of biodiversity, the management of soil erosion in watersheds, and the maintenance of river flow.

More than a crore of the local population depends on the state's forests for firewood, fodder, NTFPs, and other necessities. In addition, the benefits of ecotourism must be evaluated thoroughly so the forestry sector's contribution to the nation and the world is better understood.

The forests of the Western Ghats, which cover about 60 percent of the forested area of the state,[iii] are recognised as one of 35 biodiversity hotspots in the world and one of four biodiversity hotspots in India, making it crucial to ensure conservation. The state has five national parks and 33 wildlife sanctuaries, which make up 6.5 percent of the nation's total conservation area. Karnataka has 25 percent[iii] of the country's elephant population and the second highest tiger population in India.

Population growth is putting pressure on forest resources. Meeting developmental, livelihood, agricultural and industrial needs while conserving forests for productive and ecological services is a challenge. Although the depletion of forest cover has been halted to a large extent and forest cover has quantitatively increased in recent years, the natural forest stock is qualitatively still under pressure. Increased deforestation and degradation of the environmental resource base have serious implications for the production and resilience of the ecosystem. The loss of forest cover is a serious threat to the environment, sustainable development, and the livelihoods of millions of people in the state.

The forest department's vision is to conserve, manage, and develop forests and tree growth on a sustainable basis for present and future generations. It aims to increase tree cover to one third of the geographical area of the state in consonance with the National Forest Policy of 1988. The Karnataka Forest Department is protecting forests by implementing forest and wildlife laws. Every year, the state of Karnataka promotes the planting of 200 to 300 lakh seedlings on private lands through schemes such as Krishi Aranya Protsaha Yojane (KAPY), the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA), SMAF, etcetera. This has increased tree cover outside forests, as is evident from the India State of Forest Report (ISFR) 2021 published by the Forest Survey of India. As a result of these ongoing initiatives, there has been an increase in forest and tree cover in the state.

The Karnataka Forest Department has further implemented several programmes, subsidies, and incentives to support afforestation, boost forestry GDP, and support the indigenous people of Karnataka. These include:

- **Equipping people with alternatives:** LPG gas connections and free refills, solar lamps, and heaters will be distributed to Scheduled Caste families to relieve pressure on forests.
- **Expanding Siri Chandana Vana:** This scheme supports the protection and maintenance of sandalwood plantations and naturally grown sandalwood trees through the installation of chain-link mesh, watch and ward, soil working, cultural operations, and other protective measures.
- **Rejuvenating degraded forests:** Soil and water conservation measures could be implemented to increase the percentage of forest cover of the state. Plantations along roads leading to Scheduled Caste colonies could be maintained, and trees planted in degraded forests.
- **Raising seedlings for public distribution:** Under this scheme, seedlings are raised for distribution to the public, farmers, and organisations at subsidised rates to plant on their own land.
- **Planting trees alongside roads:** Around 4,000 kilometres of national highway, 21,000 kilometres of state highway,[iii] and 38,000 kilometres of district roads are under various afforestation programmes.
- **Greening urban areas:** The state is establishing tree-filled parks, wood lots, and avenue plantations to improve aesthetics and reduce pollution.
- **Tending to medicinal plants conservation areas (MPCAs) and medicinal plants development areas (MPDAs):** This involves the revitalisation, development, and maintenance of MPCAs and MPDAs in forest areas.

State action is further bolstered by national conservation schemes such as the National Afforestation Programme-Forest Development Agency (NAP-FDA), the National Agroforestry and Bamboo Mission, the Conservation and Management of Mangroves, the Green India Mission, and the CSS Intensification of Forest Management Scheme.

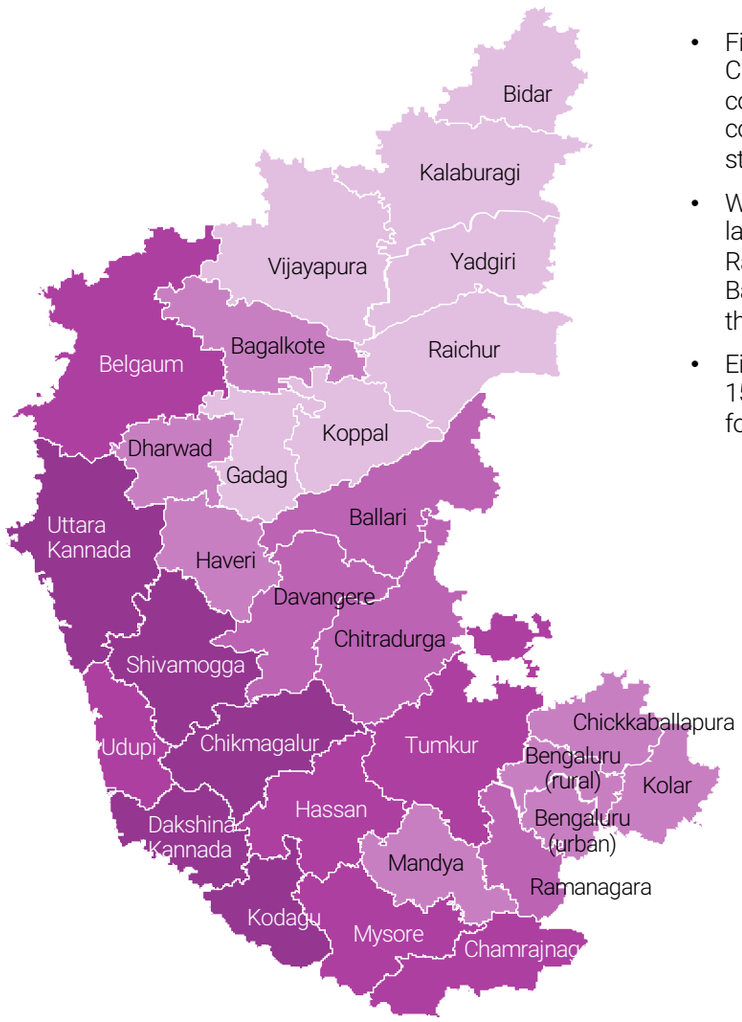
To help Karnataka reach its target of 33 percent forest cover, the government could continue the aforementioned activities, enhance their effectiveness while doing so, and adopt other initiatives as well. (Exhibit 78)

While Karnataka is one of the top five states to increase its forest cover compared to 2019[iii] (an increase of 1,392 square kilometres), more than half of its 30 districts do not have even 50 percent of the forest-cover targets set by the state government. Karnataka aims to cover 33 percent of its total geographical area with forests. One of the major reasons for the low forest cover in the districts is the lack of forest land under the forestry department. In Vijayapura, for example, where only around 0.24 percent of the district has forest cover, only 0.17 percent of the total geographical area is under the department, making afforestation initiatives difficult to implement due to a lack of jurisdiction.[77]

[77] https://www.deccanherald.com/state/top-karnataka-stories/in-karnataka-only-the-western-side-of-the mountain-is-green-1072027.html

Exhibit 78

Karnataka district-wise forest cover (2021–22) sq. km



- Five districts (Uttara Kannada, Shivamogga, Chikkamagaluru, Kodagu, Dakshin Kannada) contribute to 60 percent of the state's forest cover, while only accounting for 18 percent of the state's land area
- While making up nearly 40 percent of the state's land mass, the bottom ten districts (Vijayapura, Raichur, Koppal, Bidar, Kalaburagi, Yadira, Gadag, Bagalkote, Chikkaballapur, Chitradurga) have less than 5 percent of the state's forest cover
- Eighteen districts of Karnataka have less than 15 percent of their total geographical area under forest cover

Source: Karnataka Economic Survey 2021–22

Targeting strategic afforestation initiatives and reforms to increase forest department jurisdiction in low penetration districts such as Vijayapura, Koppal, Raichur, Yadgiri, Kalburagi, Bidar, and continuing conservation activities across the top five districts, while promoting eco-tourism across the state to incentivise natural-resource management, could take Karnataka towards its goal of 33 percent.[78]

The forest department's total revenue, which includes proceeds from the sale of timber, firewood, and other forest produces, and from other sources such as fines, forfeiture, fees, and receipts from sanctuaries,[iii] adds INR 300 crore to the SGDP. Much of this revenue comes from the sale of timber and other forest produce in all the government timber depots, which are disposed of by e-auction. With a wide host of initiatives including timber production from mature teak plantations, the development of wood- and plywood-based industries, the streamlining of regulations, and curbs on imports, the forest department expects revenue to climb to INR 465 crore by 2032. (Exhibit 79)

The department has planned the following key drivers to boost the forestry sector's GDP, streamline industry operation, and improve livelihoods and ease of doing business for farmers:

- **Reduce dependency on interstate and international imports** of timber, plywood, and precious hardwood species to save foreign exchange through the following strategic initiatives:
  - Incentivising wood-based industries dependent on hardwood species to shift to softwood and bamboo through a production-linked incentive scheme. The main wood varieties imported by India are meranti, teak, kapur, and sal, which are all hardwoods. This, coupled with log restrictions in traditional key exporters of Myanmar, Malaysia, and other tropical countries, has further prompted the need to diversify. Given the high dependence on hardwood imports, coupled with the overall high cost of hardwood varieties, wood-based industries are being pushed to reduce the import bill through a transition away from hardwood. Further, with the state planning to grow 57,000 hectares of bamboo over the next two years, this could ease the import bill, and enhance local production.[79]

[78] https://www.deccanherald.com/state/top-karnataka-stories/in-karnataka-only-the-western-side-of-the mountain-is-green-1072027.html
[79] Karnataka to grow bamboo on 57,000 hectares – Vinobha K T: The Times of India

Exhibit 79

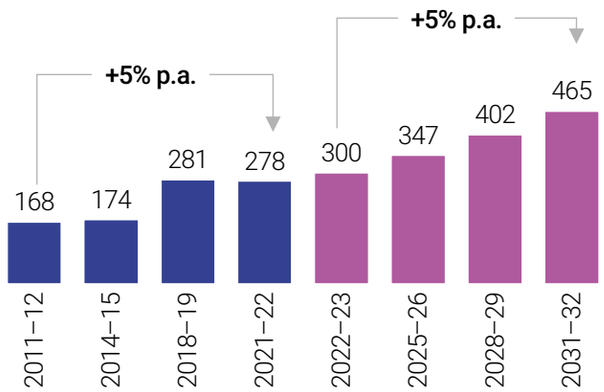
Forestry department revenue

Forest department GVA

Historical Forecasted

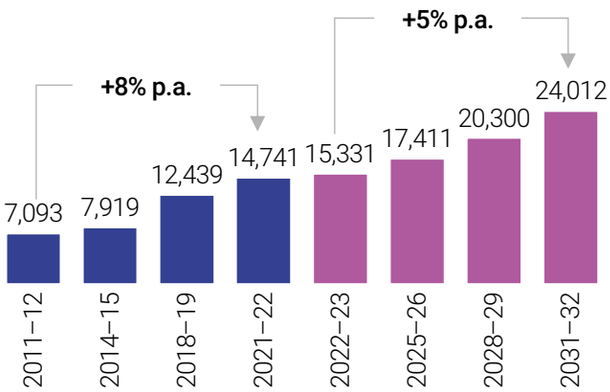
Forest department revenue performance and forecast

INR crore



Products of Forestry GVA performance and Forecast

INR crore



1. GDP Performance and forecast

— Emulate the states of Haryana and Punjab in planting fast-growing agroforestry species. Karnataka could also grow the agroforestry sector, to meet demand from interstate import-dependent and labour-intensive plywood and panel industries.

— Build on the Government of Karnataka's approval of the 2022 sandalwood promotion policy, whereby sandal trees can be extracted as per need and traded in the open market. The policy also promotes the planting of sandal trees in the identified belt of Shimoga, Hassan, Mysuru, and Chamarajanagara to reduce sandal oil imports to the state. The benefits of this will be realised after 15 years.

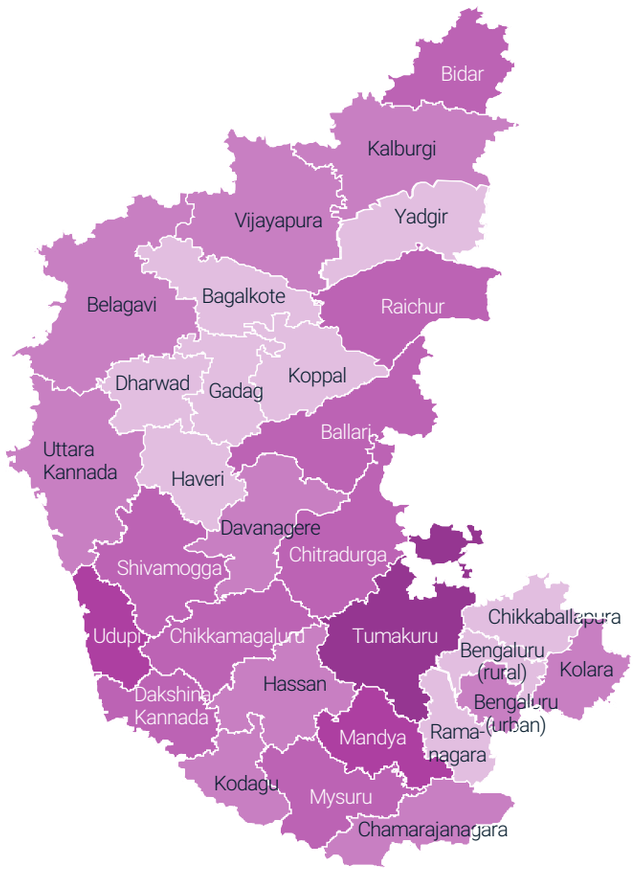
- **Agroforestry, the system of land-use management where trees or shrubs are cultivated around or among crops or pastureland, could receive more attention**. Higher yields from staple food crops, improved farmer lives due to income production, increased biodiversity, improved soil structure and health, reduced erosion, and carbon sequestration are just a few advantages of this purposeful marriage of agriculture and forestry. This can be accomplished by:

— Repurposing 4 lakh hectares of available cultivable wasteland distributed across the state (as shown in the exhibit below) into multi-purpose agroforestry and horticulture crops, to provide additional sustainable agricultural income to farmers, and increase green cover outside forest areas. (Exhibit 80)

Exhibit 80

Cultivable wasteland distribution by district[1]

ha



1. Karnataka economic survey

— Simplification and relaxation of existing regulations relating to forestry in private land to promote agroforestry with focus on planting of short rotation species, like silver oak, melia dubia, and other species, like sandal, neem, teak and red sanders, which farmers are increasingly growing on their private land.

— Set-up campaigns to spread awareness of state schemes like Krushy Aranya Protsaha Yojane (KAPY), raising of seedlings for public distribution (RSPD), and Maguvigondu Mara Salegondu Vana to procure subsidised seedlings.

— Launching campaigns to incentivise large land-holding individuals of low forest-cover districts to opt for block plantations (where single or multiple species are planted in a patch of land available), with incentives or subsidies offered in the form of distribution of seedlings at no cost or at a subsidised rate. Operationalising the ecosystem and enhancing technological know-how to take up a massive agroforestry programme in the state under different agro-climatic conditions.

— Encouraging the establishment of wood-based industries dependent on farm-forestry wood, to ensure sufficient demand for farmers embarking on agroforestry.

— Promoting planting and corrective action to nullify the negative impact of industrialisation, which is expected to exert more pressure on land over the next decade. Over the last four years alone, nearly 1,300 hectares of land have been diverted to industrialisation under the Forest Conservation Act of 1980. (Exhibit 81)

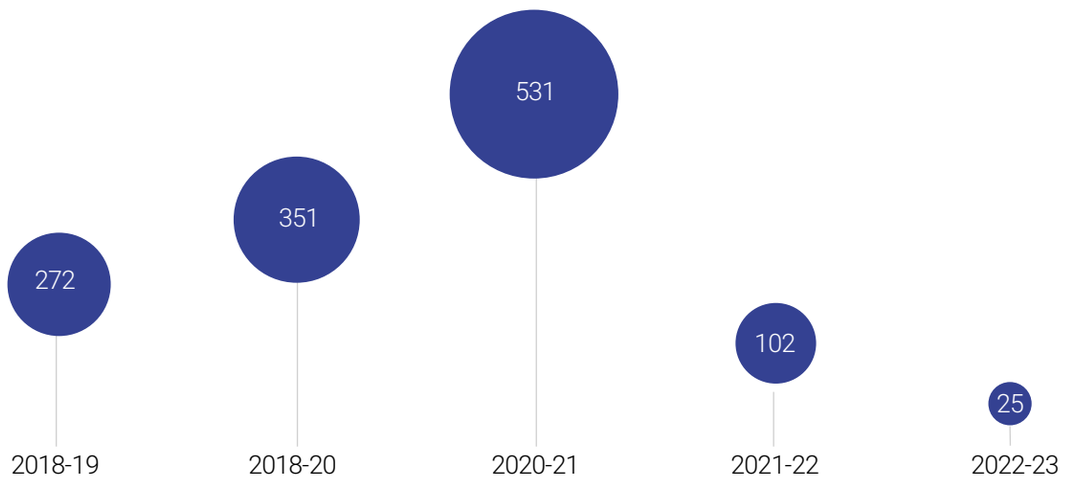
— Improving the density of forests by augmenting natural regeneration in the existing forestry areas.

— Harvesting medicinal plants in a scientific manner could generate considerable revenue for the department. Growing medicinal plants could be promoted and incentivised as part of the integrated farming system.

Exhibit 81

Karnataka: Forest Land Diverted under FC Act 1980[1]

Hectares of Forest Land



1. Karnataka economic survey

- **Promote ease of doing business** by creating an environment for private players to invest. Some of the policies that might deter new entrants and hamper the growth of existing players could be reviewed and amended accordingly. The following could be tackled:
  - — Accelerating licence issuance to unlicensed existing plywood and veneer industries established before 20 May, 2013, and grant licences for new plywood and veneer industries and new sawmills licences, and enhance the capacity of existing licensed sawmills.
- **To draw national and international tourists to less-frequented protected areas such as BRT, Bhadra, and Dandeli, there is a need to promote ecotourism amenities and create "Brand Karnataka".** The state is home to 33 wildlife sanctuaries, five national parks, and 6.5 percent of the country's total protected area.[iii] Karnataka also houses 25 percent of the nation's elephants and is home to the second-highest number of tigers. To enhance ecotourism activities in locations such as Kabini, Nagarahole, and Bandipur, the state could collaborate with private parties and the hospitality industry. There also needs to be a thorough assessment of the societal benefits of forests. Ecotourism operations could be expanded to create jobs, which would in turn grow the tourism industry as personal income per capita increases.

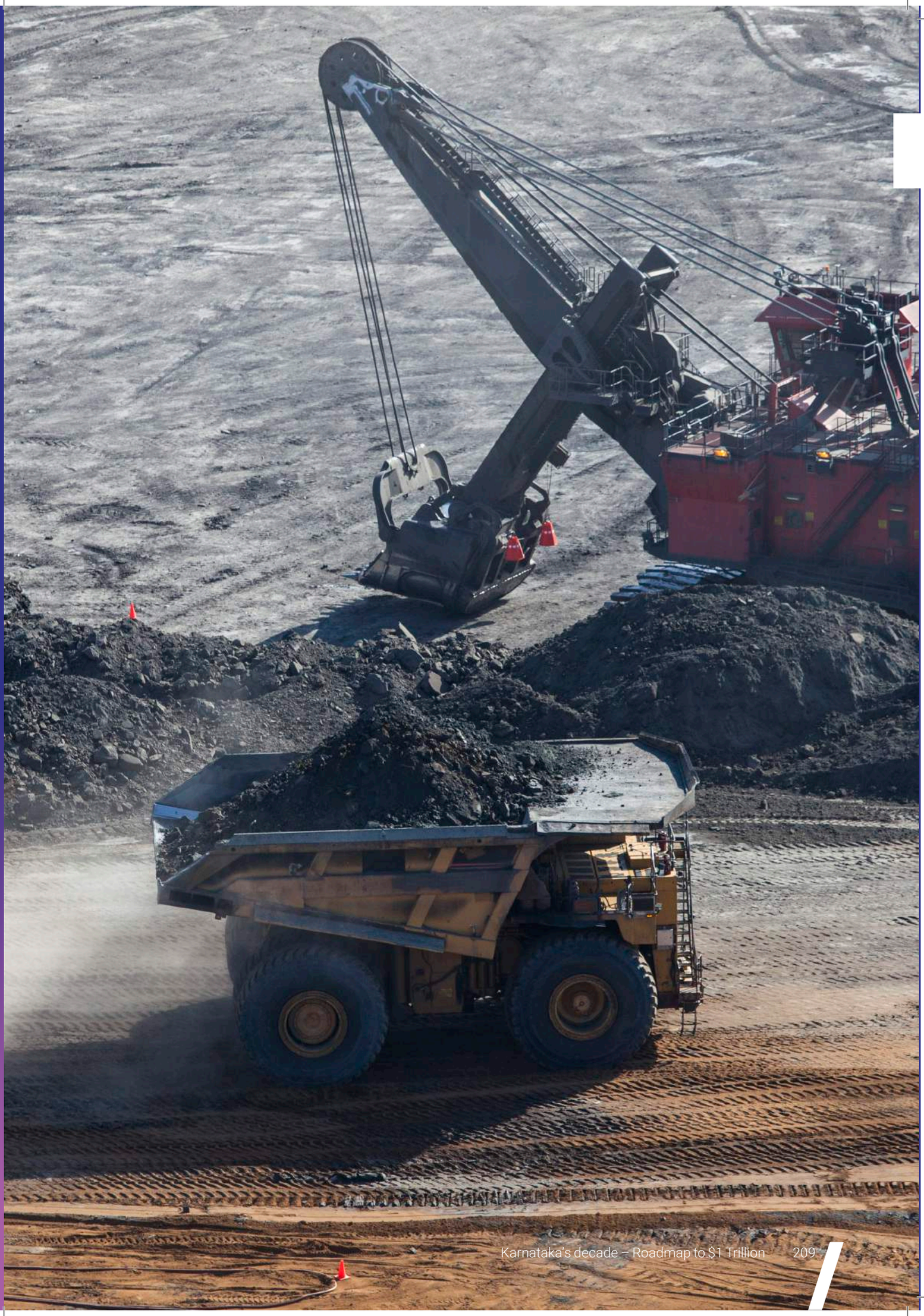
These initiatives could lead 5 percent growth in forestry department revenue and forestry GSDP over the next ten years.



CHAPTER 11

Mining





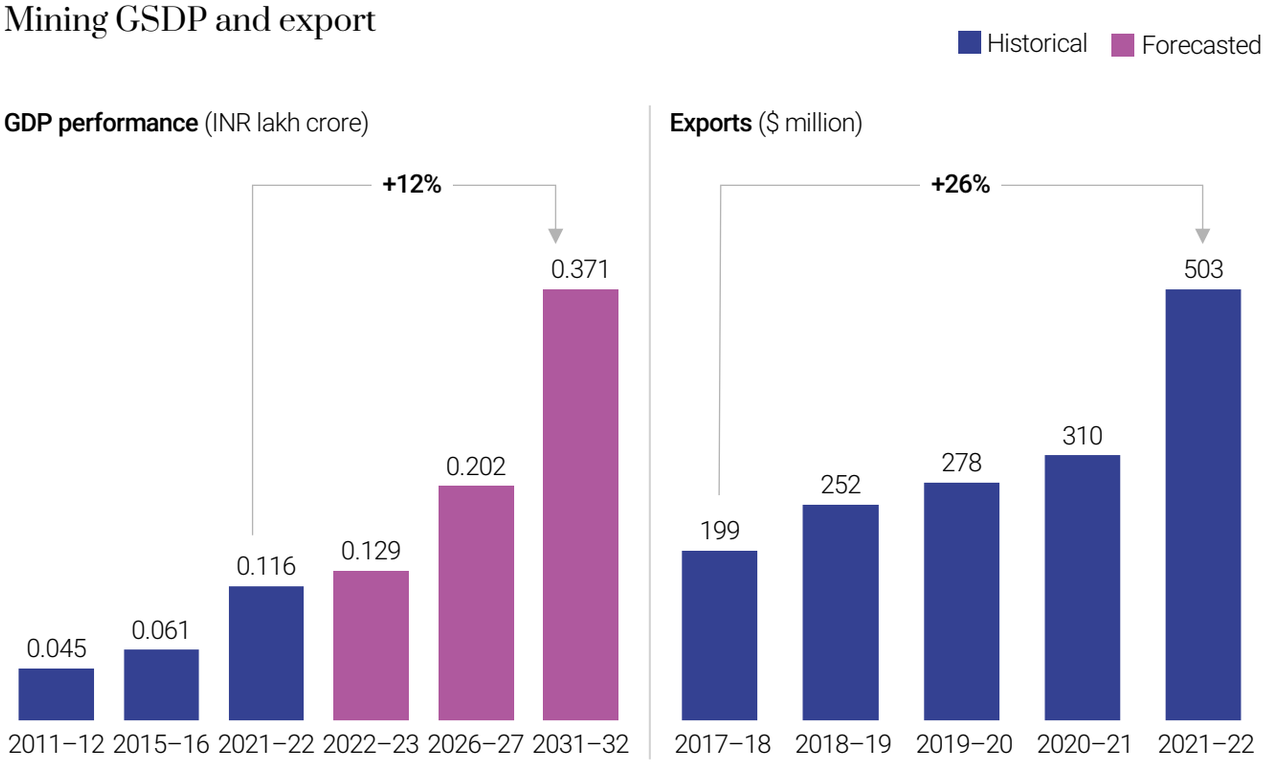
Karnataka state covers 0.192 million square kilometres, accounting for 5.84[iii] percent of India's total geographical area. The Archaean and the Proterozoic are the two oldest eons that make up much of Karnataka's geological history. The remaining eons, from the Cambrian to the modern, are rarely represented, with few deposits from recent times found along the state's coastline boundaries. Deccan Traps – a large plateau that formed when molten lava solidified and turned to rock – takes up a sizable portion of north Karnataka. The Sargur group and grey gneisses are the most ancient rocks in the state. The other significant rock types found here include schists, granulites, dykes, sandstones, quartzites, Deccan basalts, charnockites, and laterites.

Karnataka is endowed with a wide variety of minerals. The main ones are abrasive minerals, andalusite, antimony, apatite and rock phosphate, asbestos, barite, bauxite, beryl, building (granite and other related minerals) and ornamental stones, chromite, clays, cobalt, columbite-tantalite, copper, dolomite, feldspar, fuchsite quartzite, Fuller's earth, gemstones, gold, graphite, gypsum, iron ore, kaolin or china clay, kyanite, lead and zinc, lime shell, limestone, lithium, magnesite, manganese, mercury, mica, molybdenite, nickel, ochres, peat, petroleum and natural gas, platinum, potash, pyrite and sulphur, quartz and quartzite, salt, sand, soapstone, titanium, tungsten, uranium, vanadium, and vermiculite.

Mining is necessary for the state's survival and economic prosperity. The Department of Mines and Geology's royalty collections and annual targets for the financial year 2021–22 reveal increased revenue[i] of INR 6,308.31 crore compared to a target of INR 4,357 crore, and an increase of 47 percent over this period. Additionally, the sector has expanded at a rate of 9.9 percent CAGR over the past ten years, above the state's industrial growth (CAGR: 8.8 percent). Other industries have the potential to take a considerably larger percentage of the nation's exports and contribute to the state's foreign exchange. Exports have also experienced significant development, led by iron ore. (Exhibit 82 & 83)

Exhibit 82

Mining GSDP and export

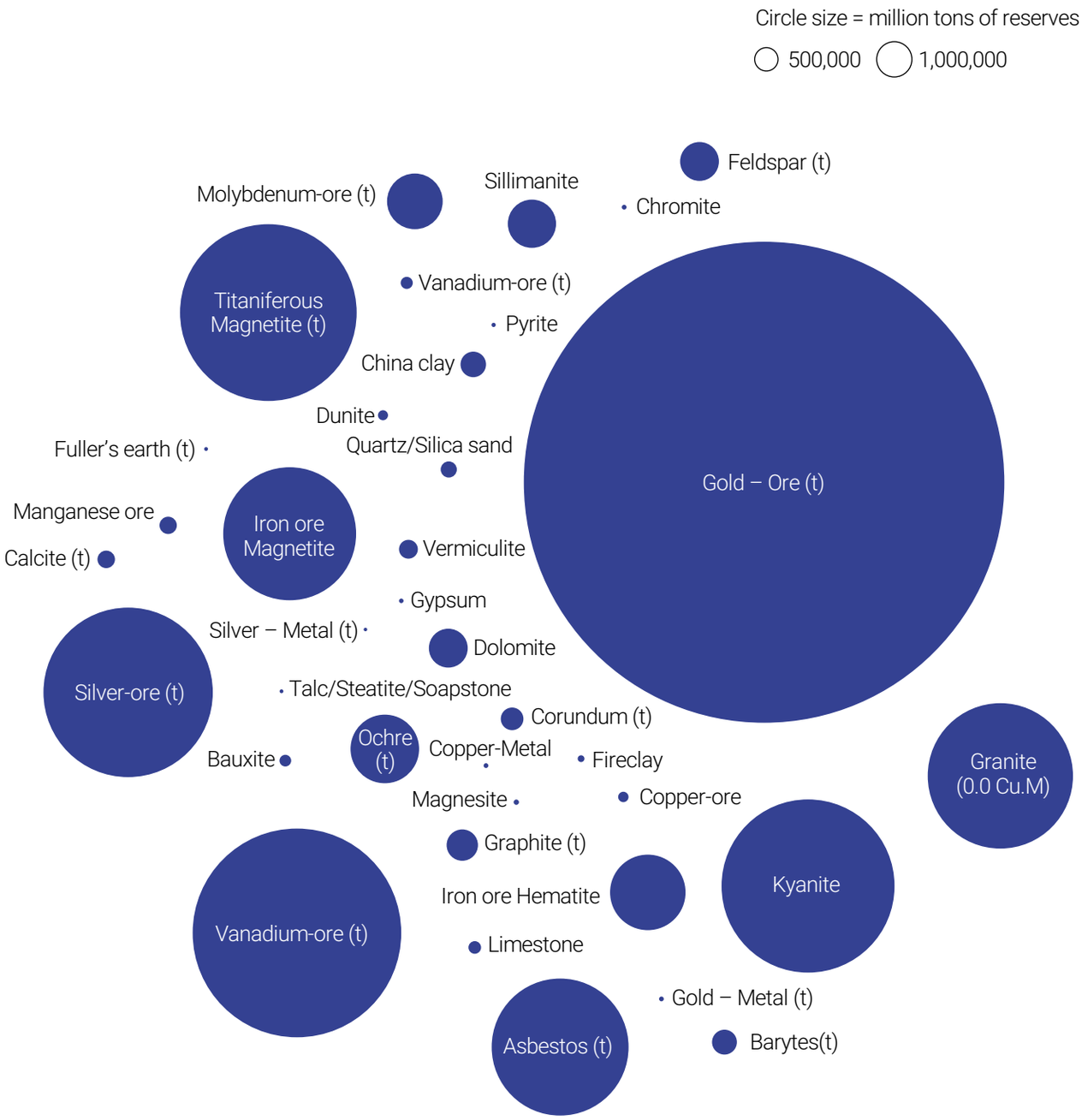


Source: Government GSDP data

Exhibit 83

Snapshot of mineral reserves of Karnataka

Reserves, '000 tons



Source: IBM

Given the abundance of minerals in the region, there is huge potential for developing new mineral-based companies. Many minerals extracted in Karnataka are exported in raw form to other states. As a result, the state loses out on the value addition of beneficiation as well as opportunities for employment in rural and underdeveloped areas. Therefore, the goal could be to promote the development of industries reliant on minerals in the state. (Exhibit 84)

Six districts – Ballari, Raichur, Kalaburgi, Kolar, Tumkur, and Kolar – contribute 72.2 percent to the mining gross state domestic product (GSDP) for Karnataka.

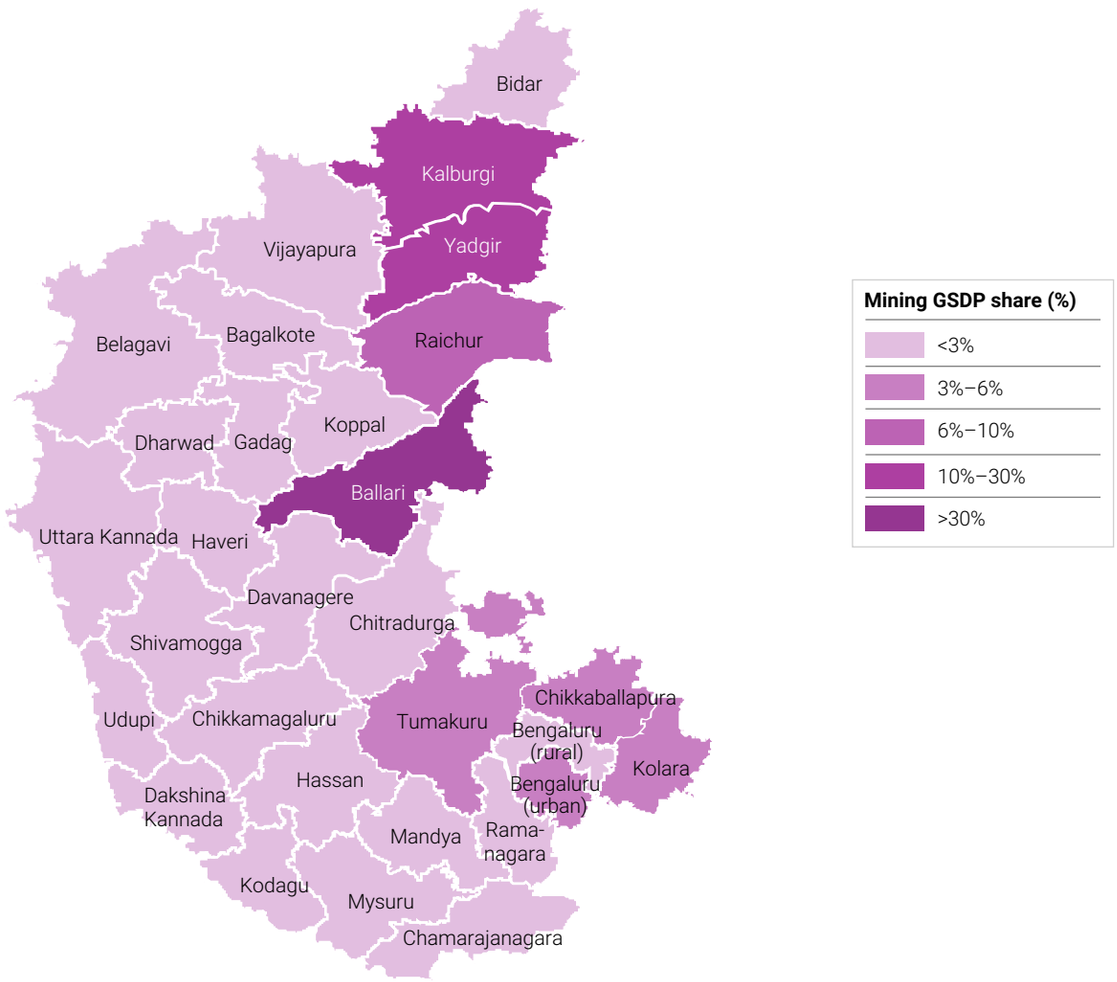
There is significant opportunity for the state to consider:

- Establish mineral-based industries in mining areas and neighbouring districts to drive growth.
- Undertake geological surveys to identify additional areas of exploration.
- Prioritise sites and promote geo-mining-based tourism.

Exploration for an in-demand mineral is an ongoing process. Coordinating the three key elements – ideas, money, and luck – may be to find new resources is the primary role of mineral exploration management. Exploration geologists could have a broad knowledge of geology as well as creativity, physical stamina, tenacity of purpose, willingness to accept risks, and the ability to act swiftly and decisively. They could also have technical expertise using cutting-edge computer tools that covers the complete spectrum of mineral exploration, from basic research through feasibility studies and development work.

Exhibit 84

District share of mining GSDP[1]



1. GDP performance value and forecast

Mining can not only capitalise on the rich resources the land has to offer but also create significant impact across the manufacturing, construction, and services sector. This could in turn generate indirect employment and drive growth in the Karnataka. (Exhibit 85)

Gujarat is the highest spender on industry and minerals on a per-capita basis[iii] among several states. In comparison to Telangana's INR 181, Andhra Pradesh's INR 160, and Haryana's INR 157, the Government of Gujarat spent almost INR 779 on industry and minerals per capita in 2019–20. Over the past ten years, the industry and minerals sector has delivered a CAGR of 13.3 percent, which is significantly higher that of the state of Karnataka. Karnataka may need to raise spending in relevant sectors if it wants to lead industrial growth and push the GDP towards $1 trillion. The state is well positioned to benefit from these natural riches thanks to the abundance of minerals and resources available to it.

The state could tackle some of the sectoral challenges and could focus on six strategic initiatives to accelerate growth in the segment and become a significant contributor to GSDP:

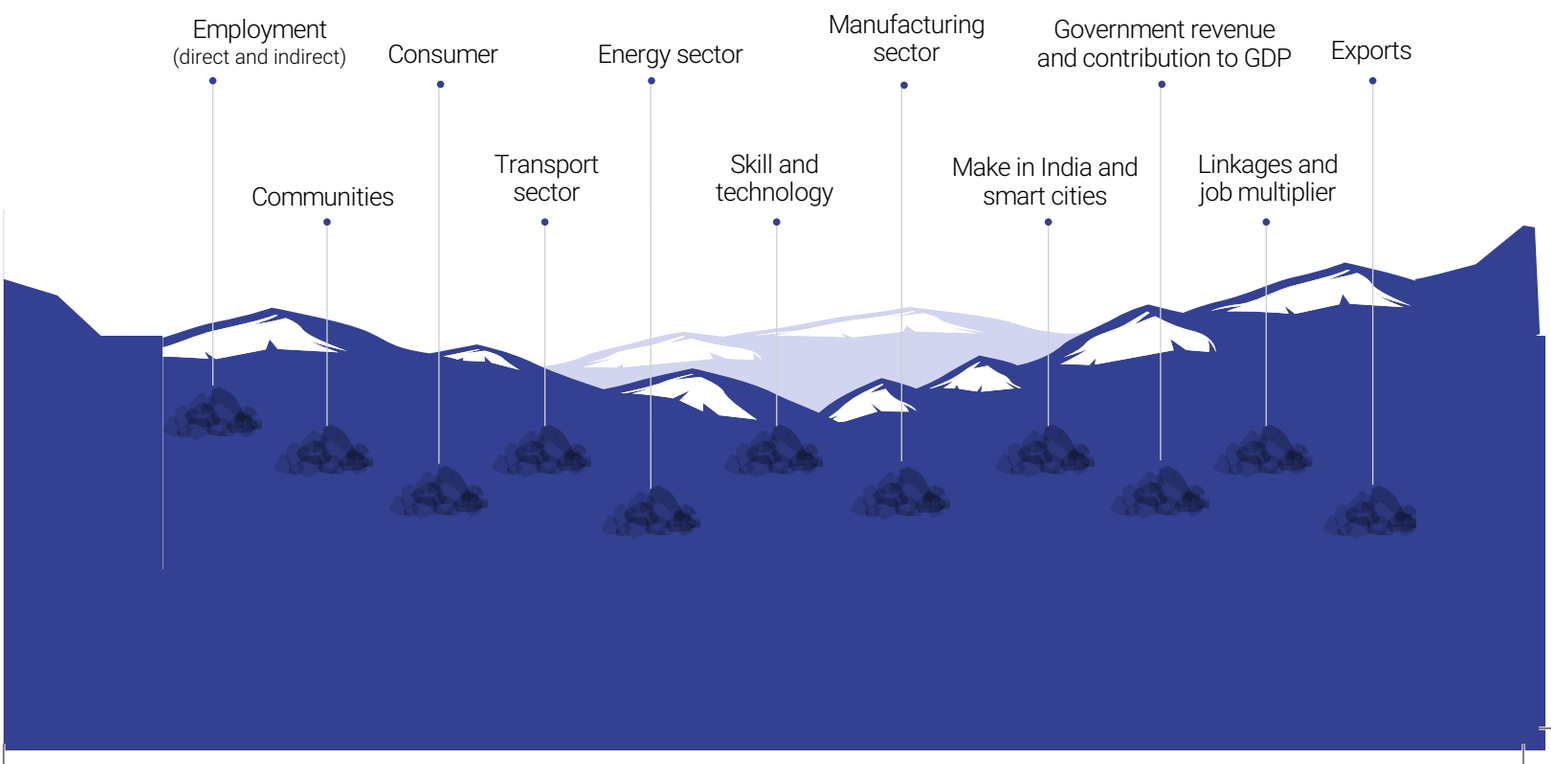
Create industries to generate mass employment

Various minerals mined in Karnataka are sent to other states in raw form, depriving the state of the value addition of beneficiation as well as employment opportunities in rural areas. Therefore, the goal would be to promote the development of industries based on minerals in the state. The ratio of direct to indirect employment in the mining sector is 1:10 – that is, for every job created in the mining sector another ten jobs (indirect jobs) are generated along the supply chain. Establishing auxiliary industries and mineral processing could create jobs and advance the modernisation of communities that are part of the Aspirational Districts programme.

- **Develop the gem and jewellery industry:** Gold is an integral part of Indian society and is a foundation of wealth and savings. India accounts for nearly one-third[iii] of the total world demand for gold. The gems and jewellery sector contributes about 15 percent to the country's total merchandise exports and employs more than 4.64 million people. India's gems and jewellery exports reached $39.14 billion in 2021–22, a 54.13 percent increase from the previous year. India is deemed to be the hub of the global jewellery market because of its low costs and availability of high-skilled labour. As Karnataka is the only primary gold producer (it is home to Hutti Gold Mines Limited) of India, there is scope to develop the gems and jewellery sector in the state.

Exhibit 85

Key beneficiaries of mining



- **Ceramic-based industry:** The state can capitalise on the vast deposits of kyanite and consider setting up ceramic-based industries, for example ceramic ware and tiles.[80] There could be a concerted effort to promote the state's ceramic ware across the nation. India is already the third-largest producer in the world and Gujarat contributes[iii] to 70 percent of the nation's output. Karnataka could take inspiration from the industries in Gujarat and create an end to end impact.
- **Promote local artisan-based industry:** Certain mining lease areas with placer or alluvial deposits could encompass cottage industries, providing gainful employment to a large number of rural artisans (paniyars). A local agency could be created to collect the gold produced and pay the panners on the spot.

Digital-led modernisation by adopting Industry 4.0 technologies

Advanced integrated tools may be needed to thoroughly explore deeper deposits or deposits in complex geological environments, including those concealed in the offshore zone. State-of-the-art drilling techniques with sophisticated rigs (such as reverse circulation) for 3D sub-surface delineation of ore body as well as for directional drilling and underground exploratory drilling could be used. Technological upgrading in underground non-ferrous metal mining in respect of sub-level stopping methods for improving productivity. This could also help in significantly reducing job-related risks such as dust inhalation and hearing damage. Operations, productivity, and wastage can also be managed better with improved technology. Mineral and mining start-ups can also play a role in propelling the industry forward, tackling non-core tasks on an outsourcing basis. Automation, robotics, and Industry 4.0 technology adoption can make mining and exploration operations safer, improve production, scheduling, and material flow, and track mining and exploration performance in real time.

[80] The world's third largest ceramic industry is banking on India's love for gaudy tiles, Business Insider, India Bureau

Gujarat's game-changing ceramic industry[iii]

Gujarat's ceramic industry is the largest tile production region in the country and the second largest globally, only after Guangdong in China. It accounts for more than 80 percent of national production, with an estimated cumulative investment of over INR 8,000 crores. The industry has generated direct and indirect employment for over 600,000 people across India and its most popular export, vitrified tiles, has an established reputation for quality, design, and durability.

Some of the distinguishing factors that have been instrumental to the burgeoning success of Gujarat's ceramic industry – and are instructive for other industries – include:

- The presence of an enabling environment for collaboration and competition between MSMEs
- Business access to ISO certifications for exports
- Financial support offered by banks and through various government programmes
- The adoption of new technologies, which specifically transformed the Morbi's ceramic business
- The provision of dedicated gas pipeline by the state government for uninterrupted supply of fuel
- Favourable government policies.

Explore and set up gold ore trading[81]

Gold mining and subsequent milling operations have contributed to over 32 million tons of gold ore trading (GOT) at Kolar Gold Fields and 16 million tons of GOT dumps in the Hutti Gold Mines Limited region. Dumps consist of tailings of both refractory and free-milling ore types. The waste generated (tailings) after gold recovery is stockpiled in the form of dumps. Historically, mining for higher grade of more than 15 grams per ton was a lengthy process. Initiatives applied to tailings, such as Gold Ore Trading (GOT) and COT, for waste to wealth transformation management could lead to resource maximisation.

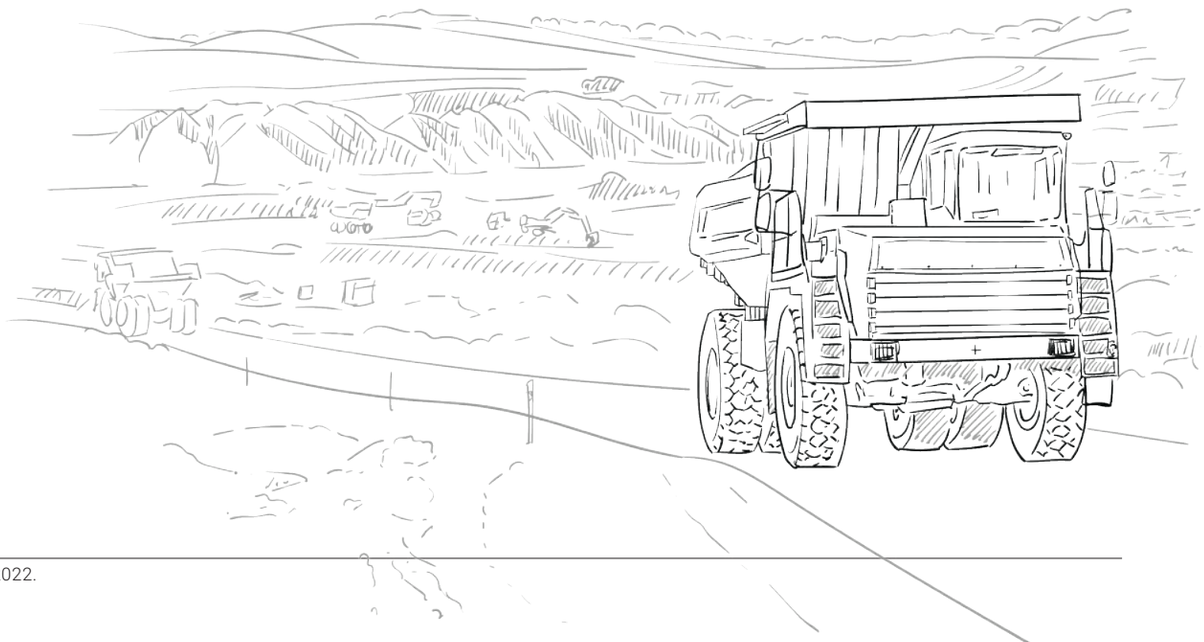
Karnataka could re-evaluate the gold tailing dumps by classifying ore reserves of dump and grades as per the guidelines of the United Nations Framework Classification (UNFC), an internationally proven system of reserves and grades.

Diamond Drilling as per United Nations Framework Classification (UNFC) and subject the samples to below studies while reviewing the R&D work carried out on GOT and COT carried out to date:

- Assessment of gold by fire assay analysis.
- Studying of the composite sample for the gold, scheelite, silver, and platinum group of minerals (PGE).
- Detail petrological and mineralogical studies to evaluate the utilisation of tailings as: micronutrients (fertiliser) for agriculture, manufacturing of bricks, tiles and civil works, road metal, sand stowing by palletisation, and manufacture of porcelain items such as plates and cups.
- Benchmark tailing samples with state-of-art metallurgical studies, such as heap leaching and bio-leaching.
- Beneficiation studies on tailings.

The state could also carry out additional techno-economic feasibility studies based on the outcome of the studies and evaluate utilisation of the tailings. Based on the feasibility studies of the tailings treatment and extraction process of all the dump sites, the following factors could be studied and statutory clearance obtained:

- Land-use studies as per the Indian Bureau of Mines (IBM) and mine closure plans as per the IBM.
- Environmental, waste rehandling, disposal, and safety management plan approval from statutory departments such as the Department of Mines & Geology (DMG), the IBM, the Karnataka State Pollution Control Board (KSPCB), the Central Pollution Control Board (CPCB), the Ministry of Environment, Forest and Climate Change, and the Director-General of Mines Safety.
- A business plan covering project investments, cash flow, and project return parameters, such as internal rate of return and net present value assumed for the entire plan of gold/copper ore tailing project.



[81] Sangurmath, 2022.

Develop and promote mining tourism

Tourists and researchers are hampered by the lack of a fully comprehensive explanation of the geo-archaeology of the region. Kolar, Hutti, and Chitradurga, among other places, can be built as a Geo-Tourism Hub and Geo-Industrial Park. A museum displaying mining techniques from antiquity to the present, as well as archaeological artefacts, would be a popular destination for visitors, students, and the public due to its visual appeal, educational value, and scientific significance. Around Kolar, Hutti, Gadag, and Ingaldhal mines, there are lush, green forests, semi-tribal villages, cutting-edge biofuel businesses, and beautiful temples and buildings. The additional tourist attraction may add value to the sector. Numerous tourists are drawn to a much smaller mines in Johannesburg,[iii] South Africa, with its original installations now abandoned. The Geo-Tourism Park area and Geo-Archaeological area can be nodal agencies in the present and the future thanks to the HGML. By then, Karnataka may be on the tourist map for mining.

Harvest the underground mine water in Karnataka[82]

There are about 400 ancient gold and copper mines in Karnataka, some at a depth of 200 metres. Mines in the Kolar Gold Fields (KGF) run up to 3.20 kilometres deep, while the main at Hutti Gold Mines is up to 1.10 kilometres deep. Among all the mines in KGF, those in the Champion Reef are deepest, at 3.230 kilometres. Together, all the shafts, drives, crosscuts, winzes (minor connections between different levels), and raises would run to 1,900 kilometres. There are 55 shafts at surface and 26 shafts underground the Champion reef. All these mines are spread over an area of nine kilometres long and 2.5 kilometres wide. After mining activities in KGF and other areas of the state were closed, the shafts, drives, crosscuts, raises, underground dams, winzes, and stopped-out areas filled up with water. It is estimated that 18 million to 20 million cubic metres of water has been accumulated in KGF. When all KGF mines were operating, an average of 95,40,000 litres of water was pumped out daily. KGF's Champion mine routinely pumped out close to 2,000 litres of water a day. Meanwhile, mining at Mangaluru, in the Yadgiri district, was suspended due to heavy inflow of ground water (52,000 litres an hour). The water that has accumulated in these mines could be treated for use in various sectors, using cutting-edge technology to ensure safe, environmentally beneficial, and sustainable outcomes.

Government support and investments

The state could spend more on the mining industry, as this would send an important message to entrepreneurs that Karnataka means business. Since it is one of the industries that creates jobs, the mining sector has a significant impact on both the upstream and downstream industries. A proposal paper, "Promoting Mineral Exploration, Mining,[iii] and Mineral Processing in Karnataka: Way Forward, July-2022" has been submitted by a committee overseen by Dr. Prabhakar Sangurmath, the director of the Hutti Gold Mines Company. Additionally, the government could concentrate on a variety of sectors to encourage growth while implementing various practices in the sector:

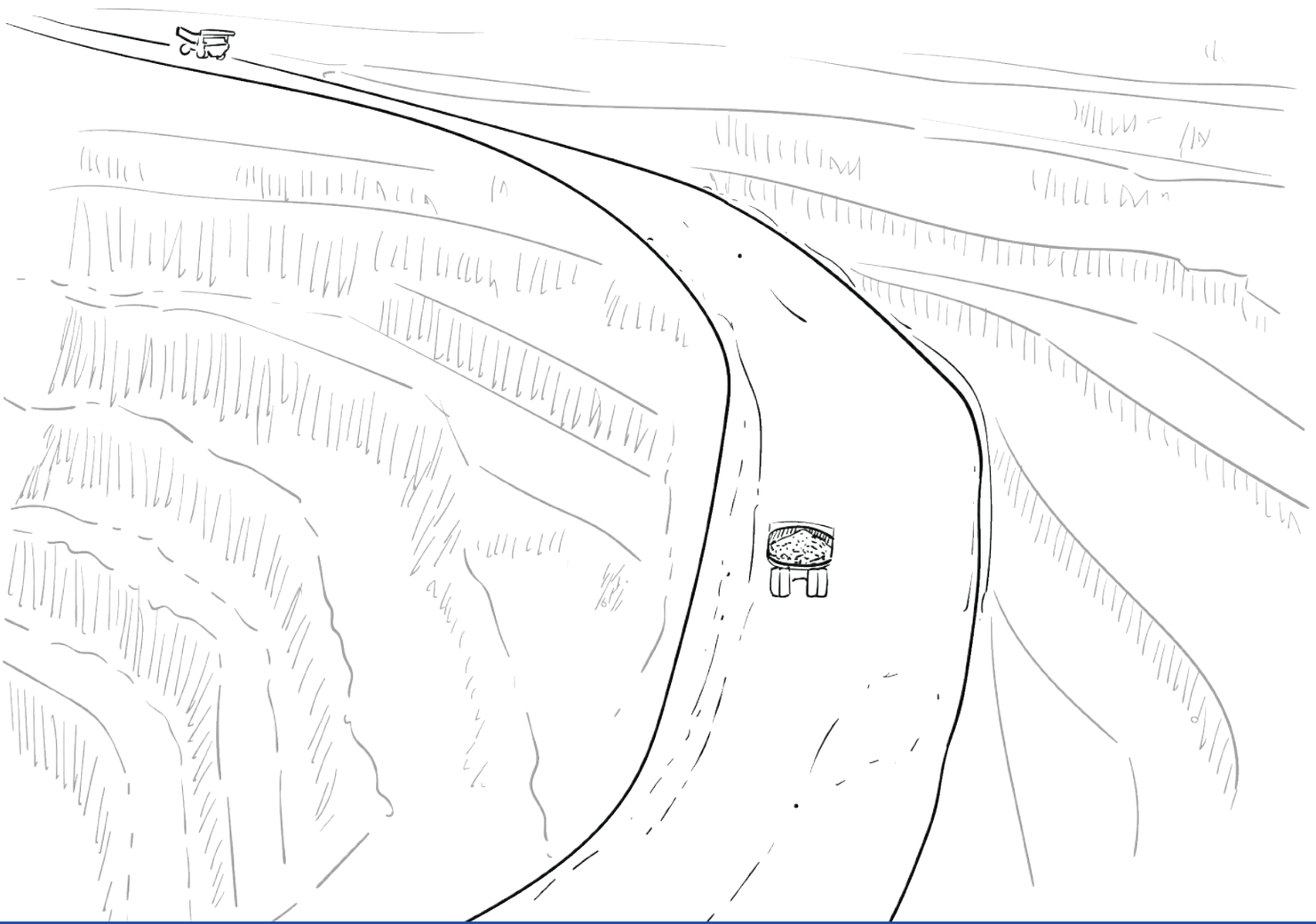
- **Adopt sustainable practices:** Sustainable extraction and use of mineral resources is important for the future of the mining sector and the state's developmental goals. The Karnataka government has formed a committee comprising experts to formulate the Karnataka Mineral Policy 2021–26. It is imperative to action those suggestions to drive sustainability across the industry.
- **Review exploration strategy and conduct geological survey:** A more vigorous exploration strategy is required, with emphasis on the identification of large deposits of low-grade ore amenable to an opencast method. The government could roll out a geological survey across the state to identify possible explorations that could be undertaken. To find and evaluate ore bodies of marginal-grade mineral deposits, ore beneficiation and metallurgical studies must incorporate modern technologies. The entire chain of exploration, mining, metallurgy, engineering, and associated works could be modern and cost-effective, incorporating state-of-the-art equipment, machinery, and processes.
- **Establishment of a School of Mining:** The government could develop an education centre to skill, reskill, and upscale the workforce, expose youthful talent to top-notch techniques, and make the exploration, mining, and metallurgical professions appealing.
- **Increase spending on industry and minerals:** Gujarat is the highest spender on industry[iii] and minerals on a per capita basis among select states. In comparison to Telangana's INR 181, Andhra Pradesh's INR 160, and Haryana's INR 157, the

[82] Sangurmath, 2021.

Government of Gujarat spent almost INR 779 on industry and minerals per capita in 2019–20. The industry and minerals sector has shown a 13.3 percent CAGR over the last decade, which is much higher than the state of Karnataka. To lead manufacturing growth and drive the economy towards $1 trillion, Karnataka could increase spending on relevant sectors.

A public-private partnership model could be explored for extracting the mineral deposits. The state could learn how to tackle industry labour issues, and the latest techniques for beneficiation, skills development, and corporate social responsibility.

Karnataka's abundant mineral resources could create jobs, boost the economy, and improve residents' quality of life. The state could consider enhancing exploratory activities to meet rising demand for minerals and to reduce import expense. Karnataka could ensure its exploration and extraction processes are safe and environmentally friendly to secure a sustainable sector.



References

i Karnataka economic survey

ii GDP performance and value forecast

iii Mining committee

CHAPTER

12

Healthcare







COVID-19 taught us many things, including the importance of having a solid health sector. While Karnataka's gross state domestic product (GSDP) is not directly impacted by the sector, it is a ballast for other industries, increasing productivity by ensuring a healthier workforce. Non-linear returns could be seen on investments in industries like healthcare (HC) and education.

According to a national rating by Niti Ayog on SDGs, Karnataka ranks fifth nationally in the "good health and well-being" category with a score of 78/100,[iii] outperforming the national average of 74. Karnataka is making great strides towards ensuring the health and well-being of its people. The state has outperformed the nation across numerous indicators relating to infrastructure. (Exhibit 86)

The influence of the HC GSDP on Karnataka has steadily increased over the past few years and the state has also been focusing on specific indicators to ensure holistic development in the sector. (Exhibit 87 & 88)

Despite a respectable "good health and well-being" rating, Karnataka's health spend as a percentage of GSDP contribution still falls short of the best globally. A shortage of medical staff and primary healthcare centres (PHCs) could be addressed timeously to ensure everyone has adequate access to healthcare. There could be effective execution under Ayushman Bharat – the national government's plan to provide free access to health insurance coverage for low-income earners – to prioritise addressing the shortfall. (Exhibit 89 & 90)

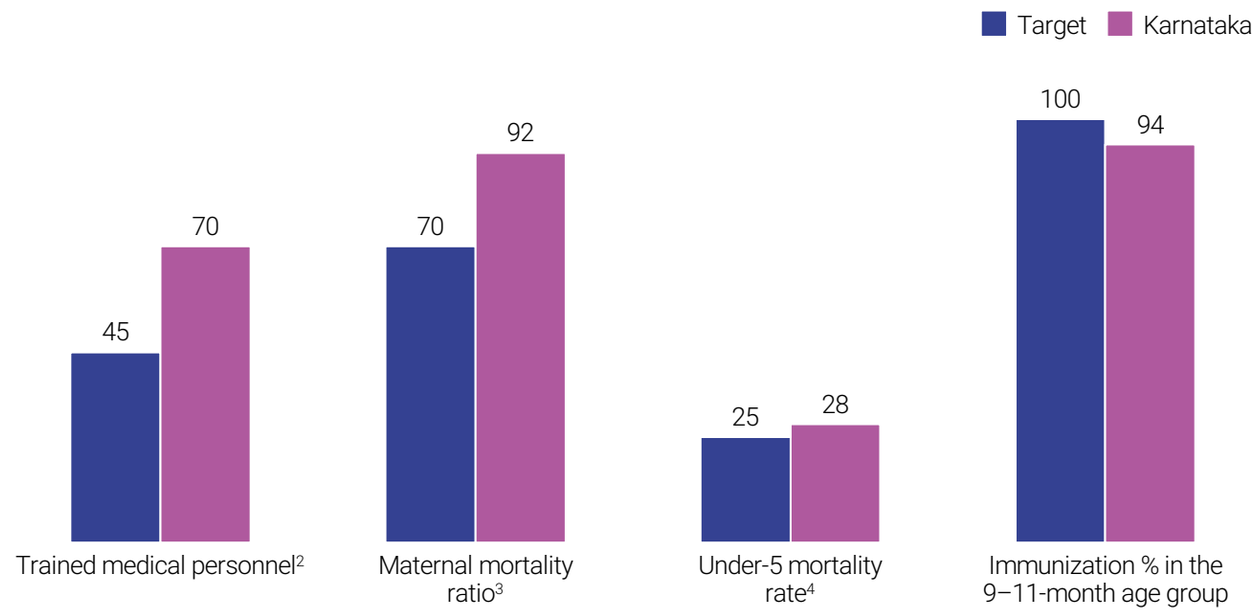
Both urban and rural areas lack 454 PHCs, with urban areas accounting for 54 percent of the deficit. There is a shortfall of 232 PHCs in the five districts of Bengaluru Urban, Belagavi, Mysuru, Vijayapura, and Dharwad, which account for 51 percent of the deficit.

There is a deficit of 16,959 personnel across the state among medical officers, pharmacists, nurses, midwives, health assistants, laboratory technicians, and multi-skilled group workers. There is an immediate need for the state to address this shortfall by encouraging enrolment in these programmes, growing its training facilities, and offering job opportunities near where medical professionals live.

Exhibit 86

Good health and well-being indicator[1]

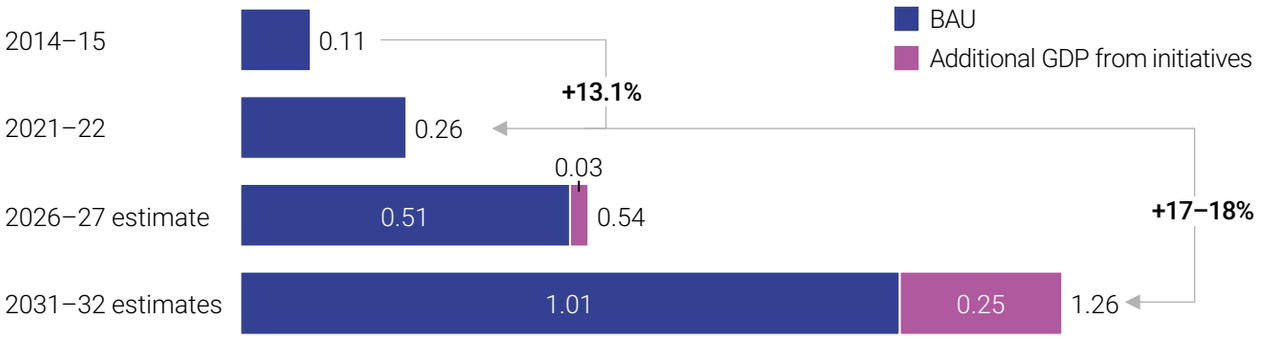
Percent



1. Healthcare committee
2. Physicians, nurses, and midwives per 10,000 population
3. Per 1 lakh live births
4. Per 1,000 live births

Exhibit 87

Healthcare GSDP



Source: Government GSDP data

Exhibit 88

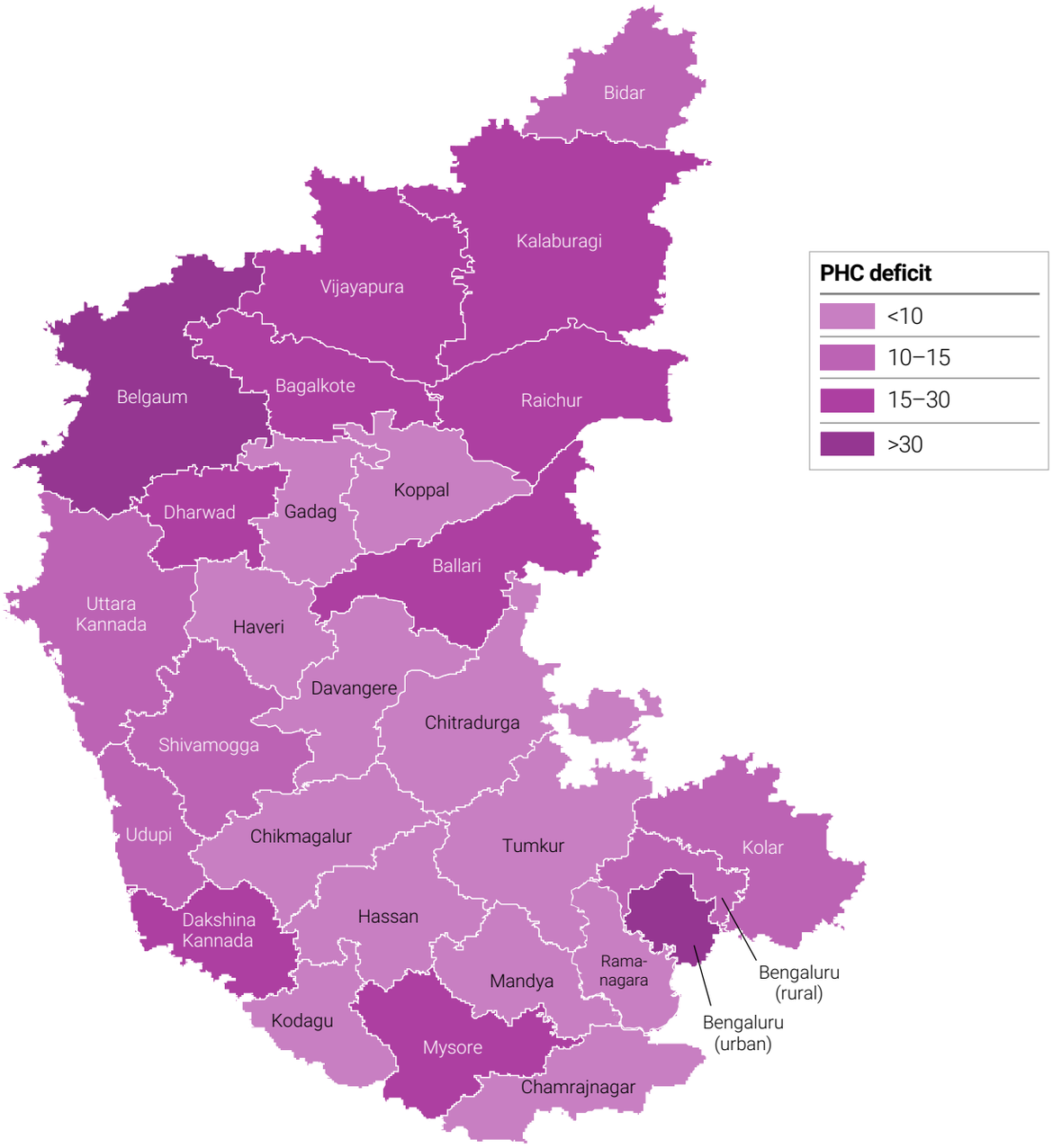
Sector vision[1]

Macroeconomic indicators	From (2021–22)	To (2031–32)
Nominal sectoral GSDP (INR lakh crore)	0.25–0.26	**1.2–1.3**
Healthcare spend as % of GDP	4.7%	**8%** (by 2025)
Hospital beds per 10,000 population	9–10[2]	**47–50**[3]
# of Doctors per 10,000 population	19.70[4]	**50–60**[5]
# of Nursing and Midwifery personnel per 10,000 population	38–43[6]	**180–190**[7]
Global maternal mortality ratio (per 100,000 live births)	92	**<70**
Under-5 mortality rate (per 1,000 live births)	28	**12** (goal for many countries) (23 as of 2025)

1. GDP performance and value forecast
2. State population: 71,961,497, total number of beds: 70,474 (Handbook of Statistics on Indian States)
3. Benchmark: OECD average
4. National Medical Council (2021)
5. Benchmark: OECD Best in Class
6. Indian Nursing Council Annual Report 2021–22
7. Benchmark: OECD Best in Class

Exhibit 89

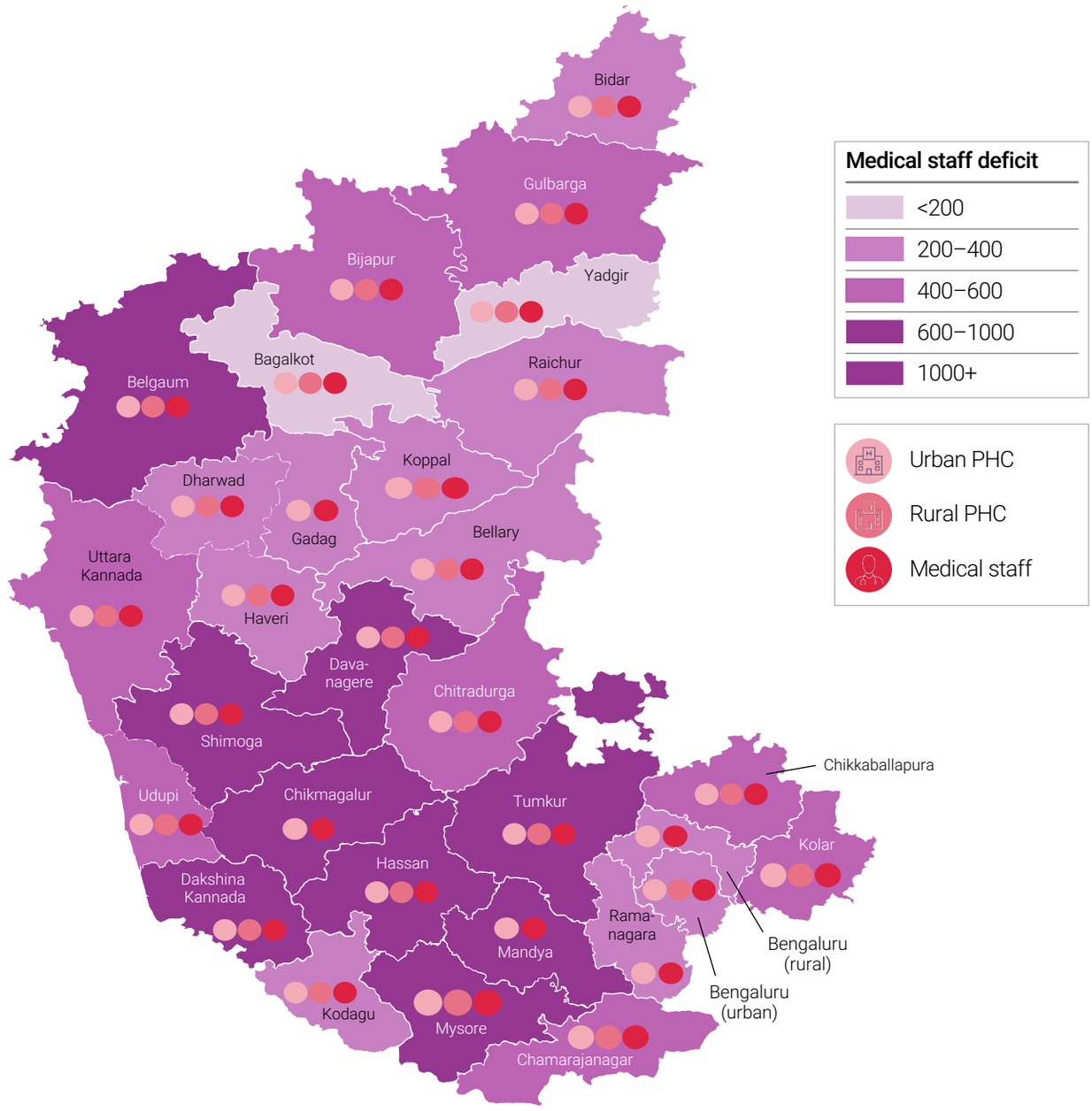
PHC deficit across state, district overview[1]



1. Healthcare committee

Exhibit 90

PHC and medical staff deficit, district overview[1]



1. Healthcare committee

According to a 2021 report by government think tank Niti Aayog focusing on national health index scores, Karnataka ranked 19th nationally and last among big states for improvement. The report showed that the incremental change in health index scores from the base year (2018–19) to the reference year (2019–20) varied significantly among large states. A majority of the states recorded an improved performance. While Uttar Pradesh[i] showed the largest increase in index scores, Karnataka registered the largest decline. Karnataka ranked last in the table led by Uttar Pradesh, Assam, and Telangana. To rank among the top five in the national health index, the state's health officials from the public and private sectors could work together. The state could make every effort to excel in all 24 factors that make up the health index scores and continuously improve each of them.

The state of Karnataka will experience a change in its demographics as it moves towards a $1 trillion GSDP during the next ten years, including a rise in the number of people over 60 years old. In Karnataka, the number of people aged 18 to 23[ii] has been dropping at a yearly rate of 1 percent. Populations in most Indian states are rapidly ageing, except for a few densely populated states like Bihar (north) and Uttar Pradesh (south). The number of young, particularly in the south, is drastically declining. (Exhibit 91)

A society with an ageing population would need an enhanced focus on state healthcare infrastructure compared to one with a young population. To address the needs of the elderly, Karnataka could build more state-of-the-art facilities, particularly in rural areas, with adequate primary, secondary, and tertiary facilities in every district. The state already lags the nation on average spending in the health sector, with much of the population concentrated in rural areas. Focused strategies need to determine what infrastructure will be needed to support the needs of citizens in the coming years. As per current projections, by 2031,[iii] 15 percent of Karnataka's population will be in the over-60 age group, compared to the national projection of 13.1 percent. Given the high share of people in this age bracket, Karnataka will need more healthcare infrastructure. Moreover, a shrinking 18-to-23 age group means the number of medical professionals being produced will gradually drop. To ensure Karnataka capitalises on its strong workforce, the state may need to build state-of-the-art facilities to not only retain medical professionals but also attract professionals from outside. (Exhibit 92)

The pandemic has only served to accelerate the state's rising healthcare spending, but more could be done to guarantee that all citizens have access to quality care. (Exhibit 93)

State-wise, some regions are underserved (especially the northern districts). All areas and social groups could have access to healthcare services for economic growth, which calls for a healthy workforce and a thriving healthcare industry. The urban skew (a large portion of the health infrastructure and talent are based in cities and large towns), lack of affordability (resulting from low insurance or healthcare financing penetration), and the focus on curative aspects of health, especially tertiary care, are some of the regrettable characteristics of the health sector today.

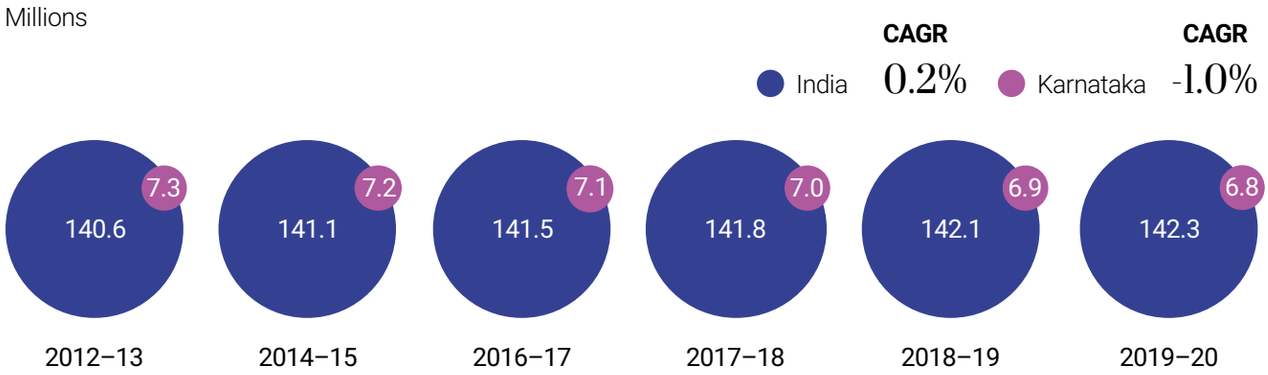
Increased lifestyle-related illnesses can result from a shift in people's habits, requiring adequate infrastructure. Given the state's and the nation's economic realities, the emphasis must be on preventive health and wellness, which could hopefully ensure that many people who would otherwise have needed costly curative interventions will be filtered off those because of the focus on preventive and primary health (lost time at work).

The state urgently may need to increase healthcare spending as well as establish an execution engine to ensure current efforts are carried out while concentrating on new strategic initiatives to build a cutting-edge and reliable healthcare infrastructure.



Exhibit 91

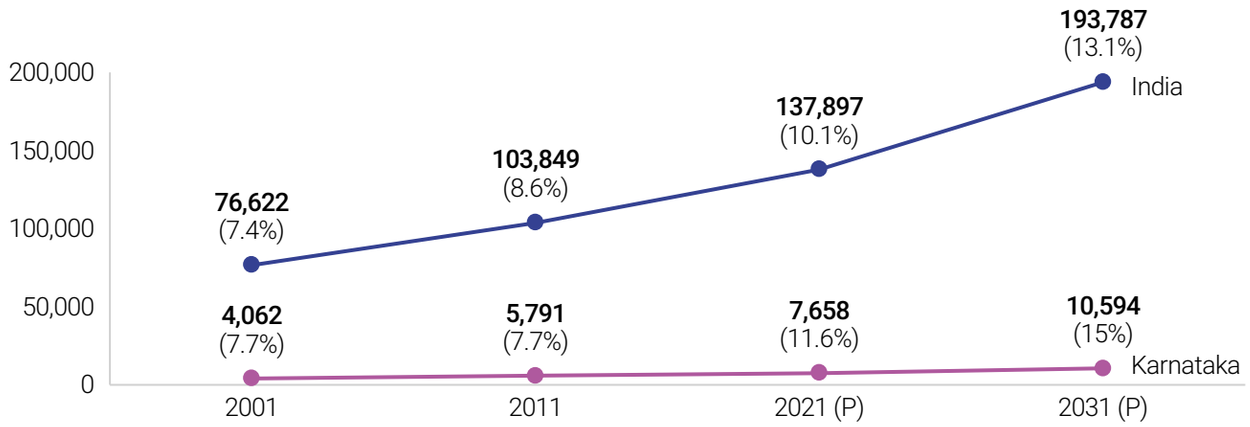
Trend of 18–23-year-old population in India and Karnataka



1. Karnataka economic survey

Exhibit 92

Percentage of population above 60 in India and Karnataka

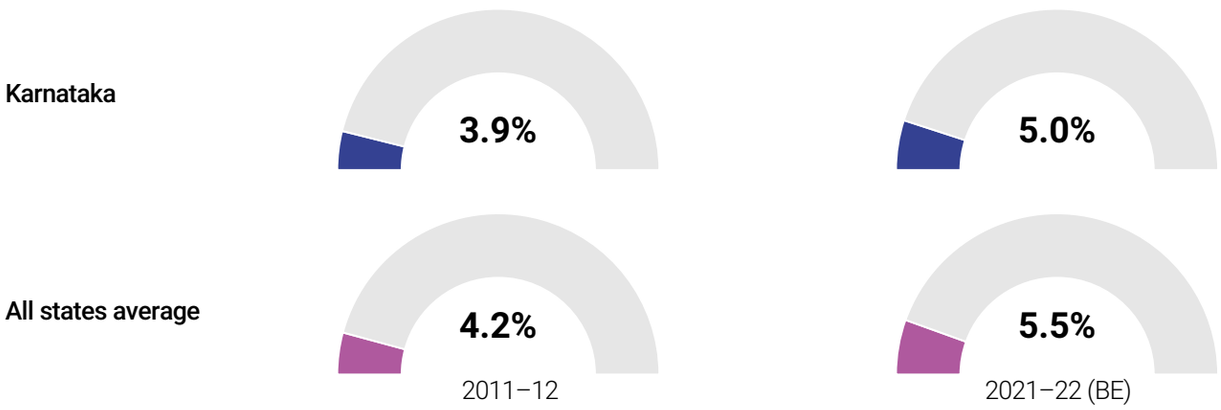


Source: Elderly in India 2021 (MOSPI)

Exhibit 93

Health spend[1]

Karnataka has allocated 5 percent of its total expenditure on health, which is marginally lower than the average allocation for health by states (6 percent). The state could aspire to target 8 percent of the spend to Healthcare by 2025



1. Karnataka economic survey

Proposed theme of focus

focus



01 Develop state-of-the-art infrastructure

Ensure adequate infrastructure particularly in the rural areas, with adequate access to primary, secondary, and tertiary facilities

02 Karnataka as a preferred destination for Medical Tourism

Become a sought-after destination for global and national patients

03 Address medical staff deficit in state

Boost and set up Infrastructure to address the shortfall of medical personnel 16,959 medical staff in the state

04 Create a preventive healthcare ecosystem

Create a very effective and efficient preventative healthcare system from grassroots level of the society

05 Achieve universal health coverage

Healthcare cover for the common man “missing middle” who are out of the health coverage umbrella

06 Scale up digital interventions

Modernise operations across healthcare facilities by adoption of digital technologies

07 Governance and execution focus

Set up of teams to ensure combating the current shortcomings while rolling out new initiatives

08 Initiatives to scale up PPP programmes

Facilitate and promote deeper private sector penetration into Tier 2 and Tier 3 cities

The state could consider actions across eight priority areas:

Develop state-of-the-art medical infrastructure

An additional 160,000 hospital beds may need to be added to the system to provide health cover under the Ayushman Bharat–National Health Protection Mission (AB–NHPM). While there is infrastructure availability in the cities, rural areas face shortages and need increased access to primary, secondary, and tertiary facilities.

There is a shortage of primary healthcare facilities across the districts, with a shortfall of 245 urban and 209 rural PHCs. The state government could prioritise setting up adequately staffed PHCs to ensure basic healthcare treatment is available to every citizen. (Exhibit 95 & 96)

In many districts, rural citizens must travel long distances to access basic healthcare. Many of the 30 districts need a large 500-bed multidisciplinary hospital that can cater to the needs of the community. These hi-tech facilities would also attract doctors and medical staff to work in small towns, instead of moving to large cities in search of good hospitals. PHCs in every taluka would cater to the basic needs of citizens.

It is not feasible for the government alone to undertake the required changes. The restructuring of the state's healthcare system must include a readiness for partnerships with the private or non-governmental sectors. Engaging with private actors to create cost-effective and top-notch delivery institutions may require the state to facilitate and promote deeper private sector penetration into Tier 2 and Tier 3 cities (innovative models with enhanced cost advantages for private players, who can be compensated based on numbers treated and outcomes delivered.) (Exhibit 96)

Efficient and effective use of existing infrastructure

Extensive infrastructure can be built on all fronts to support a highly effective healthcare delivery programme and ageing population while also providing state-of-the-art healthcare facilities. However, there is a pressing need to leverage the resources that have already been built, whether in the public or private sector. There is no justification for the state's numerous healthcare delivery facilities to use less than 50 percent of existing assets. There is an urgent and immediate need to sweat assets already created, improve productivity, and reduce the costs of delivering healthcare. Effective utilisation and rationalisation of existing medical infrastructure to balance supply and demand can help the state be a catalyst for the change Ayushman Bharat seeks to deliver. The government could establish a budgetary allocation that is free of constraints, to promote maximum capacity utilisation by rewarding healthcare professionals and institutions by giving financial assistance through banks and other financial organisations.

The state could establish partnerships between medical colleges, community health centres, and PHCs to offer modules for providing periodic, continuous digital upskilling programmes to qualified primary healthcare providers.

There could be an enhanced focus on childcare to reduce Karnataka's high maternal mortality rate (MMR). This could include the following:

- New-born and child healthcare services can be scaled up through evidence-based interventions, improved intrapartum, postpartum, and follow-up services, with a focus on early intervention through screening and effective referral linkages.
- The state could use standard paediatric care packages to ensure paediatric care units have the same level of infrastructure, staffing, and clinical standards as new-born care. This may require considerable investment and targeted interventions. This would reduce fatalities brought on by inadequate infrastructure or medical staff.

Promote model setups: The state could look at model setups in the districts and taluks to showcase success and increase local adoption and acceptance of these facilities. Moreover, this would also showcase the robustness and effectiveness of these interventions in a live setup and not under circumstances where variables are controlled.

Set up **AYUSH (ayurveda, yoga and naturopathy, unani, siddha, and homeopathy) care models across four districts** as demonstration projects to integrate AYUSH into existing services for identifying areas of stand-alone management of AYUSH interventions and setting up a wide range of integrated services through standardised approaches.

Be the **first state to join the piloting of the National Digital Health Mission (NDHM)** by identifying two districts for the pilot rollout. Two to three hospitals in each of the districts across public and private systems could be the initial participants in this integrated programme, which can then be replicated in other districts.

Create a preventive healthcare ecosystem

The entire health industry (be it public or private) can commit to and deliver an effective and efficient preventive healthcare system.

Smart healthcare professionals could adopt tools such as AI-enabled predictive algorithms that can determine the possibility of a disease before the occurrence of the first symptom. They could also use fail-safe tools to estimate disease burden and healthcare costs for communities and craft solutions to tackle diseases and minimise costs. The approach could be to keep people healthy through the strengthening of existing infrastructure and ensuring education on good health; sanitation and safe drinking water are not luxuries. This can help to keep millions of people out of hospital.

The state could improve healthcare literacy through education and awareness programmes that include:

- Creating user guides and learning collateral for rural consumers, disseminated through accredited social health activists (ASHAs), on navigating the digital healthcare system (for example, Ayushman Bharat Health Account registrations), the need for check-ups at fixed intervals, and nutrition and sanitation requirements to drive healthcare literacy.
- Providing education and counselling services in all public health facilities with engagement of AYUSH doctors for behavioural changes and counselling for developing healthy lifestyles.
- Dispelling myths about nutrition, such as the importance of protein consumption, and raise awareness of cheaper, alternate sources of protein, such as soya milk and lentils, as well as their positive effects on health.
- Prioritising data- and evidence-based campaigns at the district and taluka levels at the start of a programme, before targeted interventions, or before the introduction of new schemes.
- Introducing campaigns on child mortality, the importance of immunisation and nutrition, and conducting immunisation drives in high-risk districts to reduce under-five mortality rates by 2025.

Conduct preventive healthcare camps for all, with an increased focus on villages with high ageing populations.

Establish a strong public health surveillance team in districts to tackle local epidemics, disasters, communicable diseases, non-communicable diseases, mental health, and injuries by liaising with state-level agencies and academic institutions. This could help the state identify risks and challenges in early stages and drive targeted interventions.

Focus on non-communicable diseases

- An integrated programme on non-communicable diseases (NCDs) could be rolled out across the 31 districts by competent teams at health and wellness centres and district hospitals.
- Implement standard protocols for screening of risk factors and diseases among more than 30 people in all educational institutions, workplaces, community settings, and healthcare institutions at district and taluka levels. The screening can be followed up with counselling and regular checks.
- Strengthen research at the National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases & Stroke (NPCDCS) by identifying four to five medical colleges that can augment epidemiology

research at state-level academic institutions. Four regional NCD centres of excellence could be established in the next year for implementing coordinated activities in multiple areas. All medical colleges and apex institutions could participate in developing programmes and implementing capacity building, training, screening, service delivery, referral, monitoring, evaluation, and research.

Improve the overall health of women by addressing all health concerns of women, such as anaemia, cancer, domestic violence, and gender disparity. For example, anaemia can be tackled with a broad-based approach that includes providing iron-folic acid supplementation; improving nutritional services under the Integrated Child Development Services, Kishori Shakti Yojana, and SABLA schemes; ensuring food security; improving literacy; and reducing poverty among women.

Operationalise all health and wellness centres to increase awareness in communities, promote healthy lifestyles, and provide screening, referrals, and follow-up activities to reduce the prevalence of NCDs.

Leverage data to identify districts and talukas that have high maternal mortality rates, with concomitant mapping for reproductive and child health resources for strengthening maternal health programmes.

Roll out and monitor measures such as Society for Nutrition, Education and Health Action clinics to promote health and address malnutrition among adolescent women, and ensure timely access to basic health services such as immunisation, nutritional deficiency testing, and sanitary pads.

Multisectoral coordination bodies guide anaemia programming in Sierra Leone and Uganda[iii]

Setting up these bodies yielded common lessons:

- Communication and follow-up were required to mitigate the conflicting commitments and competing priorities of stakeholders and sustain their participation in the working group.
- Providing all members with a foundation of anaemia knowledge was needed and was achieved through technical presentations.
- Networking opportunities, stronger working relationships, and in some instances, increased collaboration (e.g., bringing together trade; agriculture; and information, communication, and technology to promote fortified and biofortified foods).
- Feedback loops between national and district efforts were viewed as important but challenging to maintain.

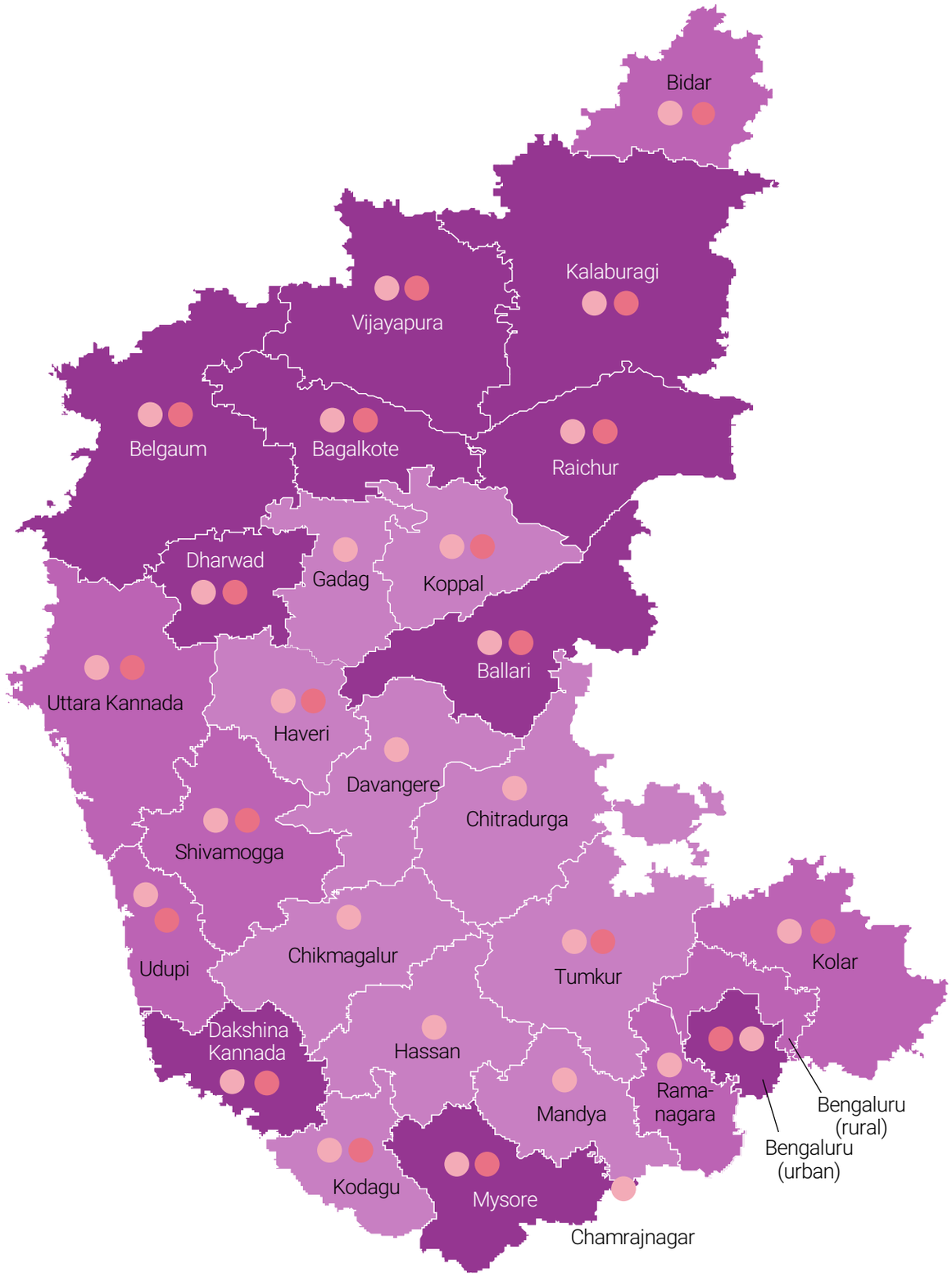
Sierra Leone and Uganda have developed multisectoral strategies to address anaemia

Sierra Leone developed the National Strategy for Prevention and Control of Anaemia 2017-2025, the first anaemia strategy in the country. They decided to identify priority actions centred on scaling up or improving interventions without being duplicative of other strategies. The strategy emerged through a process of working group meetings, one-on-one interviews, and review meetings, which enabled a strong consensus among participants.

Uganda established the National Anaemia Prevention and Control Strategy 2016/17– 2021/22, building on its pre-existing Anaemia Policy 2002. They decided to develop a comprehensive plan that does not make major changes to sector mandates but fosters an integrated, multisectoral approach to strengthen implementation. The new strategy resulted from a collaborative process achieved through periodic working group meetings, consultative workshops, and visits by NAWG members to districts to inform the strategy.

Exhibit 94

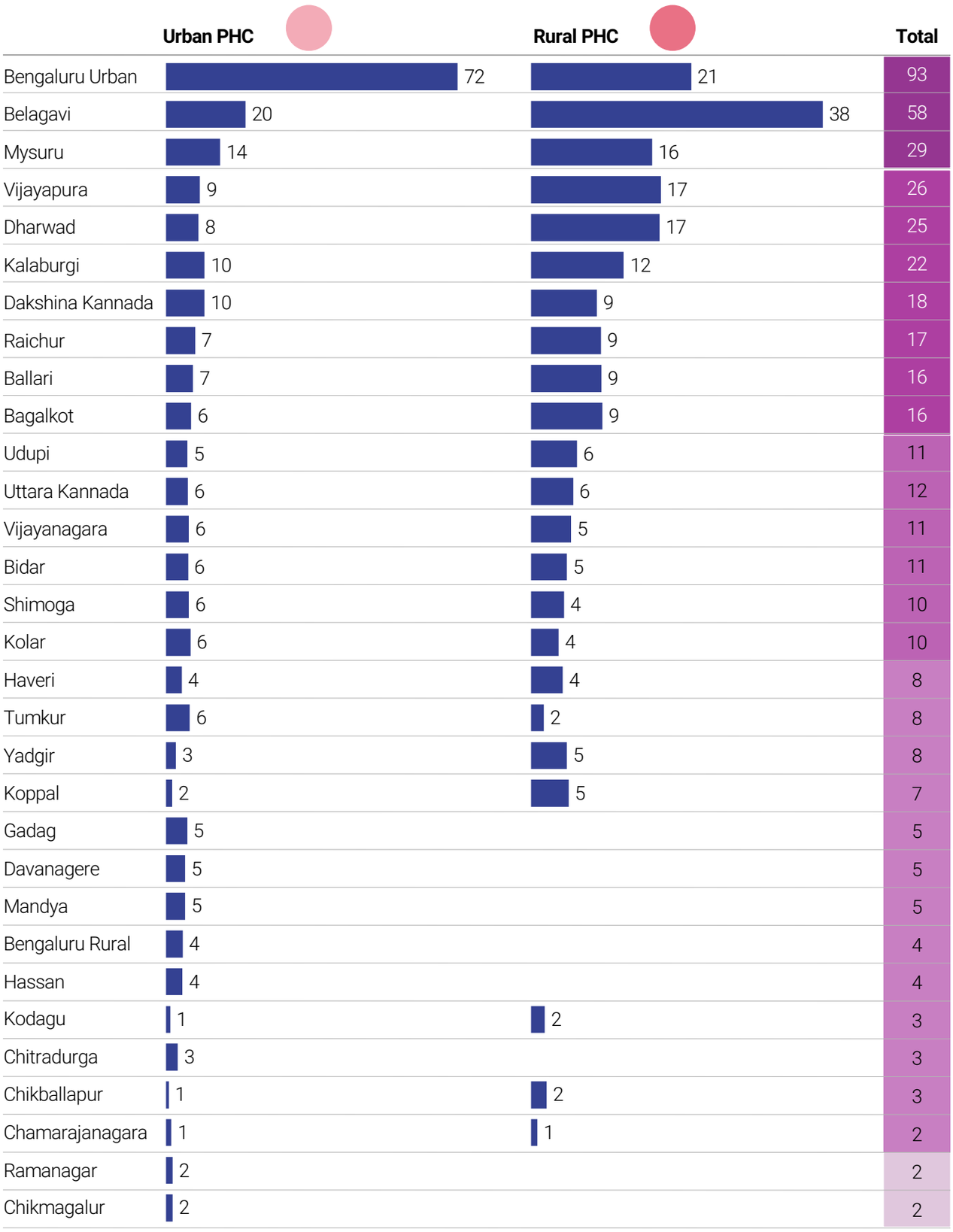
Deficit of primary healthcare centres across the state[1]



1. Healthcare committee

Exhibit 95

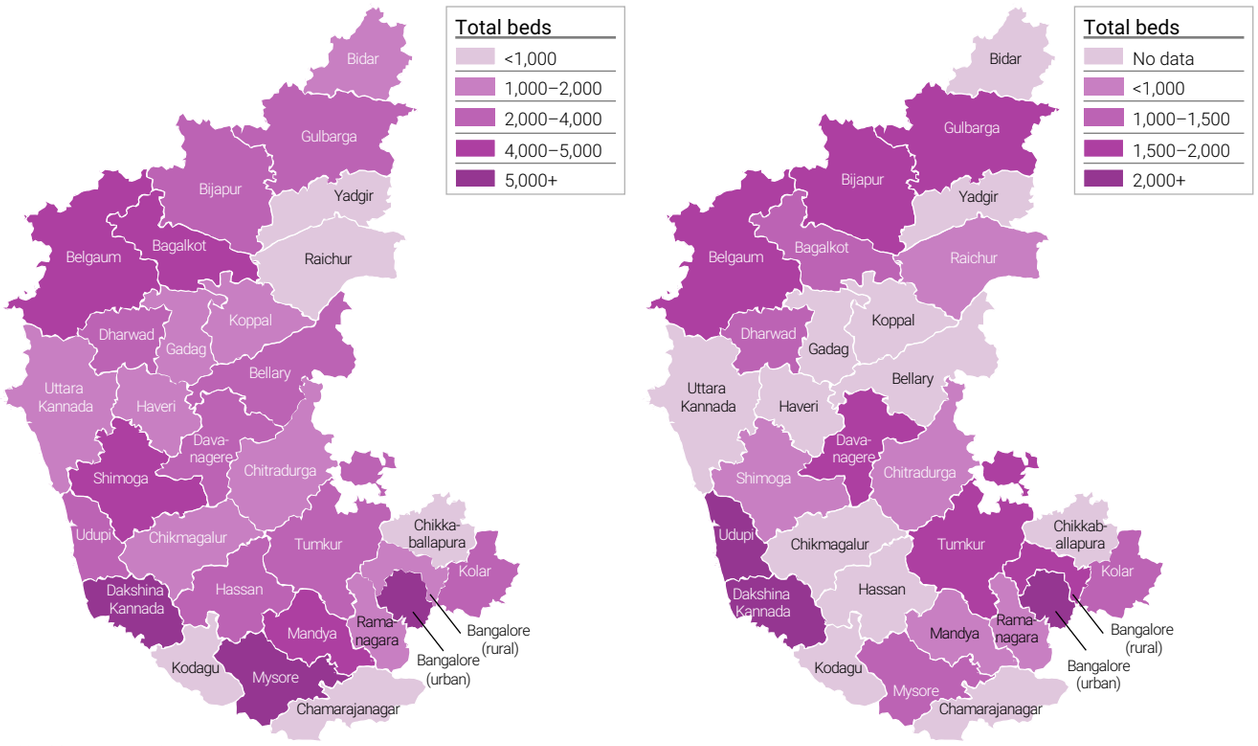
Deficit of primary healthcare centres across the state[1]



1. Healthcare committee

Exhibit 96

of Beds across private hospitals and medical colleges across districts[1]



1. Healthcare committee

Scale up digital interventions

Karnataka could modernise operations across healthcare facilities by adopting digital technologies. There is an immediate need to convert all healthcare delivery institutions to smart healthcare clinics and hospitals. A combination of technology and human workforce may be needed to establish future-ready institutions. The state could take advantage of its start-up culture and digital ecology to promote the adoption and integration of Industry 4.0 technologies. To achieve this, the state can work in collaboration with technology firms. Automated processes rooted in an ecosystem of connected resources would deliver better and more affordable patient care.

The state could have a strong focus on providing elevated customer experience across the entire patient lifecycle journey by adopting digital solutions. It could aspire to roll these out across all the healthcare centres and encourage adoption by private players to provide a seamless experience to patients. These solutions could include:

- Touchpoints such as websites, mobile apps, and call centres for seamless appointment booking and reducing the need for multiple forms.
- Integrating department systems and creating a multipoint billing system with digital payment integration.
- Digitising clinical records, making it easier for doctors to make informed decisions.
- Using a single-click discharge system to manage real-time cross-department updates on billing and treatment notes.

The state could leverage its technology ecosystem to establish/modernise a health analytics division under the Department of Health, focusing on the collection of hospital data, capacity utilisation, disease prevalence in the region, disease being treated, doctors, and patient demographics. This would help to assess Karnataka's health sector performance at the primary and secondary levels and recommend evidence-based interventions at the general practitioner and taluk levels. Also, it would offer techniques and aid in lowering disparity amongst various populations. This could help in driving higher levels of preventive healthcare by identifying certain viral outbreaks and limiting disease prevalence. It could also help to identify disease prevalence in certain districts/talukas and drive targeted interventions applicable to the region's demography by:

- Scaling up new-born and child healthcare services through evidence-based interventions, and improved intrapartum, postpartum, and follow-up services, with a focus on early intervention via screening and effective referral links.
- Developing high incidence/prevalence reports for various districts for monitoring control measures and epidemiological investigations of all individual disease cases at district/taluka levels based on action reports.

Karnataka could also use digital health integration for clinical execution to capture 20 percent of the $10.6 trillion Indian market. This could be achieved by:

- Installing remote monitoring solutions in all primary healthcare centres to make way for virtual diagnoses, where specialist doctors can diagnose patients without actual visits as far as possible. This could be a breakthrough in Tier 2 and Tier 3 cities, where access to proper healthcare is difficult as 60 percent of hospitals and 80 percent of doctors in India are in urban areas. Karnataka can leverage technology to ensure healthcare reaches every citizen in the state.
- Partnering with technology companies to drive the integration and adoption of Industry 4.0 solutions (Internet of Things, cloud computing, AI, and robotics).
- Empowering community healthcare workers (for example, ASHAs, MPHWs, and auxiliary nurse midwives) to deliver higher-quality primary care for underserved segments via remote doctor supervision. This could be enabled by telemedicine platforms, point-of-care mobile testing solutions, and digital upskilling platforms available under the ambit of the Ayushman Bharat Digital Mission.

The state could also develop and deploy solutions (in partnership with tech companies), such as patient flow management systems, dynamic staff allocation systems, inventory, and procurement optimisation tools across public hospitals to digitise hospital operations and upgrade legacy architecture, thus reducing the cost of healthcare and improving patient turnover.

These digital interventions can help the state move one step closer to its "Health for All" goal by enabling remote diagnoses via telehealth for rural districts, increasing doctor availability, and ensuring in-time diagnosis of prospective diseases, reducing the burden on the healthcare system.

Using health data surveillance to guide environmental upgrading in Indore, India[iii]

The city of Indore, India, has enjoyed a sustained period of economic growth as a major hub of industry and trading. However, commercial expansion and migration have placed a heavy strain on the city's resources, particularly its limited water supply. The city has also been unable to keep up with its rapid expansion and is struggling with inadequate drainage and sanitation. The result is a rising incidence of water and vector borne diseases, such as typhoid and diarrhoea.

To tackle this threat, the local government is now implementing an innovative city-wise disease surveillance and information system to address the current gaps in monitoring and responding to outbreaks, particularly in poor or marginalised areas. By gathering data from public and private clinics and hospitals, the city is able to identify and respond to potential outbreaks in real time, including through SMS. Besides providing an accurate real-time picture of their prevalence and location, the system also provides authorities with a solid evidence base of high-risk areas to guide their future sanitation development. These investments, targeted in the most vulnerable areas, will help lower the incidence of disease by eliminating the stagnant environmental conditions that encourage its spread.

Address the shortfall of medical staff

Although the state has a reasonably good ratio of infrastructure and medical professionals to population, the skewed distribution of the PHCs and medical staff has resulted in a deficit across the 30 districts. (Exhibit 97 & 98)

Given that there is a shortfall of about 16,500 medical staff in the state (723 MBBS, 1,512 pharmacists, 7,492 nurses, 1,752 assistants, 1,517 laboratory technicians and 3,253 Group D personnel), there is an urgent need for the state to address this shortfall by ensuring that verified individuals are fit for deployment and can find employment close to home. There is also a need to boost and set up infrastructure to address the shortfall of medical personnel by:

Setting up medical colleges and specialisation institutes with state-of-the-art infrastructure. Ten districts in the state (Bidar, Yadgir, Koppal, Gadag, Ballary, Haveri, Uttar Kanada, Chikmagalur, Chikkaballapura, Hassan, Chamarajanagar, and Kodagu) have a deficit of private medical college facilities. The state could incentivise private institutions to establish colleges and institutes in these regions. The state could also work with centres to increase the intake of students in older institutes to boost the number of MBBS graduates in the next five years. Private players with large medical facilities could be pushed to set up medical institutes with a focus on specialisation degrees to produce more medical professionals.

Setting up public and private training centres (incentive driven) to boost supply to meet state demand. This could include:

- Nursing and assistant training centres: The six districts of Bengaluru Urban, Belagavi, Mysuru, Tumkur, Hassan, and Mandya contribute a 39.2 percent deficit and could be prioritised.
- Lab technician training centres: The six districts of Bengaluru Urban, Shimoga, Mysuru, Tumkur, Hassan, and Mandya contribute a 39.1 percent deficit and could be prioritised.

Additionally, public and private medical colleges could launch nurse and allied health professional paramedical training programmes to provide accredited, high-quality education for auxiliary healthcare professionals and help address the shortage of nurses and paramedical staff.

Modernising the existing medical centres to boost doctor availability (for example, incentivising doctor empanelment and participation through stipends based on the consultations) for telemedicine platforms such as eSanjeevani.

Launching and running multi-media campaigns to promote nursing and assistant as an aspirational profession and publicise the nursing and assistant qualification programmes.

The state could prioritise resolving this shortfall as demand will increase as more infrastructure is added to the state.

Achieve universal health coverage

Low government spending on healthcare has constrained the capacity and quality of services at public institutions. This drives most individuals to the private sector. However, due to low financial protection, this places a major economic burden on all strata of society. Health insurance would be an important instrument to safeguard against these shocks.

Despite the coverage of different segments of society under Ayushman Bharat – Pradhan Mantri Jan Arogya Yojana (AB-PMJAY) and private voluntary health insurance, about 30 percent[iii] of people in the country are devoid of health insurance. Since its inception in 2018, the Pradhan Mantri Jan Arogya Yojana, or PM-JAY, has linked up with more than 8,500 healthcare centres and received over 99 million visitors. Leveraging India's health stack and other infrastructure (including digitally enabled community health centres opened across the country under the Ayushman Bharat Digital Mission) would quickly close this coverage gap and help underserved communities receive the care they require. This can be accomplished through telehealth-enabled diagnostics and primary-care services delivered in rural areas by digitally skilled healthcare workers. Along with infrastructure capacity, each individual can be enrolled in the Ayushmann Bharat insurance programme to access secondary and tertiary care.

The state could look at partnering with players and design a low-cost comprehensive healthcare product for the missing middle.[83] The government, private sector, and insurers must work together to cover healthcare costs for citizens to prevent out-of-pocket expenditure. To achieve this, the government can:

- Provide government data and infrastructure as a public good to reduce insurers' operational and distribution costs and design targeted plans. For example, it can share government data (after receiving consent) to aid in customer identification and outreach.
- Provide funding to cover premium costs to increase financial viability for consumers and insurers.

[83] Health Insurance for India's Missing Middle, Niti Ayog

- Adjust base prices (in consultation with providers) to better reflect overhead costs and capex-related costs for hospitals of various sizes and in different cities, in addition to procedural costs (for example, cost of power, rent, interest).

Evaluate the inclusion of primary and outpatient department care (for example, high-complexity oncology care) in insurance coverage packages, rather than just inpatient care. This could help in driving the agenda of preventive healthcare where many people would be avoiding outpatient diagnosis due to increased out-of-pocket expenditure.

While working to provide more options for citizens, efforts to raise awareness of existing options and the importance of health coverage could be prioritised. The government can:

- Run digital and door-to-door campaigns to ensure universal enrolment in Ayushman Bharat to cover vulnerable sections of society. For example, ASHA workers could go door-to-door to get people to register for Anyushman Bharat health accounts. This would help achieve the 100 percent enrolment target sought by PM-JAY.
- Build consumer awareness of health insurance through campaigns, especially among the missing middle. Myths and misconceptions about spending on health insurance need to be addressed to increase the uptake.

Develop Karnataka as a preferred destination for medical tourism

Karnataka has one of the country's largest training institutions for doctors, nurses, and paramedics, and the state has well-developed urban infrastructure. This could be leveraged in the same way that the IT sector did in the 1990s. The state could strive to provide sufficient manpower not only for the country, but for the entire world. The state could offer medical tourism, and the government and private sector could collaborate to make it the world's healthcare destination.[iii] By 2050, more than a quarter of the population in advanced economies will be over 60. In advanced economies, the elderly are likely to have higher disposable incomes and spend double or triple what they do now on healthcare.

India is 10th among the 46 countries considered in the Medical Tourism Index (MTI) 2020–21, which ranks their attractiveness for medical tourism.[84] Karnataka has an opportunity to pivot and become the "hospital of the world". The state is already well-positioned in comparison to other states and could seize this opportunity to become a sought-after destination for international patients. To be at the forefront of the healthcare talent supply chain both nationally and globally, the state could continue to build high-quality healthcare talent capacity.

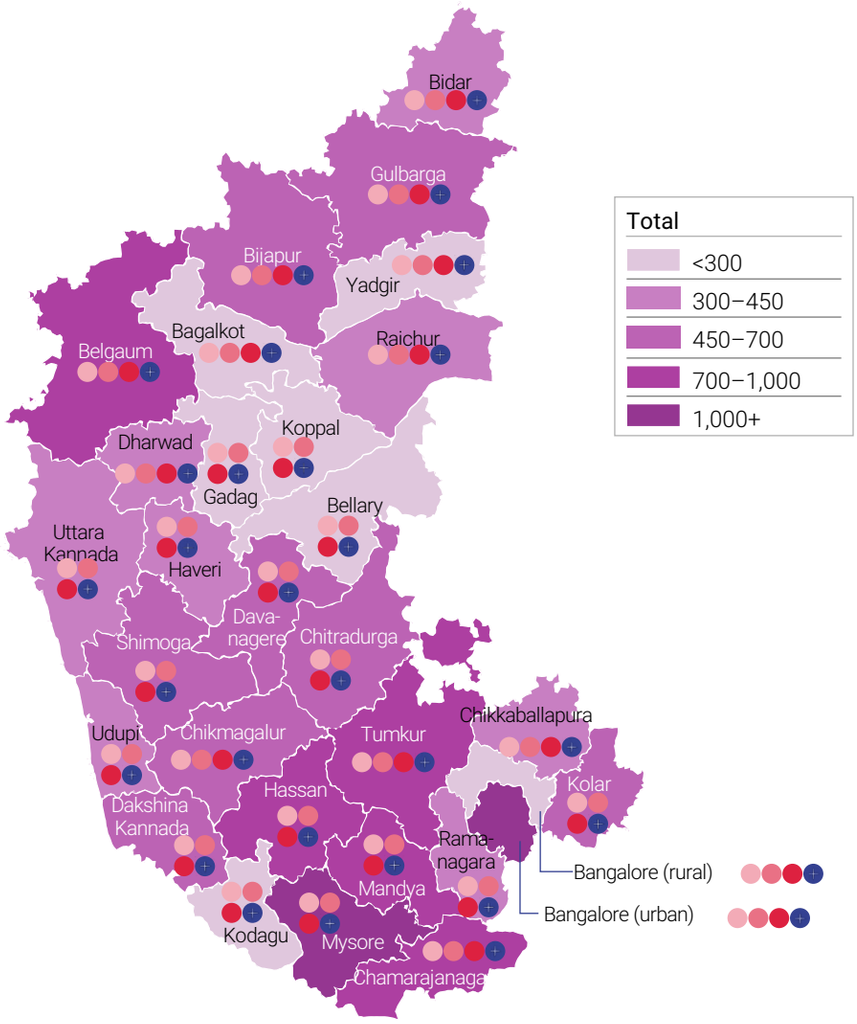
The state could invite private players to focus on infrastructure development to establish and promote Karnataka as a top medical tourism destination of the world. This could be achieved in the following ways:

- Tier 2 towns such as Mysuru can be targeted as medical tourism hubs. This would aid in the construction of quality infrastructure in the state's Tier 2 towns, thereby providing quality healthcare in the region. The state could lower the overall cost of treatments for medical tourists by cutting the cost of operations and infrastructure setup and lowering the cost of stay for incoming patients. As more medical professionals move to these specialty centres, the medical care will improve.
- Develop towns like Mysuru into international yoga destinations by building the necessary infrastructure. The state could learn lessons from towns like Rishikesh, in the northern state of Uttarakhand, which has become a global hub for yoga and wellness tourism. The town brims with yoga schools and wellness centres where foreigners pay up to $700 for a seven-day retreat.[85]
- Leveraging the strong tech ecosystem in the state, the government could launch a one-stop digital portal for medical tourists (in partnership with tech companies) with information on available treatments and their locations/providers. The government could also simplify medical visa procedures for medical tourists.
- The state could with the Department of Tourism to enlist all AYUSH wellness centres, **multi-specialty** hospitals and ayurveda centres on the tourism council website, with tariffs and treatment options.
- Identify 20 to 25 countries (starting with those in Africa and the Middle East) that could be sources of medical tourists. The state could connect with the governments of those countries and run roadshows and medical fairs abroad to showcase Karnataka as a preferred medical destination.

[84] Medical Tourism Index 2020–2021: Global destinations; MedicalTourism
[85] High-end hotels, luxe yoga retreats: Rishikesh is the new hub for luxury travel, Shreyanka Mazumdar, TNN

Exhibit 97

Medical personnel deficit[1]



1. Healthcare committee

Initiatives to scale up public-private partnerships

It is not feasible for the government alone to undertake the changes required, and therefore a willingness for partnerships with the private or non-governmental sectors can be integral to the transformational journey of Karnataka's healthcare. The state can facilitate and promote deeper private sector penetration into Tier 2 and Tier 3 cities to build cost-efficient and world-class delivery institutions by partnering with private players.

- The state could develop financially attractive value propositions to improve public-private partnerships (PPPs), such as outcome-based compensation mechanisms, mutually agreed tariffs for end-users to improve financial viability, and incentive schemes for centres being operated in rural areas.
- Use digital solutions to implement IT-enabled automated payments linked to digital KPI monitoring systems measuring service delivery conditions outlined in PPPs to avoid payment delays and incentivise operational excellence, for example, through smart contracts. To ensure compliance with service-level agreements in PPPs for healthcare infrastructure, there is a need to establish digital control towers to monitor patient statistics, drug and equipment inventories accounts, and personnel utilisation via electronic records maintained by healthcare facilities.

Exhibit 98

Medical personnel deficit[1]

	MBBS	Pharmacist	Nurse	Others: Assistant	Others: LabTech	Others: Group D	Total
Bengaluru Urban	166	175	649	320	194	388	1,892
Mysuru	38	87	460	118	95	218	1,016
Hassan	13	96	409	155	74	186	933
Tumkur	13	105	440	46	81	220	905
Belagavi	54	49	451	113	60	175	902
Mandya	2	95	347	69	75	203	791
Kalaburgi	26	72	295	66	45	135	639
Shimoga	17	50	314	28	69	139	617
Chikmagalur	25	69	262	74	62	100	592
Davanagere	24	61	264	39	49	129	566
Kolar	24	56	204	102	41	91	518
Dakshina Kannada	33	31	239	46	54	74	477
Chamarajanagara	19	60	184	57	52	101	473
Chitradurga	11	52	249	17	37	101	467
Vijayapura	31	50	192	56	36	95	460
Uttara Kannada	24	28	240	13	58	74	437
Udupi	13	38	182	57	24	74	388
Haveri	18	35	208	12	48	64	385
Ramanagar	6	29	191	12	33	98	369
Chikballapur	5	16	174	57	38	70	360
Dharwad	22	39	148	30	32	84	355
Vijayanagara	9	39	165	15	35	89	352
Bidar	20	30	169	34	30	51	334
Raichur	17	23	158	40	38	57	333
Bengaluru Rural	7	8	155	32	26	50	278
Koppal	17	26	137	25	28	45	278
Bagalkot	11	15	159	25	13	35	258
Gadag	19	19	122	40	21	16	237
Ballari	17	18	112	26	24	30	227
Kodagu	13	24	87	22	25	38	209
Yadgir	9	17	126	6	20	23	201

1. Healthcare committee

- Curate capability-building programmes for officials in charge of PPP activities. This could help in creating a framework of best practices and guidelines for writing RFP's and contracts, prevent delays/disputes in tendering, implementation, and project operations. Moreover, this can increase the appetite and confidence of the private players to adopt the PPP model and go a long way in attracting additional investments to the state.
- Plan for and provision a separate budgetary allocation for PPP projects and schemes to prevent the need for budgetary adjustments, bureaucratic delays, and auditory objections that can delay the payment releases and dampen the financial attractiveness of the projects.

Set up teams and a taskforce

While the government plans these interventions, there would be a need to set up teams and a taskforce to oversee new initiatives. These could include:

- An overarching implementation body, the Karnataka State Health Council for Integrative Medicine and Healthcare, to link education, healthcare, research, drug manufacturing, and IT platforms in the AYUSH sector in a comprehensive manner for robust healthcare management.
- An independent task force to examine district-level variations and deficiencies, setting up specific strategies for aspirational and low-performing districts to strengthen regionalisation of child healthcare services to reduce inequities and variations.
- State-level and district-level convergence committees to establish institutional mechanisms for the convergence of activities by the departments of Women and Child Development, Education, Social Justice and Empowerment for early childhood development and nutrition programmes.
- An autonomous Occupational Health Authority to plan, supervise, implement, monitor, and enforce occupational health services across multiple sectors.
- A task force to develop a comprehensive plan for elderly care, to examine issues beyond medical care, including assisted living, adult day-care, long-term care, residential care, hospice care and home care. A hub-and-spoke model could be developed that integrates comprehensive geriatric care in urban and rural areas, with primary healthcare centres as an add-on service.

Overall, there are numerous touch points that must be toned, worked on, and addressed to ensure the core sector grows and help reach a trillion-dollar economy within a decade.

The healthcare aspiration is: "A healthy India, where citizens are health-aware and engaged, and have equitable access to affordable health coverage with a focus on prevention, early diagnosis, and assured minimum quality of care, offered by a vibrant and sustainable ecosystem of public and private players".[86]

[86] Healthcare and economic growth, Karan Singh, Parijat Ghosh, Livemint 2016

References

i Karnataka economic survey

ii GDP performance and value forecast

iii Healthcare committee

CHAPTER 13

Education





After China and the United States,[iii] India is likely to surpass the $10 trillion GDP threshold by 2023. India's population advantage, its rapidly expanding consumption patterns, open markets, and technological edge make up its strength. India is a diverse country, with varying growth and development trends across its different states, which stands in stark contrast to the national picture.[87]

Karnataka is among the top five states in India and has demonstrated strong growth over the years. Its per capita state[ii] GDP of INR 3.05 lakhs in financial year 2022 estimated (FY22E) is the highest among these top five states. A standout feature of the state economy is that it had the highest share of services[ii] at 66.1 percent of gross state valued added (GSVA) in FY22E – the highest among all states. This is a product of its robust IT services industry and other formal employment in the country. Karnataka constitutes less than 5 percent of the national population but contributed 8.7 percent[ii] to the national GDP in FY22. While Karnataka has certainly done well in the past, now that the COVID-19 crisis has passed, it needs to re-orient its strategies by studying the unique needs and capabilities of its citizens and demographics, and the sectoral composition of its economy.[88]

Karnataka is an economic powerhouse. It is the third-largest state economy in India, at INR 20.5 lakh crore nominal gross state[ii] domestic product (GSDP) in FY22, translating to a per capita GSDP of INR 3.05 lakhs. Karnataka's per capita GSDP is the highest among the top five states and, indeed, one of the highest in the country. The services industries, such as IT, contribute a significant 66 percent to the state economy.

Pai and Holla in 2022 recommended four education-related strategies for Karnataka:

First, education will be vital in maintaining a productive workforce when the population declines. Government must focus its three mutually-independent roles in education–that of policymaker, instituting a competent accreditation agency and regulator independent of government, and restructuring the education department to deliver a higher quality of public education.

Second, higher education is particularly valuable in today's knowledge, economy-led growth era, and specialisation resulting from quality higher education will help keep the economic momentum going.

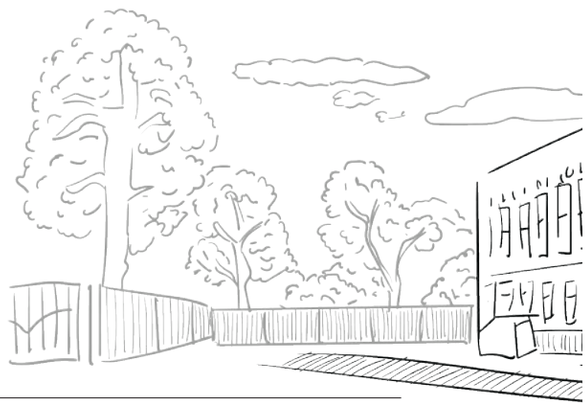
Third, there is a considerable asymmetry in workforce-to-sector dependence. Forty-one percent of the workforce depends on the agriculture sector, contributing only 14 percent to state GVA. Karnataka may find it advantageous to explore the potential of the agricultural sector by promoting changes in the preservation and manufacture of value-added products. This includes reforming the food-processing sector to support growth in the agricultural sector.

Fourth, to facilitate this anticipated transformation, the education sector must incorporate the relevant knowledge and skills into higher education and vocational programmes. Opportunities must be created in the regions where the production takes place to develop cutting-edge technologies and industries based on agricultural products. Comparatively, 86 percent of the state's GVA is generated by industry and services, which support 59 percent of the population and offer chances for significant growth and employment with higher wages. Consequently, the wage ratio of an agricultural dependent to one in industry and services is incredibly skewed, at 1:2.7:5.1, calling for an immediate rebalancing.[89] In addition, as the state focuses on expanding its manufacturing and other sectors, demand for talent across jobs and geographic areas will grow.

Karnataka may need to set aspirational goals for the coming decade to be a leader in skilled workforce production and reduce the need to depend on other states to fulfil its talent requirements. (Exhibit 99)

Knowledge and innovation—the India Innovation Index

NITI Aayog has developed the India Innovation index in an effort to raise India's position[iii] in the global innovation index. India's index is a combination of two dimensions – enablers and performance – with seven pillars and 36 indicators between them. The findings from the index provide some interesting insights about the ranking of states on the India Innovation Index. There is a strong positive correlation between the GDP of the state and the Innovation Index. This demonstrates that increased economic growth fuels increased innovation, and vice versa.



87 Pai and Holla, 2022
88 Pai and Holla, 2022
89 GVA data from MOSPI and Karnataka Economic Survey 2021–22, Workforce data from PLFS

Exhibit 99

Education sector vision[1]

Macroeconomic indicators	From (2021–22)	To (2031–32)
GER (higher education)	32.2	**50**
GER (higher secondary education)	65.24	**100**
% of GDP spend on education (government) (%)	1.5%	**6–7%**[1]
Vocational training availed by children (%)[2]	14.2%	**60%**
Pupil teacher ratio	24	**30**
School Education Quality Index (SEQI) (national rank)	3	**1**
Average annual drop out rate at secondary level	16.25	**8.8**

1. Education committee
2. Aarthika charche, FPI Journal of economics and governance
3. Economic Survey 2021–22; Skill Karnataka 2030



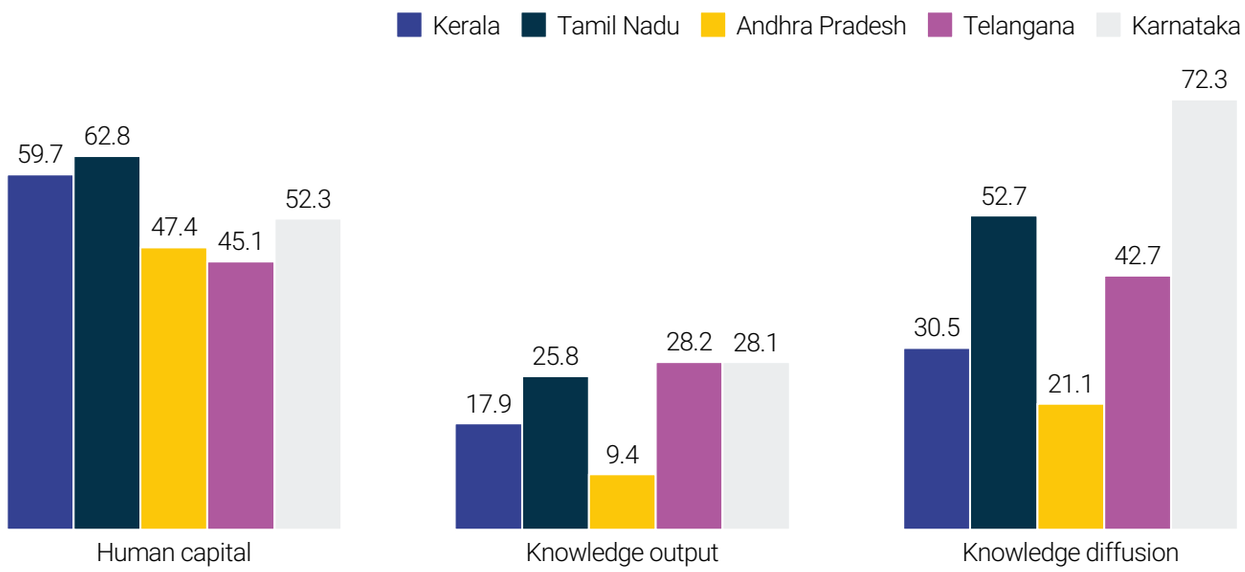
Knowledge output and human capital

When comparing southern states in terms of knowledge output – human capital and knowledge diffusion – Karnataka leads in knowledge diffusion and shares the top position with Andhra Pradesh in knowledge output. However, when the human capital is compared across the southern states, Tamil Nadu leads with 62.8 percent, followed by Kerala with 59.72 percent, and Karnataka is in the third position at 52.27. (Exhibit 100)

While Karnataka leads in K-12 enrolment, it is the higher education gross enrolment ratio (GER), which is at 32.2 percent that lags other southern states – they have GERs of over 35 percent, with Tamil Nadu at 51.4 percent. The decline in enrolment in secondary and higher secondary education must first be corrected, as is the case with the national trend, before Karnataka aspires to obtain a greater enrolment in university education. Higher education and specialisation will increasingly become more important for innovation and knowledge creation. They are both essential for growth that is driven by the knowledge economy over the coming decade and beyond. The state also needs many programmes for vocational training and skills development that can assist in rebalancing the workforce away from an overreliance on agriculture and towards other sectors. As these skills tend to be taught in higher education, this chapter focuses mostly on that level of education in Karnataka ($1 trillion skills development professionals by 2032).

Exhibit 100

Comparison of select innovation indicators across the southern states



Source: India Innovation Index 2019–20

Historic growth and the current status of K-12 education in Karnataka

GER has always been used as an indicator to measure access to formal education in the absence of the Net Enrolment Ratio (NER). However, the analysis in the following section has been made using the NER. (Exhibit 101)

The southern states have performed better with respect to human development indicators, hence it may be useful to compare the performance of Karnataka with reference to them. Research shows that Karnataka is the only southern state with a 100 percent NER at the lower primary level for both boys and girls. In a sense, this reflects the years of sustained effort to make sure that no child is left behind.

While the NER for India overall at the upper primary level drops by 20 in comparison to the lower primary level, Karnataka has an 89.8 percent NER and Kerala 81.66 percent. This indicates a drop of around 10 percent in the NER at the upper primary level. The declining trend in enrolment continues as one moves to the higher grades of IX and X. The national NER of 50.3 percent paints a bleak picture in showing that almost half of the children in this age group are not part of the formal education system. Karnataka and Kerala, with a GER of 72.31 and 74.13 percent respectively for IX and X, are way above the national average.

Comparing the NER for the higher secondary level for the year 2019–20, Kerala records a high of 62.38 percent against the national NER of 32.3 percent. Karnataka records greater than the national average at 39.78 percent. However, Tamil Nadu fairs better than Karnataka with a NER of 43.36 percent.

It is important to concentrate on getting grade XII students through school, which will require a transition of students from grades VIII, IX, X, and XI. This will help identify which students are eligible for higher education.

According to an analysis of student enrolment in the regular mode for the years 2015–20,[ii] Tamil Nadu has the highest percentage (8.71 percent) among the southern states, followed by Karnataka (6.14 percent). Karnataka has recorded a small but steady rise compared to Tamil Nadu, which has had a slight decline. The enrolment percentage for Andhra Pradesh is 4.77 percent, 3.89 percent for Telangana, and 2.5 percent for Kerala.

As observed earlier, Karnataka trails its southern neighbours in GER for higher education. Enrolment has to be significantly increased so that a well-educated and trained talent pool will be ready to fuel the needs of economic growth. Otherwise, there will be a larger influx of working talent coming from outside Karnataka to meet these needs.

Exhibit 101

NER southern Indian states (2019–20)

U: Upper **Hr:** Higher

	Primary (I–V)			U. Primary (VI–VIII)			Elementary (I–VIII)			Secondary (IX–X)			Hr Secy (XI–XII)		
Region	**Girls**	**Boys**	**Overall**	**Girls**	**Boys**	**Overall**	**Girls**	**Boys**	**Overall**	**Girls**	**Boys**	**Overall**	**Girls**	**Boys**	**Overall**
Andhra Pradesh	85.7	88.8	87.3	70.6	72.2	71.4	87.7	90.7	89.2	55.2	55.1	55.1	37.2	32.5	34.7
Karnataka	100.0	100.0	100.0	89.5	90.1	89.8	100.0	100.0	100.0	71.5	73.1	72.3	43.4	36.4	39.8
Kerala	90.5	90.7	90.6	81.8	81.7	81.7	93.1	93.4	93.2	74.1	74.0	74.1	65.9	59.0	62.4
Tamilnadu	84.7	84.6	84.6	70.7	72.1	71.4	89.1	89.1	89.1	54.0	55.7	54.9	46.8	40.1	43.4
Telangana	95.0	94.8	94.8	72.9	72.8	72.8	96.0	95.8	95.9	57.2	56.9	57.0	36.1	26.1	30.9
India	92.4	90.5	91.4	71.9	70.4	71.1	91.3	89.7	90.4	50.3	50.6	50.2	33.3	31.4	32.3

Source: NIC School Education Report 2019–20

Despite Karnataka performing well at primary level, in terms of secondary education, it lags considerably. It should be noted that all the education outcomes of enrolment, transition, and retention fall sharply at the secondary and higher secondary levels. Dropout is inextricably linked to these parameters. This can be attributed to several factors including cultural, environmental, school-based, and socioeconomic. NITI Aayog annually ranks and measures the progress of Indian states on different sustainable development goals (SDGs), highlighting their performance and journey towards achieving SDGs, including SDG 4 (Education).

Karnataka is ranked third in the SDG India Index for 2020–21,[i] improving its score from 66 in 2019–20 to 72 in 2020–21. However, there are certain high priority SDGs for Karnataka may require immediate attention, one of them being SDG 4. The performance of Karnataka in this SDG has declined from frontrunner in 2018–19 to performer in 2020–21. The average yearly dropout rate at secondary level (grades IX to X) is one of the key indicators where Karnataka's performance under SDG 4 has repeatedly been a cause for concern. Karnataka's performance on the indicator measuring learning outcomes has also dropped from an achiever and frontrunner to being a performer. It implies that the percentage of students with minimum proficiency level in terms of nationally defined learning outcomes have reduced for grades III, V, VIII, and X.

Accessibility of formal schooling for all, especially for children with special needs (CWSN), is still a significant challenge across a number of taluks. There are 93 taluks in the state that are below the state average in the education development index. Through the Midday Meal scheme (MDM), 53.48 lakh[iii] school-going children are served midday lunches six days a week in government and private aided-schools in the state. The RTE 2009 has been implemented successfully to provide access to quality education for children from impoverished families. Such initiatives with adequate financial support to children can be extended in these 93 taluks specifically.

Karnataka could focus on schemes and programmes that address the poor performing SDG 4 indicators. The actions required are related to increasing enrolment in secondary education, reducing dropouts, providing inclusive education, and increasing mass literacy. The efforts need to be focused on the districts of North Karnataka, especially the Kalyan Karnataka region. This focus, combined with an introduction of skills education at secondary and higher secondary levels, has the potential to transform K-12 education across taluks with innovative models including cluster schools, hub-and-spoke schools, and partnerships with model private and public schools. In addition, the purposeful use of connectivity technology is required to increase access of access by schools in all taluks as that can help prepare towards taking SGDP growth beyond the $1-trillion goal.

Historically, the state, and particularly the capital city of Bengaluru, has pioneered the establishment of science and technology institutions comparable to international standards. The Indian Institute of Science (IISC) and other national research institutions like the National Centre for Biological Sciences (NCBS), Raman Research Institute (RRI), Indian Institute of Astrophysics (IIA), Indian Satellite Research Organisation (ISRO), National Aeronautics Laboratory (NAL), Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), National Law School of India University (NLSIU), Indian Institute of Science, Bengaluru (IIMB), and International Institute of Information Technology, Bengaluru (IIITB), are among the best research and teaching institutions in the country. These institutions have state-of-the-art facilities in terms of laboratories and libraries that are the envy of other universities and institutions in the country. They can be a key pivot for research relationships that could fuel economic growth. (Exhibit 102)



Exhibit 102

Distribution of universities in India and Karnataka by types

India has a total of 135 institutes of national importance with 80 deemed private and 36 deemed public. Karnataka has a total of 69 universities. The distribution of the different types of universities in Karnataka follow the national pattern with 30 state public universities and 18 state private universities. There are 11 private universities and 4 state ones. There are 4 institutes of national importance, 1 central university, and 1 open university in Karnataka.

#	State/UTs	All India	Percentage	Karnataka	Percentage
1	Central University	48	5%	1	1%
2	Central Open University	1	0%		0%
3	Institute of National Importance	135	13%	4	6%
4	State Public University	386	37%	30	43%
5	Institute under State Legislature Act	5	0%		0%
6	State Open University	14	1%	1	1%
7	State Private University	327	31%	18	26%
8	State Private Open University	1	0%		0%
9	Deemed University – Government	36	3%	4	6%
10	Deemed University – Government Aided	10	1%		0%
11	Deemed University – Private	80	8%	11	16%
	Grand total	**1,043**	**100%**	**69**	**100%**

Source: AISHE 2019–20

In addition to the aforementioned universities, Karnataka is renowned for independent and autonomous research and specialised institutions, with more than 25 in the state. These include: the Raman Research Institute; Institute of Social and Economic Change (ISEC)[iii]; National Institute of Advanced Studied (NAIS); and the National Centre for Biological Sciences (NCBS), among other specialised institutions. Among the leading private universities in India, the Manipal Academy of Higher Education, Christ (deemed to be a university), and Azim Premji University are honourable mentions.

These institutions not only contribute to specialised research but also to the larger social development within and outside the state. The form and spectrum of higher education institutions in Karnataka is wide and varied, from independent research institutes to social and scientific research. While Bengaluru has the largest concentration of universities and other eminent higher education institutions, two more knowledge centres are needed in the Mangaluru and Dharwad-Hubbali areas.

Education priorities

The New Education Policy 2020 was a milestone event for the education sector across India. Karnataka was the first state to get off the starting block with its task force report, Implementation Plan – Karnataka National Education Policy 2020. This is a key reference document. The report's suggestions for K12 education could be carefully considered and adjusted to take post-pandemic lessons into account. It is necessary to keep in mind the most recent Annual Status of Education Report (ASER) study, which highlights the frightening decline in fundamental standards following the COVID-19-pandemic hiatus. Additionally, to ensure the state is well poised to develop a skilled workforce for the future while addressing the current challenges, a 360-degree approach can to be adopted, for which six priorities or themes and 34 relevant actions or initiatives have been suggested for the state to consider.

Prepare an educated and skilled workforce for 2032

According to the United Nations' World Population Prospects Database (2012), India will soon have the largest working population in the world. This sizeable workforce will form the backbone of India's economic development over the coming decade and more. To meet Karnataka's goal of achieving a $1 trillion GSDP by 2032, the appropriate quantity and quality of talent needs to be readily available. Higher education will be key to this, as well as driving higher education success on the key drivers of change – expansion, equity, and excellence. Higher education is also vital for aligning the focus on streams of academics and research with the needs of the various sectors that drive the economic engine. Suggested actions for this include:

- Set up grassroots innovation enabling networks (GIEN) to link grassroot innovators, civil society organisations, industry, academia, and public administration. Support the identification, development, validation, recognition, and diffusion of grassroots innovations.
- Leverage the NIAS developed model for identifying and mentoring gifted children to develop a talent pool of skilled professionals.
- Facilitate mobility between VET and mainstream education through a system of credit transfer (included in NEP 2020 as part of the lateral linkages).
- Increase the number of seats for lateral entry substantially to encourage students who opt for vocational or diploma streams, while allowing students who have taken a break in education to re-enter institutions with ease. Re-entering academia with the added advantage of industry experience will simultaneously attract the best talent from across the country.
- Start a vocational training centre in every government HEI in Karnataka by accessing the PMKKY 4.0 fund of the Government of India Skill Development department to prepare and send proposals to the government[iii] (there are 430 government first grade colleges, 102 government polytechnic colleges, 16 government engineering colleges, six VTU engineering colleges and two skill centres). The government of India (GoI)[iii] has agreed to a target of 250 colleges if GoK sends proposals.
- Start compulsory English employability classes in all government higher education institutes to address language barriers to employability and prepare graduates for the job market.
- Push for compulsory registration of every student on the government skills portal. Compulsory registration must be an enhanced central focus to impart skills-based training to students. Skill banks may need to be created to cater to industry demand while improving employability.

Modernise infrastructure

For the conceivable future, government schools will continue to be responsible for the enrolment of a significant chunk of students in schools. Karnataka has an invaluable responsibility to have a strong and effective government school network that will help create the foundation for future talent, contributing to India's economic might. Identifying talent and providing mentoring support is essential to realise the full potential of this critical group of students. NIAS has developed a model for identifying and mentoring gifted children. The state government can leverage this to develop the talent pool in Karnataka. School complexes or clusters can help promote equitable education and continually improve standards across the state. Karnataka can consider moving now from its preliminary work to an action plan with time and goals, with a state-wise transformation anticipated in four to five years. Ways to do this include:

Develop infrastructure to support higher education: There are 3,971 colleges in Karnataka, out of 39,955 colleges in India altogether.[90] Nearly 70 percent (2,793) of these colleges are privately aided. The remaining 30 percent of these colleges are government and government-aided colleges. The role of the private sector in higher education in Karnataka is significant and it may be important to examine the distribution of these institutions across different districts, as well as between professional and general colleges. It is likely that sectoral growth across industries occurs in Karnataka – meaning that a well-dispersed availability of institutions links local talent with industries.

- **Expand colleges and universities** (including professional colleges and universities in underdeveloped districts of Karnataka) Beyond Bengaluru to create a positive impact on enrolment (especially for girls). Additionally, aid those who have graduated to find both education and employment opportunities closer to their place of residence.
- **Optimise the use of the current infrastructure** by running colleges in shift systems and increase student enrolment across multiple courses that are aligned with the emerging needs of the employment market. Among the southern states, Karnataka has the highest number of colleges with 4,047. The student enrolment in colleges in Karnataka is 1,415, which is the highest among the southern states. Karnataka also records the highest number of colleges per lakh population, indicating better access. Among the southern states, Tamil Nadu records the lowest access with 38 colleges per lakh population. (Exhibit 103)

[90] AISHE, 2020

Exhibit 103

Student enrolment across colleges per lakh population in major south Indian states

States	No. of colleges	No. of colleges per lakh population	Average enrolment per college
Karnataka	4,047	59	1,415
Andhra Pradesh	2,750	51	547
Kerala	1,417	48	575
Tamil Nadu	2,610	38	872
Telangana	2,071	53	545

Source: AISHE 2019–20

Increase availability of schools

Karnataka has to reach the number of students who can access schools. They can do this in various ways.

Implement innovative models like cluster schools, hub-and-spoke school models, and private and public school partnerships, along with purposeful use of connectivity technology to increase access by schools in all taluks.

Efforts like Sarva Shiksha Abhiyan (SSA)[iii] have helped ensure near universal access to primary schools, however, it has also led to the development of numerous very small schools, which are economically sub-optimal, increase operational complexity, and negatively impact the teaching-learning process. NEP 2020 envisages the school complexes/ cluster model as a solution to this where one secondary school is grouped with all other schools offering lower grades within a radius of 5–10 kilometres, to achieve greater resource efficiency, improved coordination, leadership, and governance of schools in the cluster.

In Himachal Pradesh, clusters/ complexes[iii] are largely functional at the primary school level, with a cluster for every 5–8 primary schools. While larger clusters exist for secondary schools, they are mostly administrative.

- Each cluster has a CHT (cluster head teacher), who visits the schools in the cluster for review, provides subject-specific and resources support, conducts cluster meetings for curriculum planning, identifying learning gaps, and conducts baseline and end-line surveys, and supports conducting of training for teachers in the cluster.
- For the smaller primary schools, the CHT is the only head for all the schools in the clusters, and structurally, the CHT owns the development needs of all the primary schools in the cluster.
- The autonomy is devolved to the centre head teacher in terms of decision-making for all the schools, limited however to academic tasks only. The clusters are provided with financial, resource support.

In Telangana,[iii] separate school complexes are established for both primary and secondary schools, with ~10–20 schools/cluster in rural areas, with urban clusters being even larger.

- Clusters are given several provisions, like grants to meet expenditures on meetings, school visits, etcetera, and provision of INR 22,000 as School Complex Development Fund
- A cluster resource person (CRP) is appointed for provision of subject-specific academic support to schools. The administrative authority, school supervision, and monitoring in Telangana are devolved to the cluster level, under the cluster head.
- The school complexes undergo regular meetings to discuss issues of drop-outs, conduct discussion meetings on curriculum setting, and address problems faced by teachers.
- Across some well-established complexes, schools share computers, labs, libraries, and implement the concept of twinning of schools to drive complex development.
- The school complex head possesses the authority for salary, leave disbursements, disbursing centre and state provisions to the schools, monitoring the quality of midday meal programmes, teacher profiling and data collection, and organising teacher training programmes and workshops for capacity building. The complex head also plays a crucial role of preparing School Complex Development Plan and its implementation.

Set up schools and rollout initiatives like Midday Meal (MDM), right to education (RTE) across the 93 taluks that are below the state average in the Education Development Index.

Enable accessibility of formal schooling to all, especially children with special Needs (CWSN).

Set up education cities around the Mangaluru, and Dharwad-Hubbali[iii] areas similar to knowledge parks that are being set up in Dubai, for example.

Expand hostel facilities for girls to provide additional encouragement for them to enrol into higher education.

Collocate skilling centres in HEIs by accessing PMKKY 4.0 funds to improve employability of students. Prioritise taluks where the transition rates from higher secondary school to degree courses are low, with an emphasis on girl's education.

Establish a government engineering college in each district in Karnataka to guarantee the development of a workforce that is prepared for the workplace.

Strengthen the existing infrastructure to impart quality education by:

- Enabling ICT and STEM labs access to every school, eventually through the installation of such labs in each school, starting with cluster or hub-and-spoke model schools. Complement this with digital subject content in Kannada and other languages spoken in Karnataka, including English. Establish centres of excellence and skill development centres at all educational centres where technical institutions could provide skill-based training.
- **Establishing Atal Tinkering Labs (ATL):** To encourage learning through experimentation, innovation, and outcome-oriented imagination, ATLs need to be set up in cluster and hub-and-spoke model schools across the state. The ATLs could be complemented with NIAS advanced learning centres to provide onsite support for the advanced learners in grades V to X, offering three-to-four hour weekend sessions.
- Establish a well-stocked library with access to digital content at every school, starting with cluster schools and hub-and-spoke model, to ensure access while the infrastructure setup is being rolled out.

Tumakuru Digital Library won Urban Development Award[iii] for the Best Digital Project (First in the World to deploy Smart eBooks)

Tumakuru digital library, a part of the Tumakuru smart city, boasts of an e-library with access to many smart books. The library has a collection of e-books, e-journals, business news, magazines, newspapers, and test preparation books and also provides students access to a platform for test assessment. The digital content is available to visitors in a multitude of languages like Kannada, Tamil, Telugu, Malayalam, Hindi, etcetera. The library houses more than 15,000 e-books (including comics, novels, reference books, literature books from reputed authors, etcetera), access to 60 million journal articles, 400+ newspapers, 200+ magazines, etcetera.

Leverage the advancements in technology and focus on digitisation

Karnataka may need to take advantage of the benefits of technology and focus on digitisation in schools. It could consider the following:

- Begin with digitising cluster and nodal schools to facilitate digital training from highly skilled teachers in urban centres, thereby improving the quality of education (especially for STEM courses). This could then be extended to all schools. Establish PPPs with private firms to make digital content available to higher education institutes across Kannada, including in English. Where feasible, make agreements with nearby states to source content in languages such as Marathi, Telugu, Tamil, Malayalam, and others.
- Engage with edutech players to adopt digital tools such as smart-classroom hardware to improve schools' academic and operational efficiencies, while enabling central access of information for evidence-based decision-making. Access Government of India (GoI) software platforms like Samarth for LMS and ERP, instead of reinventing the wheel. Improve operational efficiency while enabling central access of information for evidence-based decision-making.
- Use technology as an enabler and develop contextualised education resources (such as e-content, audio-visuals, etcetera) and introduce gamification into the curriculum delivery via digital platforms.
- Use the National Knowledge Network facility to enable high-speed, high-quality internet connectivity to every school across the state within three years. This can be achieved by collaborating with and incentivising telecom companies.
- Incentivise private schools to adopt digitisation to improve the quality of education.

Focus on integrated, skill-based education

According to the New Education Policy's clause 4.26, vocational training[iii] should be provided to all students. Students in grades VI through XII may be offered internship opportunities to be exposed to vocational subjects, while Karnataka could consider industrial expansion in line with the SGDP goal.

Karnataka could collaborate with LABOURNET, NTTF, and other organisations that have been leaders in skill development. These organisations are critical to the creation of the vital skilled labour force that can facilitate the transformation in the vocational and skill education.

That state needs to enable reach and sustain near-100 percent graduation levels at higher secondary levels. Additionally, to develop a skilled talent pool in line with industry needs, centres of excellence and skill development centres at all educational centres need to be established. Ideally, the aforementioned centres should work with technical institutions to upskill students and staff.

Vocational and skills education can provide the right platform to enable the 75,000 children school dropouts to become skilled talent. This can be achieved through collaboration with NGOs and focused private sector players. The analysis of rates of return on education indicates that the overall returns to education for regular workers are the highest for diploma (15.9 percent), followed by graduation and above a degree (11.5 percent), and secondary education (10.2 percent).[91] Therefore, there is an urgent need to focus on skill-based technical, professional diploma, and certificate courses tailored to the requirements of the job market.

The state could introduce internship opportunities for students through grade VI to XII to learn vocational subjects (such as farm mechanisation and basic machine operations) keeping the expansion of industry in mind to fulfil the demand for talent. This can ensure that the state's largest industry, agriculture, is modernised, and that individuals have the opportunity to move into fields like post-harvest management.

Karnataka needs to improve the oversight structure for vocational education and training centres (VETs) and facilitate greater industry involvement (for example, the design of courses or conducting trainings) and providing greater alignment with market needs. This could be done by:

- Collaborating with ITI's, private sector, and vocational training centres to design and launch creative and innovative courses. For example, short-duration training courses (15 to 30 days), covering subjects such as machine operations, drone operation, or farm management, which can be used to reskill, upskill, and improve productivity.
- Collaborating with NGOs and focused private sector players to provide vocational and skills education to provide the right platform to enable the about 75,000 school dropout children to become skilled talent.
- Collaborating with LABOURNET, NTTF, and leading skill development organisations to create the necessary skilled labour force that can facilitate the transformation in the vocational and skill education.

Karnataka could promote the co-development of industry-relevant content between academia, HEI-Edtech, or online-education start-ups, leveraging India's strong edutech ecosystem. This then could be disseminated to Indian and global learners to provide necessary upskilling and vocational trainings to bridge students' skills gaps.

NEP-2020 also stresses the importance of weaving skills development and vocational education in the higher education fabric. Apart from the larger human capital benefit, this approach (along with the other steps that would be getting taken under the larger skills development umbrella) can help build the correct talent pool for the state.

Focus on research

Karnataka may need to focus on research, development, and innovation. This can be done by:

Developing and launching the Karnataka R&D Innovation Platform (e-KRDIP) to bring together stakeholders involved in R&D, business, entrepreneurial initiatives and so forth, to ensure that R&D benefits reach all the people and regions that it should. (Particularly, MSMEs and start-ups that depend on external sources of information, knowledge, know-how, technologies, and research partnerships to build their innovative capability and reach their markets.)

Dedicating its focus on the top 100 institutes in the state

- Karnataka can budget for and release large research grants to encourage multi-disciplinary research and applied research; also collaborate with corporates to receive grants under their CSR activities.

[91] Singhari and S. Madheswaran, 2016

- The state can create healthy competition through collaborative research by providing ample opportunities for collaboration by organising conferences, workshops, research fellowships for international travel and stay, and vice versa.
- It can also consider setting up a multi-disciplinary panel of experts to govern the allocation of research grants to increase the pool of high-quality scientists and professionals across diverse fields.

Focusing on developing 100 to 200 institutes into teaching and research institutions.

- This can be done by establishing a mechanism of mentoring by the top 100 universities and colleges to help these institutions become future centres of quality research and teaching.
- Recently retired professors could also be used for mentoring and to advise on research.

Setting up and developing research infrastructure, such as:

- Interdisciplinary research centres (IRCs) to encourage and facilitate long-term interdisciplinary research environments in higher education institutes (HEIs). IRCs enable institutional priority area development and structural development.
- Regional research consortium (RRC) to fund research collaborations between regional HEIs; this will help synergise their research strengths to solve regional or societal problems, as well as aid in engaging inter- and intra-institutional research teams to undertake interdisciplinary research.
- Innovation and entrepreneurship management research centres (IEMRC) to fund research projects seeking to understand and resolve the unique challenges that individuals, organisations, and partnerships face in undertaking systematic innovation in the Indian context.
- Collaborative research centres (CRC) in HEIs to enable them to connect and work with industries, MSMEs, and start-ups in the region. These will also provide an ongoing long-term platform for collaboration between different STI stakeholders to improve industrial research and innovation.
- Small business technology enabling centres (SBTECs): This can select HEIs to meet SMEs' R&D needs. Additionally, they can help the engaged HEI faculty to improve knowledge regarding their field's practical aspects, develop networks, and share experiences.

Expand faculty and develop programmes

Karnataka could set up an independent teachers' academy at state level through a public-private partnership model to address recruitment, foundation and induction training, periodic capacity building, performance assessment, professional development, ethics, research, and database management.

It could also develop long-term, sustainable teacher recruitment and development plans and implement them over the coming 12 months. The state could build the ICT skills and capabilities of existing and new teachers, with periodic assessments (such as once every two years, made mandatory like the continuing medical education programme for medical practitioners). It could also collaborate and partner with industry leaders and global institutions to train teachers on global practices.

Finally, the compensation and compensation structure of teachers could be updated to attract and retain quality talent.

Incorporation of multi-disciplinary bodies

- The creation of a non-operational group preferably outside the existing administration, to act as a nodal group for overseeing the achievement of the recommended goals and initiatives that focus on improving the infrastructure and quality of education.
- Education Analytics Division under the Department of Education to focus on the collection of school data, student statistics, and market research activity to assess Karnataka's education performance at primary, secondary, higher secondary, and research level. Evidence-based interventions in schools at GP and taluk level may be required to reduce inequality among different populations. Karnataka is focusing on evidence-based policies by pooling and analysing the data at taluk and GP level. This has been extremely useful in locating specific taluks and villages that require interventions. Data analytics has helped to discover correlations among the variables to find populations groups that require urgent attention in the hope of reducing inequality among different populations. This could be systematised, with data being published with high frequency and transparency. Similar data needs to be generated and analysed at higher educational level to facilitate efficient planning and implementation.

- **Centre of learning for international students:** The state may need to create the environment for attracting international students by providing appropriate accommodation within the campus or nearby, as well as matching India's curriculum to international standards and transforming the assessment systems to capture diverse student learning. The NEP 2020 has also emphasised the need to focus on the internationalisation of higher education. Indian students have traditionally travelled abroad for higher education, and it has been observed that there is a steady increase of students from African countries and the Middle East. Examining the share of the foreign students who come to India for higher studies, nearly one-third of them studied in Karnataka in 2015 to 2016.[i] However, for the year 2019 to 2020, the percentage dropped to about one-fifth. One of the prime reasons could be the COVID-19 pandemic. More importantly, however, it might be the lack of essential facilities like hostels on campus, and the discrepancy between the present curriculum and pedagogical methods compared to those used elsewhere. It would be beneficial to tackle the aforementioned difficulties in India, and notably in Karnataka, which has a number of professional and general institutions. Karnataka could then recruit students from other countries as an attractive destination for higher education. As a result, it's important to foster an atmosphere that can draw in international students by offering suitable housing on or near campus, aligning the curriculum with international standards, and changing assessment methods to better reflect the learning of diverse student populations. (Exhibit 104)
- Establish a SWAT team with a dedicated focus on increasing enrolment in secondary education, reducing school dropouts, providing inclusive education, and increasing mass literacy in districts of North Karnataka, especially in the Kalyan Karnataka region.
- **Prepare for the impact of emerging technologies:** Establish a committee of industry and academic leaders to build system capabilities to prepare students, teachers, and schools for the emerging transformation from generative AI. Additionally, work needs to be done for Karnataka to become a leader in embracing and integrating this transformation (for example, identifying what are the technologies and impact towards which it needs to work).

Exhibit 104

State-wise distribution of foreign students in India and southern states

Year	All India	Karnataka	%	Andhra Pradesh	%	Kerala	%	Tamil Nadu	%	Telangana	%
2015–16	45,424	14,398	31.7	1,787	3.93	133	0.29	5,377	11.84	3,032	6.67
2016–17	47,575	13,050	27.43	2,341	4.92	104	0.22	4,889	10.28	3,461	7.27
2017–18	46,144	12,041	26.09	2,092	4.53	136	0.29	3,542	7.68	2,877	6.23
2018–19	47,427	10,023	21.13	1,982	4.18	217	0.46	4,101	8.65	2,020	4.26
2019–20	49,348	10,231	20.73	2,094	4.24	302	0.61	4,461	9.04	2,261	4.58

Source: AISHE 2019–20

Run awareness campaigns

- This could be done by promoting vocational education and jobs as an aspirational profession (accord the prestige and respect to vocational education) and publicising the existing courses and related opportunities.
- Campaigns and roadshows could be developed to encourage private players to adopt government and private-aided schools and provide monetary benefits to schools in terms of improving physical and digital infrastructure and also giving teachers the necessary training.

More institutes of national importance and other eminent institutions can be started and supported, building deep specialisation and subject focus.

The curriculum could be revised at every university in the top three highest enrolment degree courses with industry inputs to improve employability and ensure industry relevance of the skills imparted.

The well-publicised credit transfer is undoubtedly a positive development. But equally crucial to this is developing templates for all courses at the national or state level that have a natural balance of standardisation and flexibility. This applies to higher education institutions of varying quality. The introduction of a rule requiring institutions to grant credits to students for courses taken through Swayam, NPTEL (national programme on technology enhanced learning), and MOOC (massive open online courses) can undoubtedly assist students in reaping the rewards of government initiatives.

The state could ensure fully functional placement cells in all universities and government HEIs with proper industry collaboration to improve the probability of placement for graduating candidates.

Financial and budgetary support:

- The Department of Higher Education's budget could be increased to an annual spending of 2 percent of the GSDP and account for at least 30 percent of the overall education budget. Private higher education institutions can be encouraged to increase spending on faculty development and research. Connections between universities and research institutions must be organically developed to encourage resource sharing and exchange.
  - Create an initial fund by levying a surcharge of 5 percent on excise duty on liquor, which could amount to about INR 500 crore per year[7] to be used for funding educational initiatives.
  - Allow universities to float long-term bonds (more than ten years) to build the necessary laboratories, libraries, and other academic and hostel infrastructure. These bonds can be guaranteed by the state (interest on the bonds could be paid by the universities from their fee collection and internal funds while the principal upon maturity should be paid by the state.) It is possible to allocate INR 5,000 crore in the form of bonds over the coming five years for this use. By doing this, the infrastructure would match that of India's best. The money held in bank deposits by many universities could be used to purchase bonds, thus recycling these funds.[92]
  - Incentivise financial institutions (with interest rate sharing, for example) to reduce the high nominal education interest rates of 10 to 14 percent that deter students to purse education.
  - Set up a dedicated research-focused fund of INR 250 crore in FY 2023 and possibly INR 500 crore by 2025 and, thereafter, INR 1,000 crore a year by 2030. The funds could be made available to public and private universities on a competitive basis for STEM and social sciences research.

[92] Karnataka Higher Education Vision Document, 2012

Execution oversight and enablement: suggestions

Establishing a framework for oversight and facilitation is just as crucial as declaring goals and outlining tactics to achieve them. Suggestions are detailed below.

- A non-operational group could be established, preferably as an independent entity, which operates outside current government departments, each of which has its own mandate. This group will serve a nodal establishment to oversee the attainment of these goals.
- This group could have a dedicated staff that is directly accountable to external stakeholders, including the state monitoring authority to realise this goal (if created) or to the CM's office, academia, industry (as well as directly through industry bodies such as FICCI, CII, BCCI, and other such bodies across the state).
- It can have an operating CEO together with other officers and staff, and a governing board that meets monthly.
- It can be data-driven and technology-based.
- It could be highly transparent with data and publish dashboards and information for public consumption. It could also be upfront with additional data for specific stakeholders including the Government of Karnataka, institutions, employers, civic groups as needed, and so forth.
- It could engage with respective ministries, trade bodies, enterprises, on the one hand, and with institutions on the other, with the specific objective of continually monitoring talent demand across various streams of specialisation and enabling institutions to ramp up capacity and capability in those areas.
- It could publish an annual position paper on talent availability and Karnataka's preparedness for the future.
- To provide insights and understanding of the existing talent capital as well as the emerging pipeline, the group can act as a connection with international bodies and entities, and closely collaborate with the relevant industry and trade development sections of the Karnataka government. In essence, it can offer some form of talent-capital promotion and development services.
- It can provide a forum for promoting and advancing cross-disciplinary research cooperation. Instead of replicating what each institution would be doing, the goal is to make research collaborations more manageable as a whole.
- Sufficient budget may need to be allocated for operation of this unit.
- Ten years after being established, the group's needs, objectives, constitution, and accountability can be reviewed, and a decision taken whether it can continue in its current form or not.



References

i Karnataka economic survey

ii GDP performance and value forecast

iii Education committee

CHAPTER 14

Urban Development





More than 675 million[93] people live in India's urban areas. In 2021,[94] this amounted to 35.39 percent of the population; by 2036, this is projected to rise to 40 percent. Urban areas contribute 63 percent of GDP, but this is projected to increase to 75 percent by 2036. According to the 2011 census, 39.27[95] percent of Karnataka's population already lived in urban areas, and this number has been steadily rising. This has been a turning point for the state as cities with populations under 1 lakh are increasingly emerging as wealth-producing hubs. Urban areas in Karnataka are expanding exponentially, which has created new challenges, such as expanding revenue layouts, unauthorised colonies, the loss of parks and open spaces, the failure to prepare and implement master plans, poor local body governance, and insufficient parking.[96]

There is a significant regional disparity in urban growth – and accompanying economic development – in Karnataka. Bengaluru has the highest[iii] level of urbanisation (90.94 percent) and Kodagu the lowest level (14.61 percent). While Uttara Kannada, Raichur, and Gadag districts have seen very slow growth, Udupi and Dakshina Kannada have experienced rapid urbanisation. With Bengaluru as the model city, 10 percent of towns or urban agglomerations are home to 70 percent of the urban population.

With a score of 78, Karnataka ranks seventh among states in the United Nations' Sustainable Development Goal 11, which focuses on making cities and human settlements inclusive, safe, resilient, and sustainable. The state is in the aspirant category for installed sewage treatment capacity as a percentage of sewage generated in urban areas, with a score of 32 and value of 31.92.[97]

This behoves the state to invest in adequate governance and infrastructure to support urbanisation. A new World Bank report estimates that India may need to invest INR 8,635 crore ($840 billion) over the next 15 years – or an average of $55 billion per annum – into urban infrastructure if it is to meet the needs of its fast-growing urban population effectively.[98] (Exhibit 105)

The central and state governments are making efforts on a broad scale to overcome these obstacles by implementing projects such as the

93 The Hindu quoted UN report, 30 Jun 2022
94 World Bank, IBRD – IDA, United Nations Population Division
95 Karnataka Economic Survey 2022–23
96 Inputs from Urban Development committee
97 Niti Ayog SDG, 2020–21
98 World Bank Report, 14 Nov 2022

Exhibit 105

Infrastructure outlay on budget – India[1]

Year	India ₹ trillion	In ₹ crores	% Increase
2018–19	3.8	3,80,000	44%
2019–20	3.36	3,36,000	–11%
2020–21	4.39	4,39,000	30%
2021–22	5.54	5,54,000	26%
2022–23	7.5	7,50,000	35%
2023–24 (expected)	10	10,00,000	33%

1. Karnataka economic survey

Note: ₹1 trillion = ₹1 lakh crores or 1 million
$ 1 trillion = 1,250 crore rupees

100 Smart City plan,[99] creating eight satellite towns,[100] pursuing the Gati Shakti scheme[101] for infrastructure development, rolling out a bus rapid transit system in Bengaluru and the Hubballi-Dharwad region,[102] and implementing faecal and sludge-management systems to promote environmental sanitation. However, to make the best use of the current policies, all preparation must be expedited. More than 100 of the 314 urban local bodies (ULBs) do not have master plans, according to the most recent planning statistics. Except for the Bengaluru Metropolitan Area Structural Plan – 2031, the entire state does not have a single regional plan. When the urban population grows, measures can be made to ensure people have access to basic requirements such as clean air, drinking water, unhindered public transportation, and safe housing. Karnataka could focus on the pattern of urbanisation that could result from the plethora of projects that have surfaced because of Gati Shakti and the National Logistics Policy, which are anticipated to integrate with various central and state government missions. These include the Jal Shakti Mission, AatmaNirbhar Bharat, the PM Ayushman Bharat Health Infrastructure Mission, the National Green Hydrogen Mission, the National Monetisation Pipeline (NMP), the National Infrastructure Pipeline (8,200 projects), the Sagar Mala and Bharath Mala projects, as well as the Government of Karnataka projects.

The state could focus on:

- Increasing grassroots impact by transforming small towns and municipalities into self-sustaining townships.
- Creating a state-wise master plan for all cities to help with infrastructure development.
- Serving as a model for an efficient and congested transportation system through holistic transportation (including all modes of public transportation) and transit-oriented urban space planning. (Exhibit 106)

99 https://smartcities.gov.in/
100 Town and country planning organization initiative, MHUA
101 National Portal of India, PM Gati Shakthi Scheme
102 Hubballi - Dharwad, BRTS Company Ltd, https://www.hdbrts.com/en

Exhibit 106

Urban development – vision1

Percent

Macroeconomic indicators	From (2021–22)	To (2031–32)
Master plan coverage of ULB	38	**100** (69% by 2026–27)
% Waste disposal (of total generated in ULBs)	48	**88** (68% by 2026–27)
Public transport capacity	35	**50** (42% for 2026–27)
GER (higher education)	32.2	**50** (40% by 2026–27)
% Slum population	5.39	**2.8** (4.09% by 2026–27)

1. Urban development committee

Build self-sustaining towns

In Karnataka, numerous smaller towns serve as unofficial satellite towns and some of them serve as counter-magnets to the large cities. It is possible to promote systematic development and tax collection by identifying such towns, upgrading them to remain satellite towns, and managing any ribbon developments. The state could take the following important steps to drive these:

- Set up eight satellite towns in Karnataka, two each along the Bengaluru–Mysuru, Bengaluru–Hubballi, Bengaluru–Hassan, and Bengaluru–Kola corridor; leverage public-private partnerships (80 percent private, 20 percent public) to fund this project with the estimated cost of setting up one township being approximately INR 1,000 crore, excluding the land.
- Drive the scale-up of small towns and municipalities into self-sustaining townships (city corporations, town municipalities, pattana panchayats) through an accelerated push on upgrading basic services by:
  - Setting in motion a plan to use the approved budgetary spends of INR 3,885 crore[iii] and INR 350 crore sanctioned by the central government in 2020–21 efficiently to accelerate the provision of basic services (electricity, water, and sanitation).
  - Facilitating the above by reserving 2 percent of the sanctioned budget for spatial and infrastructure planning of each of the identified townships.
- Request funding from the central government to build a satellite city in Karnataka under the Urban Infrastructure Development Scheme for Satellite Towns, which has an INR 8,000 crore[iii] budget. To achieve this, the government can present a sound development strategy that includes initiatives to strengthen three key infrastructure facilities: solid-waste management, sewerage/drainage, and water supply. To create a satellite city in Karnataka, the Kalyana Karnataka Region Development Board can find 1,000 acres of land and create a robust development plan that includes initiatives that can strengthen three key infrastructure facilities.[103]
- Convert 50 Gram panchayats to town panchayats to attract higher fund allocation and better governance for the region (like the initiative that was planned in 2015 by the chief minister targeting the conversion of 42 Gram panchayats into town municipal panchayats, with 13 designated as town municipal corporations).[104] Two to three towns could be reclassified as town municipal corporations. The 53 Gram panchayats can be identified according to a per-population cut-off definition.

Intensify logistics infrastructure

Tamil Nadu's urban population is currently 48.40 percent of the state's total.[105] For Karnataka to support its projected urban population, the state could ramp up its logistics infrastructure to levels similar to those of Tamil Nadu. The key statistics below show that Karnataka lags in capacity across the board. (Exhibit 107)

- Build high-capacity transport corridors to support the high demand of transporting food grains and sugar, for example, between Mangaluru and Bengaluru; Mangaluru and Hubballi (Ghat section); Kodagu, Kushal Nagar, and Mangaluru; and Ramnagar and Anmod (near the Goa checkpoint), like the Mumbai-Pune expressway.
- Increase freight transport capacity by adding tracks in high-traffic areas (for example, between Mangaluru and Hassan), inland container depots (currently one), and container freight stations (currently seven).
- Increase warehousing capacity in high-production belts such as Mangaluru to manage grain and sugar production. Multiple sugar mills in Uttar Pradesh[106] were taken over by the state government and are being turned around through road and motor vehicle support. The Karnataka government can take proactive measures to address this situation.
- Create dedicated rail freight corridors along major freight corridors in line with Western and Eastern Dedicated Freight Corridors in the state (for example, Bengaluru to Chennai and Hassan to Mangaluru).[107] This can help save fuel costs, augment capacity, and reduce the cost of logistics for manufacturers and agriculturists.
- Set up logistics zones on the periphery of major cities with an easy approval process for predesigned land use. Establish preplanned integration with railways and highways and integration with multimodal logistics parks to control cost and improve time-to-market

103 Size of the land as provided by Urban Development Committee
104 56 village panchayats upgraded into town panchayats, TMCs and CMC, the Hindu on 2 May 2015
105 Census 2011
106 Tribune India reported 4 March 2020
107 https://en.wikipedia.org/wiki/Dedicated_freight_corridors_in_India

Exhibit 107

Comparisons: Logistic infrastructure – Karnataka and Tamil Nadul

Parameters	Units	**Tamil Nadu** (Value)	**Karnataka** (Value)
Road length	km	NH 6,858 km	NH 7,412 km / SH-28,985 km
Railway track	track-km	6,836	6,083
Inland Container Depo (ICD)	#	10	1
Container Freight Station (CFS)	#	57	7
Air freight station	#	NA	1
Private Freight Terminal (PFT)	#	1	2
Air cargo terminal	#	6	9
Rail goods shed	#	361	322
WRDA registered warehouse capacity	mt	13.43 lakh mt	3.47 lakh mt
Cold storage capacity	mt	3.83 lakh mt	6.76 lakh mt
Port traffic	mt	108.6 mt	3.73 million mt
Logistics training centre	#	8	7
No. of individuals trained in logistics	#	563	809

1. Multiple sources, as collated by Urban Development Committee

Tamil Nadu - 2nd largest cargo facility in the country with 28.3% share and highest number of CFS (57) and WRDA (1.015)

Source: Logistics lead survey-2021-GoI

for manufactured products. The Karnataka Industrial Areas Development Board could accelerate implementation of the proposed multi-modal logistics park development (planned under Bharatmala Pariyojana) on 400 acres of land in Obalapura, near Bengaluru.

- Double the current cold-chain capacity of 3.83 lakh metric tonnes by incentivising the creation of cold-chain infrastructure (for example, Tamil Nadu provided interest[iii] subvention and the reimbursement of state goods and services taxes in 2018 to scale up food-processing units and cold chains). This can help in the post-harvest management of 47 lakh MT of marketable surplus and contribute to exports and industry growth.
- Implement inter-operational tags (FASTag 2.0) across the various modes of transport to ease movement and reduce loss of revenue (for example, pilferage of interstate toll collections and interstate permits).
- Drive the effective implementation of the Gati Shakti scheme (the central government scheme to drive development of multimodal connectivity that can provide integrated and seamless connectivity for the movement of people, goods, and services from one mode of transport to another across states) by:
  - Efficiently using the allocated funds by aligning the state-level master plan, the National Logistics Policy, and the land revenue acts to ensure integrated action across all levels of governance (the three-tier system).
  - Implementing the Gati Shakti platform at state level and mandating that departments identify their projects on the platform and use it for data consolidation and management.
  - Establishing a state-level master plan for the remaining 100 urban local bodies, detailing the logistics plan, showcasing the siding, and connecting infrastructure to

micro, small, and medium enterprises (this is a major employment opportunity), industrial clusters, granaries, cold chains, and markets (budget of INR 25 lakh per urban local body).

Environmental sanitation

The National Green Tribunal fined the Government of Karnataka INR 2,900 crore[108] for poor waste management in October 2019. The state could step up the pace of implementing waste-management systems. The following key actions could be considered this:

- Set up sewage treatment plants at INR 2.5 crore per unit across the remaining 280 urban local bodies to promote recycling and manure production. Only 5,290 MT of the 13,200 MT of waste produced daily is processed.[109] The amount of waste produced is expected to increase exponentially, so treatment capacity could be expanded across all 314 urban local bodies and 66 Class I and II cities to ensure waste treatment exceeds the current 60-percent level.
- The pollution control board could implement an e-waste management regulatory framework. E-waste poses a significant risk to humans, animals, and the environment. Precious metals such as copper, silver, gold, and platinum can be recovered from e-waste through scientific processing. Karnataka's technology sector is large and generates a large amount of e-waste. This is likely to increase in the coming decade as technology becomes more pervasive in all aspects of life. The state could ensure the effective implementation of policies to ensure proper e-waste management. Bengaluru has the potential to become India's e-waste hub. In Karnataka, channelised e-waste management can generate a revenue of INR 2,900 crore per annum.[iii] Only INR 317 crore has been recovered from the 2.9 lakh metric tonnes of e-waste generated per year, with a potential loss of INR 2,569 crore estimated. For proper management, urban local bodies must improve waste segregation at source.
- Integrate rag pickers into the formal system and involve them in recycling and recovering waste, as is being done in Maharashtra.[110]
- Recycle plastic collected during waste collection at the nearest cement plant. Small initiatives that could be piloted in cities include collecting extra deposits and refunding these once the plastic bottles are returned.
- Include toilet-maintenance guidelines (for example, fines for dirty toilets and audit grants for schools to maintain toilets) as an agenda in the sanitation policy and leverage private-public partnerships to maintain public "pay and use" toilets and toilets in government schools and universities.
- Karnataka is one of India's most water-stressed states, so there is a need for effective management of available resources as water will become the main constraint on economic development. The state could aim to improve water-resource management in urban areas holistically and sustainably.

Strengthen mobility services

A strong public transport system may be needed to reduce the dependence on private vehicles and curb traffic congestion. Developing urban transit can be achieved in the following ways:

- Introduce holistic transport (including all forms of public transport) and **transit-oriented urban-space planning**, especially in emerging townships and new regions in growing urban local bodies. Use of public transport instead of private vehicles could be encouraged.
- Draw up comprehensive city mobility plans for all cities and urban local bodies, prioritising areas with heavy traffic congestion. To ensure the execution of a strong public transport system, cities could extend programmes such as the bus priority lane in Vijayanagar and Kalaburagi and the bus rapid transit system in Bengaluru and Hubballi-Dharwad to be replicated across major urban local bodies. Additionally, cities could plan and implement policies to nudge people away from private vehicles towards public transport and non-motorised modes. These could include higher rates for private-vehicle parking and higher taxes on vehicle ownership.
- Strong monitoring and effective execution of the Bengaluru suburban rail project could provide affordable and sustainable transport to 8.9 lakh commuters daily and boost transit-oriented development. [111]

108 NGT fines Karnataka INR 2,900 crore for lapses in waste management, Times of India, 16 Oct 2022
109 Pollution Control Board
110 Urban Development Policy, Maharashtra
111 Karnataka Economic Survey 2022–23

- Accelerate the implementation of the safe systems approach (a holistic and comprehensive approach to building multiple layers of protection that provides a guiding framework to make places safer for people) for road safety would halve road deaths.
- Design an accessible infrastructure for pedestrians and cyclists in urban spaces in urban local bodies (phase one would focus on Bengaluru, Mysuru, and Hubballi) to target a 50-percent reduction in pedestrian deaths.

Enhanced quality of life

Strengthening basic amenities for the urban population can enhance people's lives. The Government of Karnataka could consider the following actions:

- Strengthen the electricity supply, find sustainable alternatives, and make distribution efficient to make 24/7 electricity a reality across all urban local bodies.
- Discourage unauthorised developments, which have resulted in significant tax revenue losses for the state, by instituting harsh penalties for unauthorised land developments and park encroachment.
- Provide safe housing to all slum dwellers in urban local areas. Following the success[iii] of the private-public plan to build 10 lakh houses in and around Bengaluru, Karnataka could accelerate slum redevelopment by continuing to leverage these partnerships to build additional houses to provide better living conditions to the poor and create a balance in the control of these lands.
- Proactively extend the action framework for controlling air pollution defined in AQMC 2019[112] that was implemented in Bengaluru to other cities with a low air-quality index, such as Hubballi, Belgaum, Mangaluru, Gulbarga, Hoskote, Hassan, Shravanabelagola, Haveri, and Raichur.

Drive greener transport

Reducing pollution, curbing resource depletion, and meeting future energy demands may require long-term thinking. A move away from vehicles with internal combustion engines to greener options, such as electric vehicles (EVs), would help ensure greater environmental sustainability. The following interventions could be considered:

- Leverage EV in logistics infrastructure design, with a focus on creating e-lanes and EV charging stations along expressways and major highways. While the Government of Karnataka has been at the forefront of EV adoption in the country, implementing an EV policy in 2017, consumer adoption has been low due to a lack of charging. The state could also consider extending a road tax exemption for EVs and converting all public transportation buses to EVs where possible.
- Promote non-traditional greener fuels in non-passenger modes of transportation. The state has also been proactive in supporting green-fuel-based vehicles, removing the requirement for a permit in January 2022.[113] However, subsidies and a production-linked incentive scheme[114] for green-fuel-powered vessels could enhance this drive.

112 Revised action plan for Control of Air Pollution in Bengaluru city, KPSCB
113 Karnataka: No permit required for green vehicles, Times of IndiaTimes of India, 29 Jan 2022
114 FAME and PLI Schemes promotes use of electric vehicles in the country, Ministry of Heavy Industries, Dec'22

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CHAPTER 15

Bengaluru





Bengaluru: India's technology and innovation capital

Bengaluru, the largest city in Karnataka, pays most of the state's taxes and contributes significantly to GSDP (Gross State Domestic Product). It has the highest per capita income of any city in India. When Bengaluru's contribution to income is discounted, the per capita income of the state drops closer to the national average.

It leads other Indian cities in several fields, including IT, biotechnology, science, avionics, and space. In essence, Bengaluru is the country's innovation and tech capital. Its ecosystem ranks as one of the top five[iii] in the world for innovation, technology development, research and development, and human capital.

To fulfil Bengaluru's potential as a global tech hub, resources could be ploughed into developing the city. Bengaluru faces severe infrastructural challenges, brought about, in part, by increased economic activity and concomitant population growth.

The city may need a focused plan to develop the Bengaluru Metropolitan Region, to improve the lives of citizens, and contribute towards Karnataka's broader goal of achieving a GSDP of $1 trillion. It is no longer sufficient to use one central strategy to develop the entire economy of a state. Instead, each region in the state may need a differentiated and focused agenda, based on the specific needs of its population.

In this report, we offer suggestions to the Karnataka government regarding how to capitalise on Bengaluru's inherent strengths and transform it into a hi-tech global city:

- A new governance model, with devolution of power.
- New mobility mechanisms to increase citizens' productivity and their quality of life. Policies could be oriented to create cities that are walkable, that have advanced frameworks around waste management, pollution, cleanliness, and other major challenges.
- A better balance between state and private schools, and improved quality of education.
- Better access to quality healthcare.
- Affordable housing for all.

Governance

By 2051, it is expected that nearly half of India's projected population of 1.7 billion[iii] will live in municipal areas, on less than 2 percent of the nation's land. Thus, the interplay between urban and rural areas, and the bodies that govern these, can play an important role in shaping state-level spatio-economic development, quality of life, and well-being.

The Bengaluru Metropolitan Region is the only metropolitan region in the state of Karnataka. Bengaluru is the state's only megacity. The administrative dynamics of Bengaluru and its hinterland have transformed over the years, resulting in an at times fragmented and inefficient governance model.

In 1985, the Government of Karnataka constituted the Bengaluru Metropolitan Region, administered by the Bengaluru Metropolitan Region Development Authority, with a footprint of 8,005[iii] square kilometres. The region has been further broken up into six local planning areas, each with its own Intermediate Master Plan (IMP). IMPs operate in parallel to the 2015 Revised Master plan of the Bengaluru Metropolitan Area and the Comprehensive Development Plan. In short, the region is divided into multiple jurisdictions and administered by several plans, and there are insufficient mechanisms to ensure the cohesion of the various strategies.

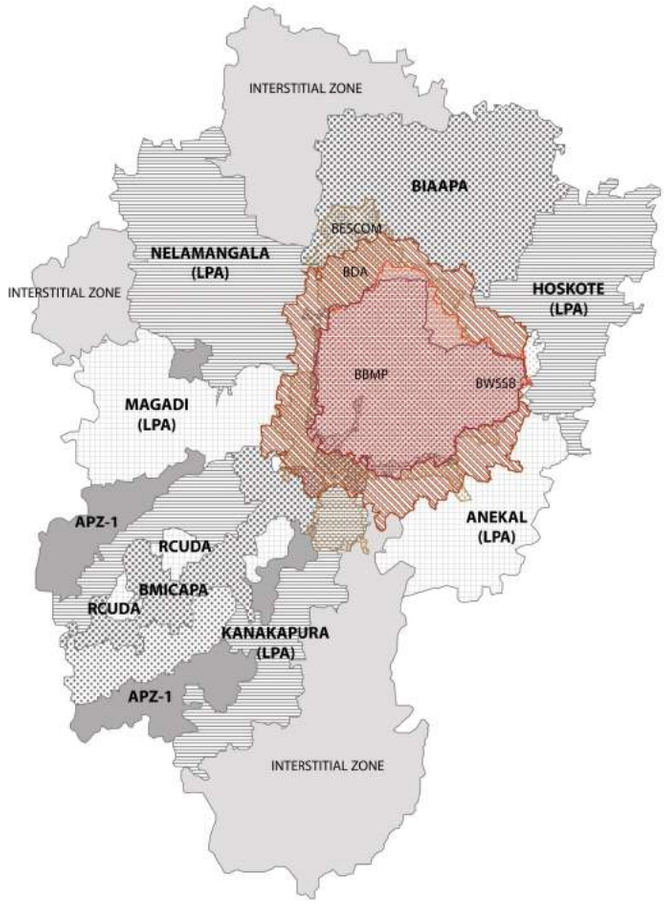
Substantial inefficiencies could be eliminated by dovetailing the region's administrative frameworks to establish an integrated planning framework. This is not a new idea – calls for a decentralisation agenda, the restructuring of governance, and spatially integrated plans, have been made by state government, development authorities, municipalities, and civil society.

India's rapid urbanisation, which is spurring much of the country's economic growth, demands that the governance of urban areas be constantly revisited. The devolution of power can go a long way to ensuring citizens are better served.

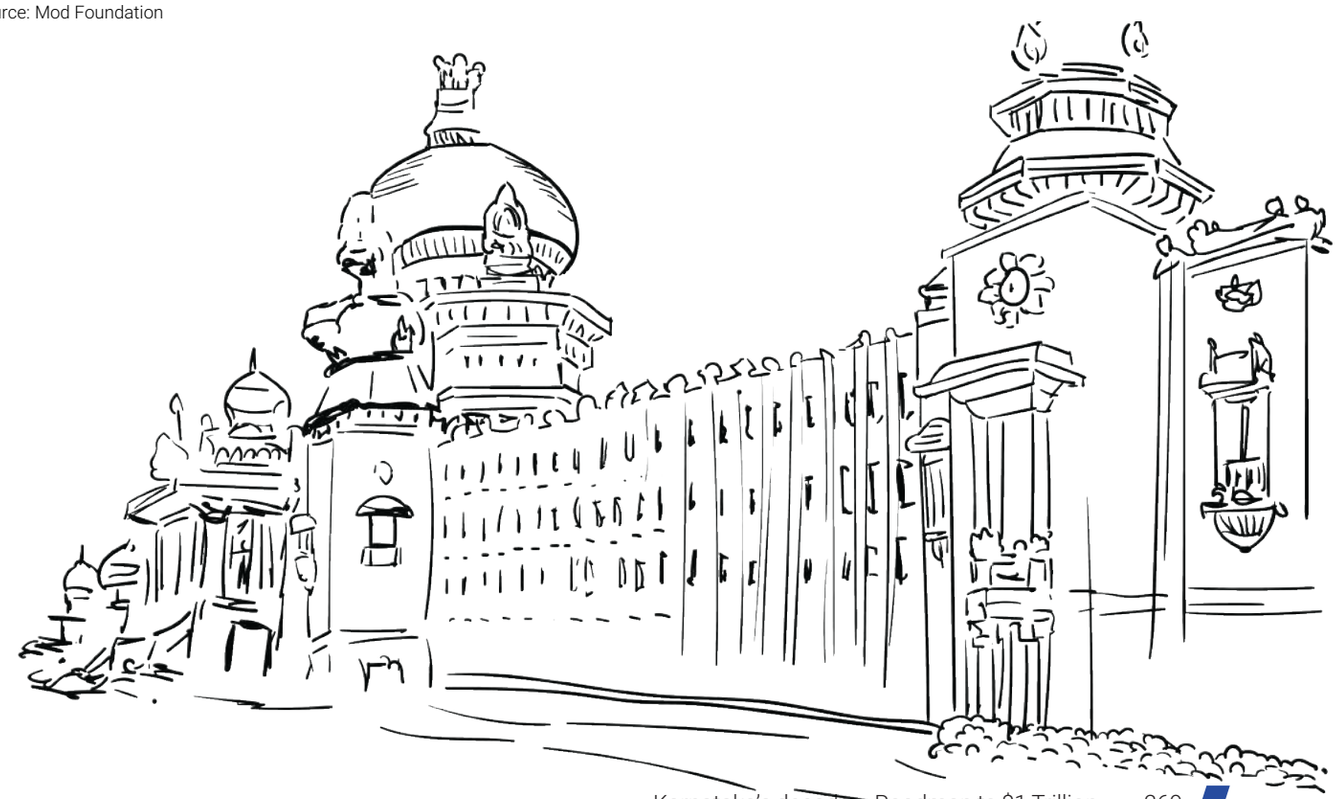
There are also simple ways to improve urban living. For example, upgrading mobility policies could turn urban areas into "walking cities", and there could be a fresh approach to waste management, pollution, and cleanliness. (Exhibit 108)

Exhibit 108

Local planning areas in the BMRDA with overlapping jurisdictions of parastatals highlighted



Source: Mod Foundation



Municipal corporation and parastatals

The municipal functions of the city are shared between the municipal corporation and a number of parastatals. The 1992 Constitution Act (74th Amendment) allowed urban local bodies (ULBs), including municipal corporations, to be established as institutions of local government. It also empowered state governments to devolve certain functions, authority, and power to collect revenue to these bodies and made periodic elections for them compulsory.

However, ULBs lack autonomy in managing their cities. Several city-level functions are managed by parastatals – themselves managed by and accountable to the state. Additionally, powers of taxation have only partially been devolved to ULBs, leaving municipal finances stressed. This hampers service delivery in cities and creates administrative challenges at the municipal level.

The Bruhat Bengaluru Mahanagara Palike Act (BBMP Act) of 2020 adds a new level of government to the existing three-tier municipal structure in the city: that of zonal committees. It also gives the municipal corporation increased powers of taxation. Under this legislation, the corporation has the mandate to prepare and implement schemes for the 18 functions laid out in the Constitution Act (74th Amendment). But it does not clarify whether it will be new bodies, created at the municipal level, or the existing parastatals that will perform the functions. If it is existing parastatals that will continue performing their functions, the BBMP Act does not clarify to whom they will be accountable: the state or the municipal corporation.

This could create a dual administrative challenge. Firstly, if there are multiple agencies performing similar functions, it would lead to a functional overlap, ambiguity, and a waste of resources. Secondly, and more importantly, the presence of parastatals, managed by and accountable to the state government, erodes the autonomy of the ULBs. Several experts have highlighted that this lack of municipal autonomy has led to challenges in governance, effective service delivery, and the development of urban areas.[115,116]

Restored municipal autonomy could be the crucial factor in achieving needed improvements in accountability, transparency, and governance.

In 2011, an expert committee on urban infrastructure recommended that the 18 functions of local-level government be set out in an activity map.[117] This could help to identify which functions are in the exclusive domain of municipalities and which can be shared with the state and the central government. Experts have also recommended that the municipality be responsible for providing civic amenities in its jurisdiction and that, if a parastatal exercises a civic function, it could be accountable to the municipality.[118] (Exhibit 109)

Discussion and analysis of the available data tells a tale of multiple deficits plaguing the BBMP.[119] These include the following:

Ineffective governance and administration:

The existence of siloed parastatals – such as BWSSB, BESCOM, BDA, and BMTC – that operate beyond the control of the city's leadership leads to serious coordination challenges.

The absence of citizens' voices

Analysis suggests there is negligible citizen participation at the third tier of city governance. The 74th Constitutional Amendment mandates that citizen participation be ensured through the vehicle of ward committees, however this is routinely breached.[120] Requests for the performance of commonly required civic services are often met with demands for "speed money" (the corrupt solicitation of bribes for overcoming delays in execution).

Deficits of trust

Aspects of the structure of local government, such as the distribution of mandates across numerous bodies, have diminished accountability for service delivery. The negligible mapping of activities of civic agencies and the unclear delineation of responsibilities of elected representatives and officials contribute to this.

Poor state of human resources

The management of a city requires urban professionals with the appropriate skills. In this regard, there is a sizable vacuum across civic agencies. On top of this, there is negligible job-oriented training and a lack of transparency.

115 Bills States (prsindia.org)
116 https://cag.gov.in/en/audit-report/download/110761
117 The High-Powered Expert Committee (HPEC) for Estimating the Investment Requirements for Urban Infrastructure Services, Ministry of Urban Development, March 2011, https://icrier.org/pdf/FinalReport-hpec.pdf.
118 Sixth Report, Second Administrative Reforms Commission, Ministry of Personnel, Public Grievances and Pensions, 2007, https://darpg.gov.in/sites/default files/local_governance6.pdf.
119 Executive Summary: BBMP restructuring, https://bbmprestructuring.files.wordpress.com/2018/05/bbmpr_executive-summary_english.pdf
120 "4,219 ward committee meetings held across Bengaluru in last one year" | Bengaluru News (indianexpress.com)

Exhibit 109

Duplicating mandates across agencies creates confusion

Planning and land development	**City master and zonal plans**	Bengaluru Development Authority (BDA) for Bangalore Urban and peri-urban/ Bengaluru Metropolitan Regional Development Authority (BMRDA)/Karnataka Industrial Area Development Board (KIADB) for industrial areas
City roads	**Capital works**	BDA/Bruhat Bengaluru Mahanagara Palike (BBMP)/ Public Works Department (PWD)
	Maintenance	BBMP/housing associations/cooperatives, etcetera.
Public transport	**Metro Rail**	Bengaluru Metropolitan Rail Corporation Limited/ Infrastructure Development Department
	Buses	Bengaluru Metropolitan Transport Corporation
Water supply	**Capital works**	Bengaluru Water Supply and Sewerage Board (BWSSB)
	Maintenance	BWSSB/housing associations
Sewerage	**Capital works**	BWSSB
	Maintenance	BWSSB/housing associations
Waste water treatment		BWSSB
Solid waste	**Disposal**	BBMP/Karnataka Composting Development Corporation
	Local collection	Resident welfare associations/non-governmental organisations/BBMP
Solid waster recycling	Karnataka Composting Development Corporation	
Housing and slum development	Karnataka Housing Board, Karnataka Slum Clearance Board, BBMP/BDA	

Source: BBMP restructuring

Planning gaps in local planning areas

The lack of town-planning professionals is a barrier to planning, coordination, and management in Bengaluru. Additionally, the city's administration lacks proactive and innovative solutions for the city's myriad problems. This is evident in the administration's reactive responses to the haphazard urban developments on the outskirts of the BBMP area.

Implementation challenges

Information and implementation silos make it challenging to ensure the smooth implementation of projects. A lack of planning and project management leads to delayed projects of poor quality.

Empowering the BBMP could boost service delivery

The consequences of mandate overlap due to Bengaluru's multiple parastatals working on public issues alongside the municipality can be seen in the functioning of the BWSSB.

An autonomous body formed by the state of Karnataka state in 1964,[iii] the BWSSB is responsible for water and sewerage functions across the entire Bruhat Bengaluru Mahanagara Palike area, which is 800 square kilometres. This includes the Bengaluru Core area (245 square kilometres), eight UBLs (330 square kilometres), and 110 villages (225 square kilometres).

The BWSSB has the following mandates:

- The supply of water adequate to meet demand.
- The creation of a sewerage network and the safe disposal of sewage.
- The preparation and implementation of plans for augmenting water supply and the safe disposal of sewage.
- The levying and collection of water charges on a "no loss no profit" basis for sustainability of the system.

Apart from the operation and maintenance of the water supply and sanitation systems and the service associated with them, the BWSSB also undertakes large infrastructure projects, such as the Cauvery Water Supply Scheme and Sewage Treatment Plants. The devolution of the mandates for these functions reduces accountability in the service. Furthermore, the BWSSB focuses on larger infrastructure projects to the neglect of regular services of maintenance and ensuring water quality standards. Citizens have a limited ability to influence the priorities of the BWSSB or hold it to account for failures.

This overlapping of jurisdiction also manifests itself in other city systems: A lack of accountability around stormwater drains and roads leaves infrastructure in a constant state of disrepair and, quite often, unsafe in terms of hygiene, sanitation, and security.

Bengaluru's growth dynamics indicate that energy use may continue to increase, the inadequate public transport system may be put under increasing pressure, and water scarcity may worsen. Large sections of the city are exposed to hazard, such as urban floods and water scarcity, because of rapid and unplanned urbanisation. Air pollution and the outward growth of the city are contributing to an urban heat island effect, which has been noted to result in local temperature variations and irregular rain showers.

These dynamics may need a response in the structure of local government itself, which could empower the BBMP as an efficient, accountable, and transparent government – the key to a well-functioning city and a better quality of life for its citizens.

Boosting Bengaluru's urban information system

As the rapidly urbanising epicentre of Karnataka's growth, Bengaluru may need uniform, large-scale, and accurate spatial datasets for the planning and monitoring of development activity. The challenges of Bengaluru's current data usage systems are manifold: They include disaggregated data with various agencies; data duplication; multiple file formats; large amounts of spending by individual agencies on decision support systems; and limited staff know-how.[121]

Cities consist of multiple and overlapping systems – transport, water and sewerage, electrical, and parking. Urban planning projects too often contain each of these systems in a silo, without considering the interconnections between people, systems, and technology.

[121] Digital India, National GIS initiative, data sharing policy, launch of national and state geoportals, Karnataka GIS project and suggestionss by high powered steering committee (https://www.niti.gov.in/role-digital-infrastructure-socio-economic-development)

Conventionally, cities have been using information technology and communication in three ways: As a single application to address urgent problems; to build infrastructure and accompanying services; and to experiment with several applications without having a long-term or definitive vision in place.

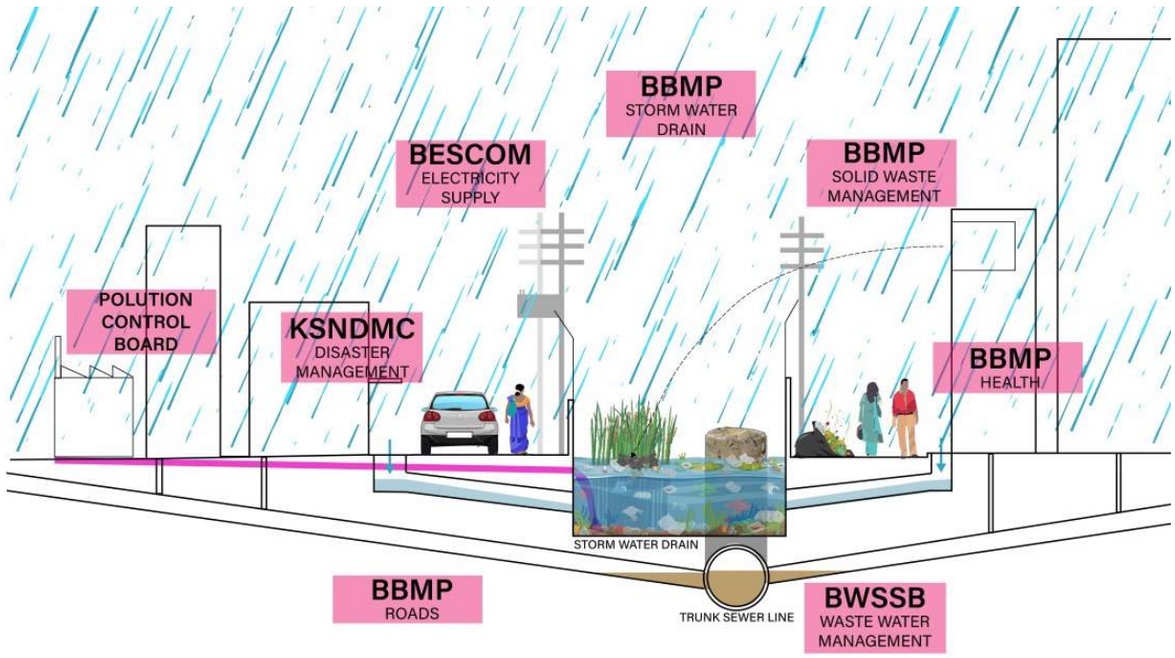
By contrast, a well-developed digital infrastructure could help a city access, share, collate, and use the information derived from all interactions between people, places, and systems. The ability to capture, classify, and analyse information from different systems and use this to plan for the operation of the city as a unified "system of systems" brings unexpected and broad-ranging benefits.

Such an approach may, however, require more sophisticated systems of city governance and management. These will extensively use automation, including artificial intelligence, the Internet of Things (IoT), big data analytics, and other technological advances. The creation of diverse platforms and the collection and publishing of city data would allow cities and their citizens to create, monitor, and measure progress with more depth and speed. Access to urban data could lead to better informed and more empowered citizens and help the government make smarter decisions. The collation and analysis of open data would also enable the identification of focus areas for intervention.

A holistic database covering physical and social infrastructure across the entire city and including all segments and age groups – including migrants – would allow Bengaluru's administration to make targeted interventions in the running of the city. Health and education are key areas where granular data is needed. This, in turn, would help in coordinated planning and project implementation across agencies, having the potential to reduce expenses greatly by minimising project delays and reducing the incidence of duplicated works. (Exhibit 110 & 111)

Exhibit 110

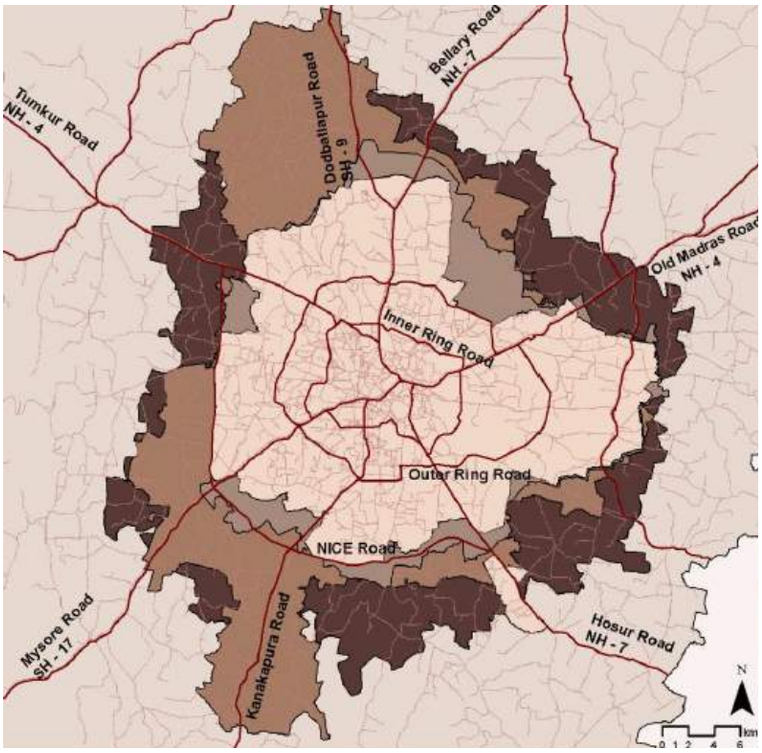
Overlapping jurisdictions results in spatial mismanagement creating multiple black spots in the city



Source: Mod Foundation – flag for point about overlapping jurisdictions

Exhibit 111

Varying jurisdictions of the same 'parastatal' agencies



Service provider jurisdictions in Bengaluru

Legend

- BMTC routes
- Major roads
- BWSSB boundary
- BBMP boundary
- BESCOM – metropolitan zone
- BDA boundary
- BESCOM – rural zone

www.bbmprestructuring.org

Data Source: BBMP, BDA, BESCOM, BWSSB

Source: BBMP restructuring

Mobility

Creating the new 8-to-80 Bengaluru

Cities that embrace the "8-to-80" approach have streets that can be used by people, independently, from the age of eight years old to 80. Usage can range from an eight-year-old riding their bike to school to an 80-year-old walking to the shops. Everyone can move about the city in a safe, convenient, and enjoyable manner.

A comprehensive mobility network for Bengaluru

Bengaluru's rapid growth rate has led to several traffic challenges. The city's infrastructure has not kept pace with the population growth, leaving it with narrow, poorly maintained roads that are unable to handle the traffic volume (Fig 1). The lack of a proper public transportation system and adequate parking facilities have worsened the problem. Another significant challenge is the lack of traffic management and enforcement.

The government has implemented a number of solutions to ease congestion. These include an expansion of the public transportation system and the development of parking facilities. Additionally, it is pursuing a range of traffic-management measures, such as intelligent traffic systems (ITS) and the use of technology to monitor and enforce traffic laws.

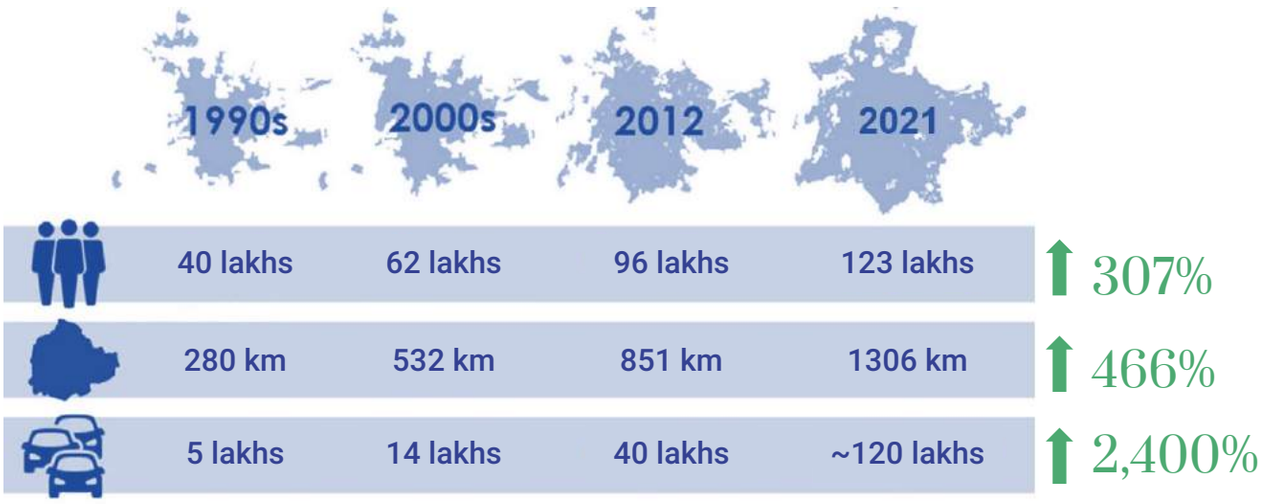
Tackling congestion in Bengaluru

Traffic congestion levels in Bengaluru are generally higher than those in other Indian cities. This is driven by limitations in the city's older public transport networks, which are primarily road-based, and by the significant growth in private vehicles. These high levels of congestion bring huge costs, in the forms of reduced productivity (Figure 6), fuel waste, and accidents. Recent estimates from the Bengaluru Development Authority, released as part of its 2031 master plan, suggest that 1.18 crore citizens waste 60 crore person-hours annually and almost 2.8 lakh litres of fuel per hour in the city due to congestion.[122] (Exhibit 112)

[122] Unlocking Cities: The impact of ridesharing across India

Exhibit 112

A synopsis of the city's growth over the years. With an estimated 80,000 taxis operating under the aggregator model, Bengaluru has witnessed first-hand how shared and electric mobility have led to a reorganisation of transport ownership and delivery. In this context, the city could rethink mobility planning



Source: Mod Foundation

A combination of infrastructure improvement, increased capacity of modern mass transit, and efficient alternatives to vehicle ownership would help curb congestion. (Exhibit 113)

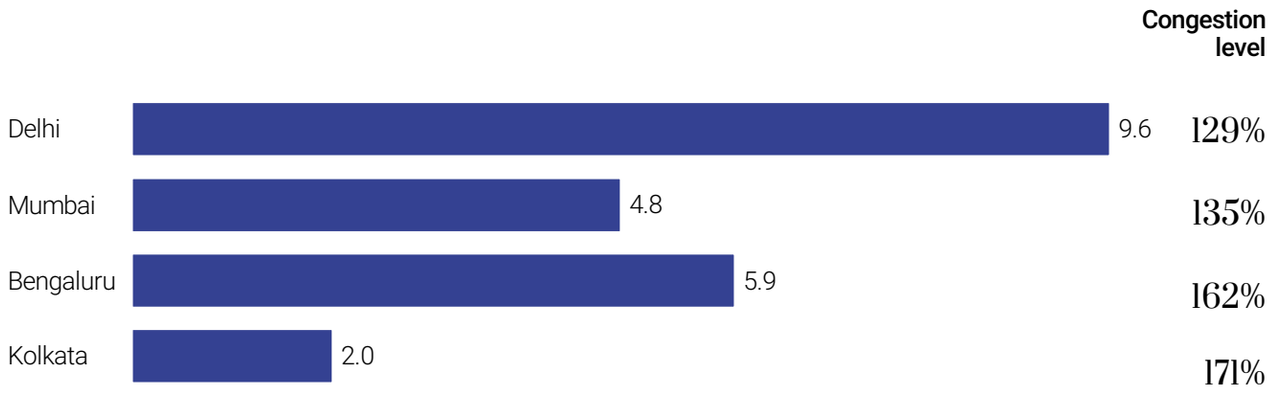
The key to ensuring a sustainable and people-centric transport system lies in harnessing information communication technologies, factoring resilience into infrastructure planning, retrofitting existing urban infrastructure to promote cleaner commuting modes, and developing innovative urban infrastructure in a timely manner to serve people of all age groups. Investing in strong, local public services now, including in public transport infrastructure, could be a vital step to ensure a just, prosperous, and green future for all. A strong public transport system benefits workers – especially women, migrants, the young, and precarious and informal workers who often face greater barriers to employment.

"Public transportation is more than just a way to move people around. It's a vehicle for opportunity, equity, and a better quality of life"[123]

[123] C40's Cities Climate Leadership Group chairman and Los Angeles Mayor Eric Garcetti

Exhibit 113

Cost of congestion across cities



Source: Report – Unlocking Cities, Centre for Urban Economic Studies, Department of Economic, University of Calcutta, Kolkata, India.

Traffic congestion in Bengaluru could deter investors, which is one of the reasons it could be a major concern for the government. There have been complaints about a lack of coordination between various transport and civic bodies, which has seen public transport projects being delayed. The passing of the Bengaluru Metropolitan Land Transport Authority (BMLTA) Bill by the Karnataka legislature in December 2022 is a first step towards resolving the city's mobility challenges. The BMLTA can be an integrated authority for urban mobility, bringing every form of transportation within the city under a single planning agency. The enactment of the bill can ensure a comprehensive mobility plan for the gridlocked city, adopting sustainable urban transport models. Integration of land use and transport planning are also key elements of it. The legislation also provides for measures such as congestion parking, parking regulations, tolling, and special-purpose lanes to regulate travel demand in the urban mobility region.

The BMLTA can cover an area of 279 square kilometres, taking over from multiple government agencies, such as the BMTC (for buses), BMRCL (for metro), the Karnataka Transport Department, and the Bruhat Bengaluru Mahanagara Palike.

The authority's primary roles could be:

- Vision-setting and getting sign-off among stakeholders for a comprehensive mobility plan for the city, including non-motorised modes of transport and prioritising pedestrians.
- Coordinating with all government and private sector stakeholders to create a collaborative ecosystem to ensure the design of comprehensive mobility plan-aligned projects.
- Helping agencies deliver according to plan.
- Updating planning tools regularly to help design effective interventions in urban transport.
- Integrating the various modes of transport via the introduction of a common mobility card that works across transport modes (Figure 7), and creating technology (such as a customised app) that monitors and streamlines last-mile connectivity. (Exhibit 114)

Harnessing transit-oriented development

Transit-oriented development (TOD) is a planning and design strategy that promotes urban development that is compact, mixed-use, pedestrian- and bicycle-friendly, and is closely integrated with mass transit. It does this by clustering jobs, housing, services, and amenities around public transport stations. A new World Bank study recommends looking simultaneously at the "three values" (3V) of a neighbourhood – transit connectivity, quality of the urban environment, and market potential – to identify which stations are good candidates for TOD and what kind of development makes sense in each neighbourhood.[124]

[124] Transforming the Urban Space Through Transit-Oriented Development: The 3V Approach, World Bank

Exhibit 114

Common mobility card



Source: http://www.nalandaias.com/national-common-mobility-card-ncmc-indias-first-driverless-metro/

Promoting higher densities and concentrating jobs within relatively small areas, TOD creates agglomeration effects proven to boost a city's competitiveness. Studies have shown[iii] that doubling job density, for instance, increases economic productivity by 5 percent to 10 percent. This concentration creates vibrant communities with high-quality public areas and shorter commuting distances – making cities more livable. Proximity to mass transit improves access to TOD neighbourhoods, boosting their attractiveness and increasing the value of real estate. Bengaluru could harness these increases in value to finance additional transit improvements, affordable housing, and other initiatives that promote sustainable, inclusive growth.[125]

TOD can achieve a range of objectives, including:

- Increasing the viability of public transport and revitalising urban core areas through redevelopment and planning land uses that create lively, sustainable places in greenfield development.
- Creating vibrant urban spaces that slash dependency on private vehicles for commuting and lead to improved quality of life.
- Making public transport a more attractive and efficient option, while reducing dependence on private cars and promoting shorter commutes.

High-density corridors

High-density corridors (HDCs) in Bengaluru are areas of the city that have high population densities and large concentrations of commercial and residential buildings. These areas are typically characterised by heavy traffic, crowded streets, and bustling environs. Over the years, these areas have grown rapidly, due to increasing demands for housing and commercial space in the city. These HDCs include:

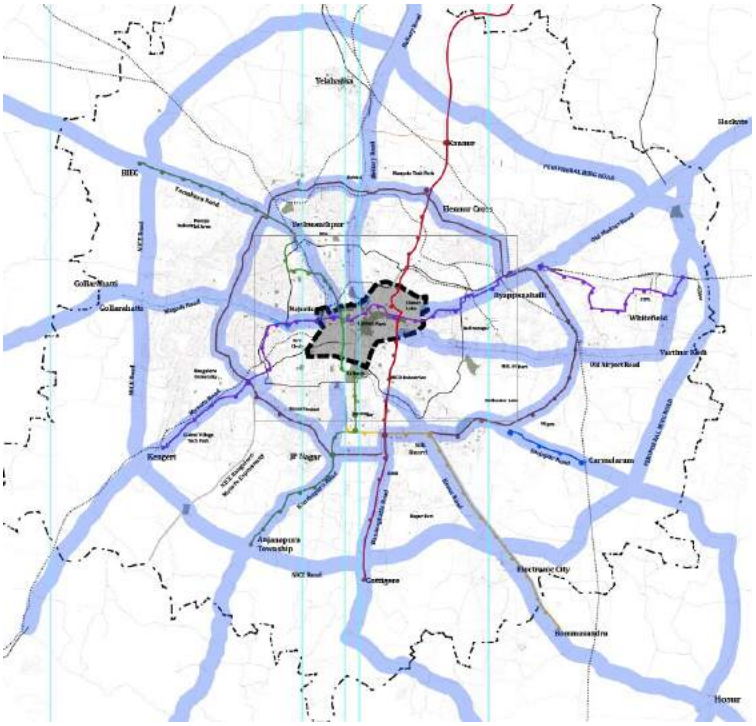
Bellary Road	Kanakpura Road
Mysore Road	Bannerghatta Rd.
Tumkur Road	Old Airport Road
Magadi Road	Inner Ring Road
Old Madras Rd.	Outer Ring Road
Sarjapur Road	Hosur Road

These HDCs are in strategic locations characterised by arterial connections with the city, popular commercial high streets, and proximity to the IT corridors. They are popular residential neighbourhoods for professionals who work in the vicinity and are therefore often clogged with traffic. Additionally, the lack of open spaces and green areas in these corridors leads to a sense of overcrowding, affecting quality of life. (Exhibit 115)

[125] For example, In Hong Kong SAR, land value capture brought in about HK$140 billion in revenues between 1980 and 2005, and unlocked land for 600,000 public housing units

Exhibit 115

HDCs in the city



Source: Mod Foundation

There is an urgent need to improve the condition and maintenance of the roads in the city and to shorten commute times. A grant[iii] of INR 400 crore has been allocated by the Karnataka state government for the development and improvement of 12 HDCs. The BBMP's road infrastructure wing can implement the project in consultation with the Department of Urban Land Transport. The redevelopment of these HDCs could include:

- The optimisation of the road geometry.
- The construction of an underground metro network where not already planned.
- The addition of well-designed pedestrian amenities, including footpaths with clear space for walking; dedicated cycle tracks that are segregated from the traffic carriageway; the provision of safe crossings at regular intervals; and landscape elements, including shade-giving trees.

Metro network

The objective of the metro network is to provide metro access to every citizen of Bengaluru within one to two kilometres of their place of work or residence by 2032. (Exhibit 116) The map below indicates all planned phases of the Namma Metro. Three more routes may be included for optimal use of resources:

- Old Airport Road – from MG Road to Hope Farm via Marathahalli and Whitefield (IT corridor connectivity).
- Old Madras Road – from KR Puram to Hoskote (Narsapura industrial area connectivity).
- Inner Ring Road loop.

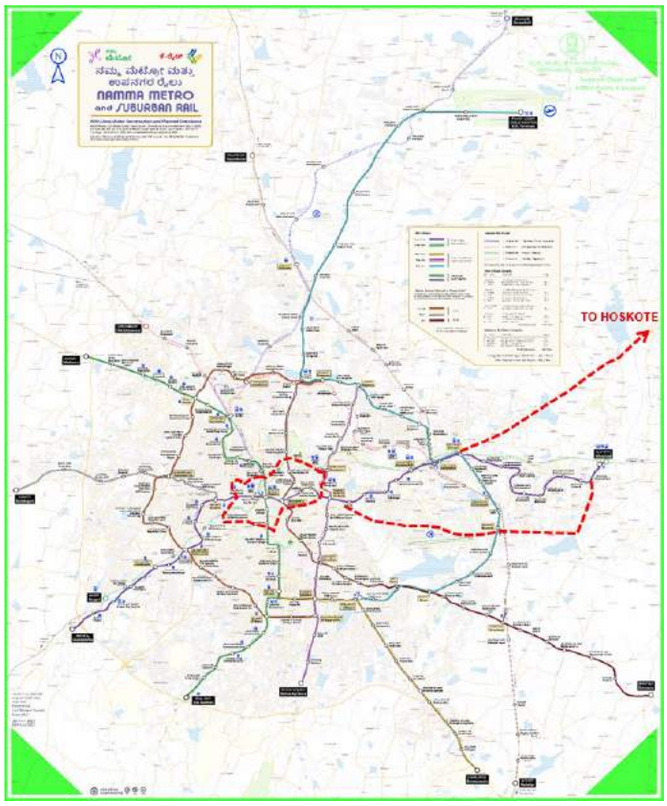
Public transport network

A 2019 TomTom Index – a report about traffic congestion across 417 cities in 57 countries – found Bengaluru to be the most congested city in the world.[126] And, while the number of vehicles on Bengaluru's roads keeps rising every year, little seems to be done about managing this.

126 TomTom Traffic Index: https://www.tomtom.com/traffic-index/ranking/

Exhibit 116

Metro lines phase I to phase 3B



Souce: BMRCL

The share of private vehicles in the city[iii] surged by 280 percent between 2007 and 2020, to 2.1 million to 8 million vehicles. Public transport[iii] infrastructure, on the other hand, has a low 48 percent usage and the city's public transport system cannot keep pace with the substantial increases in transport demand.

So far, policymakers have focused on augmenting traditional road infrastructure measures as a solution to traffic-related problems. Until now, the gap in public transport availability has not been addressed. Also, last-mile modes of transport connecting commuters with the Green and Purple Line of Phase I of Bengaluru Metro and the BMTC buses remains a problem.

The government could take several steps to alleviate the congestion and provide transport systems fit for a growing future Bengaluru. Currently, two mass rapid transit networks are being built in the city – the metro rail and the suburban rail. The Bengaluru Metro[iii] operates over a total distance of 56 kilometer, with another 120 kilometres of track expected to be laid by 2025. The first phase of the Bengaluru Suburban Rail Project (BSRP), formally initiated in June 2022, is expected[iii] to come on-stream in about three years.

New mobility solutions have great potential to enhance the usage of public transport. Regulatory challenges faced by new mobility operators in Karnataka are being addressed as a priority. Research suggests that the best outcomes in public transport result from taking a whole-network approach.[127] This includes:

Physical planning. When mass transit routes, as well as walking and cycling infrastructure, intersect one another, passengers can easily move from one mode to another to complete their journeys.

[127] Influence of public transport quality attributes on user satisfaction of different age cohorts | A Journal of the World Conference on Transport Research Society, Volume 9, Sep 2021

Integrated fares. If payment systems are integrated, passengers can pay once for trips that include multiple public transit modes. Smart ticketing systems automatically adjust the fare that is charged to reflect each passenger's specific journey and travel frequency.

Integrated operations. Ideally, a single agency could be responsible for managing all public transport systems in the city. This allows for seamless intermodal integration and timetabling, smart ticketing, and single apps for users to find information. London is a good example of this[iii]: Transport for London is responsible, either directly or through licences and franchises, for managing London's metro, bus, and tram (DLR and Tramlink) systems, city-wide cycling infrastructure, taxis, and water buses, in addition to London's Major Road Network (most smaller roads are managed by borough councils).

BMTC

The Bengaluru Metropolitan Transport Corporation (BMTC) is the sole public transport provider for Bengaluru, serving urban, suburban, and rural areas. BMTC offers a variety of buses and services, including air-conditioned buses, special airport services, free services from the central bus station to the railway station, fare concessions, and daily and monthly bus passes for regular commuters. Between 2011 and 2019, BMTC's fleet strength increased by only 7.89 percent, while the city's population increased by 32 percent.[128] (Exhibit 117)

According to the BMTC's Annual Administration Report 2018–19, the number of vehicles it owned fell from 6,677 in 2017–18 to 6,634 in 2018–19. The BMTC carries 45 percent of the city's traffic but is yet to catch up with the high growth in travel demand, its fleet size having remained largely stagnant.[129]

As of 2022, London (which covers an area roughly[iii] comparable to that of Bengaluru) is served by more than 8,700 buses, almost all of which are operated by private companies under contract to (and regulated by) London Buses, part of the publicly owned Transport for London. In comparison, despite having a fleet size of 6,798 buses, the BMTC runs only around 5,600. The BMTC could benefit greatly if it received state funding to modernise and grow its fleet over the next 10 years. Right now, the corporate entity is reliant solely on revenue from ticket sales to maintain and replace its buses.

[128] Bengaluru needs shared mobility, last mile connectivity: Uber-BPAC report, LiveMint
[129] Bengaluru Urban Infrastructure Report – 2020, KnightFrank

Exhibit 117

BMTC summary

BMTC performance

Parameter	2012–13	2013–14	2014–15	2015–16	2016–17	2017–18	2018–19 (as on Aug–18-prow.)
Depots	39	39	40	40	43	44	45
Fleet operated	6,139	6,473	6,244	6,216	6,219	6,143	6,143
Vehicles held	6,431	6,775	6,522	6,401	6,161	6,677	6,637
Effective km, per day (lakh)	12.71	13.14	12.9	12.21	11.52	11.42	11.38

Source: BMTC, Knight Frank Research

The BMTC is working on a vision document to transform the public transport system by 2030. The document is expected to be included in the city's proposed comprehensive mobility plan (CMP). It includes a long-term plan to increase the fleet size, boost operational efficiency, and reduce losses. The BMTC is also taking strides towards green public infrastructure–the corporation launched 75 electric buses in August 2022, with plans to expand the fleet to 300 e-buses, maintained by Switch Mobility.[130] The buses are equipped with new-generation, highly efficient modular batteries, with advanced lithium-ion NMC chemistry, specially formulated for the Indian market and climate.

Apart from creating a long-term vision document, the BMTC is already modernising its operations. This includes:[iii]

- Plans to implement a completely integrated intelligent transportation system to attract riders and improve revenue.
- Additional plans to incorporate digitalisation to increase ridership and revenue.
- The integration of an automatic fare collection system with the ITS and launching of an integrated BMTC app to allow for electronic, digital, and card-based ticketing.
- Provisions to allow passengers to track buses in real time.
- Revamping of tracking systems at bus stops.
- Equipping buses with GPS systems, panic buttons, and CCTV to improve safety.
- The introduction of paperless ticketing, relying on smartphone infrastructure (use of QR codes).

Numerous cities around the world offer bus service models Bengaluru can emulate to achieve its goals of inclusivity, sustainability, and growth. Here are some of the things the city may consider to bring its bus service in line with the best in the world:

- London[iii] (as of 2022) has 675 bus routes served by more than 8,700 buses across over 15 depots. Bengaluru has more than 2,411 routes served by 6,143 buses with about 45 depots. Based on this comparison of the two cities' bus operations:
- Bengaluru could consider commissioning a comprehensive mobility mapping of its bus routes. It could also propose rerouting some of its buses to serve demographic movement, moving away from planning bus routes according to location of depots (as is the present practice).
- The city could upgrade its existing fleet, with a goal to convert 100 percent of the buses into e-buses by 2032.
- Optimising bus routes to minimise overlap and ensure coverage across the city in line with demand. For example, Houston[iii] respecified their service, after the light rail transit system was put in place, to reduce the overlap of services and to ensure transit coverage in other areas of the city. This resulted in a 7 percent increase in ridership on local bus and light rail from 2015 to 2016.
- Designing an intuitive network and easy-to-read bus map.
- Providing high-frequency, reliable services. The bus network can be divided into main routes and local routes, with different frequencies.
- Bus routes on main city arteries and roads used for longer distance travel will require a frequent service, at least every 15 minutes. This is the minimum frequency at which the service is usually considered good enough for travellers to turn up without consulting a schedule.
- On local routes, a less-frequent service may be sufficient, depending on demand and provided that the service operates punctually according to the timetable. São Paulo[iii] has implemented this dual frequency timetable for the night shift, increasing night-time ridership by over 70 percent.
- The BMTC can benefit greatly benefit from state funding in modernising and growing its fleet over the next 10 years. At present, the corporate entity is reliant on revenue from ticket sales solely for maintaining and replacing its buses.
- Integration of the automatic fare collection system with the ITS and launching an integrated BMTC app to allow provisions for electronic, digital, and card-based ticketing would make the service more efficient and attractive.
- Provisions to allow passengers to track buses in real time.

130 75 Electric buses from Switch Mobility hit Bengaluru city roads, Energyworld, Economic Times

Congestion charge

A congestion charge in the city, applicable for all non-exempt vehicles entering Bengaluru during busy periods, could be implemented with the aim of reducing traffic congestion and improving journey times for buses, cars, and delivery vehicles.[131] The objective would be to make users conscious of the costs they impose on one another when they take to the road during peak hours.

At present, there are nine entry points to the inner city where the congestion charge could be levied:

- Bellari Road
- Tumukuru Road
- Magadi Road
- Mysore Road
- Kanakapura Road
- Bannerghatta Road
- Hosur Road
- Old Madras Road
- Old Airport Road.

At present, 12 million vehicles travel into the city of Bengaluru every day. Levying a congestion charge could translate into significant revenue for the city. FasTAG has been successfully deployed in the city since 2021.[132] It is proposed that the same mode be used to collect congestion charges in the city for ease and convenience. (Exhibit 118)

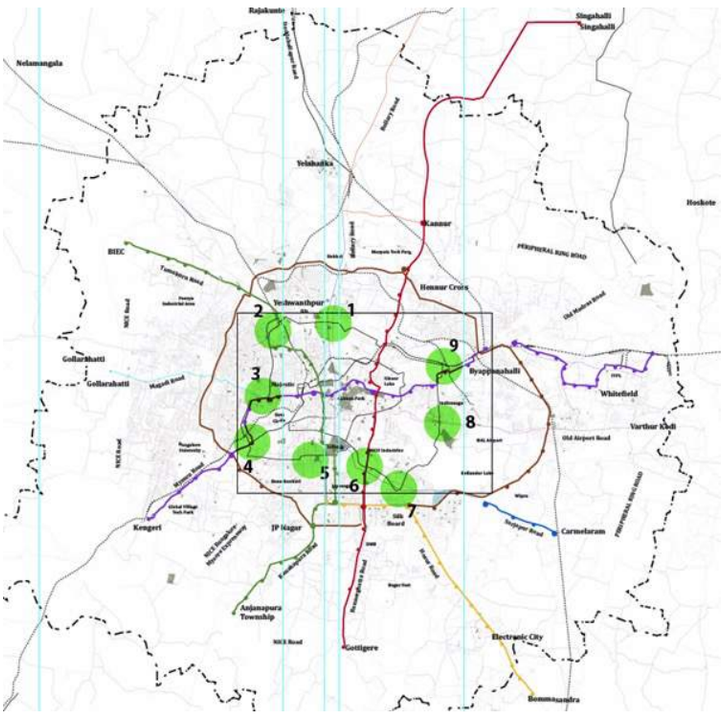
Here are some proposed advantages to the application of a congestion charge:

[131] When implemented in London, it was noticed that within three years, traffic congestion within the operational area had dropped by 30%, with delays dropping from 2.3 to 1.8 delay minutes per kilometre, "Impacts monitoring – Fourth Annual Report Overview" (PDF). Transport for London. June 2006. Archived from the original (PDF) on 16 October 2022. Retrieved 26 May 2007

[132] FASTag is a simple to use, reloadable tag which enables automatic deduction of toll charges and lets you pass through the toll plaza without stopping for the cash transaction

Exhibit 118

Map of Bengaluru highlighting entry points at Intermediate Ring Road



Source: Mod Foundation

Raising revenue. The money from the congestion charge can be spent on other forms of public transport.

Reducing congestion. Reduction in congestion equals a reduction in time wasted and reduces costs for commuters and businesses.

Reducing pollution. Fewer cars will lead to less pollution.

Making city centres more attractive for pedestrians and cyclists. This would help to improve quality of life.

Electric mobility: Decarbonisation of urban transport

The past few years have seen a significant demand for electric vehicles (EVs) in cities globally. The Karnataka Electric Vehicles and Energy Storage Policy (KEVESP) was formulated in 2017 to make Bengaluru the EV capital of India. The city provides a suitable ecosystem for research and development, technological advancement, and the manufacturing of EVs.

As per KEVESP 2017, the Government of Karnataka is targeting 100 percent EV adoption by 2030 in Bengaluru's private transport segment.[133] To promote EVs in the public transport segment, 1,500 EV buses can be phased in to the BMTC's fleet in the next three years. In the goods transport segment, a 100 percent EV target is set for three-wheelers, four-wheelers, and mini-goods vehicles by 2030. The policy also encourages e-commerce and delivery companies operating in Bengaluru to adopt electric two-wheelers/three-wheelers by 2030.

The biggest concern about EVs is charge range. A national survey suggested that the average distance travelled by an Indian commuter is about 35 kilometres daily, well within the range of an EVs average of 156 kilometres.[134] This indicates that a major consumer education programme is needed to dispel range anxieties. An investment in creating "EV corridors", with charging stations at regular intervals, would further encourage adoption of the vehicles.

Last-mile connectivity

Last-mile connectivity is an essential principle behind transportation policy. Ensuring that public transport is accessible to all the city's residents, right up to their destination, delivers a knock-on benefit to the running of the city. There are six major ways that ensuring last-mile connectivity could benefit the city:

- **Increase accessibility.** Last-mile connectivity is crucial for ensuring that public transportation is accessible to all residents, regardless of where they live or work. Without good last-mile connectivity, many residents may be unable to access public transportation, which can limit mobility and job opportunities.
- **Encourage the use of public transport.** Good last-mile connectivity can encourage more residents to use public transportation – the closer it will take them to their destination, the more likely they are to use it.
- **Reduce traffic congestion.** By providing good last-mile connectivity options, more residents may choose to use public transportation instead of driving, which can help to reduce traffic congestion on the roads.
- **Improve air quality.** The reduction in car traffic would, in turn, improve the city's air quality, which is important for public health.
- **Enhance livability.** Good last-mile connectivity enhances the livability of the city by providing residents with more transportation options and making it easier for them to access services and amenities.
- **Save consumers money.** Last-mile connectivity solutions – such as cycling, walking, and micro-mobility options – are generally more cost-effective than private vehicles. Shifting travel from cars to public transport is cost-effective for residents.

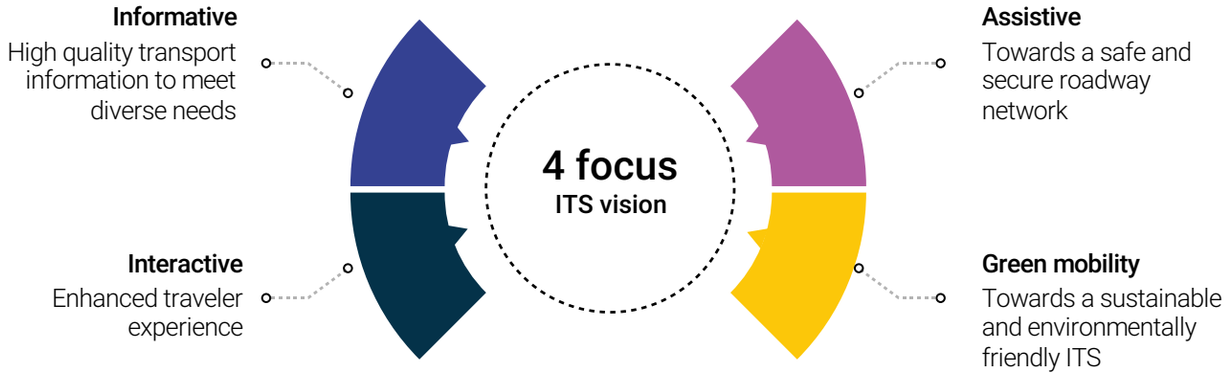
Harnessing information and communications technologies for smart traffic monitoring and control

One of Bengaluru's broad objectives is to become an "intelligent city". This may entail focused intervention in many initiatives, including the development of a unified mobile application for transport. With it, commuters will plan their trips efficiently, from start to finish. The development of a world-class transportation infrastructure entails the provision of information, allowing commuters to make informed decisions. Information could be disseminated via several media, physical and digital signage systems, information systems, timing displays at bus stops, and information on mobile applications. (Exhibit 119)

[133] Electric Vehicle demand projection for Bengaluru and power demand management, CSTEP
[134] Indian commuters travel 35 km/day, says survey, Times of India

Exhibit 119

Four focus areas of ITS vision



Source: Challenges and improvements in Singapore's urban mobility (nus.edu.sg)

Economy

Bengaluru Urban is by far the richest district in the state, averaging a per capita GDP of INR 572,786 – 2.3 times[iii] that of Karnataka's per capita GDP of INR 244,381 in 2019–20. This is due to the IT industry and other high-value industries in the city.

Bengaluru is the crown jewel of Karnataka, making up a significant component of GSDP, paying the majority of the taxes to the state's coffers, and having the highest per capita income of any city in India. The city is India's IT, biotechnology, science, avionics, and space capital.

It is imperative to develop the city and allocate the necessary resources for Bengaluru to achieve its potential as a global hi-tech city. Increasing prosperity has led to severe infrastructure challenges with the lack of an appropriate governance mechanism to meet citizens' needs.

A focused plan on the development of Bengaluru metropolitan region is required to make the city's future more vibrant and improve the quality of life for all its citizens. One central strategy to develop the whole state economy can no longer work; each region needs a differentiated and focused agenda based on its population's needs.

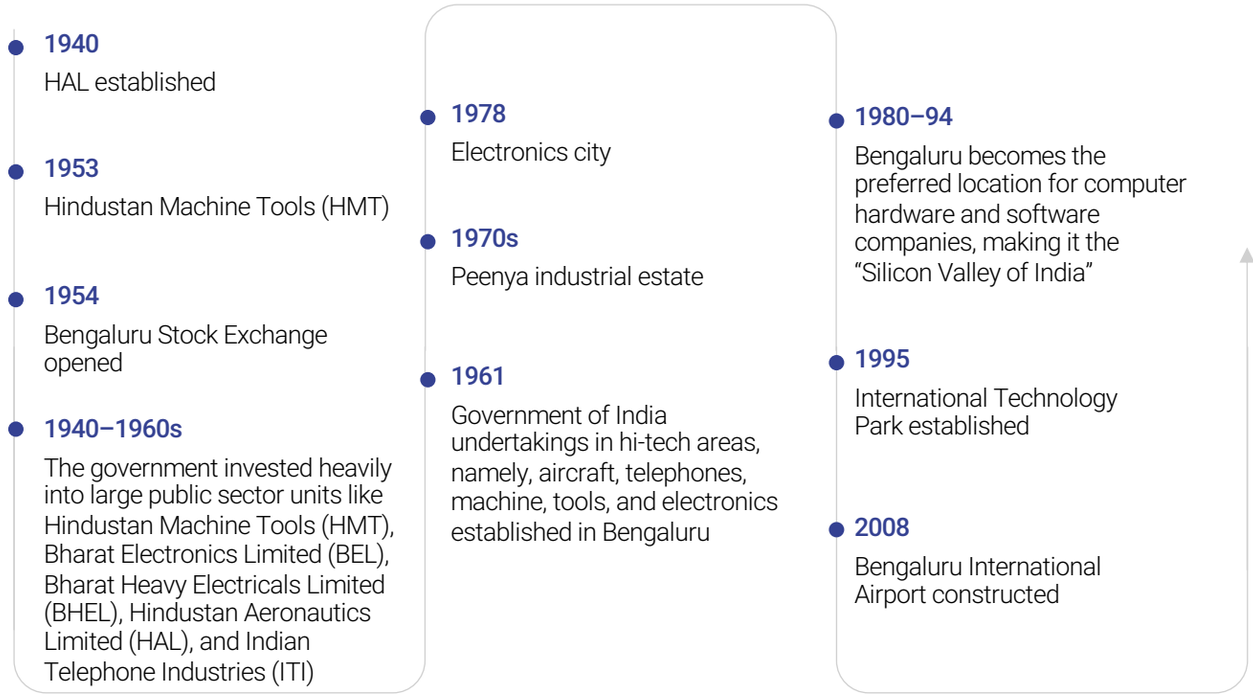
Bengaluru's evolving economy

Before India's independence in 1947, Bengaluru – known then as Bengaluru – was mainly an agricultural and manufacturing hub due to its cheap land and labour. After the country became a democracy, Bengaluru evolved into a hub for public-sector industries, particularly in aerospace, telecommunications, heavy equipment, space, and defence, with massive investment from the national government. Manufacturing giants, such as Hindustan Aeronautics, the National Aerospace Laboratories, Bharat Heavy Electronics, Indian Telephone Industries, and Bharat Earth Movers, had headquarters in Karnataka's capital.

In the early 1990s, a combination of new, national, economic liberalisation policies and the emergence of a strong education system in the city encouraged the development of an information and communication technology (ICT) sector in Bengaluru, paving the way for its rapid development into a global ICT centre. Today, the key sectors in Bengaluru include IT, aerospace and aviation, biotechnology, electronics systems, the automotive industry, textiles and garments, manufacturing, and floriculture. It also has become home to companies working in energy technology, fintech, medical technology, frontier technology, AI, robotics, quantum computing, blockchain, and genomics. (Exhibit 120)

Exhibit 120

Growth of Bengaluru's industrial sector



Source: Knight Frank Research. Directorate of Economics and Statistics, Bangalore

Spatial distribution of economy and employment

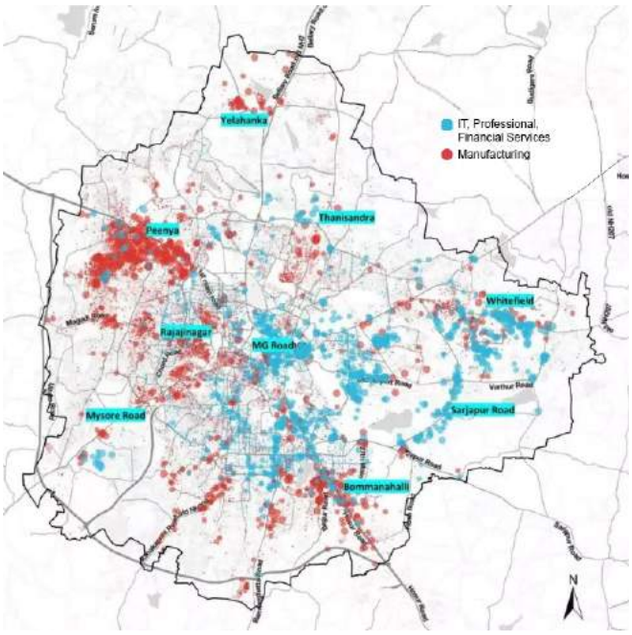
Bengaluru has different spatial clustering patterns for different economic activities: The city's manufacturing activities are concentrated in the west, while knowledge-intensive services, such as information technology, and professional and financial services, are in the east. The locations of many of these industrial clusters are influenced by historic policy decisions. For instance,[iii] the Peenya industrial area, planned and developed by the state of Karnataka in the 1970s in northwest Bengaluru, is still one of the largest industrial hubs in the state. Similarly, the city's IT corridor expanded into the southeast, partly due to the government setting up Electronics City in 1976. The establishment of Information Technology Park Limited, in Whitefield, east Bengaluru, spurred the city planning authority to actively promote hi-tech industries along the Outer Ring Road (ORR).

Companies weigh various economic factors when deciding on a location for their business. Among these are the cost of operations, availability of labour, infrastructure, and proximity to clusters. Seeing the city's economy at a spatial level helps planners identify areas of employment, plan better for infrastructure investment, and support economic growth.

The economies of our cities are highly diverse and have different infrastructure and development requirements. For example, areas with knowledge-intensive services might require IT parks and commercial/ recreational centres, while a low-tech manufacturing cluster would require more focus on buildings and warehouses with affordable rents, housing, and social infrastructure (such as schools and primary healthcare centres). Economic diversity, crucial for sustainable growth and job creation, is also instrumental in promoting mixed-income neighbourhoods. (Exhibit 121 & 122)

Exhibit 121

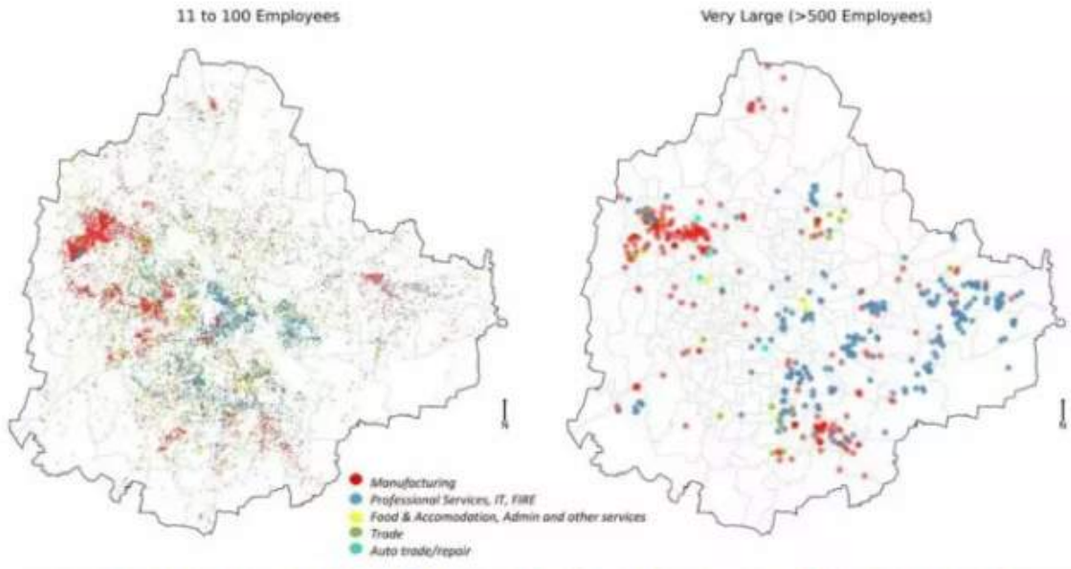
Location of manufacturing and knowledge-intensive services in Bengaluru



Source: Comprehensive Economic Data Set, IIHS 2022

Exhibit 122

Location of enterprises based on economic activity and size



Source: Comprehensive Economic Data Set, IIHS 2022

In economic planning, it is important to ensure that public amenities – such as schools, medical care, restaurants, and recreation facilities – meet the needs of the number of employees expected in an area. This can help create sustainable, mixed-income neighbourhoods with diverse economies while allowing the government to concentrate on the infrastructure development suitable for each industry type.

Bengaluru has distinct economic zones, which can be enhanced by turning them into robust neighbourhoods. The Chickpete area is known for its textile[iii] trade and having produced some of the earliest entrepreneurs in the city. The Shivajinagar area features clusters around auto spares and services. Whitefield began life as a town neighbouring Bengaluru, but over time has been assimilated by the city. Whitefield houses several **Information Technology Parks**, and many global firms have their India headquarters in the area. Koramangala and JP Nagar spawned many tech start-ups, while Electronics City is home to all of India's major IT service. Small- and medium-scale industries are found along major routes such as Kanakapura Road and Old Madras Road.

City cluster development

The connections between cities and their hinterlands are beneficial in both directions. When several cities and villages are tied together, they form a network that mutually benefits all its constituent parts. A balanced network consists of large cities as well as towns and villages of various sizes.[135]

One of the tasks of an equitable government is to ensure economic growth in regions outside the core, while ensuring human settlements offer a decent quality of life. This calls for a social upgrading of the settlements, on top of economic enhancement and integration.

The Bengaluru Metropolitan Region (BMR) is spread over about 8,000 square[iii] kilometres and comprises multiple cities and towns. Though much smaller than Bengaluru city in terms of their economies and spatial extents, these settlements are vibrant components of the region. They need to be considered not only in terms of how they may contribute to the growth of Bengaluru, but also as independent settlements. Economic integration has emerged as a development priority for them, both intrasettlement and intersettlement. The radial network of roads that converges on the city offers the opportunity to locate jobs and people in outlying regions. The passage of economic commuters could be a catalyst for the development of the commuter hinterland. The most progressive vision for Bengaluru is of an economically integrated region with all settlements performing a variety of high-level metropolitan, national, and international functions. (Exhibit 123)

Opportunities and challenges in Bengaluru

The increasing prosperity of Bengaluru has made it attractive to immigrants and those seeking high-income employment. The city's population is now 1.1 crore[iii]– the fourth-largest urban population in the country. Infrastructure development has not kept pace with the population explosion. This is stunting Bengaluru's potential as a global hi-tech hub. The need for governance reform to address these infrastructural shortcomings is urgent. This is described in further detail in the following chapter.

One measure that could help the city realise its potential is the promotion of clusters for research, technology, and innovation. These would combine the best resources for education, industry, and research to boost the city's academics, industry, start-ups, civil-society organisations, and government bodies. Furthermore, it would help create sustainable ecosystems for tech and innovation. These, in turn, can be highly valuable for tackling local social issues with locally relevant solutions, which could be scaled and made globally competitive.

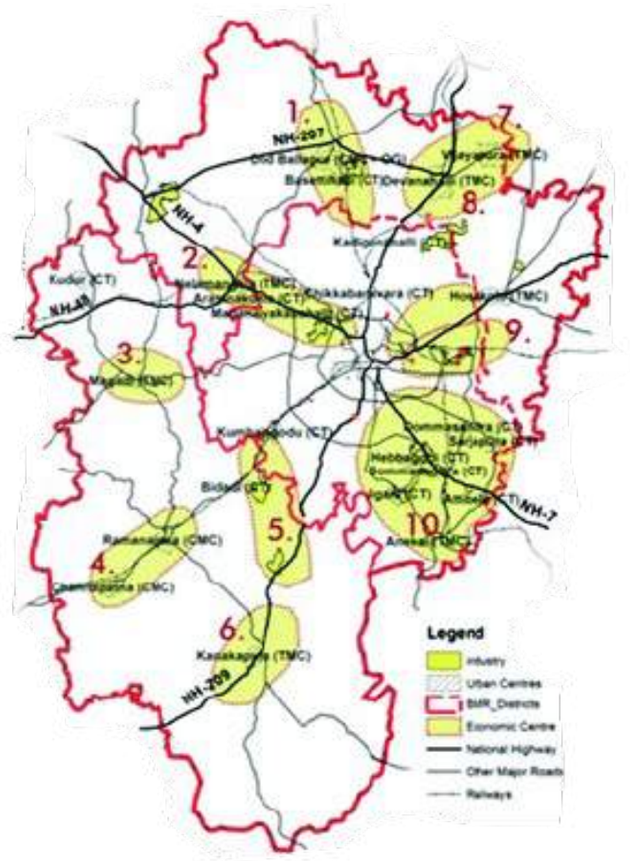
The Bengaluru Science and Technology (BeST) cluster is one such collaborative effort.[iii] Inaugurated in Bengaluru in November 2022, the cluster includes more than 50 organisations working in sectors including health and wellness, urban life, and technologies such as AI and blockchain.

A proposal for funding for the BeST cluster was submitted[iii] with principal investigator (PI) Professor Govindan Rangarajan (Director, IISc), and co-PIs Professor Ambarish Ghosh (Professor, IISc) and Dr. Taslimarif Saiyed (CEO, CCAMP). The funding was sanctioned by the Office of the Principal Scientific Adviser (PSA) to the Government of India. The BeST cluster was launched formally at the plenary session of the 2022 Bengaluru Tech Summit, by the PSA, Professor Ajay Sood, in the presence of Professor G Padmanaban, former Director of IISc, and Shri S Gopalakrishnan (Kris), Co-Founder, Infosys, on 16 November 2022.

135 BMRDA Revised Structure Plan 2031

Exhibit 123

BMRDA region showing the predominant industries in the many settlements



Vijayapura (agro-based)
Agriculture, cocoon prod., silk thread, weaving, small scale industries

Devanahalli (service sector)
IT park, aerospace park, hardware park, ITC SEZs, freight and logistic services

Hoskote (manufacturing)
Heavy engg., industries, spares of heavy machinery, factories, small scale, silk textile

Anekal (manufacturing and IT service)
IT and BT industry, trade and export, manufacturing of electronic products, and software development, etc.

Dodballapur manufacturing (textile)
Apparel Park (Phase I & II), textile industries, silk weaving and some chemical industries

Kanakpura (agro-based)
Fertile land – agriculture, cash crops, horticulture, sericulture – cocoon production, silk textile, and food products

Nelmangla – Peenya (manufacturing)
Product based (iron, steel), textile, small scale industrial cluster

Magadi (agro-based)
Agriculture, sericulture, small scale industries (textile)

Channapatna and Ramanagara (agro based)
Agriculture, horticulture, sericulture with small scale industries

Bidadi – Harohalli (manufacturing)
Big industrial estate, factories – Toyota, automobile engineering parts

Source: BMRDA

Accelerating IT services

IT services is a sector with one of the largest value-adds, with data from the Ministry of Statistics and Programme indicating[iii] that the value-add in 2017–18 was 70.6. The IT services lever also has a massive feed-forward effect. India today exports $170 billion[i] worth of software.

Karnataka already has a leading IT services sector. This could be carefully expanded to improve its value-add to GDP and boost India's IT-export capabilities. Today, Karnataka contributes a substantial 38 percent to India's[iii] IT exports and this is growing at 10 percent to 12 percent every year. Up to this point, IT has created 21 lakh jobs in Bengaluru alone. Over the next five years, the industry, combined with the start-up ecosystem, can create 2.5 to 3.5 lakh high-skilled jobs.

While building a robust pipeline for formal education, Karnataka can bring focus to IT-related education streams. By following training models laid out by Infosys and other IT giants, the students in these courses can be trained to global standards. Inviting industry participation here is crucial.

In addition, the world of IT is changing rapidly, bringing advancements in multiple interdisciplinary fields. Karnataka could take up a position of global leadership in technology by building IT centres of excellence (CoEs) in all areas, with state-of-the-art laboratories and resources and top talent. Some fields in which CoEs could create change include:

- AI
- Machine learning
- Blockchain
- Cybersecurity
- IoT
- Enterprise automation
- Agritech

This would ensure the state's success in IT for decades to come, and can attract top talent from around the world.

Investing in the start-up ecosystem

The innovation-driven, start-up-led knowledge economy is where the future lies. India is witnessing the meteoric rise of a robust start-up ecosystem. The country is the third-largest start-up base in the world.[iii] Today, India has over 75,000 start-ups, which raised a cumulative $112 billion between 2014 and 2021. Of this, $49 billion was raised in 2021 alone. The ecosystem has a collective value of $500 billion today. India has the third-largest number of unicorns (companies with over $1 billion in valuation) in the world at 105, of which 46 reached that valuation in fiscal year 2021 and 14 did so in fiscal year 2022 by the date of writing. This indicates a rapid acceleration.

It is estimated that by 2025 or 2026, India could have 100,000 start-ups to employ approximately 3.5 million people.[136] With these numbers, India's start-up ecosystem will be the second-largest in the world, beaten only by that of the United States. These start-ups have the potential to reach a market value[iii] closer to $1.5 trillion by 2025. The ecosystem is on track to yield 100–150 more unicorns.

With over 250 accelerators and incubators,[iii] more than 500 institutional investors, and over 2,000 active investors, India already has a healthy private-investment ecosystem. But Indian capital is only a small part of the total investment in the country. Foreign giants are increasingly capitalising on India's exponential growth. Merely 10 percent of total inbound capital is estimated to be domestic. With foreign players owning most of Indian data and platforms, there is an urgent need for more domestic capital to be infused into the system. This is where governments like Karnataka's can have meaningful impact.

[136] https://www.cnbctv18.com/entrepreneurship/india-to-have-more-than-1-lakh-start-ups-by-2025-says-mohandas-pai-5155711.htm - Mohandas Pai

Bengaluru constitutes a whopping 40 percent[iii] of the Indian start-up ecosystem. It is a top destination for seed-stage and growth-stage funding. It is the largest unicorn hotspot in India, home to 45 of India's total of 105. In fiscal year 2021, the city processed 551 deals that raised a cumulative $21.3 billion. This was nearly half of India's total of $49 billion. It is also home to the largest number of venture capital funds in India, beating both the national capital, Delhi, and the financial capital, Mumbai. This cements it as the undisputed innovation capital of India. (Exhibit 124)

The creation of a state-wise Fund-of-Funds (FoF), to invest in and grow start-ups, can be a significant step in encouraging the ecosystem. An INR 5,000 crore FoF could provide a solid foundation for Indian start-ups to grow. Some focus areas for the FoF could be:

- Fintech start-ups
- IT start-ups
- Enterprise tech start-ups
- Deep science start-ups in health, water, agriculture, semiconductors, and other fields
- Logistics and supply chain start-ups.

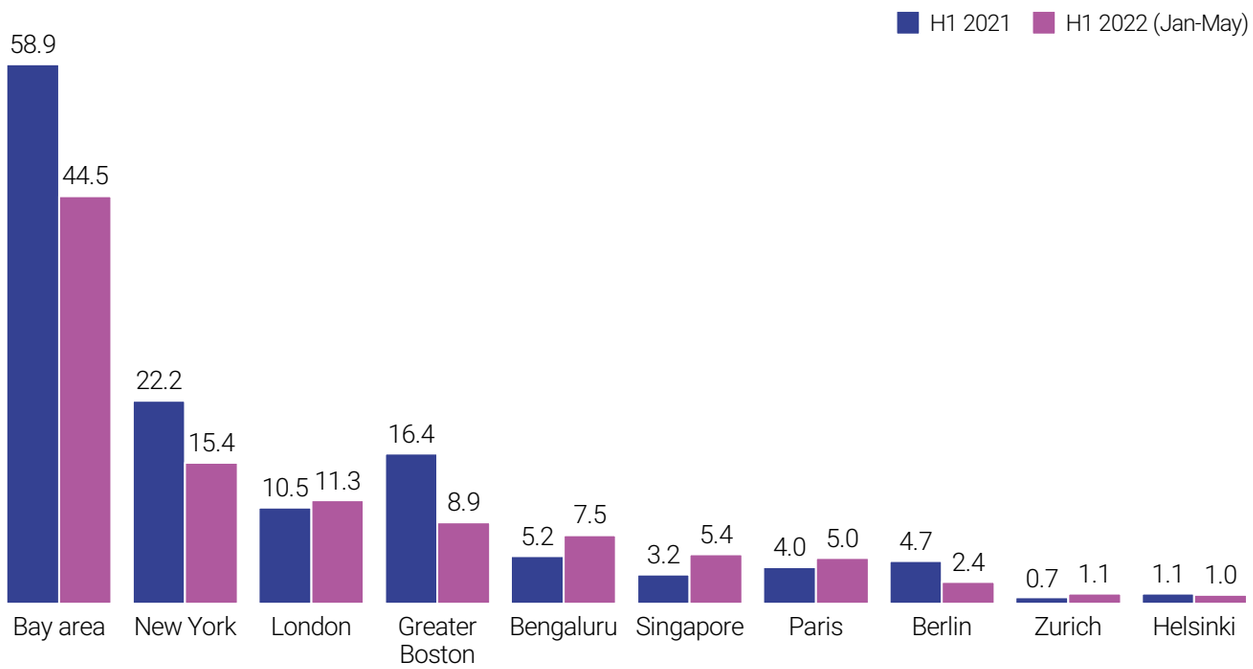
Karnataka has a rich history of supporting entrepreneurship. The Karnataka State Financial Corporation (KSFC) has helped grow global giants such as Infosys, Biocon, and MTR Foods. This could be a useful model for the state to re-adopt, providing interest-free or low-interest loans and FoF grants to help accelerate the start-up ecosystem.

Exhibit 124

Bengaluru is a top five global destination for innovation and start-ups

Pecking order: Top ten global cities, based on VC investments in the first six months

$ billion



Source: Business Standard. Global startup Ecosystem Report, Dealroom.co May 2022

Manufacturing sector

Bengaluru has a strong manufacturing sector, which includes traditional industries such as garments and food processing, and newer industries such as EV manufacturing. Bengaluru's Peenya industrial area, which was once one of the largest industrial[iii] nodes in Asia, is home to many large- and medium-scale industries. Apple recently[iii] chose the city as the site for its only active plant outside China.

Nearly 80 percent[iii] of the state's garment factories are located in the Bengaluru Urban district, which sees a significant amount of migration from rural Karnataka. The total garment workforce in the district is about 2.8 lakh, 72 percent of whom are women.[137] Good working conditions and industry investments in this significant sector could have massive benefits. The Union Government's Make in India programme identifies the garments and textiles industries as a priority area in which to encourage investment. Department of Commerce data shows that more than 180 garment factories in Karnataka shut down between 2019 and 2021. This left around 32,500 people, 66 percent of whom are women, jobless. In the six garment units that reported the most layoffs, 1,870 men and 5,710 women lost their jobs. All six units were in Bengaluru.[138]

Investment in the manufacturing sector could promote jobs requiring diverse skill sets not limited to those obtained in formal education. It can diversify the economy, reducing Bengaluru's heavy dependence on the service sector. Education and training for skilled jobs like garment manufacturing could provide opportunities for many young people in the country while increasing the quality of India's manufacturing sector. Well-paying, stable jobs with good working conditions can be an important aspect of the city's development in the near future.

Informal sector

Like many other metros in India, Bengaluru has a large, thriving informal economy, including domestic workers, street food vendors, construction workers, hawkers, gig-economy workers, and contract workers. The city is home[iii] to about 42 lakh migrant labourers, which is about 44 percent of its total population. They are mostly employed in the manufacturing and construction industries, in small restaurants, and the automotive industry. Roughly half of the migrants work as contractual labourers.[139] These jobs deliver crucial city amenities, and these jobs and the migrant labour performing them could be included in city policies and debates. Their importance to the functioning of the city demands that they are made more formal, ensuring a better quality of life for the workers and an additional revenue source for the government.

137 Garment workers forced to resign en masse, says report | Deccan Herald
138 K'taka Govt Data Shows 32k Garment Jobs Lost In 3 Years | Bengaluru News – Times of India
139 Bengaluru's Informal Labour Markets (iimb.ac.in)

Education

Education is the most important component in the development of the city, as it influences health outcomes, the environment, and the economic development of Bengaluru. It can improve people's economic opportunities by enhancing their skills to prepare them for productive employment. Over the years, Bengaluru has become an education hub, with an extensive network of schools and colleges. Among these are institutions that provide some of the best education in the country.

According to the 2011 census, the literacy rate of Bengaluru is 87.67 percent – better than the national literacy rate of 77.7 percent.[140]

Despite the abundance of colleges and schools in the city, the quality of education has not improved. Bengaluru has seen a significant increase in its dropout rate.[141] There are multiple reasons for this, ranging from inadequate funding for education to a lack of infrastructure for addressing problems in the governance of education. To solve these issues, a comprehensive education can be considered.

The United Nations' Sustainable Development Goals (SDGs) present several key objectives that education policy must aim for.[142] The following is a list of objectives applicable to Bengaluru:

- Education for all
- Development of infrastructure
- Improving learning outcomes —innovative interventions on a larger scale
- Education financing—students could be provided with financial assistance to achieve academic excellence
- Accountability and transparency.

Education for all

The state government and the municipality can ensure equal access for all women and men to quality, affordable technical, vocational, and tertiary education, including university education.

Education model and improving the gross enrolment ratio

The adoption of a three-tiered model for the educational system – comprising primary, secondary, and tertiary levels – could help the government make quality, affordable education accessible to everyone, at all levels of education. To institute this thoroughly, all social, gender, and ability barriers must be eliminated, giving equitable access to all. One measure the government could consider **to improve low literacy and enrolment rates is to work, at a grassroots level, in the communities struggling to improve them.**

A similarly targeted measure may be required **to increase the gross enrolment ratio: Working with girls and women at primary, secondary, and tertiary levels of education.**

Establishing a quality public education system

Over the years, the state government has implemented schemes to improve schools in the city and encourage the private sector to participate in education. A sharp rise in private schools has given parents and children more options, but has also increased the average cost of education in the city. Many families prefer private schools over state schools.[143] However, this reliance on private schooling was exposed as a weakness when, during the COVID-19 pandemic, private school students from low-income families were forced to drop out of school due to financial strain.

A quality public education system would provide quality education to everyone and reduce dependency on private schools. To avoid the catastrophe of children being forced out of school due to financial issues, the government could consider guaranteeing free education to all, up to class XII.

Increasing the annual budget for education

Only a small portion of the annual municipal and state budgets goes towards education. This is one area that demands attention from policymakers who want to effect progress in education. Bengaluru's education should be judged not by the sheer number of government education institutions in the city, but by the quality of the education in those institutions.

Allocating at least 10 percent of the city's GDP to education is an achievable target that could support low-income groups and create and disseminate knowledge.

140 Census Data | Government of India (censusindia.gov.in)
141 UDISE+2020_21_Booklet.pdf (udiseplus.gov.in)
142 https://en.unesco.org/gem-report/sdg-goal-4
143 What ails Bengaluru's government schools? – Citizen Matters, Bengaluru

Development of infrastructure

Establishing a network of educational institutions

If the government ensures that all children have access to quality early childhood development, care, and pre-primary education, more would be ready for primary education. Comprehensive geographic information system (GIS) mapping of schools by the education department and the Karnataka State Remote Sensing and Application Centre (KSRSAC) shows an uneven distribution of schools in the city. Some areas in the city are underserved while others have multiple schools close together, resulting in low gross enrolment ratio in some schools. This results in wasted resources in one ward and a lack of infrastructure in others.[144]

Using GIS mapping, the government could plan a more equitable spread of its resources, and have, at least:

- One Anganwadi for every 2,000 people;
- One primary school for every 5,000 people;
- One secondary school for every 7,500 people; and
- One college for every 1.25 lakh population.[145]

In addition to primary and secondary schools, **the government could increase the number of Anganwadi and nurseries in the city.** This would deepen early childhood care and education. Building and upgrading education facilities that are accessible by children and differently abled people, and cater for all genders, providing safe, non-violent, and effective learning environments for all, would ensure inclusion.

Infrastructure such as metro stations could be harnessed to serve learners. For example, **metro stations could be used for Anganwadis, primary schools, and local clinics.**

Setting up excellent institutions of higher education

To help deepen disciplinary specialisation and build subject focus, more institutes of national importance could be built in the city. Bengaluru is known for many specialised institutes, such as National Institute of Mental Health and Neuro Sciences, Indian Institute of Management – Bengaluru, National Law School, and University of Visvesvaraya College of Engineering. The government could collaborate with these institutions to spawn more of these specialised institutions in engineering, management, and other research fields.

Bengaluru's education and heritage district

This central district combines the city's built heritage with the promise of higher education.[iii] It is spread over nearly 2,200 acres, with more than 30 buildings of heritage value, prominent urban parks, and clusters several educational institutions (UVCE, Bengaluru University, Central College, Maharani College, SJI Polytechnic, Sri Krishnarajendra Silver Jubilee Technical Institute, St. Carmel College, Law College, Bengaluru Medical College, and ancillary buildings).

Development of this education and heritage district holds the potential to create a unique experience in the past, present, and future of the city. Here are the main objectives of this vision:

- Creating a unique place identity for the district, wherein visitors will directly experience the city's unique character.
- Implementing a universal signage strategy for all heritage/cultural venues (including navigation and information signage).
- Developing heritage walks and cultural events curated around the city's built heritage.
- Repurposing heritage structures into venues of cultural and educational significance.
- Adopting the National Education Policy (NEP) 2021 to create multi-disciplinary clusters around education, research, and university clusters. This would introduce broad, holistic, multi-disciplinary education with flexible curricula, integrating vocational education and multiple entry and exit points that allow various levels of certification.

144 With 76,000 schools on GIS map, Karnataka looks at analytics to rationalise schools, Economic times
145 Urban and regional development plans formulation and implementation (URDPFI) guidelines, Volume 1 Jan 2015

- Introducing focused collaborations with industry, government, and knowledge institutions to leverage the city's innovation culture.
- Using the infrastructure of institutions (auditoriums, event spaces) to host cultural events for the city, inculcating a "culture of learning".

A comprehensive plan for Bengaluru's education and heritage district may first require a detailed initial feasibility study, at the cost of roughly INR 2 crore.

Data management and monitoring
New educational infrastructure can be proposed only after carrying out a GIS mapping of schools in the city.[146] This would bring new levels of detail to understandings of the distributions of Anganwadi and primary and secondary schools in Bengaluru.

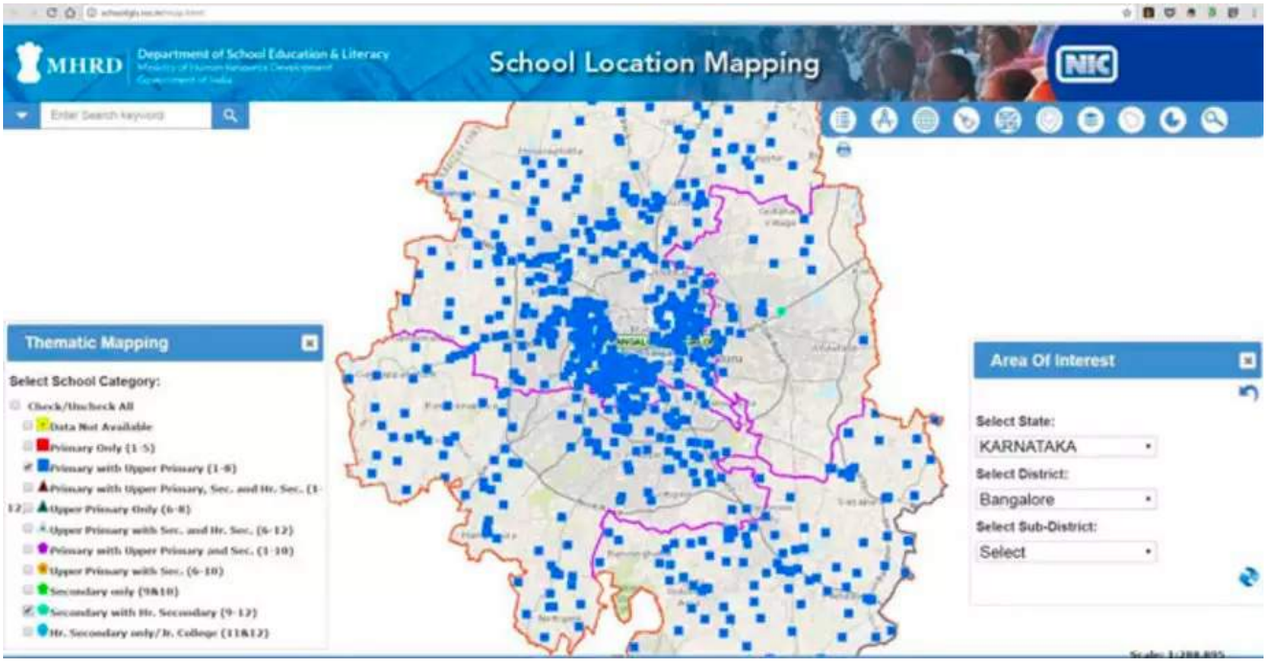
With this done, the government may be in a better position to allocate resources tactically. This would also help in solving issues with enrolment ratios and unbalanced pupil-teacher ratios.[147] An efficient deployment of the GIS mapping data could be to integrate it with data from the student tracking system.[148]

Under this system, a unique digit code would be assigned to every school child, from classes 1–10, in all government and private schools. This would help in future infrastructure developments. A schoolchild would retain one unique ID code throughout their schooling in the city, regardless of changing schools. (Exhibit 125)

146 https://schoolgis.nic.in/
147 With 76,000 schools on GIS map, Karnataka looks at analytics to rationalise schools, Economic times
148 https://sts.karnataka.gov.in/STS/front/loadindexhome.htm

Exhibit 125

School location mapping for Bengaluru



Source: School Geo Portal

Equilibrium between public and private schools

The city is home to several private schools (Figure 20). This is partly due to perceptions that government schools fall short in numerous areas – with poor infrastructure and low rates of accountability, poorly trained or absent teachers, and poor attendance and pass rates.

There is some merit to this perception. During the COVID-19 pandemic, very few live online classes were held by government schools.[149] Learners at these schools, therefore, have been denied crucial learning experiences. This has only increased the education gap between government school and private school learners. This learning gap exists between the groups of students because of disparities in resources.[150] Without intervention, it is expected to widen in the coming years. Contributing to this is the growing integration of digital and hi-tech processes into schooling.[151] (Exhibit 126)

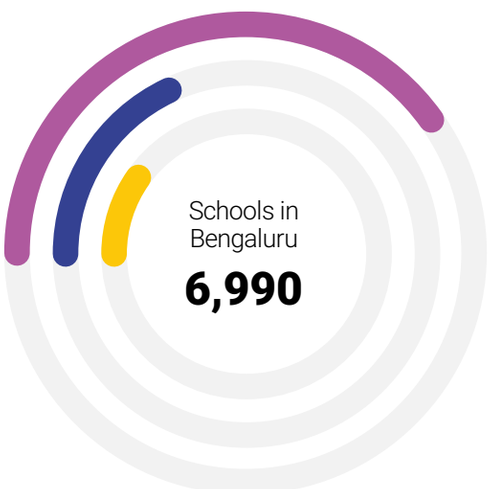
The establishment of schools in the city has not followed any plan. A consequence of this is that the government has permitted private schools to be opened in areas where government schools already exist. This has led to the death of government schools. Learning from this mistake would involve designing a **framework for educational facilities – private and public – at ward, zone, and city levels to ensure the tactical allocation of resources.**

An annual government allocation of at least INR 5 lakh to each government school could be considered to address infrastructural and academic needs in the city's schools. A special budget may be needed for each school to provide students with free or subsidised tablets and laptops for use in their studies. This could be critical in bridging the learning gap between private school and government school students.

149 The reality of online learning in Bengaluru's government schools – Citizen Matters, Bengaluru
150 "Online classes are critical for underprivileged children during COVID" – Citizen Matters, Bengaluru
151 Technology Driven Education – EDUCATION TODAY

Exhibit 126

Private and government schools in Bengaluru



No. of private schools in Bengaluru	4,717
No. of government schools in Bengaluru	1,511
Other schools	762

Source: With 76,000 schools on GIS map, Karnataka looks at analytics to rationalise schools, The Economic Times (indiatimes.com)

The promotion of sustainable development requires the government to ensure that all learners acquire the knowledge and skills they need, through education in sustainable development and sustainable lifestyles, human rights, gender equality, the promotion of a culture of peace and non-violence, global citizenship, cultural diversity, and how culture contributes to sustainable development.

Innovative curriculum

A technology-rich curriculum, with a philosophy of "teach less, learn more", could be introduced to improve learning outcomes. A host of learning initiatives could address learning gaps and ensure students are learning at their grade level:

Focus on foundational learning

All students have different levels of understanding and require different teaching strategies. Grouping students by their academic abilities is, therefore, something that can be done to ensure learners get what they need. This grouping can happen in grades six to eight. Many students drop out in grades nine and ten, due to neglect and academic weakness. These students need special attention, with education programmes differentiated according to their academic levels.

School excellence programmes

These programmes recognise students and schools for good performance in the academic year.

City-wide learning initiatives

These initiatives could include summer camps, reading campaigns, sports camps, and spoken-English classes in the city.

Improve vocational and employment skills

There is a need to increase the number of youth and adults who have relevant skills, including technical and vocational, so they can go on to gainful employment and entrepreneurship. A curriculum could be formed to encourage problem-solving, critical thinking, and the application of knowledge. This would help students develop entrepreneurial and soft skills, setting them up to be employable once their education is completed.

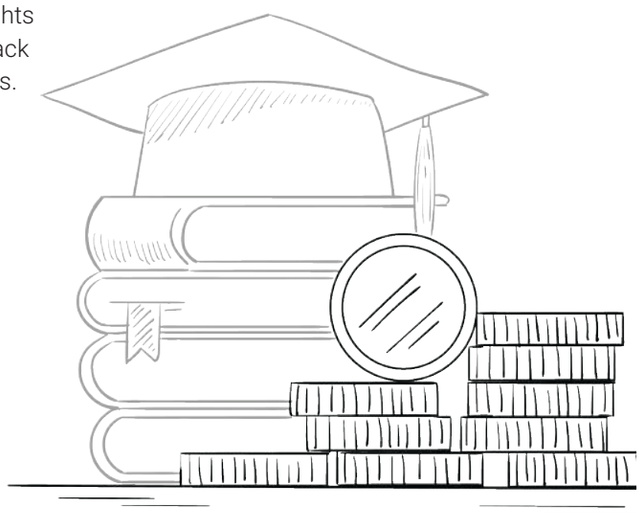
Train of teachers and school leaders
The quality of teaching at Bengaluru's government schools is a major concern. In Karnataka, the Department of State Educational Research and Training (DSERT) and the District Institutes of Education and Training (DIETs) are the nodal authorities for training teachers in government schools and for framing the curriculum for student learning.[152]

The government could substantially increase the supply of qualified teachers, including through international cooperation where teachers are trained by eminent institutions. Sending teachers and principals for training programmes at eminent institutions in India and abroad would expose them to teaching styles and learning environments that allow students to flourish at these institutions. Insights from this exposure would flood back into the city's schools and colleges.

Enroll principals in leadership programmes to increase their sense of ownership and responsibility. Monthly and varied sessions, organised in collaboration with management schools like IIM-B, could transform the running of schools.

Collaboration with overseas universities would allow the import of educational practices that can be implemented in Bengaluru.

Mentorship programmes could support teachers from government schools, providing on-site learning support workshops. Experienced educators could be assigned five to six schools to visit regularly and provide mentorship to teachers.



[152] Home – Department of State Educational Research and Training (karnataka.gov.in)

Education financing

Free education, from the primary to secondary level, could be provided to all children from low-income families. This would ensure access to equitable, quality education and would likely enhance relevant, effective learning outcomes.

Allied to this intervention, **expanding the availability of government-funded scholarships for students in tertiary education could bring widespread benefits.** This includes scholarships for vocational training and for technical ICT, engineering, and scientific programmes. Under the Mukhyamantri Vidyarthi Margadarshini scheme, the government is providing free coaching for students preparing for different entrance tests. This could be expanded and made accessible to all students in Bengaluru.

In addition, **more hostels may have to be built in the city** to support students from other towns and villages pursuing their dreams in Bengaluru.[153]

Similarly, the government could introduce a **sports programme**, which provides financial assistance to sportspeople, enabling them to get the best nutrition and equipment and compete globally.

Fee regulation

Fees at private schools are higher than those at government schools.[154] Fees charged by the private schools could be regulated under the Karnataka Education Institutions (classification, regulation, and prescription of curricula) Rules, 1995.

The state government could **regulate fee collection by formulating new laws.** This would allow fees to be governed by parameters such as location and infrastructure. Proper administration of these policies may require a committee that regulates the fees schools in the city can charge.

Governance — accountability and transparency

Pre-primary or nursery education

Bengaluru's recent boom in pre-primary schools demands that new measures be introduced to regulate the sector. Many pre-primary schools have emerged in the city in the recent past, within a loose framework that allows inconsistencies to weaken the system – some pre-primary schools are in residential complexes, managed by underqualified staff.

Primary and secondary education

In Bengaluru, primary education is the responsibility mainly of the local body and the state government. The Karnataka Education Act, 1983, requires the state government to establish and manage primary and secondary schools. The BBMP, being an urban local body, also manages its own network of schools, with its own revenue. Around 17,220 schools in the city are run either by the BBMP or the state government.[155]

The state government, through the Department of Primary and Secondary Education, manages a vast network of schools. This system of education governance is highly centralised, contrary to the theory of devolution envisaged in the 73rd and 74th Amendments to India's Constitution. A centralised system results in inadequate monitoring and quality control.

153 Karnataka Education Budget: 20 Bengaluru Public Schools, 7 Model Varsities to be Set up (news18.com)
154 Parents to file PIL on fee hike in Bengaluru's private schools – Citizen Matters, Bengaluru
155 Enrolment in Karnataka govt schools up by 4 lakh, but number of teachers declines, Indianexpress

To ensure quality education in all the city's schools, the frameworks of education governance can be reformed. This will involve governance at multiple levels – that of the education department, which will deliver high-quality education, the accreditation agency, and the policymaking committee. A Bengaluru city committee and school-level management committees can operate under the education department. For equitable, consistent policy outcomes, all government and private schools in the city could fall under the accreditation agency and the city-level management committee. These would monitor the quality of education, and the learning and physical environments, at the schools.

The mandatory implementation of school management committees (SMCs) in all schools can allow government agencies to determine the scope for improvement in various sectors of the education system and in schools, and act accordingly. Committees could be delegated powers over finances and hiring, among others.

School Management Committees
The Right to Education Act 2009 mandates that all schools should have SMCs. Not all the schools in Bengaluru have followed this rule. SMCs ensure schools run smoothly and parents are involved in operations.

Clear themes in the optimal running of SMCs have emerged. Parent members could be elected annually and organise programmes throughout the year to benefit students. SMC members could undergo regular training to increase understanding of their roles and functions. An SMC app could be introduced to help schools, parents, and other community members connect directly with decisionmakers. This would empower schools and parents to take accountability as well as give feedback to institutions.

School-level SMCs could be overseen by city-level committees, which would help organise programmes and facilitate feedback to help make necessary changes.

The committees could work together to prioritise streamlining admissions processes, ensuring the regular attendance of students, and improving the quality of education at schools. Citywide parent-teacher meetings (PTMs) can be organised, with government schools holding these on the same day. These can be advertised throughout the city to increase awareness and the participation of parents in their children's learning.

In the city, state rules mandate only the minimum size of land required for establishing a school. They do not regulate classroom-student ratios, numbers of buildings, or space available for sports. All these factors could be regulated for quality education in the city.

Streamline admission process
The necessary changes could be brought into the admission process to streamline the process and increase accountability.

An online, centralised admissions process can combat the shortcomings in the current admissions systems. Parents who cannot operate the online system could visit their nearest government school to complete the process. The online system would allow parents to apply to multiple schools using a single form. Documents needed for admission could be uploaded on the system. For RTE reservations, the admissions lottery could be online and centralised to eliminate any human interference. All relevant information can be published online.

Health

The relationship between health and economic development is vital. The chief component of economic development is human capital–but any economy will suffer when it has an inadequate healthcare system.[156] The lack of basic health facilities and medicines affects a society's ability to produce optimally. Some Bengaluru residents are forced to skip work to access healthcare, which can result in financial difficulty. At a systemic level, this leads to poverty and has devastating effects on the city's economic development.

Healthcare in Bengaluru

The BBMP and the state government are jointly responsible for providing healthcare services to the people of Bengaluru. The Bengaluru Municipality has about 144 primary healthcare centres, six referral hospitals, 26 maternity hospitals, and eight tertiary hospitals. The state Department of Health and Family Welfare (DoHFW) operates about 232 health sub-centres in Bengaluru's eastern, northern, and southern talukas. These overlap with zones in the jurisdiction of the BBMP. Overall, the state department supports 670 Anganwadis, 209 junior health assistants, 58 birth attendants, 218 liaison volunteers (known as Samparka karyakartheyaru), and 402 accredited social health activists (ASHAs) in Bengaluru Urban.[157]

With this overlap between the state and the municipality, it is possible that about 30 percent to 40 percent of wards in the city do not have a primary health centre (PHC)[iii]. Furthermore, all eight tertiary hospitals are in the central area of Bengaluru, which creates imbalance in the provision of healthcare to the different parts of the city.

Here are some key objectives the municipality and state government could work on to reform healthcare in Bengaluru:

- Streamline services at healthcare facilities and enhance the quality of healthcare in the city, taking steps to improve patient experiences at facilities.
- Increase human resources and use them judiciously, increasing the efficiency of the deployed manpower.
- Finance the provision of good and affordable basic medical services to all citizens.
- Enable technological advancements in care through knowledge sharing and research initiatives.
- Produce and ensure the high quality of drugs – at affordable prices – in all government hospitals and healthcare centres.
- Implement a health-management information system in the city – improving the productivity of the city's health department, health centres, and hospitals. This platform would include information on patient care and hospital administration. It would have a back-end and a front end with user processes and features. All of these steps could take place within the framework of a comprehensive healthcare plan that reforms all health agencies and facilities at every level. A systematic analysis of gaps and challenges would be important in proposing policy directions for the city.

Health services – improving healthcare facilities

The state government and the municipality could cooperate on an analysis of the existing resources in the system, including the gaps in infrastructure. Capacity and demand can be quantified, and the system's scanning facilities, oxygen stocks, ventilators, vaccines, and medicines added to an inventory. The care capacity required for the city's population could be calculated – for example, for the number of hospital beds the city needs per 1,000 people. Crucially, the city could use accurate information on the numbers and types of healthcare professionals in the city, including doctors, nurses, dentists, and other health workers.

The state government and the BBMP could work together to upgrade primary health centre (PHCs), providing them with more doctors, laboratory facilities, laboratory technicians, pharmacists, and other resources. They could build more general hospitals in areas outside the city centre, to include residents in these areas in the health system. The state government and the BBMP could jointly ensure that newly built hospitals are operational, by sanctioning the posting of doctors, nurses, and other staff as soon as possible.

156 Economics and Health, Prof. Amartya Sen, The Lancet, Dec 1999
157 (https://bbmp.gov.in/departmentwebsites/Health/Pressreleases.html)

Healthcare in the city suffers from a lack of coordination between the two agencies responsible for providing it – the state and city governments. For example, at the level of primary healthcare, there are four different facility types: urban health centres; urban family welfare centres; maternity homes; and dispensaries. These provide services, but do so independently, failing to function in unity and constitute a network for administering comprehensive healthcare.

Furthermore, all primary-level health facilities lack basic facilities and doctors.[158] Even basic diagnostic tests and ultrasounds are often unavailable at these facilities. Most patients are referred to diagnostic laboratories or referral hospitals for these tests.

Institute a three-tier health system model to resolve inefficiencies and promote coordination

To address these issues, **a model for the health system could be implemented that facilitates vertical and horizontal coordination** between healthcare facilities and different levels of administration. This could be achieved with a three-tiered network– comprising neighbourhood clinics, polyclinics, and hospitals.

Neighbourhood clinics are ward-level health facilities set up by the municipality. They provide low-cost, high-quality primary healthcare in communities, especially low-income ones. Diagnoses, medicines, and tests can be provided free at these clinics. To ensure accessibility, the clinics can be close to existing public amenities and transport infrastructure. According to data from the **Urban and Regional Development Plans Formulation and Implementation** (URDPFI), cities could aim to have one dispensary for every 15,000 people.[159] This translates into at least three neighbourhood clinics in every ward in Bengaluru. In all the areas outside BBMP jurisdiction, one clinic for every 15,000 people could be provided by the state health department. This would help to reach the most vulnerable communities, resulting in lifesaving health interventions.

Polyclinics are the second level of the network. These offer specialised diagnoses and treatment in areas such as paediatrics, ear, nose, and throat, and ophthalmology.

A rigorous adoption of polyclinics would reduce the burden on hospitals, helping provide quality healthcare to all patients. There could be one polyclinic for every 45,000 people in the parts of the city outside BBMP jurisdiction. Within the BBMP zone, there could be a polyclinic in every ward.

Hospitals are the third level of the network. These are spread across the city, not concentrated at the centre. The services and products provided at hospitals, including medicines, tests, and surgeries, need to be affordable. There could be one hospital for every 2.5 lakh people in the city.

One challenge that must be overcome to ensure the responsible participation of citizens in the health system is that of people's perceptions. This can be achieved by improving the standard of healthcare in Bengaluru, which would convince people of its value.

In revamping the city's health system, the municipality and the state government can follow minimum standards set by the World Health Organisation (WHO). These give guidance on health resources such as doctors, nurses, and dentists.

In many cases, Bengaluru exceeds these minimums. For example, the WHO stipulates that one allopathic doctor be provided for every 1,000 people (a ratio of 1:1,000).[160] However, in Bengaluru, the ratio is 1:584[iii] – one doctor for every 584 people. Dentists are required in a ratio of 1:7,500. Bengaluru's ratio of dentists to civilians is 1:973 – again, significantly higher than the WHO minimum.

But, in the case of hospital beds available in the city, Bengaluru has one hospital[iii] bed for every 9,562 people, which is much lower than the suggested standard of five beds per 1,000 inhabitants in a city.

158 Bengaluru: Multiplicity of agencies, poor coordination hit quality of urban healthcare, says study | Cities News, The Indian Express
159 Urban and regional development plans formulation and implementation (URDPFI) guidelines, Volume 1 Jan 2015
160 Medical doctors (per 10,000 population), THE GLOBAL HEALTH OBSERVATORY, WHO

Improving health governance

The city of Bengaluru, also known as Bengaluru Urban, is the core part of Bengaluru. It is subdivided into four talukas: East, North, South, and Anekal. East, North, and South overlap significantly with the jurisdiction of the BBMP. (Exhibit 127)

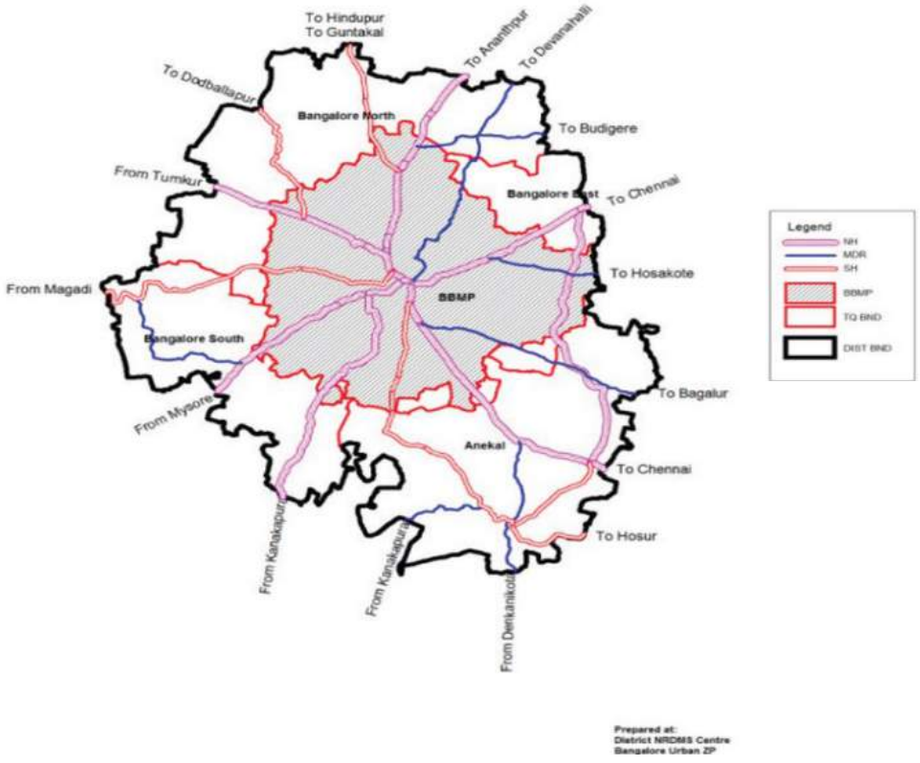
The governance of Bengaluru is shared by the state administration and the BBMP. The state administration operates across the entire Bengaluru district, managing government departments, including that of health. The BBMP is the administrative body for civic amenities and infrastructural matters within Bengaluru Urban.[161]

Public health services in Bengaluru are provided by the municipality, state government, and central government (only to central government employees under Central Government Health Scheme). The BBMP mostly provides healthcare in the older 134 wards of BBMP. In the newer areas within the jurisdiction of the BBMP, primary healthcare is provided by the state DoHFW. Secondary and tertiary healthcare is provided by BBMP referral hospitals and taluk, while district hospitals are operated by the state DoHFW.[162] (Exhibit 128)

[161] UHC report 1.5.indd (azimpremjiuniversity.edu.in)
[162] Healthcare in Bengaluru city – Need for a participatory, comprehensive health plan

Exhibit 127

Bengaluru urban map



Source: Bengaluruurbandistrict.nic.in

The operations of these agencies make complex boundaries in the city, fomenting confusion and challenges to urban health governance. The overlap in jurisdiction between the state department and the municipality is reducing access to services for the city's most vulnerable residents. Presently, in Bengaluru, the city has a three-tier urban health system comprising health posts, family welfare centres, maternity homes, and tertiary and super specialty hospitals. These institutions fall into different jurisdictions.
(Exhibit 129)

Exhibit 128

Health and infrastructure service delivery

Category	Facility	No. of existing facilities
Public	No. of UPHC	212
	No. of UPHC	11
	No. of sub-centres	280
Private	No. of private hospitals	6,138

Source: Azim Premji University

All of Bengaluru's referral hospitals are within the core area of the BBMP. The close proximity of the different levels of health facilities within the BBMP area thwarts efforts to set up referral chains within the city. The principle of referral chains is that patients visit health posts and PHCs for minor illnesses and referral hospitals for more serious issues. But, because all facilities are nearby, residents in the BBMP area choose the facility closest to them, even if it is a district or referral hospital. This clustering of health facilities in the centre of Bengaluru causes two main problems:

- Crowding in district hospitals, causing patients with serious health problems to wait longer to see doctors.
- Difficulty accessing referral hospitals for people who live outside the city centre.

Also, because of the lack of coordination between facilities, many of the cases that could be solved at lower-level facilities are sent to referral hospitals.

A blueprint for **an effective referral system that links primary, secondary, and tertiary care** could be formed to support patients. To address disparities in healthcare provision, health service facilities could be distributed according to population density and serve the specific needs of their local communities. A city-level committee, as well as the hospital committees, could also represent the users of the hospitals.

High-quality healthcare for all communities and income groups

Another disparity in the provision of healthcare services is in the different levels of access enjoyed by members of different income groups. Part of this is rooted in a lack of awareness about health facilities among members of low-income groups.

In Bengaluru, there are only 1,100 ASHAs and 440 Auxiliary Nurse Midwifes (ANMs)[iii] for its population of around 1.3 crores. This amounts to one ASHA for every 11,500 people and one ANM for every 29,000.

> To reach members of the community who need them, Bengaluru must increase its numbers of ASHAs and ANMs.[163]

As mentioned earlier, operational complexities and the absence of basic health facilities in PHCs means patients with minor healthcare complaints are needlessly referred to the city's main district hospitals.

For patients living on the periphery of the city, especially those in low-income groups, travelling to hospital can be expensive.

Many of the low-income communities in the city use the services of hospitals such as Vani Vilas or KC General Hospital.164 Most of these services are available at primary-level healthcare centres. This use of hospitals in place of primary health centres results in overcrowding at the hospitals, which in turn undermines the quality of care that can be provided.

163 "Primary healthcare should remain with BBMP" – Citizen Matters, Bengaluru
164 Bengaluru: Multiplicity of agencies, poor coordination hit quality of urban healthcare, says study | Cities News, The Indian Express

Exhibit 129

Health personnel and facilities under various jurisdictions in Bengaluru Urban district

	Level of care	Community level	Primary level healthcare	Secondary healthcare	Tertiary care
Public healthcare services	**NUHM-HWF**	ASHAs, ANMs, MAS sub-centres, national programmes, community outreach health camps	PHCs, ARS	UCHCs, citizen help desks, district hospital	Medical college hospitals, autonomous hospital – NIM – HANS, SJICSR, KMIO, SGITO etc.
	BBMP	MAS, health outposts, MMU, Indira transit clinics, sanitation, drainage, drinking water	UPHCs, ARS, UFWC, health kiosks	Maternity homes, referral hospitals, general hospitals	-
	ESI	-	Provided through other institutions, 112 dispensaries	ESI hospitals	Through empanelled hospital
	AYUSH	-	Ayush dispensaries	Hospitals	Medical college, affiliated hospitals
	CGHS	-	Wellness centres	Empanelled hospitals	Empanelled hospitals
Private		-	Clinics, day care facility (medical/ surgical), dental clinics, diagnostic centre, diagnostic laboratory	Nursing homes, hospitals, blood banks, maternity home, general hospital	Medical colleges, dental colleges, specialty hospital, multi-specialty hospital
Charitable institutions		-	-	✓✓	✓✓✓✓

Source: UHC report 1.5.indd (azimpremjiuniversity.edu.in)

Currently, the government provides allowances, medicines, and treatments under multiple schemes. Under the Janani Suraksha Yojana scheme, allowances for mothers of newborn babies could be increased if the mothers are holders of Scheduled Cast and Below Poverty Line cards. Under the Janani Infant Safety Programme, ASHA workers and ANMs could be appointed in every ward to ensure every pregnant woman and newborn receives free medication, laboratory services, meals, and free transportation for the year before and after delivery.

Many people do not know about generic or free medicines provided by the government. To make efficient use of existing capacity, the government could open more stores of generic medicines in the city. Ward committees could run awareness campaigns about free public health facilities.[165]

[165] Janani Suraksha Yojana – An initiative to prevent infant mortality and childbirth issues, TimesNext

Budget allocation

In 2021, the BBMP allocated around INR 336.6 crore for public health – a mere 3.6 percent of its total budget. **Building infrastructure to meet Bengaluru's health goals may require the BBMP to increase the public health's allocation to 15 percent of the total budget.** (Exhibit 130 & 131)

Health data and information

Health surveillance

In 2015, India adopted the SDG targets for 2030, including the one relating to health and wellbeing. The development of the city's healthcare system can be guided by these goals. These targets include reducing global maternal mortality, end preventable deaths of newborns and children under 5 years of age, ending epidemics of AIDS, tuberculosis, etcetera, and also achieve universal health coverage, and to healthcare services. The SDGs also target to reduce the number of deaths ad illnesses from hazardous chemicals and air, water and soil pollution, and contamination.

To keep track of the progress of these targets, monitoring of healthcare data is required. The municipality could work on the systematic collection, analysis, and interpretation of the city's health data. This can help develop a comprehensive system for observing all the diseases that go through the city's healthcare facilities.

Health integration management system

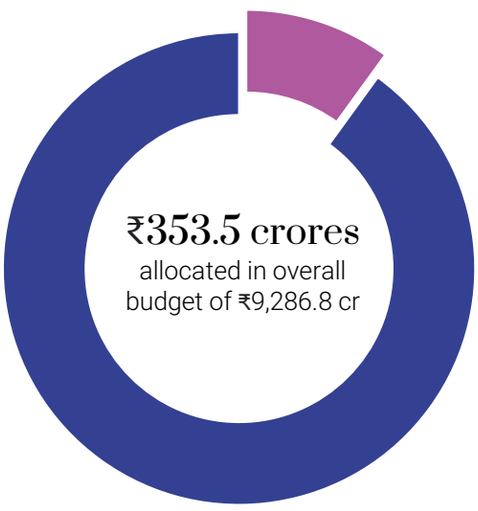
All health-related processes could be integrated into a city-wise management system under a health integration management system (HIMS). This could cover:

- **Patient-related processes**, including registration, outpatient clinic consultations, inpatient department, investigations, surgeries, pharmacies, and blood banks.
- **Hospital administration processes**, allowing efficient healthcare facility management and streamlined operations.
- **Additional features**, such as teleconsultations, grievance redressal, and GIS mapping for all healthcare facilities, with real-time updates.
- **Backend/ancillary processes**, which are essential to improving the efficient management, planning, and governance of Bengaluru's healthcare operations. Part of this could be the government's adoption of the Aadhar card. This can allocate unique healthcare numbers to patients, who would be able to book appointments using their cards. Also, it can help build a consolidated platform that stores all the city's health-related records in one place.

Exhibit 130

Allocated budget for healthcare in the year 2021 by BBMP

Budget for healthcare and hospital construction/maintenance

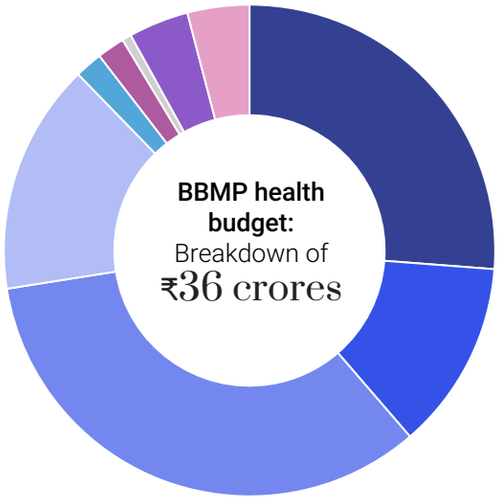


Source: BBMP

Exhibit 131

Breakup of the budget for healthcare in the year 2021 by BBMP

Health budget components (crores)



Salary and office expenses	25.7%
Honorarlums, consultancy charges, etc.	12.2%
Programme exp. (Indira canteens, mosquito control)	33.1%
COVID management	14.9%
Housekeeping and laundry service	2.8%
Dialysis centre maintenance	1.8%
Hospital equipment	0.7%
Medicine supply	3.9%
Miscellaneous	4.0%

Source: BBMP



Quality of life

Bengaluru ranked first on an "ease of living" index, released by the urban development ministry,[iii] among Indian cities with populations over one million. The index measures 49 indicators of quality of life, economic ability, and sustainability under 13 categories.

The index aims to accelerate India's urban development by promoting evidence-based policymaking. It also works to promote healthy competition among cities. Two assessment frameworks were developed by the ministry to assess the progress made by cities across the country (included the 100 smart cities and state capitals). The first framework used was the Ease of Living Index (ELI).[166] The second was the municipal performance index (MPI). The ELI measures the wellbeing of citizens using four broad parameters: quality of life (weighted at 35 percent); economic ability (weighted at 15 percent); sustainability (20 percent); and citizen perception (30 percent).

To get a true picture of a city's liveability, we must understand the methods by which ease of living is assessed. The ELI score is arrived at by calculating the weighted average of the scores of all the four parameters mentioned above.

For instance, quality of life is assessed using indicators such as education, health, housing, drinking water, solid-waste management, mobility, safety, and recreation. Economic ability is assessed in terms of level of economic development and economic opportunities. Indicators for sustainability include environment, green spaces, and air quality. (Exhibit 132)

[166] Delhi not among top 5 capitals on the liveability index: Survey, Times of India

Exhibit 132

Ease of living index

How the capitals fared

0–30 31–60 61–100

City	Ease of living index	Quality of life (out of 100)	Economic ability (out of 100)	Sustainability (out of 100)	Citizen perception survey (out of 100)
Bengaluru	66.70	55.67	78.82	59.97	78.00
Chennai	62.61	60.84	34.16	57.05	82.60
Shimla	60.90	53.05	23.39	69.16	83.39
Bhubaneswar	59.85	51.79	11.57	57.77	94.80
Mumbai	58.23	51.12	32.12	60.74	77.90
Delhi	57.56	51.22	50.73	56.02	69.40
Dhopal	56.26	57.92	14.01	51.68	78.50
Raipur	56.26	54.74	11.73	63.77	75.30
Gandhinagar	56.25	55.02	15.12	51.99	81.10
Jaipur	55.80	47.66	10.49	57.07	87.10

Criteria weightage	**35**	**15**	**20**	**30**
%	Quality of life	Economic ability	Sustainability	Citizen perception survey

Note: Index did not rank four capital cities – Dispur, Daman, Amaravati, and Kolkata

Source: https://timesofindia.indiatimes.com/city/delhi/ill-at-ease-delhi-not-among-top-5-capitals-on-the-liveability-index/articleshow/83652269.cms

Bengaluru was top in economic ability, with a score of 78.82.[iii] But its ranking drops sharply in the other three categories: quality of life (12th, with a score of 55.67); sustainability (13th, scoring 59.97); and citizen perception (18th, scoring 78).

Bengaluru's position of first overall is, therefore, overwhelmingly due to its economic ability. Its consistent performance in the IT sector and consistently high GDP cannot be disputed. However, in the categories of quality of life and sustainability, the city has room for improvement.

It is interesting to note that the municipal performance index[167] presents an altogether different picture.[168] This ranking is based on five verticals: services (weighted at 30 percent); finance (weighted 20 percent); planning (at 15 percent); technology (at 15 percent); and governance (at 20 percent).

In the category for cities with populations of over one million, Indore (with a score of 66.08) is ranked first, followed by Surat (60.82). In the category of cities with populations under one million, the New Delhi Municipal Corporation is ranked first (52.92), and Tirupati second (51.69). Bengaluru is ranked at a lowly 31. (Exhibit 133)

167 Ease of Living and Municipal Performance Index 2020, Drishti IAS
168 The reality behind Bengaluru's ease of living ranking, Deccan Herald

Exhibit 133

Municipal performance index

Rank	Million+ municipality	Score
1	Indore	66.08
2	Surat	60.82
3	Bhopal	59.04
4	Pimpri Chinchwad	59.00
5	Pune	58.79
6	Ahmedabad	57.60
7	Raipur	54.98
8	Greater Mumbai	54.36
9	Visakhapatnam	52.77
10	Vadodara	52.68
11	Navi Mumbai	50.74
12	Coimbatore	50.52
13	Varanasi	50.14
14	Bareilly	50.04
15	Raikot	50.03
16	Patna	49.25
17	Hyderabad	49.08
18	Chennai	4874
19	Jaipur	48.58
20	Ghaziabad	48.28
21	Hubli Dharwad	48.14
22	Madurai	48.10
23	Chandigarh	47.71
24	Agra	47.71
25	Thane	47.04
26	Kalyan Dombivali	46.36
27	Vijayawada	46.04
28	South Delhi MC	46.00
29	Meerut	45.52
30	Nagpur	45.12
31	Bengaluru	45.02
32	Nashik	44.97
33	Lucknow	44.76
34	Gwalior	44.31
35	Dhanbad	44.00
36	Kanpur	43.65
37	Prayagraj	42.91
38	Amritsar	42.68
39	Ranchi	41.76
40	Faridabad	41.45
41	Vasai Virar	40.86
42	East Delhi MC	40.79
43	Jabalpur	40.42
44	Ludhiana	39.88
45	Solapur	39.82
46	Jodhpur	39.37
47	Aurangabad	38.09
48	North Delhi MC	37.66
49	Srinagar	25.93
50	Kota	25.90
51	Guwahati	18.14

Source: Municipal Performance Index 2020 – INSIGHTSIAS (insightsonindia.com)

Outside its economic ability, Bengaluru lags many Indian cities by several parameters. Credit must be given to private enterprise and foreign investment, especially in the technology and service sectors, for strengthening the city's economy. The state has played an enabling role, introducing policies that have facilitated growth in the sector.

It is clear that if Bengaluru is to sustain its economic vibrancy and global profile – continuing to attract the best talent in science, technology, and entrepreneurship – it can pay attention not only to the ease of doing business in the city, but also to ease of living. Equally important is to improve the functioning of city institutions, civic authorities, and all bodies that deliver services such as water, electricity, public transport, and regulation. This may require the government to prioritize strengthening urban local bodies.

There is an urgent need for comprehensive strategies for urban development in Bengaluru. These could be structured in accordance with the long-term aim of improving the quality-of-life index in the city. A few measures can contribute to improving the city's quality of life:

Create sustainable transport systems by expanding the existing public transport networks in the city and creating an efficient, affordable, and environmentally friendly system. This will include encouraging cycling, walking, and the use of EVs.

Develop green spaces, as these affect cities' microclimates and quality of life. There is a large and growing body of evidence that being in nature has positive effects on mental health. Studies show that green spaces lower stress levels, reduce the rates of depression and anxiety, and reduce cortisol levels, all working to improve general wellbeing.[169] A Dutch study showed that people who live within three kilometres of extensive green spaces are more able to deal with stressors than those who don't.[170] This reality was brought into sharp relief by the COVID-19 pandemic and measures implemented to thwart it.

Promote mixed-use development, and holistic, mixed-use developments centred on public transportation, that combine residential, commercial, and industrial uses. This can help to reduce traffic congestion, promote walkability, and create a sense of community. This type of concentration creates vibrant communities, high-quality public areas, and shorter commuting distances. They make cities more liveable.

30-minute city

The 30-minute city is the concept of a transparent, reliable, flexible, and liveable system. It highlights human scale and decentralisation as core themes and posits that if people live within 30 minutes of food suppliers, health services, and employment, they live within a secure system. Neighbourhoods that are walkable, bikeable, and replete with transit options contribute to this empowerment of communities, giving residents access to services, amenities, and opportunity. Bengaluru's unprecedented trajectories of urbanisation and economic growth have resulted in haphazard development. This continues to hurt the health of humans and the environment. While the city is touted as a world leader in innovation, the quality of life in the city continues to be poor. It is imperative that the application of streamlined strategies and cohesive long-term visions in the city's governance focuses on improving quality of life in Bengaluru. An urban design concept that will be useful in ensuring this is the 30-minute city.

Advantages of the 30-minute city include:

- Increased walkability and bikeability, which lead to increased physical activity and improved health.
- Reduced reliance on cars, which in turn curbs congestion and air pollution.
- Improved spatial connectedness that encourages social cohesion and community interaction, fostering a citywide sense of belonging.
- Increased economic development, by creating opportunities for small businesses and entrepreneurs to thrive in. This is achieved by providing a range of different types of commercial, cultural, and community spaces that can accommodate different types of activities. (Exhibit 134)

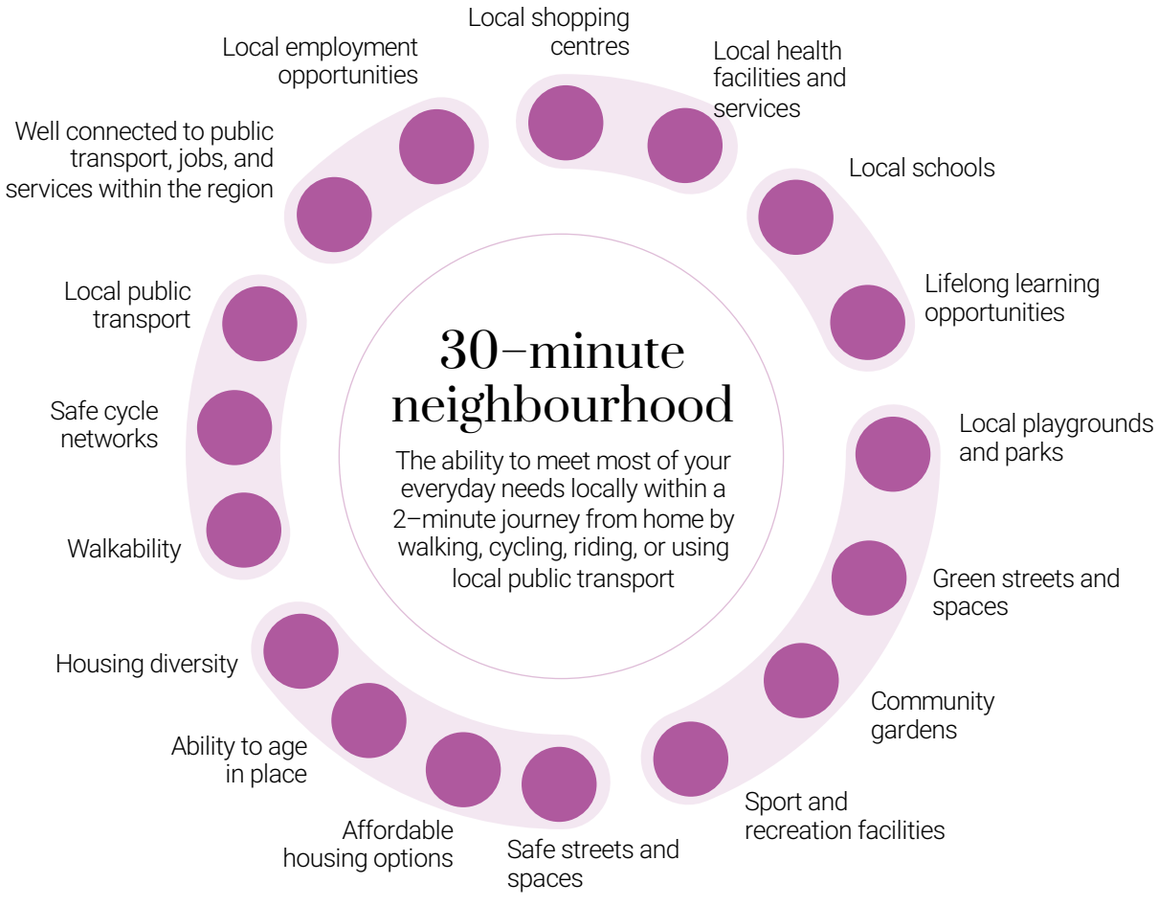
The 30-minute city model can also **strengthen the city's municipal governance model.** Like in most Indian cities, most decisions affecting Bengaluru are made at the level of state government, with municipalities wielding little power. As Bengaluru expands, it is increasingly important for the city to decentralise its governance and empower metropolitan and local wards.

The vertical domains within the existing governance structure mean that most departments work independently. The city may need to be empowered to plan and implement solutions in a coordinated manner. In addition, citizens can invest in the city's vision to help create cultural spaces that are public and useable.

169 (Park et al, 2010); (Wells et al, 2003) Need more information for this reference. Publication name, publication house.
170 Van den Berg et al, 2010.

Exhibit 134

Characteristics of a 30-minute city



Source: https://urbandesignforum.org.nz/2022/02/general/the-20-minute-city-survey/

'De-infrastructured' systems

The lack of transparency around the construction and operation of urban infrastructure could be urgently addressed. Crucial governmental processes, such as energy generation, transmission, and distribution are either too out of sight or too technically complex for citizens to understand. Few people really understand where drinking water comes from and where wastewater goes when it leaves our homes. Where does our garbage go?

Typically, one only learns how fragile these systems are through crisis. One lives under the assumption that the systems will always work – in good times and in bad. Although infrastructure systems appear strong and reliable, they are in fact riddled with weaknesses. This fact was realised in the recent power outages in Texas[iii] and the blocking of the Suez Canal by a cargo ship, substantially interrupting global trade. Infrastructure systems are becoming more vulnerable as climate change raises the intensity and frequency of events behind infrastructure breakdowns. (Exhibit 135)

There is also an economic argument for de-infrastructuring. Instead of a large system with a single point of control and regulation, de-infrastructuring requires multiple actors, new partnerships, cooperatives, and funding mechanisms to operate the city.

The erection of de-infrastructured systems may require larger capital outlays than simply connecting one system to a larger one. But an expanding set of models has emerged for shared investment, ownership, and operation that can offset or defer these upfront costs. The longer-term benefits include lower lifecycle costs, lower carbon emissions, increased reliability, risk avoidance, community benefits, and financial benefits.

Housing

Karnataka's 2016 Affordable Housing Policy states that affordable, adequate housing is essential to ensure dignity for residents and inclusive economic growth for the city and the state. The state has a responsibility to ensure universal access to affordable and adequate housing.[171]

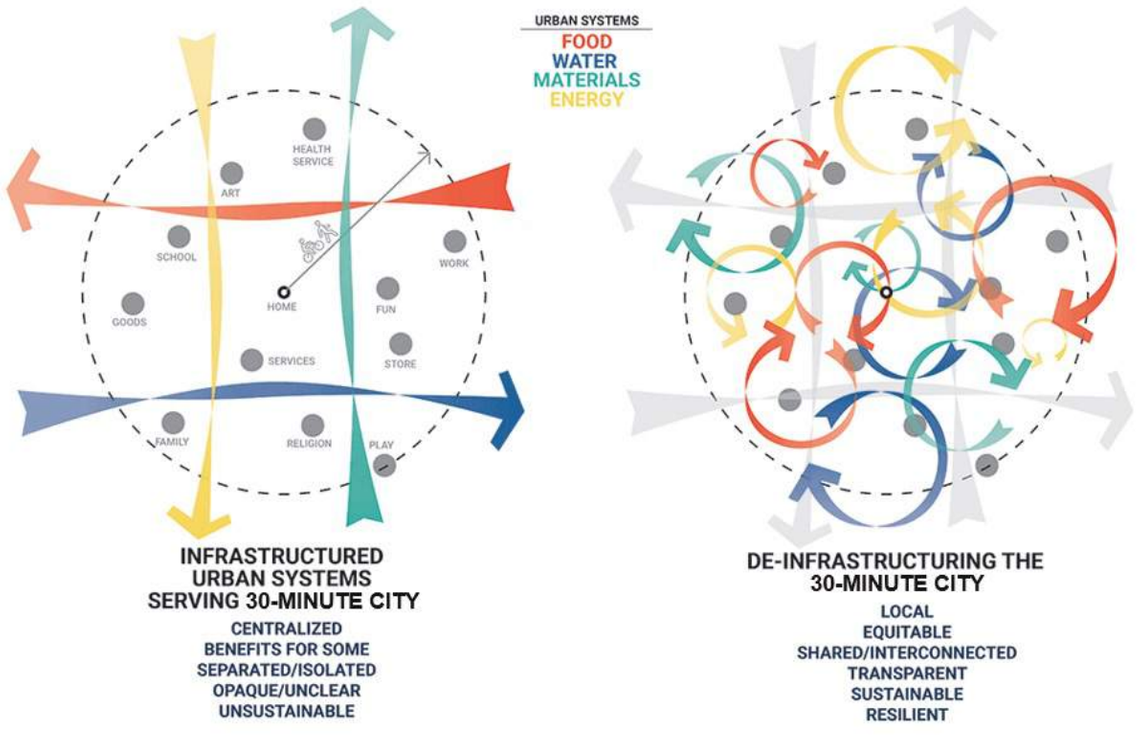
There is a large shortage of housing in urban Karnataka, which will be compounded by migration. Despite the efforts of the Government of Karnataka, housing for all remains out of reach. The failures of the past demand a new approach that increases the state's contribution, leverages communities' capacities, and partners with private developers to reduce the housing shortage.

As of 2011, the Bengaluru metropolitan region (BMR) had a total population of 11.69 million. This is projected to increase to 16.48 million by 2021. As per these estimates, the decade of 2011–2021 had a population growth rate of 41.3 percent, outpacing that of the 2001–2011 period, which was 38.9 percent.[172] This stupendous population growth has led to unchecked urban sprawl, translating into the varied challenges of urbanization. Providing infrastructure to keep pace with population growth has become difficult for ULBs.

[171] Karnataka Affordable Housing Policy 2016–17
[172] Bengaluru-urban-infrastructure-report-2020-india-urban-infrastructure-report-7671.pdf (knightfrank.com)

Exhibit 135

Concept of de-infrastructuring the city systems for a 30–minute city



Source: https://urbanland.uli.org/planning-design/de-infrastructuring-in-the-era-of-the-15-minute-city/

Affordable housing

Population growth and the need for adequate housing are interrelated. According to figures from the 2011 census, the stock of residential units in Bengaluru at the time was 21.04 lakh units, with 2.18 lakh vacant houses. Of the total number of residential units, 40 percent were owned and 60 percent were rented. Renting often proves more convenient than buying, due to high land rates and long travel distances.[173]

The number of households in the city has increased by two and half times in the past two decades[i] – from 9 lakh in 1991 to 21 lakh in 2011. This might imply an increase in nuclear families. Average household size, however, has decreased from 5.98 members in 1991 to 4.05 in 2011, projected to reach 3.89 by 2031. Simultaneously, the gap between the rate of income growth and the rate of increase in real estate prices has reduced the average size of dwelling.

Around 60 percent of the total demand for housing in the city is in the affordable range. The rest is largely from the middle- and higher-income categories. The Bengaluru Development Authority (BDA) estimates housing demand in 2031 could be for 57 lakh units.

A detailed study, undertaken in 2011,[174] revealed that most of the urban housing shortage comes from people living in substandard or no housing. Additionally, most of the shortage affects people in the EWS (economically weaker section) and LIG (lower income groups) groups. According to the government,[175] around 10 percent of Bengaluru's population lives in one of the city's 597 slums.[176] Today's housing shortage has been estimated at 1.2 lakhs. Housing demand in the city is being met by the Bengaluru Development Authority, the Karnataka Housing Board, and private developers.

At the same time, there are 2–3 lakh unoccupied houses in the city.[177]

The migrant population forms 44 percent of the urban population.[178] This population needs access to adequate housing, which would support their part-time habitation of the city. This could take the form of rental housing or forms of shared living space, such as hostels and paying-guest accommodations.

The achievement of universal, adequate, and affordable housing will have knock-on benefits for health and education outcomes, and for individuals' productivity. It can improve access to livelihoods, lines of credit, and social security. Affordable housing is also crucial in welcoming the talented individuals and national and global companies looking to set up base in the city.[179]

In addressing the city's housing shortage, the government could ensure that the supply of housing matches demand and locate housing close to places of employment and opportunity.

The city's high proportion of rented properties – around 60 percent – makes the regulation of this sector crucial. Good governance can ensure the availability of affordable rental accommodation.

173 Bengaluru-urban-infrastructure-report-2020-india-urban-infrastructure-report-7671.pdf (knightfrank.com)
174 Report: State of Housing in India, A Statistical Compendium 2013, Ministry of Housing & Urban Poverty Alleviation, Government of India
175 Abstract Details Of Slums – Karnataka Slum Development Board
176 Study reveals 2,000 slums in Bengaluru, government lists only 597 | Bengaluru News – Times of India (indiatimes.com)
177 Karnataka Tenant Act: Karnataka to soon adopt new Model Tenancy Act | Bengaluru News – Times of India (indiatimes.com)
178 Bengaluru's Informal Labour Markets (iimb.ac.in)
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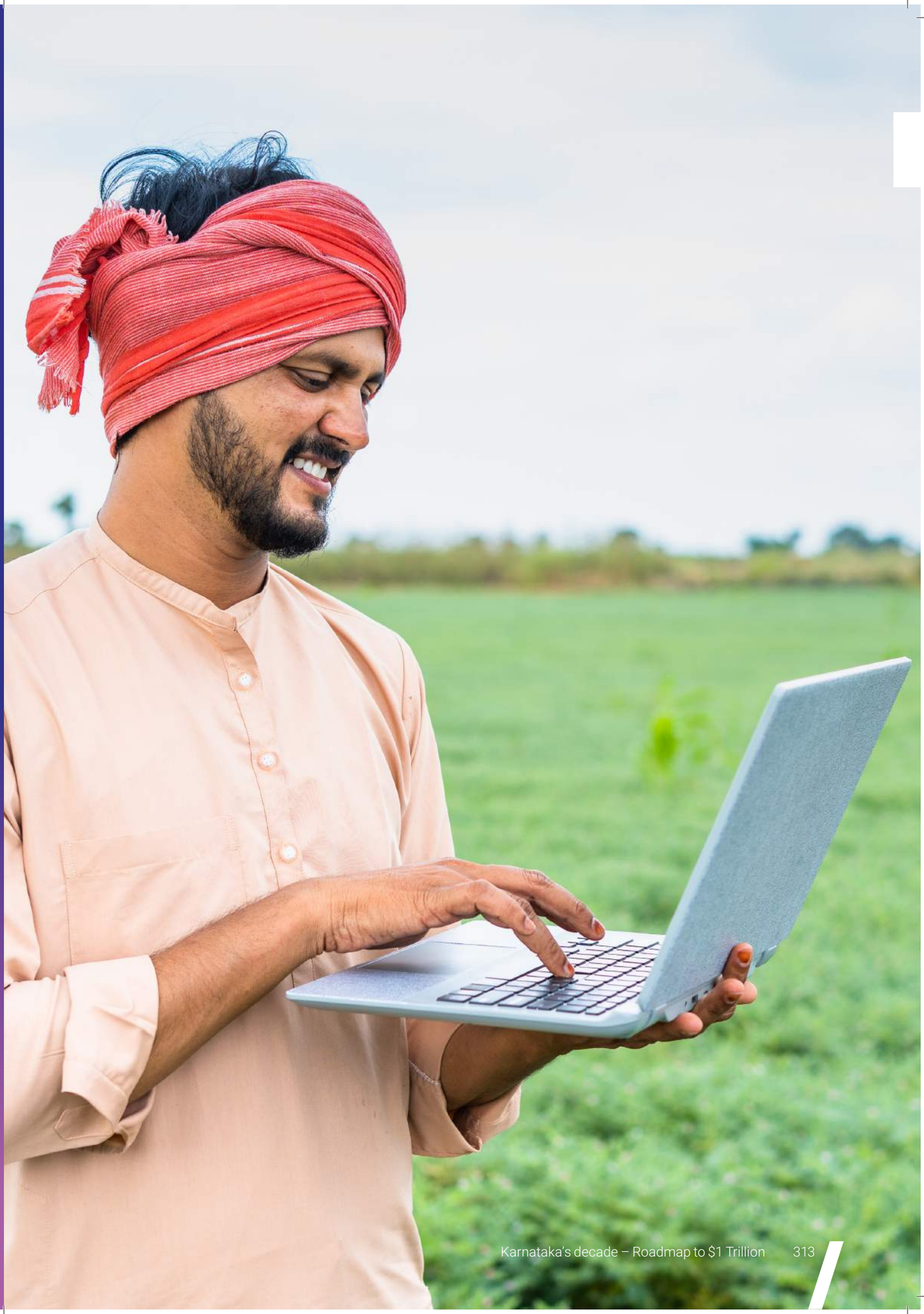
ii GDP performance and value forecast

iii Infrastructure and Bangalore committee

CHAPTER 16

Rural development





Agriculture and related industries are one of Karnataka's most important sectors, employing most rural residents. Agriculture and short-term employment opportunities generated by government initiatives are the primary sources of income for the rural population. Given that most of Karnataka's population (61 percent)[iii] lives in rural areas, an emphasis on rural development is critical. As people increasingly migrate towards cities in search of opportunity, India's rural population is decreasing and Karnataka is experiencing a faster decline than the rest of the country.[iii] The migration of the workforce from agriculture to other sectors has accelerated over the past two decades.

Karnataka has 5,954 Gram panchayats, 238 taluk[iii] panchayats, and 31 zilla panchayats.

Rural development primarily focuses on activities that will improve the quality of life and economic well-being of people in rural areas. This may require infrastructural and human capital development, healthcare availability, and overall quality-of-life improvement (for example, the provision of clean drinking water and improved sanitation). Given that agriculture provides a significant portion of the rural population's income, the state could prioritise improving agricultural productivity, yield, and farmer income. (Exhibit 136)

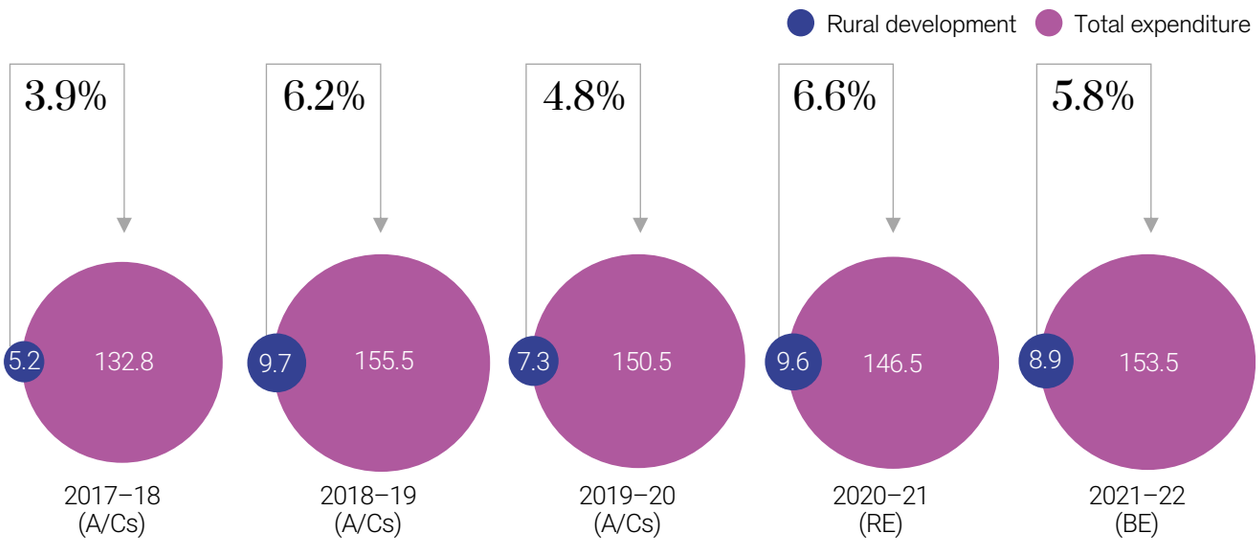
The budget estimate for financial year (FY) 2022 follows the same trend as the previous four years, with higher combined spending on the agricultural and rural sectors compared to other sectors and common development. There is a large difference between the per capita expenditure for those dependent on the agricultural and rural sectors compared to those dependent on other sectors. In FY 18, per capita expenditure for those dependent on the agricultural and rural sectors was INR 25,472 compared to those dependent on other sectors, at INR 16,093. In FY 22, these numbers were estimated at INR 29,772 against INR 18,371.[180]

[180] Pai and Holla 2022

Exhibit 136

Karnataka state development expenditure

In millions



Source: Economic Survey of Karnataka 2021–22

Karnataka is investing heavily in rural development and decentralised planning to improve the lives of its rural residents. The focus has been on housing, rural infrastructure, roads, power connections, water supply, sanitation, communication, and other areas.[iii] The state has a substantial Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) programme to increase rural jobs and build social assets. Karnataka was among the first states to decentralise planning to grassroots level through the empowerment of village panchayats and zilla panchayats. Its "activity mapping" process ensures these entities become downstream accountability instruments. The state is also developing a Gram panchayat development plan and providing significant funding to the districts.

Developing the rural areas can be challenging, given their wide distribution across the state. Gram panchayats can be established to accelerate development in these areas.

For each of the three panchayats, the state has developed an extensive range of activity mapping. In general, this places the Grama panchayats at the forefront of local service provision, the zilla panchayats and taluk panchayats as the planners, facilitators, and owners of common administrative machinery, and the Grama sabha and ward sabhas as mechanisms of downward accountability.

The proper devolution of resources, including money and functionaries, must go hand in hand with the activity mapping's devolution of functions. To make this a reality, the Department of Rural Development and Panchayati Raj has delegated several tasks, personnel, and resources to Panchayati Raj Institutions in collaboration with other departments.[181] The panchayats' resource constraints and lack of engagement slow development activity. (Exhibit 137)

Karnataka's northern districts have, on average, lower per capita incomes and larger populations than their southern neighbours. The ten poorest districts, from Kalaburgi[iii] to Chitradurga, are all in the north and had a population-weighted average of INR 1.32 lakhs per capita income in FY 20, which is more than INR 1 lakh lower than the state average. Agricultural and other rural economic activities, which are heavily dependent on these populations, suffer from weaker value-add and growth than other activities, which is exacerbated by the larger population and workforce dependence.[182]

There aren't enough opportunities with significant growth or those that add value for rural residents. With a per capita income of INR 82,176,[iii] agriculture accounts for 41 percent of the labour force and, consequently, the population. The state's average per capita GSVA is nearly three times higher at INR 2.33 lakhs. Those who have access to good-quality education leave to work in Bengaluru and other opportunity-filled urban areas, while most rural citizens cannot emigrate. Instead, they need opportunities near their hometowns and villages, in the form of labour-intensive industries, infrastructure development projects, and services-based employment.

The state could improve healthcare infrastructure in rural areas, where access to basic, secondary, and tertiary care is limited. Many of the 30 districts still do not have a multidisciplinary hospital to serve the needs of the community. Rural citizens need to travel several kilometres to access basic healthcare, which increases out-of-pocket expenses for a section of society that is already living on a low per capita income.

Rural housing is one of the major challenges that needs to be tackled. While government has formulated policies to accelerate rural housing development, 40.62 lakh households still don't have a home.[183]

Notwithstanding the difficulties, goals have been set for the development of the rural sector as part of the $1 trillion vision for the state. (Exhibit 138)

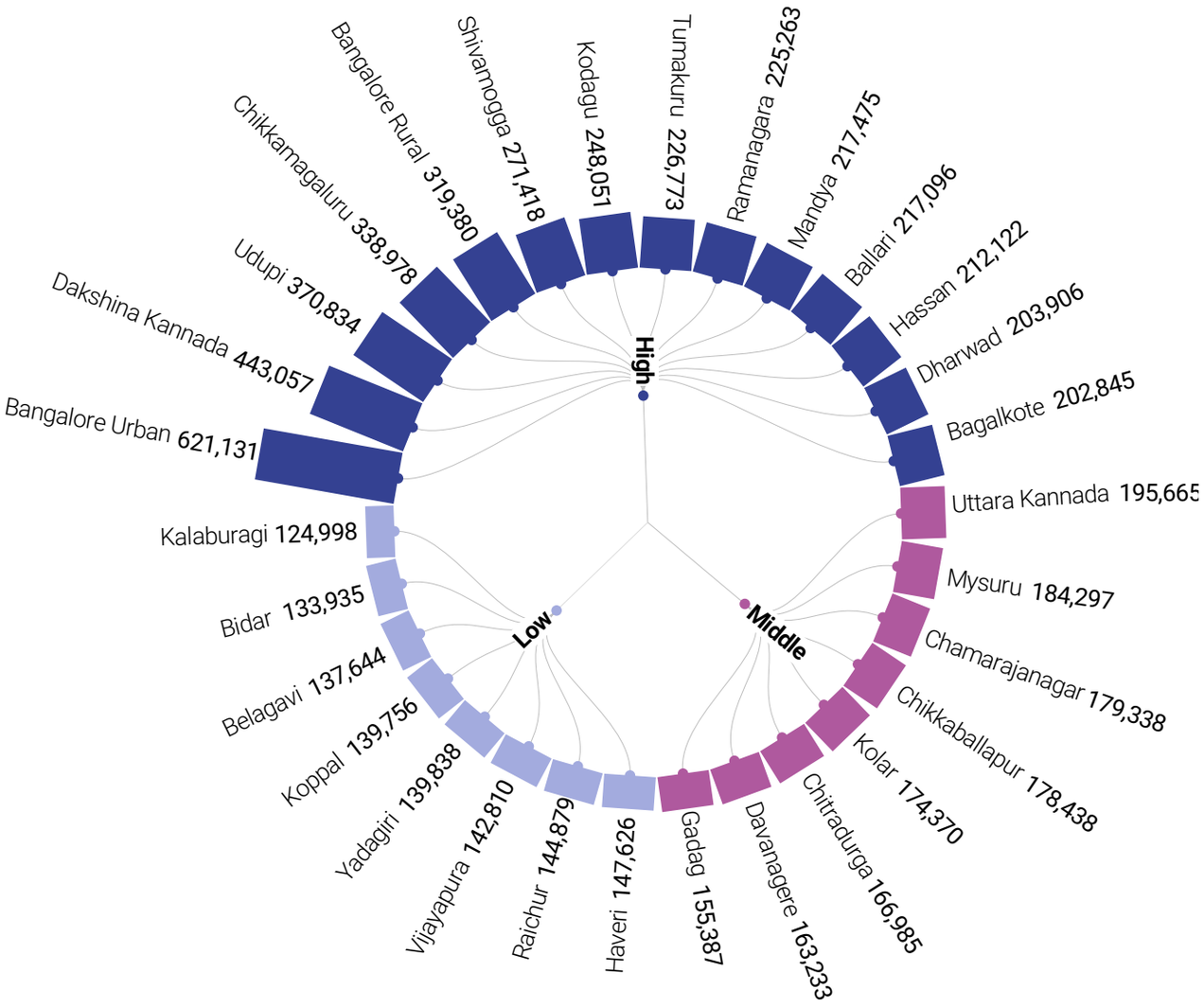
Thrust to agripreneurs

Most of the rural population is heavily dependent on agriculture for their livelihood. It is important to drive strategic interventions in the sector that can boost agripreneurs, especially small and marginal farmers.[184] These could include the following:

[181] Karnataka Economic Survey 2022–23
[182] Pai and Holla 2023
[183] Socio Economic and Caste Census 2011
[184] Exhaustive set of suggestions covered in the agriculture chapter of the report

Exhibit 137

Per capita income – district



Source: Directorate of Economics and Statistics, Government of Karnataka

- Promoting and educating farmers on diversified agricultural and allied livelihoods, including livestock and horticulture. This can help the farmers adopt modern techniques such as integrated farming systems, crop rotation and multi-cropping depending on the size of land holding, soil quality, and agro-climatic zone in which they are farming. These could help drive targeted actions at farm level and improve individual farmer income. Karnataka has abundant sunshine and land. However, it could diversify its cropping pattern from the traditional cereals to higher yielding fruit crops. Segregation of horticulture crops into a separate entity is creating unnecessary competition between departments. Keeping the overall objectives in mind, the government could form a multidisciplinary body responsible for promoting high-return crops suited to different geographies that can increase the value of the product.
- Offering assistance (financing options or credit guarantees on equipment machinery loans) through the availability of modern farming techniques, such as precision farming and micro irrigation, and mechanisms to improve yield and reduce the cost of operations.

Exhibit 138

Rural development vision

Macroeconomic indicators	From (2021–22)	To (2031–32)
# of Jobs (lakhs)	50.45	**70**
Wages per capita (INR)	309	**495**
Rural literacy rate	71%[1]	**96–100%**[2]
% below poverty line	21%[3]	**0–5%**[4]
Sanitation deprivation[5]	25%	**<1%**

1. 75th NSO
2. Benchmark Kerala rural literacy rate (75th NSO) and target to surpass
3. Based on 2011 Census
4. 2011–12, Kerela Best in Class in India at 7.1%, RBI Statistics
5. Niti Aayog MPI report, best in class Kerela at 1%

- Incentivising farmers to shift from traditional cereals to higher yielding fruit crops such as mangoes, pomegranates, grapes, guavas, papayas, and bananas. The state could collaborate with technology companies to develop an agriculture-focused app to provide information on government schemes, market demand, showcase pockets of excellence (for example, high yield achievements due to strategic interventions, as seen at Agrostar/ INI and MoooFarm) to farmers, FPOs, and other participants in the value chain to maintain information symmetry.
- Creating a multidisciplinary body responsible for educating farmers, spreading awareness, and promoting high-return crops suited to different geographies that could boost the value of output. Education could focus on one crop per district, such as pomegranates in Bagalkote, Ballary, Chitradurga, and Davangere. FPOs could act as knowledge centres, displaying price transparency systems and educating farmers about market rates other than agricultural produce market committees. For example, they could provide information about registered procurement agencies, including agriculture start-ups and large-scale processing centres. Farmers could also be educated about the market opportunity for by-products. For example,[iii] Neera, a by-product of coconut cultivation, has huge market demand for its medicinal value. The farmers growing coconuts could be incentivised by allowing them to produce Neera and sell it.
- Working with agritech companies to co-develop digital platforms to on-board private sector players by offering equipment as a service to farmers and enabling small farmers to undertake farm mechanisation with minimal capital expenditure.

Women empowerment

For the first time in its history, India has 1,020 women per 1,000 men, while Karnataka has 1,034[iii] women per 1,000 men. Data and trends from around the world show that the per capita income of a society increases when more women are educated. Increased education also results in lower fertility and increased participation of women in the workforce. Empowering women in Karnataka can be achieved in the following ways:

- Introducing specialised reforms (women employment incentives, for example) to target and promote sectors where women are more likely to be hired, such as manufacturing, community services, cottage industries, education, and healthcare. In doing so, the state could gain a competitive advantage while

addressing the labour shortage. As a result, there could be more opportunities for employment in the area and fewer women would need to commute to other districts to find work. As they would need to balance their domestic duties concurrently, this would increase the participation of women in the workforce who might not be employed today. An example of a strategic incentive to boost the participation of women in the workforce could be ten additional days of salary for every third month of employment.

- Accelerating the rollout of initiatives such as digital literacy, digital banking, and innovative financial products to empower rural women to become entrepreneurs (for example, the Internet Saathi programme and the Mann Deshi Foundation). This can have a dual impact of promoting crafts of the state, as some homepreneurs might launch handicraft-related businesses, and boosting local tour guiding. This could, in turn, help the state grow its industry and services sector.
- Prioritising the easier availability of resources, such as access to safe water and clean fuels in homes, better transport to compensate for unpaid care work of women, andpromoting labour participation. The Government of Karnataka could also launch awareness campaigns to increase women support and enhance a more equitable division of household chores among family members. According to a study conducted in three Indian states, Nepal, and Bangladesh, improved cooking stoves allow women to spend more time participating in social, economic, and family activities as they save 30 to 110 minutes each day on average.[185] To date, 1,981[iii] children have been enrolled at the 101 childcare centres stated under the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) in zilla panchayats and taluk panchayats for the care and education of children of working women.
- Ensuring the efficient execution of Grama Kayaka Mitra/Gram Rozgar Sahayak under MGNREGA Karnataka, including overseeing the registration process, distributing job cards, providing dated receipts against job applications, and the allocation of work to applicants.

Digital as an enabler for growth

With the increased penetration of mobile phones across India, the Government of Karnataka could leverage digital technology to communicate with residents in rural areas. The state could consider the following interventions:

- Develop a robust and scalable IT system to make every government service initiative digitally available in local languages with efficient two-way communication. It is imperative to spread awareness so people can reap the benefits of schemes targeting rural communities.
- Partner with technology companies to co-develop platforms and a marketplace to create a database of skilled labour banks, on-board skilled labour profiles, and provide details about availability of both skills and jobs in specific regions for a proactive reach-out by the workforce for opportunities. Two-way communication can also enable industries to post their labour requirements for jobseekers to review, while the industry itself could find suitable candidates.

[185] Gender and Livelihoods Impacts of Clean Cookstoves in South Asia, Global Alliance for Clean Cookstoves, May, 2015

Case study

The Udupi district established solid and liquid waste management (SLWM) centres across all 155 GPs for the scientific disposal of dry waste. The area has achieved success in turning waste management into an industry by employing women self-help groups and turning waste into resources. After the success of SLWM at the GP level, Udupi has begun a second phase of solid-waste management called material recovery facility (MRF), which was built in July 2021 and is the first of its kind in rural Karnataka. MRF collected 1,056 tonnes of garbage between August 2021 and July 2022. User fees brought in INR 36.04 lakhs in revenue, while dry trash sales brought in INR 84.86 lakhs. The total income generated during the year was INR 121.64 lakhs, while total expenditure amounted to INR 115.22 lakh, with a net profit of INR 6.5 lakhs after tax. (Source: Karnataka Economic Survey 2022–23)

Human capital development

New technologies help boost agriculture output may need skilled workers to implement and operate them. Scaling up a farm or business also requires know-how, which is often lacking in rural areas. The following interventions could offer solutions:

Set up topical, short-term (15–30-day duration) training courses for reskilling, upskilling, and improving productivity. Unskilled labour in the agriculture sector is a big barrier for increased mechanisation. Adopting suitable technology and machinery in cereal-crop farming can boost productivity by as much as 50 percent. An experiment by the Shri Kshethra Dharmasthala Rural[iii] Development Project to ensure end to end mechanisation in paddy cultivation showed a dramatic rise in productivity. However, the lack of trained labour to operate the machines has hampered increased mechanisation. Industrial training institutes in Karnataka offer long-term courses ranging between two and three years. Instead, short-term courses of between 15 and 30 days could easily increase the skill level of farm labour, which could result in increased productivity.

- Industrial training institutes, the private sector, and vocational training centres could lead this effort and design training courses around:
  - Tractor, tiller/machine operators
  - Thrasher operators
  - Transplanter operators
  - Harvester operators
  - Chaff cutting/milking machine operators
  - Rubber tapping
  - Tree-climbing equipment use
  - Palm-fruit harvesting, including arecanut and coconut
  - Drone operators
  - Mechanised sprayers and dusters, particularly for fruit and perennial crops
  - Farm management
  - Poultry farm management
  - Dairy animal management.
- Include short-term skilling under MGNREGA to incentivise better skilled talent. The MGNREGA programme could contain a component for the short-term skilling of qualified agricultural workers, especially young people, to encourage small-scale farmers to enrol in training programmes. The availability of skilled labour can boost production in rural areas. This can encourage new and inexperienced farmers to pursue training, enlarge the pool of competent workers available in rural areas, and ultimately raise farmers' pay.

Long-term capability-building initiatives, including dedicated programmes for entrepreneurs in supply chain, sales, distribution channels, and other business aspects. For example,[iii] Unilever's Shakti programme trains micro-entrepreneurs, and Walmart's training programmes focus on female farmers. Vocational training centres could be set up to train the youth to provide veterinary services in rural areas.

Collaborate with industry players to curate employee capability-building programmes to impart industry-relevant skills on the latest manufacturing technologies through partnerships with academic institutions and digital training platforms.

Offer and promote government and private sector scholarships and fellowships for rural students to pursue higher education.

The efficient execution of programmes such as Unnati and Rural Self Employment Training Institute training courses aligned with the National Skills Qualification Framework. For example,[iii] Homemade Agarbatti Maker, Krishi Udyami Chamber.



Raise awareness of benefits

Schemes, training courses, and programmes are all key to rural development, but are meaningless if no-one knows about them. The Government of Karnataka can choose from various methods to spread the word about its interventions, including:

- Collaborating with relevant departments to launch evidence-based multimedia communication campaigns for all government schemes ensuring a reach of 100 percent of the population. These could include door-to-door pamphlets, digital promotions, and awareness drives.
- Educating the population on the availability of skill and capability development programmes across sectors such as manufacturing, agriculture, and healthcare.
- Educating people about the start-up-village entrepreneurship programme to bolster small business in rural areas by providing support services, mentorship, seed capital, and training, for example.

Infrastructure development

Connecting rural areas to markets, equipping them with tools to boost their output, improving education, and enhancing digital connectivity are just some ways the state can enhance the quality of life in the countryside. The Government of Karnataka could implement the following:

- Pursue a "rurban" agenda, where clusters of villages are equipped with facilities perceived to be essentially urban in nature, while preserving and nurturing the essence of rural community life, with focus on equity and inclusiveness.
- Increase the availability of cold storage and food-processing centres focused on the value addition of vegetables, fruits, spices, condiments, poultry, pigs and small ruminants, and fishing. This is covered in detail in the manufacturing report. Processing centres in rural areas are mostly restricted to cereal crops, livestock, forestry, and logging. There is little processing and value addition of vegetables, fruits, spices, condiments, poultry, pigs and small ruminants, and fishing. It is essential that value-chain management of these commodities is created in the rural areas to boost the GSDP.
- Create end to end value chains for items such as fruit, vegetables, milk, and spices. A focus on the food-processing industry could see the establishment of export-oriented food parks and accompanying infrastructure such as preprocessing and cold chain. These could be set up on a town- and city-level basis, depending on their proximity to the raw materials. For example, Byadgi could focus on chilis, Chickballapur on rose onions, and Chikkamagaluru, Hassan, and Kodagu on coffee. Additionally, digitising end to end value chains (for example, by using analytics such as telemetry) would improve reliability and value-chain resilience. This could optimise their delivery networks and better forecast demand at the stockkeeping and distributor level.
- Form youth clubs, recreational centres, sports facilities, and volunteering centres to promote participation in sports, team-building activities (organising local festivals and celebrating days of national importance) and social campaigns such as the Swachh Bharat Mission. The Yuvak/ Yuvati Mangal Dal scheme by the Government of Uttar Pradesh could serve as inspiration.
- Use census town data to suitably identify around 200 smaller towns in Karnataka and develop them to sustainably absorb the rural-to-urban shift.
- Incentivise telecom companies to leverage unique Indian 5Gi standards (designed to facilitate 5G coverage for rural areas) to develop device connectivity solutions in collaboration with software players.
- Manage watersheds, especially the renovation and revival of traditional water bodies. Additionally, it could improve access to irrigation, drainages, traditional drainages, and flood protection to enable year-round farming.
- Create more centres with adequate access to primary, secondary, and tertiary facilities to address the shortfall of 245 urban and 209 primary healthcare centres in urban and rural areas. Five districts – Bengaluru Urban, Belagavi, Mysuru, Vijayapura, and Dharwad – account for half of the shortfall.

Government support

The state government holds the keys to improved life in rural areas. It can leverage policies, launch task forces, and develop action plans to ensure these districts are well run and dynamically contribute to Karnataka's vision of being a $1 trillion economy. The following support could go a long way in enhancing rural life:

- Design a rural development programme to support small villages with the aim of providing a versatile toolbox to foster, enable, and scale up innovation in rural areas. This would be particularly beneficial in northern districts such as Bidar, Kalaburgi, and Raichur.
- Encourage and support the development of local governance, panchayats, and municipalities as they are the closest link between citizens and the government. GPs could provide information, education and communication on productivity improvements, government schemes and policies, best practices, disaster (droughts and floods) adaptation and mitigation strategies such as desilting and deepening of tanks/rivers, plantation activities, flood- and drought-tolerant varieties, and changes in cropping pattern. GPs could mobilise resources using measures such as waste-to-resource (segregation at source), asset monetisation, green and clean initiatives, and improving the recovery of revenue sources (incentives/disincentives).
- Encourage the development of microbusinesses in rural regions (by making timely financing available through microfinance institutions) to boost labour productivity and the value chain of agricultural produce. Expand programmes like Swamy Vivekananda Joint Liability Groups, which operate in 5,955[iii] Gram panchayats in Karnataka and encourage the unemployed youth of the rural areas to engage in self-employment and become self-reliant. Under the Pradhan Mantri Udyog Srijan Yojana (PMEGP) scheme,[iii] fixed incentives and bank loans are offered INR 10.00 lakhs for service-based enterprises and INR 25.00 lakhs for manufacturing units at a unit cost of up to INR 25.00 lakhs.
- Dedicated task force and teams for effective implementation:
  - A task force to oversee the effective implementation of central and state policies aimed at the holistic development of rural sectors.
  - A dedicated team of experts to prepare vision documents with an action plan to increase the productivity and export potential of millet.
- Panchayats are required to conduct audits on a regular basis to verify how funds are being used. Through providing capacity building and training for the creation of Gram panchayat development plans, panchayats can be strengthened further. To ensure panchayats operate efficiently, support is needed and technical personnel can be hired and appointed.
- Provisions for the relaxation for workers under specific circumstances:
  - A 50 percent relaxation for work onsite for pregnant and lactating women, senior citizens, and physically challenged persons.
  - A 10 percent relaxation for work onsite for all women, with an additional 10 percent relaxation if 60 percent of the workforce are women.
  - Dedicated caretakers from the vulnerable section (mostly women) to be given a daily wage if there are more than five children below the age of five years who accompany their mothers to the work site.

References

i Karnataka economic survey

ii GDP performance and value forecast

iii Rural development committee

CHAPTER 17

Infrastructure and construction





The construction industry in Karnataka was INR 96,354 crore in FY 22, contributing only 4.7% to GSDP. Even in a pre-pandemic year of FY 20, the construction industry[ii] was INR 81,929 crore,[ii] contributing 5.1% to GSDP. It is a highly underutilized growth driver, not just in the state but all over the country, and has great scope to boost economic growth. The construction industry has the highest backward-linkages in terms of metal consumption, mass employment, and generation of taxes. Focusing on the construction industry can feed-forward into other sectors as well, like manufacturing and production, export and trade. The China[iii] model of aggressive infrastructure development as a driver for economic growth can be deployed in Karnataka.

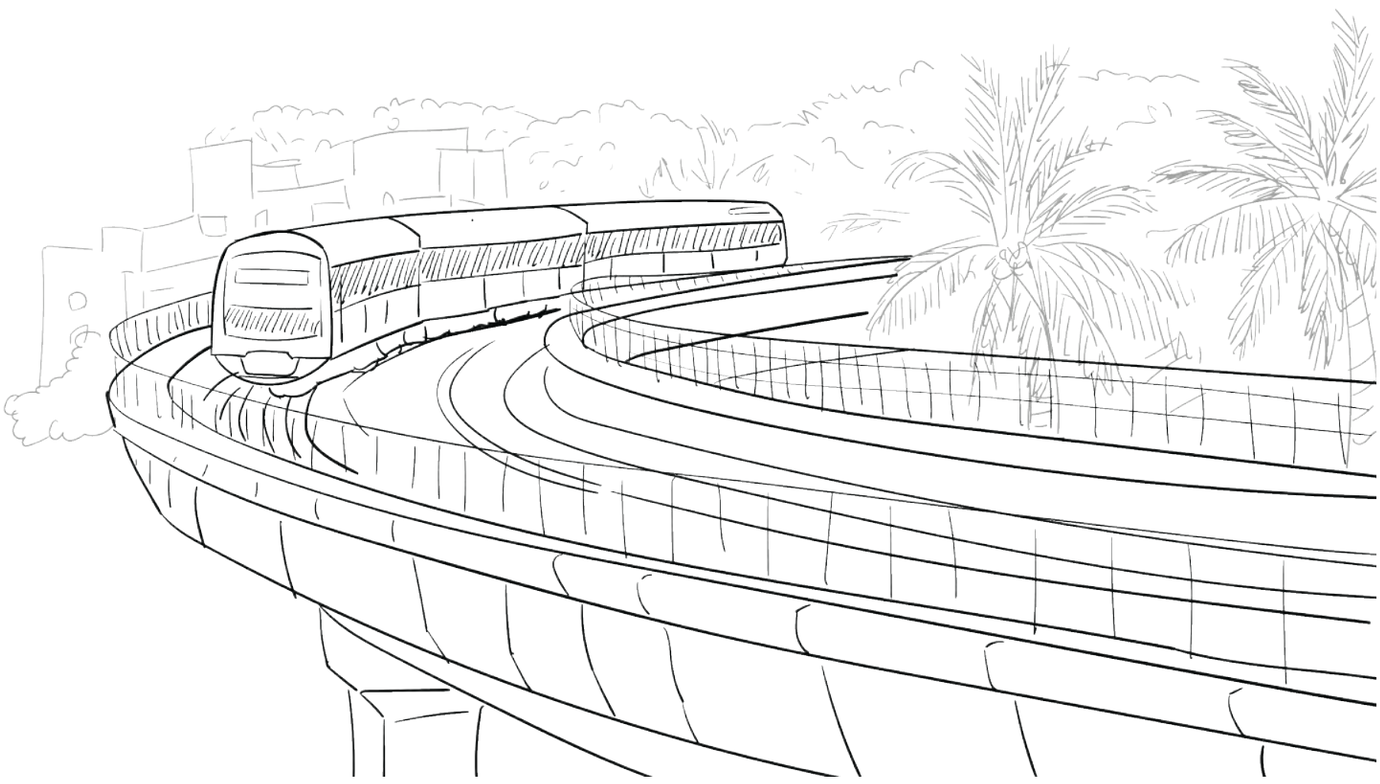
Karnataka's infrastructure spending must increase massively. This could include:

- **Suvarna Karnataka 8-lane expressway:** A state-of-the-art 8-lane expressway from Bidar to Bengaluru, with access to the Mangalore and Karwar ports, and a high-speed railway line in the middle could transform Karnataka's economy. It can increase the speed of passengers and goods, can connect all the industrial clusters to Bengaluru and the ports, and massively improve Karnataka's EoDB. Further connectivity can be facilitated with connection to the Hubli and Belgaum airports. The expressway can double as a freight corridor with appropriate warehousing and logistics facilities/parks at various junction points - thus reducing the cost of logistics significantly. Such a system can be unique as it has never been done in the country before. The corridor can also be equipped with charging stations at appropriate intervals and other relevant facilities to support large-scale electrification of trucks. Prominent tourist destinations – beach, wildlife, pilgrimage – can also be linked to these corridors for better access.
- **Rural road connectivity:** Central funding and loans from large-scale development banks can be utilized to a further extent for connecting all of Karnataka with high-quality roads. This can boost urbanization, industrialization and exports as well by connecting the hinterland with markets.
- **Railways and freight corridors:** Building a solid railway network with increased carriage speed can improve carriage of goods and people across the state.
- **Public transportation like Metro and bus services:** Metro and other public transportation can be a big infrastructure spend with the highest return-on-investment. Apart from increasing Metro footprint in already crowded cities like Bengaluru, the key is to get ahead of the game in smaller towns all over Karnataka and start building the Metro there right now since more and more people are heading to urban areas in search for opportunities. A combination of Metro and buses, preferably EV, can be designed in small towns.
- **Ports:** Karnataka has 320km of coastline[186]. The Mangalore port is the deepest inner water harbor on the west coast and can be developed to handle large trade volumes to complement the growing industry ecosystem. The Karwar port is also functional and can be developed further, along with other ports like Tadadi and Kundapura, to help Karnataka amplify its trade capabilities. Its proximity to the Suez Canal, and access to high-volume markets like Europe and East Coast of the USA, can be used to better position the state as a global trading hub.
- **Seaside living spaces:** Many coastal stretches of Karnataka are empty. Building attractive and accessible seaside living spaces with parks, public spaces, cultural venues, housing complexes, and so on, could give transform the local economies. Shanghai[iii] has done this successfully with its riverfront spaces on both the Shanghai and Pudong banks.

186 Inputs from Infrastructure and construction committee

- **Tourism infrastructure:** Karnataka has many historical and cultural places that can be developed as tourism magnets – Hampi, Belur, Halebeedu, Mysuru, and several locations along the coast. Developing a structured tourism network around these sites, and networking them with roads, railways and airports could boost the tourism industry and the local economies.
- **Airports:** The Bengaluru airport, KIAL, is processing record numbers of both passengers and cargo. With the completion of the second terminal, it can be prudent to plan another expansion soon with multiple terminals and runways. The air traffic to Bengaluru can only rise, and facilities must keep pace. Development of smaller airports around the state, like Mangaluru, Belagavi and Kalaburgi can help divert traffic from Bengaluru and assist in the augmentation of the state's capacity for passengers and cargo. A hub-and-spoke-model for dedicated air freight services between the regional airports and Bengaluru can assist in low-cost movement of high value and perishable goods to reduce time-to-market. Looking at China,[iii] many major airports have received the go-ahead to build a third runway and increase seating capacity by forecasting the demand to 2030. In parallel, new airports are being commissioned all over the country to provide additional capacity using forecasting beyond 2030. Major US airports have at least 3-4 runways,[iii] with Chicago and Dallas at 7 runways each.
- **Low-cost housing:** Housing is one of the biggest spend areas under infrastructure. It can have the highest multiplier effect – economically, socially, and culturally. There is huge scope for growth in this area.

Increasing infrastructure spending and commissioning projects all over the state also has the advantage of providing employment in the construction sector in the state. Karnataka can avail 20-30-year long-term loans from global development banks and capital surplus regions like Japan to undertake these projects.



Port infrastructure development

A case study of the new Mangaluru port[iii]

The New Mangalore Port is a key commercial hub and occupies a very strategic position in Karnataka's economic growth and development. It is the only major port in the state and serves as an important gateway for international trade and commerce, facilitating the import and export of wide range of commodities including crude oil, petroleum products, containerized cargo, and iron ore exports. Additionally, Mangalore houses the deepest inland water harbour on the west coast, and Karnataka can utilize this strategic advantage by expanding operations to gain cargo share and become a major player in international sea trade. From this strategic location, major trade destinations like Europe and Africa are accessible, as is the US's East Coast via the Suez Canal. The port commenced operations in 1975 and over the years, has grown from the humble beginning of handling less than a lakh ton of traffic to the present level of handling 39.3 MMT in FY22.

The port has excellent infrastructure facilities, including container terminals, bulk terminals, liquid cargo terminal, and a timber terminal. It has also developed a dedicated berth for handling iron ore exports. The port is also a major employment generator and also contributes significantly to revenue generation of the state.

Overall, the New Mangalore Port is a key driver of economic growth of the state and requires adequate focus towards further development. Currently, there are numerous challenges with respect to connectivity, as detailed below, that needs to be tackled. (Exhibit 139)



Exhibit 139

Snapshot of road connectivity to new Mangalore port[1]



Stretch on NH 75	Colour on Map	Lanes	Ongoing Projects	Contractor	Start Date	Project Cost	Date of completion	Progress as on 15.12.22
NMPA – Bantwal (30km)		4 lane	-	-	-	-	-	-
Bantwal – Dharmasthala Cross Road (45km)		2 lane	Four laning	KNR Constructions	23.11.21	Rs 1100 Cr	22.11.23	17%
Dharmasthala Cross Road – Addahole (15km)		2 lane	Four laning	SM Autode Pvt Ltd	01.10.21	Rs 317 Cr	30.09.23	45%
Addahole – Maranahalli (25km GHATS)		2 lane	-	-	-	-	-	-
Maranahalli – Hassan (45.14km)		2 lane	Four laning	Rajkamal Constructions	06.03.17	Rs 573 Cr	17.03.23	50%
Hassan – Bengaluru (182km)		4 lane	-	-	-	-	-	-

1. Infrastructure and construction committee

There are numerous major infrastructure projects that are under progress currently which are expected to higher volumes of trade with greater supply chain efficiencies. However, delay in completion has been slowing down the port's accelerated progress. Here's the list of major ongoing projects and their status of progress:

Four laning from Bantwal to Dharamasthala Cross Road/ Periyashanthi[iii] (45 km) was re-awarded on 23.11.2021 to KNR Constructions at the cost of Rs 1100 Cr. As on 06.04.2022, around 10% work has been completed. Scheduled date of completion is 22.11.2023.

Four laning from Dharamasthala Cross Road/ Periyashanthi to Addahole[iii] (15 km) was re-awarded to SM Autode Pvt Ltd on 31.03.2021 at the cost of Rs 317 Cr and project commenced on 01.10.2021. As on 06.04.2022, around 30% work has been completed. Scheduled date of completion is 30.09.2023.

Four laning from Maranahalli to Hassan[iii] (45.14 km) was awarded to Rajkamal Constructions Pvt Ltd on 31.03.2016 at the cost of Rs 573 Cr and 06.03.2017 was the date of start. As on 06.04.2022, around 45% work has been completed. Revised scheduled date of completion is 17.03.2023.

Completion of these projects as scheduled, can lead to enhanced connectivity, thus enabling more efficient movement of goods to and from the port resulting in reduction of congestion and delays as well as time and cost of transportation of goods.

Another challenge with respect to road connectivity faced by the port is that of the poor connectivity on NH 75. This poor connection is currently causing huge negative impacts on the EXIM trade from the state, especially given that the neighbouring Charmadi Ghat (NH 73) and Sampaje Ghat (NH 275) are often closed for heavy vehicles during monsoon. The cargo transported through NH 75 includes:

- Upto 25,000 TEUs (3,75,000 tons) of containers
- Upto 1,70,000 tons of edible oil cargo
- Upto 40,000 tons of fertilizers
- Upto 1,00,000 tons of steel coils and more

The poor connectivity leads to numerous direct and indirect impacts socio-economic impacts. Some of them are as follows:

Direct impact

Increased transportation cost
When trucks are not able to ply via NH 75, the traders may rush to ports in neighbouring states, or are forced to take NH 63 (Hubballi – Ankola route) that can add 350 km to their transportation cost. Poor road condition increases vehicle operating expenses, such as repair and fuel costs. The increased risk of reaching the port in time to catch the designated vessel also gets reflected in increased cost.

Loss of tax income for Government of Karnataka
Govt of Karnataka loses potential tax income on all the cargo generated in Karnataka and handled at the ports in other states. Value of cargo exported through ports in other states, in terms of INR Cr

Reduced cargo handling at the port
The port has a usable capacity of 74 million Metric Tonnes[iii] but has handled maximum of 42.51 MMT (~57%) in 2019. Port is developing an additional multi-cargo berth by 2023-24, which will add another ~6 MMT to the capacity. A significant proportion of the cargo listed above could be handled at New Mangalore Port.

Loss of employment opportunities at the port
Per annum around 2.5-3 lakh[iii] TEUs from Karnataka are being handled at the ports in the neighboring state.

Direct employment

- Approximate man hours required for handling one TEU = 3 hours
- Estimated man hours required for handling 2.5-3 lakh TEUs = 7.5-9 lakh hours
- Man hours contributed by 1 worker in a day = 8 hours
- Man hours contributed by 1 worker in a year (330 days) = 2,640 hours
- Direct Employment Loss (in terms of number of workers) = 285-340 people. (Exhibit 140)

Exhibit 140

Port	2019-20	2020-21	2021-22	Major commodities during 2021-22
Chennai, TN (both Sea and Air)	18,98.83	1682.71	2104.43	Iron & Steel, Textiles, Electrical and Mechanical Appliances
Kochi, Kerala	41.52	99.67	216.36	Coffee, Lead Products, Textile & Miscellaneous Food Products
Tuticorin, TN	541.77	676.56	774.27	Readymade Garments, Textiles, Electrical & Mechanical Appliances & Cereals
Kattupalli, TN	688.56	565.77	524.26	Electrical & Mechanical Appliances, Textiles, Iron & Steel & Vehicles
Nhava Sheva, Maharashtra	778.64	796.54	1591.48	Electrical & Mechanical Equipment, Sugar & its confectionaries, Inorganic Chemicals
Krishnapatanam, Andhra Pradesh	74.52	242.73	224.58	Iron & Steel, Cereals, Tobacco
Ennore, TN	110.23	67.38	500.55	Iron & Steel, Mechanical Equipment, Textiles, Rubber and its articles
Mormugao, Goa	573.69	941.06	1574.43	Iron & Steel, Sulphur, Ores & Slag, Inorganic Chemicals

Source: DGCIS, Kolkata

Indirect employment

- Approximate man hours required for handling one TEU = 10 hours
- Estimated man hours required for handling 2.5-3 lakh TEUs = 25-30 lakh hours
- Man hours contributed by 1 worker in a day = 8 hours
- Man hours contributed by 1 worker in a year (330 days) = 2,640 hours
- Indirect Employment Loss (in terms of number of workers) = 945-1135 people (Exhibit 141)

Total employment loss in port ecosystem = 1,230–1,475 people

Reduced wages, income, and vehicle ownership:
Reduced transport activity combined with a reduced frequency during the year could lead to decrease in the earnings of vehicle owners and operators.

Impact upon the transportation-dependent businesses:
Businesses such as warehousing, distribution hubs and local market establishments along the roads suffer or do not come up due to poor road condition

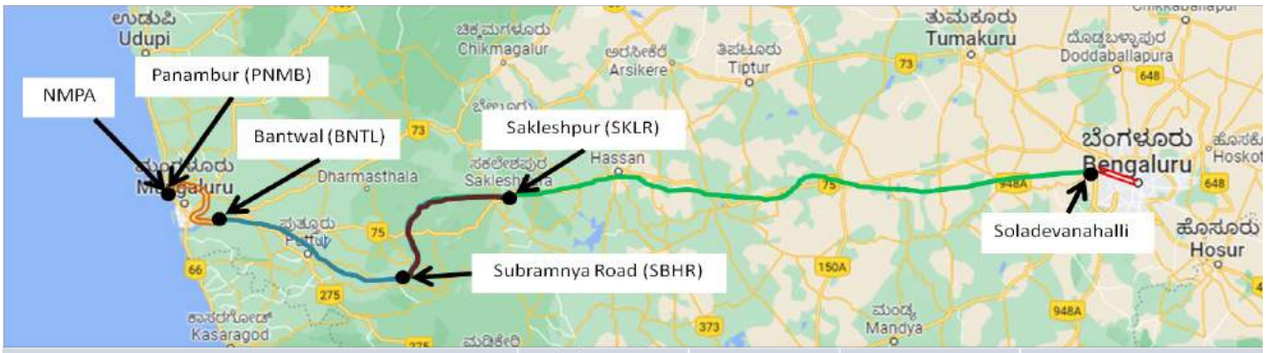
Indirect impact

Reduced international demand
The increased transportation cost can make their goods costlier in the international market resulting in loss of future orders. At times, when the goods missed the designated vessel, the delay too leads to cancellation of orders, penalties against the accepted orders and loss of future orders.

Impact upon the local development
Due to poor roads, utilization of the road and depending activities, especially tourism, gets impacted, leading to loss of earning opportunities for workers from economically weaker strata of society, including that for tourist guides, restaurants, homestays, artisans, craft workers, weavers etc. Loss of potential jobs lead to general decline in commercial activities along these roads. Quality of life and development of the region suffers a decline due to the above reasons and is further exacerbated by poor access of the population to services, such as agricultural extension, education, and health.

Exhibit 141

Snapshot of rail connectivity to new Mangalore port[1]



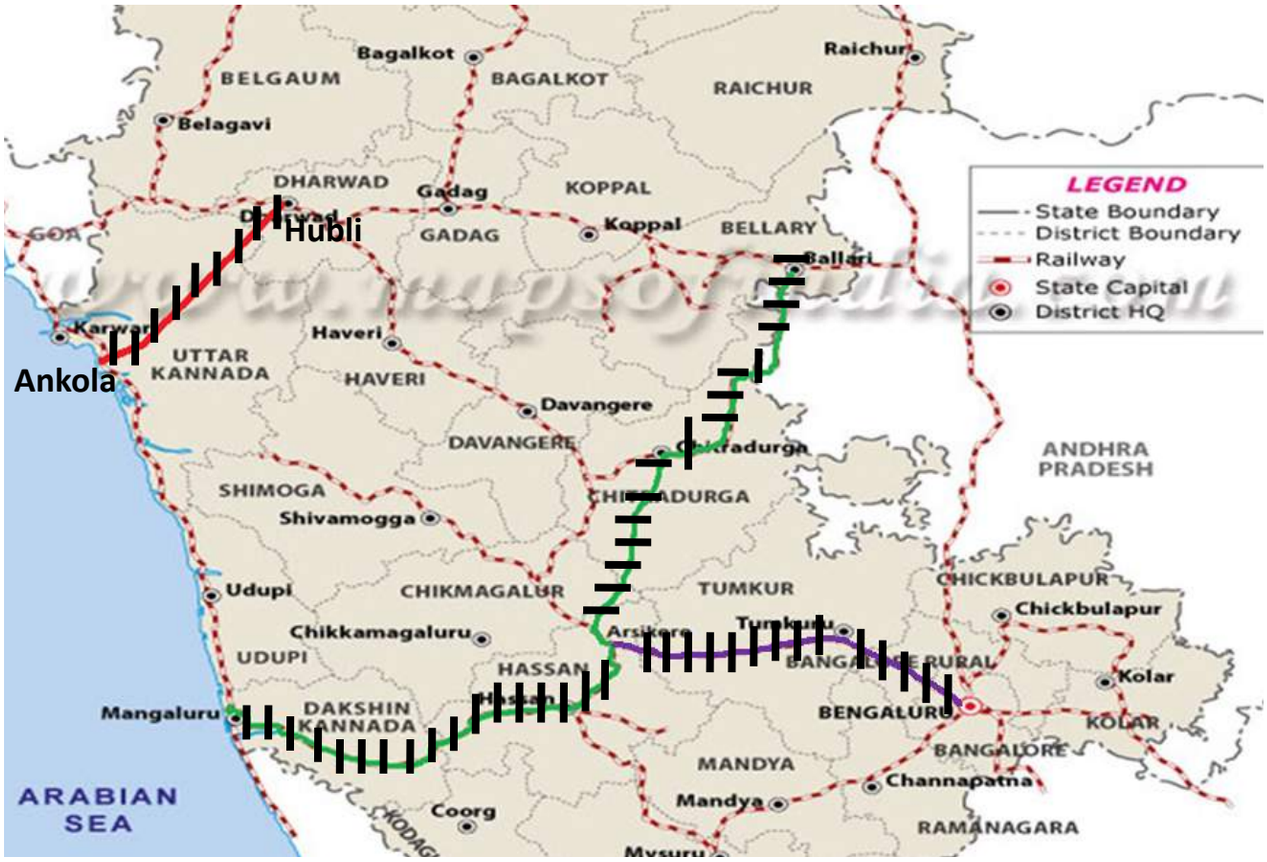
Stretch	Colour on Map	Lines	Distance	Issues
Bengaluru (SBC) – Soladevanahalli (SDVL)		Double line	16 km	-
Soladevanahalli (SDVL) – Sakaleshpur (SKLR)		Single line	190 km	-
Sakleshpur (SKLR) – Subramanya Road (SBHR)		Single line	55 km	Single line, Double charging
Subramanya Road (SBHR) – Bantwal (BNTL)		Single line	67 km	Single line
Bantwal (BNTL) – Panambur (PNMB)		2 lane	Four laning	-

1. Infrastructure and construction committee



Railways are one of the most efficient, cost-effective, and sustainable form of transportation of goods and products. While the port has well-developed rail connectivity, the closure of these lines during monsoon season adversely impacts trade.

Furthermore, the current single line rails pose a huge operational risk. Dodoubling of line from Hassan to Mangalore including tunnel of 55 km (Sakleshpur–Subramanya Road) can prove to be significantly beneficial. The current distance from the port to Bellari is almost 646km. The Ankola-Hubballi railway line can reduce this distance to approximately 560km – thus saving time as well transport cost of the large volumes of goods moving to and from Bellari to New Mangalore Port.

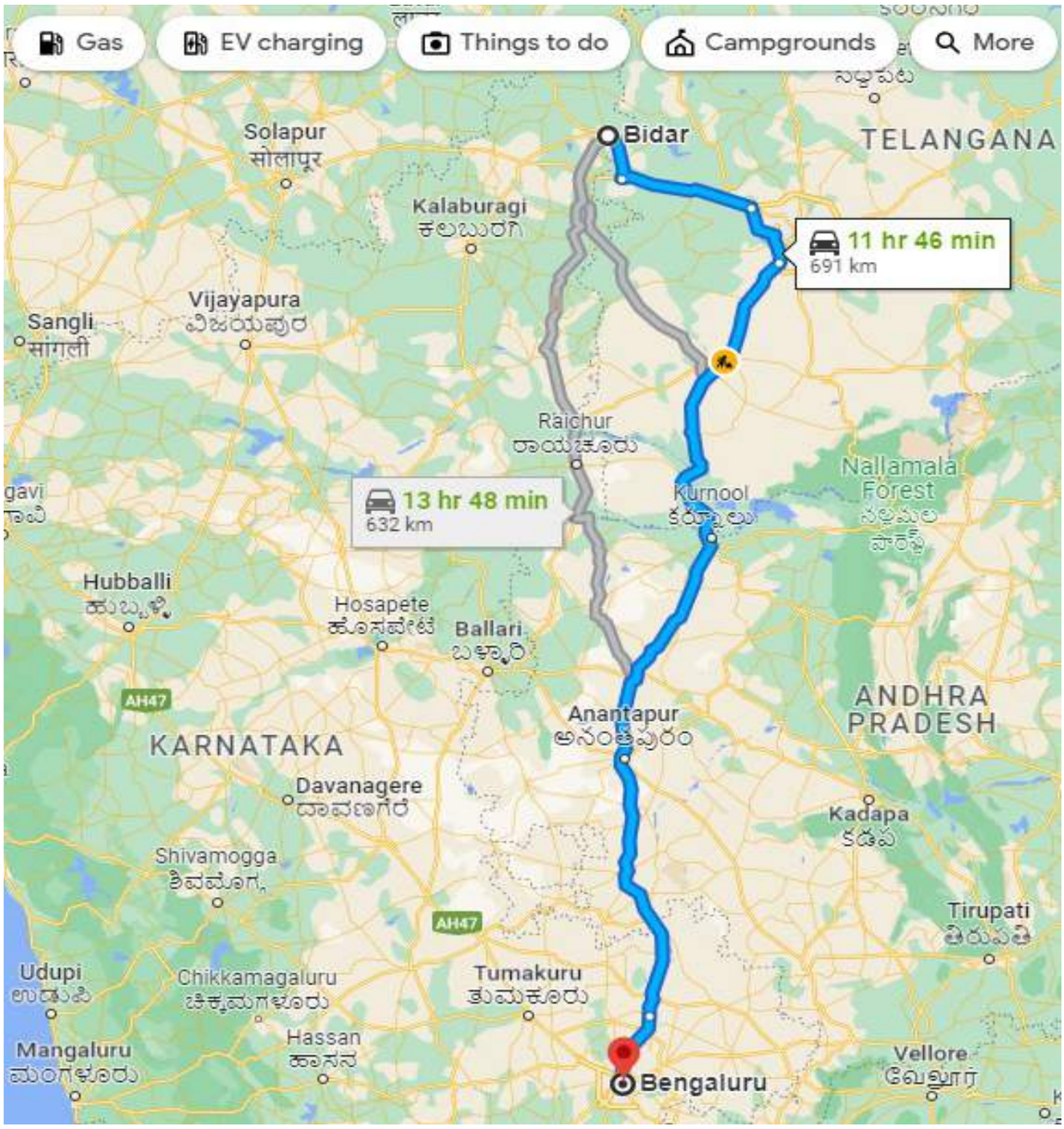


Developing suvarna corridor

At present, the shortest route, in km, from Bidar to Bengaluru is via Raichur through Andhra Pradesh and the shortest route,[iii] in time taken, is through Telangana and Andhra Pradesh. Although the former is 59 km shorter than the latter, it still takes around 2 hours longer.

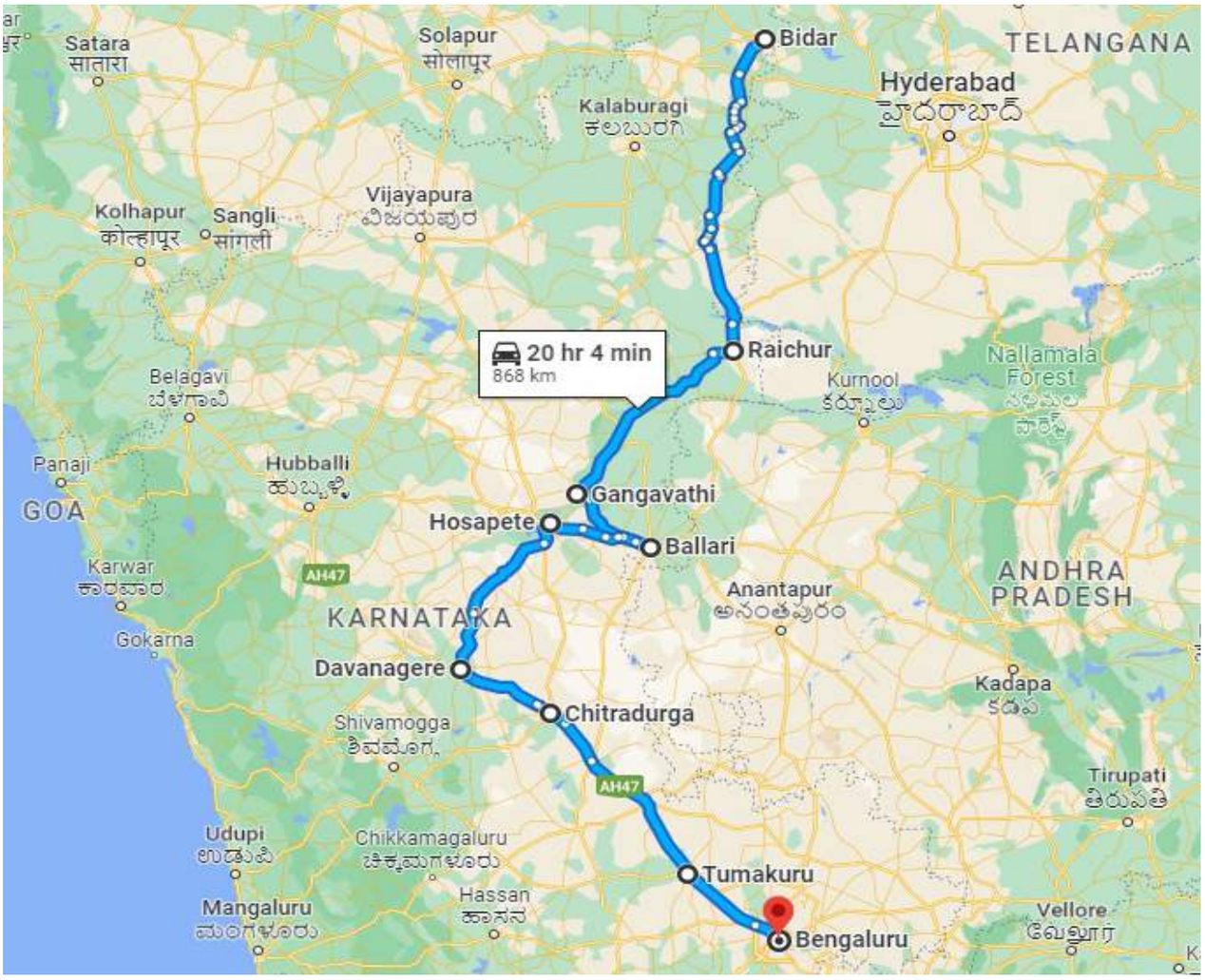
- This length-time taken difference along the two routes exemplifies the significance of the quality of infrastructure for high speed and smooth movement of vehicles.
- The shortest distance between two points is a straight line, and the former road is almost the straightest route between the two points.

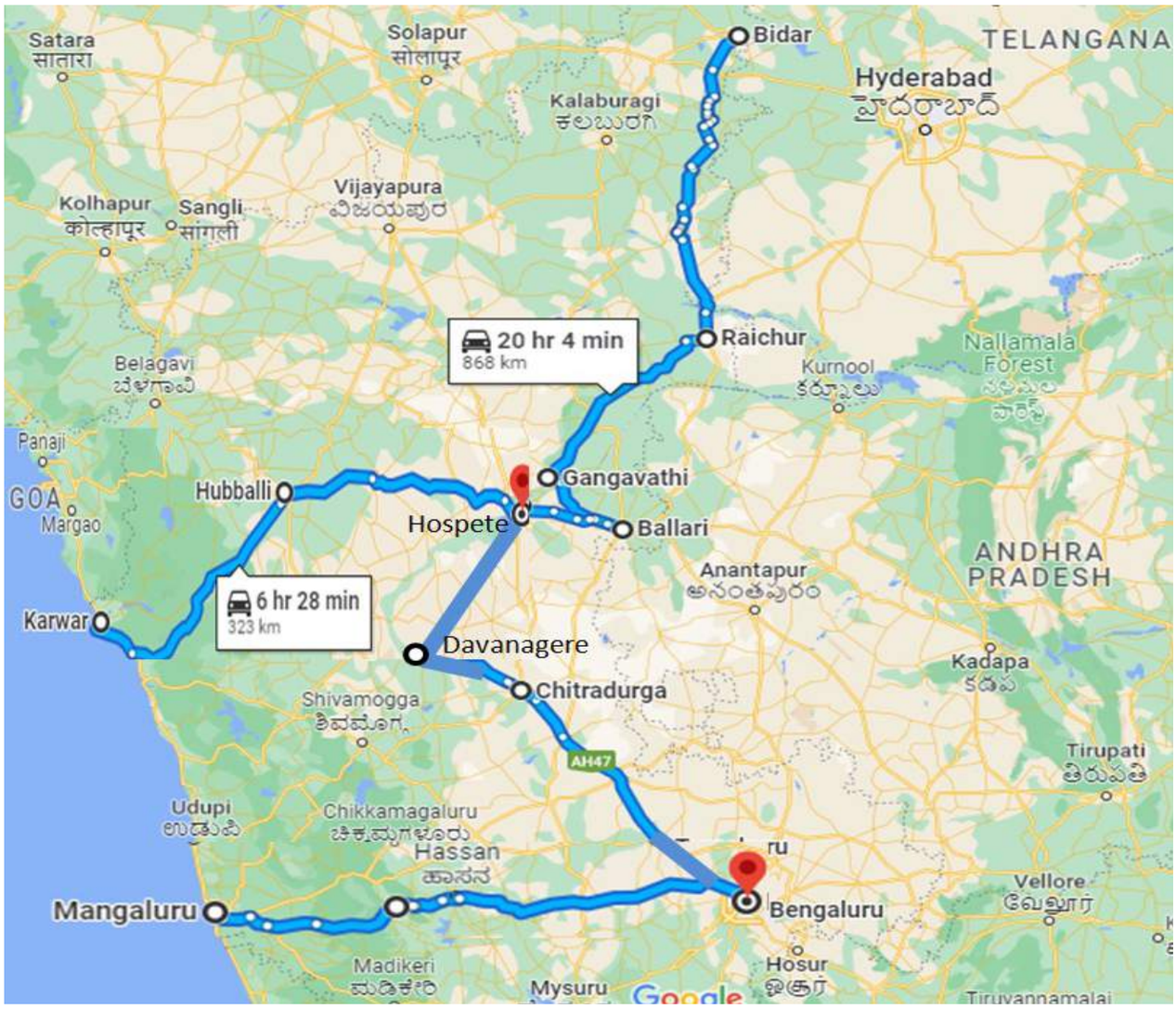
Exploring road connectivity to the proposed corridor



- Since the straightest route doesn't pass through important industrial areas of Karnataka, the best alternative could be the shortest route connecting those hubs, as shown in the following map.

Furthermore, Karwar Port has connectivity with Hospete through Hubballi, which is another important industrial hub, through NH 52, and New Mangalore Port has connectivity with Bengaluru through Hassan, Kunigal and Nelamangala and on to Tumkur, all of which are industrial hubs, through NH 75, as shown in the following map.





Note: The maps indicate movement through car, which has been used as proxy to trucks, given that trucks can ply on the mapped roads.

Exploring rail connectivity to the proposed corridor

The shortest rail connectivity between Bidar and Bengaluru passes through Telangana and Andhra Pradesh. Again, since the straightest rail line doesn't pass through important industrial areas of Karnataka, the best alternative could be the shortest rail line connecting those hubs. Further, Indian Railways uses same lines for passenger and goods movement, except in the dedicated freight corridors.

The only missing link for connectivity of industrial hubs with both Karwar and New Mangalore Ports is the gap between Ankola and Hubballi.

Suggestions to develop road and rail connectivity to the suvarna corridor from new managalore port

The road and rail routes connecting Bidar to Bengaluru, with access to Karwar Port and New Mangalore Port, connecting the industrial clusters already exist along the planned corridor.

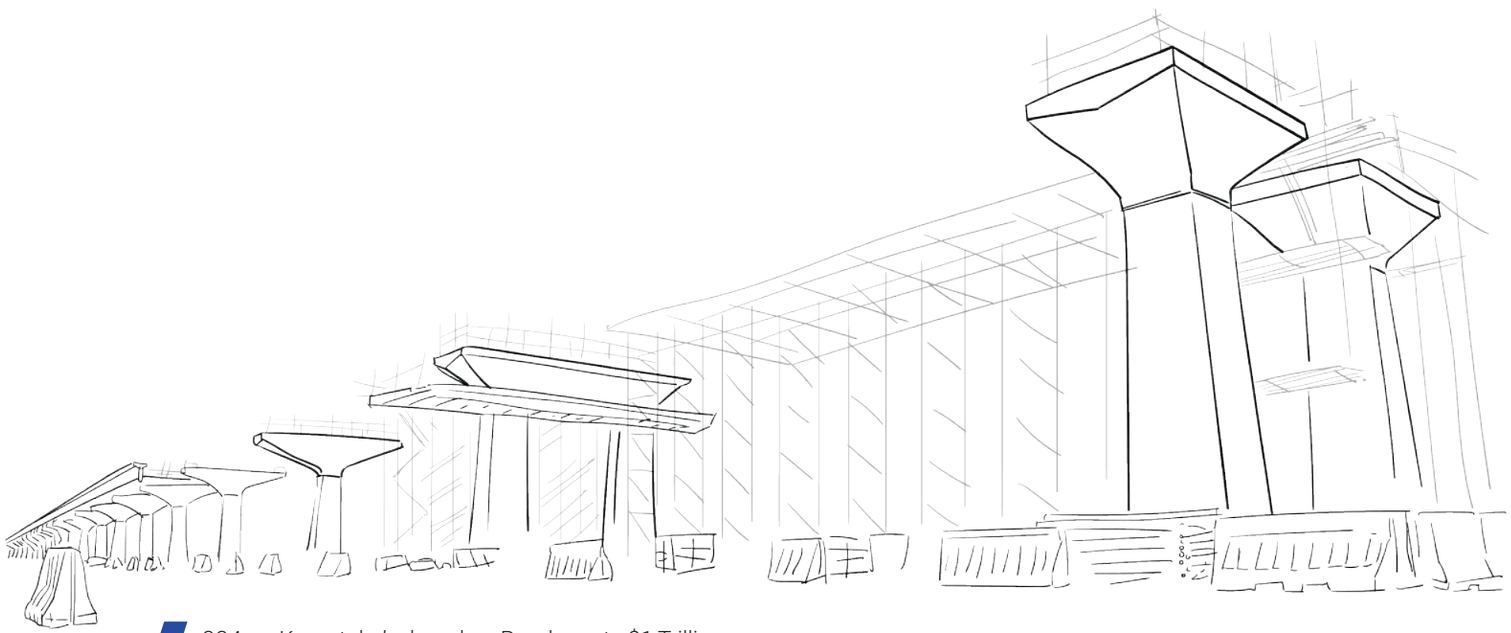
The closest existing highways along the geographical length of envisioned corridor can be widened to accommodate 2 new dedicated lanes with ample width for use as a road freight corridor.

- These freight corridors can be strengthened and modified (wherever necessary)
- The proposed Tunnel Project in Shiradi Ghat could have been a great boost for Mangaluru-Bengaluru connectivity. If that project is not undertaken, the ghat section of NH 75 can be augmented with the support infrastructure, such as retaining walls, drains and lights, which can enable all-weather use of the road.
- These freight corridors can have a dedicated maintenance teams as well.
- Warehousing, including cold storage facilities, and logistics facilities/parks can be developed along the length of these corridors.
- These corridors can be equipped with charging stations at appropriate intervals and other relevant facilities to support electrification of trucks.

Further, adding the Ankola-Hubballi rail line can ensure connectivity between the industrial hubs in North Karnataka and the two ports. Similar to the suggestion for road corridor, a single rail line could be laid alongside the closest existing rail routes along the geographical length of envisioned corridor for use as a rail freight corridor.

For better connectivity with coastal region, all the ghat roads can be strengthened and augmented with the support infrastructure, including as retaining walls, drains and lights/ reflectors, to enable all-weather use of the roads.

New Mangalore Port has immense potential to be placed very prominently on the global map. This potential needs to be tapped by addressing the above-mentioned challenges of connectivity and allowing for enhanced trade and commerce in the port.



References

i Karnataka economic survey

ii GDP performance and value forecast

iii Infrastructure and construction committee

CHAPTER 18

Human development







Karnataka, home to 5.5% of India's population contributes to 8.8% of GDP, 40% of Software (IT) Exports, ranks #1 in Innovation India Index, #2 in Milk Production, #3 in SDG India Index Score. It is a preferred destination for Foreign Direct Investments – #1 in Venture Capital Funding, #1 in Start-up economy, #1 in number CMMI Leve l 5 companies, #1 in servicing Fortune 500 (global) companies. At the core of all the above accomplishments and recognition is the availability of quality Human Capital in Karnataka.

Karnataka human development report

Development of people is one of the fundamental objectives of an economy. Holistic development ensures increased productivity which in-turn has a positive influence on economic growth. Recognizing the importance of an inclusive development, Karnataka continues to evaluate and report its Human Development. The inaugural edition of Karnataka Human Development Report (KHDR) was in 1999 and the 4th edition (KHDR 4.0) – "Bridging the Gaps towards Sustainable Well Being" was launched in March 2023, wherein the state has progressed from a HDI score of 0.429 to 0.645 @ average annual growth of 1.42%.

KHDR 4.0 is ambitious and unique - first of its kind with multi-pronged analysis, data and evidence based technology supported, district and sub-district level (Taluk/ Block) suggestions towards achieving USD 1 Trillion economy through inclusive development.

KHDR 4.0 is calculated on two levels - District Level and Taluk Level, for three sub-indices – Health, Education and Income which have total of 4 indicators at district level and localized with 14 indicators for taluk level HDI computation, as per table below.



Exhibit 146

Index	District indicators	Taluk indicators
Health	**Life expectancy at birth**	• Under 5_mortality (per 1,000) • MMR (%) (per 1 lakh) • No of Mothers who had at least 4 antenatal care visits
Education	**Expected years of schooling (EYS)**	• GER (Elementary) • GER (Secondary)
	Mean years of schoolings	• Male Literacy • Female Literacy
Income	**Per capita income (PPP)**	• Percentage of Households having access to modern cooking fuel • Percentage of households having access to toilet • Percentage of households having access to safe drinking water • Percentage of households having access to electricity • Percentage of households having access to pucca house • Percentage of workers in non-agricultural sector • Per Capita Income (at constant prices)

1. Human Development committee

KHDR 3.0 was computed for all 30 districts and their 176 taluks, hence, in order to lend conformity between KSHDR 3.0 and KHDR 4.0 and to evaluate the spatio-temporal growth, HDI is computed for same district and taluks and Per capita income at constant prices 2008-09 for KHDR 4.0.

Exhibit 147

HDI: District ranking

District	Health Index	Education			Income Index	HDI	HDI rank 2022	HDI rank 2015
		MYS Index	EYS Index	Education Index				
Bengaluru	0.77	0.662	0.693	0.678	0.77	0.738	1	1
Dakshina Kannada	0.757	0.479	0.712	0.595	0.72	0.687	2	3
Chikkamagaluru	0.77	0.465	0.687	0.576	0.672	0.668	3	5
Udupi	0.76	0.492	0.64	0.566	0.684	0.665	4	6
Kodagu	0.768	0.589	0.648	0.619	0.616	0.664	5	2
Mandya	0.764	0.446	0.704	0.575	0.607	0.644	6	14
Bengaluru Rural	0.762	0.503	0.611	0.557	0.625	0.643	7	4
Ramanagar	0.761	0.433	0.697	0.565	0.615	0.642	8	15
Kolar	0.771	0.537	0.662	0.599	0.567	0.64	9	7
Shimoga	0.755	0.385	0.71	0.547	0.623	0.636	10	10
Uttara Kannada	0.775	0.468	0.645	0.556	0.586	0.632	11	11
Bagalkot	0.774	0.458	0.625	0.542	0.594	0.629	12	24
Chikkaballapur	0.768	0.516	0.639	0.577	0.558	0.628	13	13
Mysore	0.759	0.46	0.653	0.557	0.577	0.625	14	9
Hassan	0.769	0.393	0.662	0.528	0.598	0.624	15	12
Gadag	0.767	0.424	0.703	0.563	0.559	0.623	16	20
Tumkur	0.759	0.383	0.629	0.506	0.606	0.615	17	17
Bellary	0.73	0.363	0.683	0.523	0.601	0.612	18	26
Dharwad	0.708	0.439	0.626	0.533	0.601	0.61	19	8
Belgaum	0.751	0.452	0.641	0.546	0.529	0.601	20	18
Chamarajanagar	0.776	0.344	0.633	0.488	0.573	0.601	21	21
Bidar	0.772	0.406	0.658	0.532	0.527	0.6	22	22
Vijayapura	0.771	0.381	0.667	0.524	0.532	0.599	23	19
Chitradurga	0.757	0.412	0.626	0.519	0.541	0.597	24	23
Koppal	0.765	0.399	0.64	0.52	0.524	0.593	25	25
Davangere	0.749	0.394	0.622	0.508	0.538	0.589	26	16
Haveri	0.762	0.365	0.527	0.446	0.533	0.566	27	28
Raichur	0.742	0.175	0.721	0.448	0.535	0.562	28	27
Kalaburagi	0.726	0.285	0.554	0.42	0.514	0.539	29	29
Yadgir	0.764	0.256	0.508	0.382	0.533	0.538	30	30
Karnataka	0.759	0.462	0.647	0.555	0.634	0.644		

1. Human Development committee

Human development Index (KHDR 4.) Top and Bottom 10 Taluks in Karnataka

The Human Development Index is better understood by knowing each of the sub-indices which enriches it – Health, Education and Income (Social).

Exhibit 148

Rank	Top 10 taluk	District	HDI
1	Mangalore	Dakshina Kannada	0.7867
2	Bangalore-South	Bengaluru Urban	0.7847
3	Nelamangala	Bengaluru Rural	0.7609
4	Sulya	Dakshina Kannada	0.7461
5	Bantwal	Dakshina Kannada	0.7400
6	Bhatkal	Uttara Kannada	0.7353
7	Tumkur	Tumakuru	0.7235
8	Ramanagar	Ramanagara	0.7233
9	Udupi	Udupi	0.7111
10	Hoskote	Bengaluru Rural	0.7098

Rank	Bottom 10 taluk	District	HDI
176	Yadgir	Yadgir	0.3250
175	Jevargi	Kalburgi	0.3292
174	Kudligi	Vijayanagar	0.3477
173	Shorapur	Yadgir	0.3678
172	Yelburga	Koppal	0.4133
171	Savanur	Haveri	0.4178
170	Sindhanur	Raichur	0.4186
169	Basavana Bagewadi	Vijayapura	0.4200
168	Chincholi	Kalburgi	0.4218
167	Shahapur	Yadgir	0.4298

1. Human Development committee

Health Index

Targeted interventions for the indicators outlined below through the following schemes are suggested which can reduce U5MR and MMR.

Exhibit 149

SDG	Indicator	Prevalence	Dept.	Scheme
SDG2	Children age 6-59 months who are anaemic (<11.0 g/dl)	65.50%	WCD	• Subsidy for Food Grains Distribution for AAY and PHH beneficiaries under Annabhagya scheme • Pradhan Mantri Poshan Shakti Nirman (PM-Poshan) (MDM) • **Nutrition Program:** Additional Grants from GoK (Ksheera Bhagya,Srusti, Maatru Poorna) • National Ayush Mission • ICDS – SNP • Bhagya Lakshmi • Pradhana Mantri Maatru Vandana Yojane • Ayushman Bharath – Pradhana Mantri Jana Arogya Yojane(PMJAY) • National Health Program • PM Ayushman Bharat Health Infrastructure Mission • Aroghya Kavacha
SDG2	All women age 15-49 years who are anaemic	47.80%		
SDG2	% Children who are underweight	32.00%		
SDG2	% Pregnant women aged 15-49 who are anaemic	45.40%		
SDG2	Children under 5 years who are underweight (weight-for-age)	32.90%		
SDG3	Maternal mortality rate	92	HFW	

Only 1.38 crore Ayushman Bharat Cards issued in Karnataka (as on 12 April) accounting to 20% of est population. Details of population to be covered are provided below[iii]:

Exhibit 150

Rank by progress

Rank	District	Cards issued	% Population covered
30	Bengaluru Urban	3,59,620	97.48
29	Yadgir	1,75,328	87.87
28	Ballari	4,62,962	86.32
27	Raichur	3,50,888	84.23
26	Kalaburagi	4,91,526	83.78
25	Mysuru	5,61,413	83.67
24	Bidar	3,43,851	82.24
23	Koppal	2,93,942	81.8
22	Kolar	3,31,609	80.56
21	Dharwad	4,27,071	79.95

Rank	District	Cards issued	% Population covered
10	Gadag	3,19,523	72.62
9	Shivamogga	5,32,776	71.6
8	Chitradurga	5,30,527	70.82
7	Bengaluru Rural	3,54,795	69.61
6	Uttar Kannad	4,71,356	69.11
5	Chamarajanagar	3,35,006	69.04
4	Chikballapur	4,40,243	68.1
3	Haveri	5,70,242	67.89
2	Chikkamagaluru	4,01,803	64.66
1	Udupi	4,97,759	62.46

Education index

Targeted interventions for the indicators outlined below through the following schemes are suggested which can Gross Enrolment Ratio (especially girls) and Female Literacy.

Exhibit 151

SDG	Indicators	Prevalence	Department	Schemes
SDG4	Gross Enrolment Ratio (GER) in higher secondary (class 11-12)	44.4	School education and Literacy	• Samagra Shikshana Abhiyana – Karnataka • Vidya Vikasa Scheme – Incentive for students • Scholarships to farmers children • Infrastructure facilities for primary and high schools and PU colleges in aspirational talukas
	Female literacy	75		• New India literacy programme

Income (Social) index

Targeted interventions for the indicators outlined below through the following schemes are suggested which can improve the standard of living by providing Pucca Houses, Piped Water Supply, Gas Connection and providing skill training for employment opportunities in manufacturing sector.

Exhibit 152

SDG	Indicators	Prevalence	Department	Schemes
SDG1	Percentage of households having access to pucca house	63%	Housing	• Dr. B.R. Ambedkar Nivas Scheme • Ashraya – Basava Vasathi • Vajpayee Urban Housing Scheme • Central Grants – Pradhan Mantri Awas Yojana-Urban • Pradhan Mantri Awas Yojane Grameena
SDG6	Rural population getting safe and adequate drinking water within premises through PWS	59.47%	RDPR	• Jal Jeevan Mission (Rural Water Supply Scheme)
SDG 7	Percentage of households having access to clean cooking fuel	79.70%	FCS	• Shakti Sadan (Swadhar Greh, Ujjwala)
SDG9	Manufacturing employment as a percent of total employment	11.74%	MSME	• Pradhan Manthri Kowshalyavikas Program • National Apprenticeship Promotion Scheme (NAPS) • Chief Minister Kaushalya Karnataka Yojane

Gender inequality index

Gender Inequality Index is calculated based on the following dimensions/ Indicators:

Exhibit 153

Dimension	Female	Male
Reproductive health	**MMR:** Maternal mortality rate defined as number of deaths per 1,00,000 live births, SRS **AFR:** Adolescent fertility rate defined as births per 1,000 women ages 15–19, SRS	
Empowerment	**PRF:** Female parliamentary representation (%)	**PRM:** Male - Parliamentary representation (%)
	SEF: Attainment at secondary and higher education by females (25+ years) (%)	**SEM:** Attainment at secondary and higher education by males (25+ years) (%)
Labour market	**LFPRF:** Labour force participation rate by females (%)	**LFPRM:** Labour force participation rate by males (%)

District ranking based on GII (2019) is as follows

As per AISHE report, only 32% of Girls pursue higher education. Girls who have dropped out from schooling, especially from Rural areas could adopt NIOS education and mainstream into formal education. This can provide them additional opportunities in formal employment with higher wage, thereby increasing their per capita income.

Despite 15% of state budget allocated to Women, there[iii] is a gap in achieving the outcomes in nutrition, heath and education are

Exhibit 154

District	MMR	AFR (15-19)	Political Participation		Secondary education and above by adult (25+)		LFPR (15+)		GII	Rank
			Female	Male	Female	Male	Female	Male		
Dharwad	209	23	51.8	48.2	31.0	43.6	29.8	85.1	0.44	30
Bengaluru Rural	78	39	51.4	48.6	35.9	39.0	22.7	79.1	0.42	29
Belgaum	104	53	51.4	48.6	32.1	48.1	37.8	78	0.42	28
Tumkur	86	30	51.6	48.4	17.8	42.4	27.1	79.3	0.42	27
Raichur	127	52	54.6	45.4	11.7	19.2	43.8	73.6	0.41	26
Koppal	70	50	51.5	48.5	14.1	39.9	41.0	87.5	0.41	25
Mandya	73	36	51.5	48.5	29.9	43.9	26.9	84.3	0.41	24
Davangere	109	31	52	48	21.7	33.9	31.6	81.6	0.41	23
Mysore	85	42	55.9	44.1	29.0	37.9	28.4	76.6	0.40	22
Kolar	56	52	51.3	48.7	39.3	48.1	27.2	79.3	0.40	21
Bellary	155	23	50.9	49.1	20.8	33.7	35.2	78.5	0.40	20
Chikkamagaluru	58	34	52.6	47.4	34.9	36.7	19.5	74.1	0.40	19
Ramanagar	81	35	51.4	48.6	37.4	49.0	22.7	62.6	0.40	18
Kalaburagi	165	31	56.8	43.2	17.1	34.7	48.7	76.6	0.40	17
Chikkaballapur	63	33	51.7	48.3	34.5	49.0	24	65.9	0.38	16
Vijayapura	55	66	53.1	46.9	21.9	40.9	50.9	78.9	0.37	15
Chitradurga	89	46	54.6	45.4	27.2	41.9	51.1	73.1	0.36	14
Haveri	79	28	51.5	48.5	12.7	25.2	38.6	79.3	0.36	13
Yadgir	74	42	51.5	48.5	15.6	33.5	60.5	79.2	0.35	12
Chamarajanagar	44	37	51.5	48.5	22.8	25.0	30.5	79.1	0.34	11
Hassan	60	39	51.8	48.2	20.5	27.5	45.6	84.2	0.34	10
Shivamoga	95	19	61.5	38.5	25.2	25.9	31.1	73.0	0.33	9
Bagalkot	48	42	57.2	42.8	30.2	52.8	40.2	68.4	0.32	8
Bengaluru	59	17	54.5	45.5	57.1	69.1	24.6	76.1	0.32	7
Bidar	53	27	51.2	48.8	28.1	50.7	41.9	84.3	0.32	6
Gadag	65	17	51.8	48.2	30.7	45.2	31.7	83.5	0.32	5
Kodagu	64	23	52.0	48.0	39.3	30.9	36.1	73.5	0.30	4
Dakshina Kannada	89	12	51.7	48.3	30.2	38.2	37.8	73.5	0.28	3
Uttara Kannada	46	13	52.4	47.6	29.3	46.6	34.5	69.5	0.25	2
Udupi	83	10	54.4	45.6	32.3	35.4	580	60.7	0.21	1

Malnourishment index

Malnourishment Index has been calculated for using 13 indicators. Maternal, Infant and Child Nutrition index has been computed

Exhibit 155

Scenario - I		Scenario - II	
Maternal, infant and young child nutrition (MIYCN) Index	• Children Under 5 who are Stunted (height - for - age) (%) • Pregnant women age 15-49 years who are anemic (<11.0 g/dl) (%) • Non pregnant women age 15-49 years who are anemic (<12.0 g/dl) (%) • Children under 5 years who are underweight(weight-for-age) (%) • Children under 5 years who are wasted (weight-for height) (%) • Children under 5 years who are overweight (weight-for-height) (%) • Children under age 6 months exclusively breastfed (%)	Maternal, infant and young child nutrition (MIYCN) Index	• Children Under 5 who are Stunted (height - for - age) (%) • Pregnant women age 15-49 years who are anemic (<11.0 g/dl) (%) • Non pregnant women age 15-49 years who are anemic (<12.0 g/dl) (%) • Children under 5 years who are underweight (weight-for-age) (%) • Children under 5 years who are wasted (weight-for height) (%)
Diet-related non-communicable disease (NCD) Index	• Men Elevated blood pressure (Systolic>=140mm of Hg and/or Diastolic>=90mm of Hg) or taking medicine to control blood pressure (%) • Women Elevated blood pressure (Systolic>=140mm of Hg and/or Diastolic>=90mm of Hg) or taking medicine to control blood pressure (%) • Women who are overweight or obese (BMI>25.0 kg/m2) (%) • Men who are overweight or obese (BMI>25.0 kg/m2) (%) • Men Blood sugar level - high or very high (>140 mg/dl)or taking medicine to control blood sugar level (%) • Women Blood sugar level - high or very high (>140 mg/dl)or taking medicine to control blood sugar level (%)	Life Style Related Ill-being Index (LSRIB) Index	• Children under 5 years who are overweight (weight-for-height) (%) • Children under age 6 months exclusively breastfed (%) • Men Elevated blood pressure (Systolic>=140mm of Hg and/or Diastolic>=90mm of Hg) or taking medicine to control blood pressure (%) • Women Elevated blood pressure (Systolic>=140mm of Hg and/or Diastolic>=90mm of Hg) or taking medicine to control blood pressure (%) • Women who are overweight or obese (BMI>25.0 kg/m2) (%) • Men who are overweight or obese (BMI>25.0 kg/m2) (%) • Men Blood sugar level - high or very high (>140 mg/dl)or taking medicine to control blood sugar level (%) • Women Blood sugar level - high or very high (>140 mg/dl)or taking medicine to control blood sugar level (%)

District ranking for Malnourishment index

Districts of Kalyana Karnataka Region have performed poorly in both the scenarios. Rs 5000 crore has been allocated through various schemes to tackle malnutrition in the 2023-24 state budget.

Exhibit 156

	Scenario I				Scenario II			
Districts	**MIYCN Index**	**Rank**	**DRNCD Index**	**Rank**	**MIYCN Index**	**Rank**	**LSRIB Index**	**Rank**
Raichur	0.584	3	0.079	30	0.747	3	0.094	30
Haveri	0.082	30	0.451	19	0.481	13	0.104	29
Yadgir	0.63	2	0.086	29	0.75	2	0.107	28
Koppal	0.534	7	0.261	26	0.796	1	0.225	27
Bellary	0.512	9	0.268	25	0.667	4	0.25	26
Bidar	0.567	4	0.242	28	0.643	6	0.256	25
Gulbarga	0.641	1	0.242	27	0.662	5	0.278	24
Belguam	0.562	5	0.302	24	0.613	7	0.316	23
Bagalkot	0.524	8	0.316	23	0.589	10	0.318	22
Bijapur	0.51	10	0.347	22	0.554	11	0.351	21
Gadag	0.491	13	0.425	20	0.612	8	0.376	20
Uttara Kannada	0.465	14	0.424	21	0.468	14	0.428	19
Mysore	0.316	23	0.592	14	0.365	19	0.484	18
Chikkaballapura	0.344	21	0.535	17	0.356	22	0.486	17
Dharwad	0.543	6	0.545	15	0.592	9	0.514	16
Chamarajanagar	0.372	20	0.63	13	0.424	17	0.528	15
Kolar	0.231	27	0.51	18	0.174	28	0.541	14
Dakshina Kannada	0.438	17	0.536	16	0.361	20	0.589	13
Udupi	0.314	24	0.646	12	0.289	24	0.606	12
Mandya	0.152	29	0.814	4	0.146	30	0.631	11
Davanagere	0.499	12	0.721	7	0.548	12	0.637	10
Chitradurga	0.448	15	0.712	8	0.455	15	0.653	9
Shimogga	0.507	11	0.654	11	0.45	16	0.679	8
Bengaluru Rural	0.424	18	0.679	10	0.359	21	0.701	7
Chikamagalur	0.443	16	0.691	9	0.371	18	0.723	6
Hassan	0.338	22	0.777	5	0.282	25	0.763	5
Tumkur	0.313	25	0.755	6	0.245	27	0.768	4
Ramanagara	0.202	28	0.831	3	0.157	29	0.775	3
Kodagu	0.412	19	0.874	2	0.33	23	0.894	2
Bengaluru Urban	0.309	26	0.984	1	0.263	26	0.903	1
KARNATAKA	0.494		0.566		0.509		0.543	

Child rights index

It is suggested to the children with the right tools and prepare them for the future. Child Rights Index has been computed at a State level for 5 rights from 14 indicators.

Karnataka ranks 7 in the country with a score of 0.623 while Kerala and Tamilnadu are at the top in fulfilling child rights and enabling them to grow and achieve their fullest potential.[iii]

Exhibit 157

Child rights	Indicators
Right to life	• Under 5 Mortality • Life expectancy at Birth • Maternal Mortality Ratio
Right to healthcare	• Percentage Children under 5 yrs who are underweight • Immunization of 1 yr old child • Percentage of Population with improved sanitation facilities (urban and rural) • % Population with improved drinking water facility (urban and rural)
Right to education	• Expected years of schooling of girls • Expected years of schooling of boys • Gender inequality in expected years of schooling (absolute difference between boys and girls)
Right to protection	• Child labour • Adolescent birth rate • Birth registration
Right to enabling safety environment	• Crime against children

Multidimensional poverty index

Multidimensional Poverty Index (MPI) aims to measure the non-income-based dimensions of poverty, to provide a more comprehensive assessment of the extent of poverty and deprivation. The MPI tracks deprivation across three dimensions and 12 indicators as outlined below for 226 Taluks across 31 districts. Data from NFHS 5 survey has been utilized to compute the MPI at various levels – District, Taluk and State.

Exhibit 158

Dimensions	Indicator	Reasoning
Health	**Maternal health**	• A household is considered deprived if any child between the ages of 0 to 59 months, or woman between the ages of 15 to 49 years, or man between the ages of 15 to 54 years -for whom nutritional information is available - is found to be undernourished
	Child and adolescent mortality	• A child/adolescent under 18 years of age has died in the family in the five-year period preceding the survey
	Nutrition	• A household is deprived if any woman in the household who has given birth in the 5 years preceding the survey, has not received at least 4 antenatal care visits for the most recent birth, or has not received assistance from trained skilled medical personnel during the most recent childbirth
Education	**Years of schooling**	• Not even 1 member of the house aged 10 years and above attended 6 yrs of schooling
	School attendance	• Any school-aged child is not attending school up to the age at which he/she would complete class 8.The household has inadequate housing: the floor is made of natural materials, or the roof or wall
Standard of Living	**Housing**	• The household has inadequate housing: the floor is made of natural materials, or the roof or wall are made of rudimentary materials
	Electricity	• The household has no electricity
	Bank account	• No household member has a bank account or a post office account.
	Drinking water	• Households with source of safe drinking water beyond 30 mins walk from home
	Sanitation	• Households with no improved or shared toilets
	Assets	• The household does not own more than one of these assets: radio, TV, telephone, computer
	Cooking fuel	• A household cooks with dung, agricultural crops, shrubs, wood, charcoal or coal

Exhibit 159

Multi-dimensional poverty index - top and bottom 10 districts in Karnataka[1]

Rank	Top 10 District	MPI
1	Bengaluru Rural	0.0005
2	Ramanagara	0.0012
3	Dakshina Kannada	0.0015
4	Chikkamagaluru	0.0018
5	Kolar	0.0018
6	Kodagu	0.0031
7	Mandya	0.0032
8	Mysuru	0.0039
9	Udupi	0.0043
10	Hassan	0.0055

Rank	Bottom 10 District	MPI
31	Yadgir	0.1150
30	Kalburgi	0.0776
29	Vijayapura	0.0677
28	Raichur	0.0518
27	Bidar	0.0485
26	Gadag	0.0480
25	Koppal	0.0446
23	Ballari	0.0383
23	Vijayanagara	0.0383
22	Haveri	0.0367

1. Human Development committee

Exhibit 160

Multi-Dimensional Poverty Index - Top and Bottom 10 Taluks in Karnataka

District	Taluk	MPI	Ranking
Bengaluru Rural	Hoskote	0.0000	1
Bengaluru Rural	Nelamangala	0.0000	2
Dakshina Kannada	Mangalore	0.0001	3
Dakshina Kannada	Mudabidri	0.0001	4
Chikkamagaluru	Sringeri	0.0002	5
Ramanagara	Magadi	0.0002	6
Mandya	Mandya	0.0002	7
Kolara	Kolar	0.0002	8
Bengaluru Rural	Devanahalli	0.0005	9
Belagavi	Khanapur	0.0131	10

District	Taluk	MPI	Ranking
Yadgir	Gurumithakala	0.1794	226
Kalburgi	Yadrami	0.1633	225
Yadgir	Shorapur	0.1081	224
Vijayapura	Talikote	0.1063	223
Yadgir	Vadagera	0.1046	222
Yadgir	Yadgir	0.1028	221
Kalburgi	Kamalapura	0.1010	220
Yadgir	Shahapur	0.1009	219
Kalburgi	Jevargi	0.0921	218
Gadag	Rona	0.0907	217

Upon analysis, a strong co-relation between MPI with houses with low Sanitation, Cooking Fuel, Assets , Nutrition and moderate co-relations with households deprived of schooling and maternal health was found.

Social security is an important enabler, but there is a gap between the have and have not's. Details of coverage achieved by Social Security Schemes in the State is as below:

In order to successfully eliminate MPI it is pertinent to saturate the government schemes through a targeted approach. Two Programs: Aspiration Taluka Program and Data Lake were initiated to address improve the above indices.

Exhibit 161

Scheme	Total beneficiaries	Total population (including potential beneficiaries)	Gap
Indira Gandhi National Old Age Pension	18,00,316	57,91,032 (as per census 2011)	38,10,175 (Gap calculated based on projected old age population)
Sandhya Suraksh Yojane	30,32,610	76,58,000 (as per projections by NCP (2021)	
Manaswini Pension	1,37,454	-	
Mythri Pension	2020	20,266 (Census 2011)	18,725
Pension for widow of suicided farmer	5,382	-	
Physically Handicapped Pension	9,29,829	13,24,205 (Census 2011)	6,24,562
Acid Victim Pension	44	-	
Endosulphan Pension	6,798	-	
Widow Pension	17,74,983	29,89,429 Census 2011)	14,51,071
Total	**7,689,436**		

Note: This data does not cover the beneficiaries of central social security schemes in the state of Karnataka.

Aspirational taluka program

The Aspirational Taluka Program was designed to index the each taluka for Nutrition, Health and Education dimensions, identify the poor performing taluks and channelize efforts of all stakeholders like government departments, NGOs, Private sector, academia etc.

102 taluks in Nutrition, 100 in Health and 93 in education were indentified as Aspiration Taluks.

For the first time, in 2022-23 Rs 3,000 crore was provided in the State Budget for improving the quality of education in 93 talukas, strengthen the health services in 100 talukas and alleviate child malnutrition in 102 talukas.[iii]

The success of the Aspirational Taluka Program has resulted in its continuity and enhancement for 2023-24 wherein basic amenities and essential human resources will be provided and action will be taken to deliver various services of the Government to the people.

The Aspiration Talukas for some important indicators of human development (inclusive of the various indices mentioned above) are as follows:

Exhibit 162[1]

S. No	Indicator	Aspirational taluk	Number
1	No. of households to be provided with access to safe drinking water	26	18,79,033
2	No. of households to be provided with access to modern cooking fuel	104	21,00,263
3	No. of households to be provided with access to toilet	95	19,98,573
4	No. of households to be provided with access to pucca house	118	34,68,940
5	Maternal Mortality Rate (MMR)	82	511
6	Infant mortality rate	86	2,439
7	No. of pregnant women who should undergo atleast 4 ANC Visits	100	1,09,706
8	No. of households received Health Insurance (%)	122	69,70,447
9	Children age 12-23 months to be fully vaccinated (%)	103	2,41,017
10	Children under age 3 years who should be breastfed within one hour of birth (%)	118	3,51,209
11	Children under 5 years who are underweight (weight-for-age) (%)	112	12,79,643
12	Children age 6-59 months who are anaemic (%)	125	23,58,573
13	Adolescent girls aged 15-19 years who are anaemic (%)	113	11,32,192
14	Children age 6-23 who should receive adequate diet	141	9,44,189
15	Pregnant women age 15-49 years who are anaemic (%)	113	3,07,194
17	Number of schools to be provided functional ICT	224	3,079
19	Number of Schools to be provided functional girls toilets	194	1,075
21	Number of secondary schools with PTR above 30	207	1,116
22	Number of females to be made literate	104	36,38,089
23	Drop out rate in high school	103	1,36,267
24	Number of secondary schools to be provided with maths teacher	215	1,304
25	Number of secondary schools to be provided without science teacher	222	1,652
26	Number of secondary schools to be provided with English teacher	222	3,329
27	Number of secondary schools to be provided with Social teacher	221	1,700
28	Number of schools without library	204	3,388
29	Number of schools to be provided with internet connection	226	29,374

1. Human Development committee

Data lake

Datalake in an Artificial Intelligence based initiative between Dept. of Planning and IIIT-B. The primary objective is to design and develop necessary technologies and data models to support data-driven decision making. Dept. of Planning plays a significant role in ensuring optimised allocation of resources and in ensuring that resources reach the right objectives at the right time. It is imperative to make planning activities process-oriented and data-driven.

Data lake provides for policy intervention that would mathematically translate into conditioning of several variables across several models. Conditioning of these variables would propagate changes in variables downstream, leading to some change in the target variable of the respective Bayesian network.

A comparison of Impact analysis of various factors leading to IMR/U5MR and MMR are as follows:

Exhibit 163

Infant mortality rate	Impact (%)
Skilling/literacy, Per capita income	17.75
Iron folic intake (Mothers)	11.83
Under-weight (Children)	9.12
Houses requiring gas connection	8.53
Pregnant women ANC 4th visit	8.13
Diarrhoea (Children)	7.89
Vitamin A intake (Children)	7.15
Stunted (Children)	6.41
Breastfed for 6 months	5.42
Houses requiring electric connection	4.93
Anaemic women	4.56
Kutchha houses	4.26
Low birth weight	4.02

Under 5 mortality rate	Impact (%)
Immunization (children)	14.18
Skilling/literacy, Per capita Income	17.82
Married under 18	6.27
Postnatal care	6.55
Stunted children	5.00
Under-weight Children	6.00
Sever Acute malnutirion	5.56
Adequate diet (Children)	5.55
Iron folic acid (Mothers)	5.53
Wasted (Children)	5.49
Women BMI	5.23
Anaemic children	5.17
Moderately Acutre Malnutrition	4.96
No electricity	3.64
No assets	3.04

Maternal mortality rate	Impact (%)
No sanitation	22.76
Providing pucca houses	17.35
Pregnant women ANC 4th visit	16.63
Requiring health insurance	13.83
Low BMI (Adult)	13.41
Pregnant anaemic women (15 -49 yrs)	8.26
Skilling/literacy, per capita income	7.77

As seen from the above tables of correlation, the Mortqality rate depends on the skilling levels, literacy of women and per capita income.

- Imparting literacy to women, ensuring 100% girls to attend school, or vocational education are strategies which will have a positive impact on reducing infant/ Maternal mortality.
- According to IMF, reaching gender parity in labour force would boost India's GDP by as much as 27%

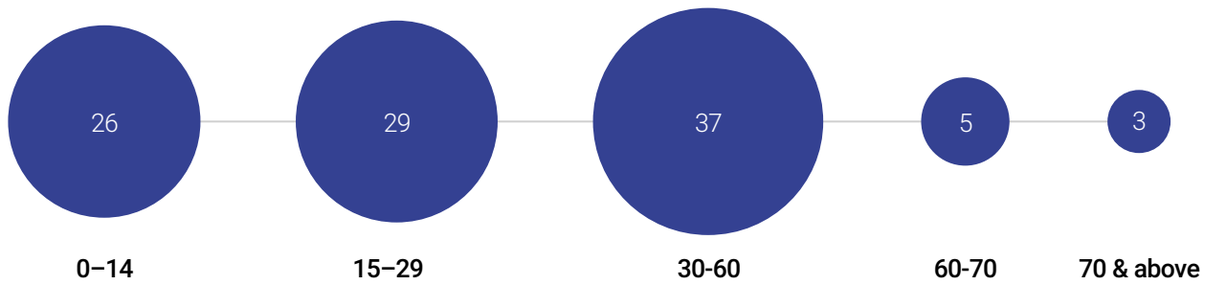
Role of youth in human development

Karnataka's demographic dividend is as follows:

Youth contribute to 29.2% (est 2.1 crore) of the state's population whose potential should be harnessed in achieving USD 1 trillion economy[iii].

Exhibit 164

Percentage of est. 7.19 crore population



Youth data in education

In 2018, around half (48%) of the state's youth population were in the lowest bracket of attainment (10th grade and below).

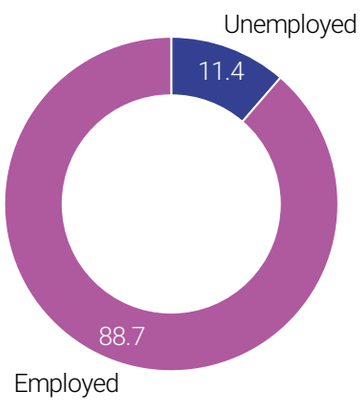
- 32% of the youth population had completed higher secondary education (11th or 12th grade).
- Only 21% completed tertiary education (undergraduate or postgraduate education)
- Gross Enrolment Ratio (GER) in Higher Secondary Education is 55.6
- Gross Enrolment Ratio (GER) in Higher Education (18- 23 years) is 32

Youth data in health

- 49.4% of Women age 15-19 years are anaemic
- 26.5% Men age 15-19 years are anaemic
- 21.3% of women aged 20-24 years are married before age 18 years
- 30% of all deaths due to suicide in the state.
- 40% is adolescent fertility rate for women age 15-19 years

Exhibit 165

Details of youth employment





Skill development plays a vital role in preparing them to be future ready. Karnataka leads the country in Gig economy, with an estimated 79 lakh jobs in the gig economy.[iii] Four broad areas of skilling: Soft skill (which includes mental well being and language skills), Future skills (Drone technology, AI, ML, Space tech and cyber security), Green Skills (E-mobility, EV, Renewable energy etc) and Core Skills (Manufacturing related) have to be focused.

NASSCOM has embarked on a free online FutureSkills program with the Department of Skill Development and Department of Higher Education with a target of 5 lakh people.

An IMF study indicates that Skilling can contribute from 0.5 to 2% of GDP and a study by Gallop has estimated USD 509 Billion[iii] as contribution to National GDP through Digital skills like Cloud Computing, Software development etc.

Currently. there are only 800 accredited skill training providers in Karnataka who can skill only 60,000 youth per annum. 100 Polytechnics[iii] and 250 ITI s can cumulatively train around 1.6 lakh youth per year totalling to est 2.2 lakh youth vocationally skilled per anum.

Skilling should be made into a mass movement with every institute of higher education mandatorily skilling youth as per NSQF framework.

SDG finance

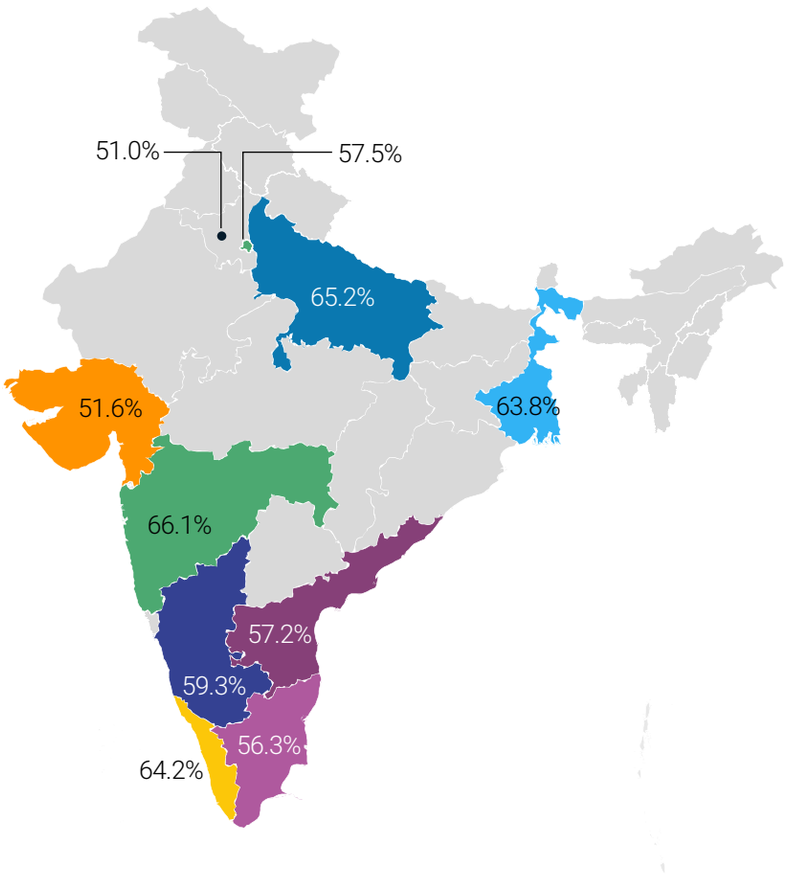
Human development comes at a cost – both literally and figuratively. Currently, Human Development has been achieved at the cost of Climate Change. An estimate from world bank states that Climate change alone is cutting into 3% of GDP.[iii] There is a global resolve to take corrective action against climate change.

Corporate India has embraced SDGs and aligning their activities through ESG (Economic, Social and Governance) reporting and Business Responsibility and Sustainability Reporting (BRSR). Corporate India is in sync with the Government of India which has announced Green Bond Budgeting, which has resulted in India joining the Sovereign Green Bonds Club with USD 2 billion subscription of Green Bonds January 2023.

As a leader in Innovation, Karnataka could bring out instruments like Social Bonds, Green Bonds, Carbon credits etc and leverage on the current market sentiment.

Exhibit 166

States with highest employability



1. Maharashtra
2. Uttar Pradesh
3. Kerala
4. West Bengal
5. Karnataka
6. Delhi
7. Andhra Pradesh
8. Tamil Nadu
9. Gujarat
10. Haryana

Source: India sills report, ISR 2022

Conclusion

Human development can contribute to USD 30 billion in Karnataka's economy in the next 7 years by achieving the following:

- 100% of the youth are skilled
- Gender parity in labour force participation from the current 23% to 50%
- Enhancing overall labour force participation of state from current 53.26%
- Infant and Maternal Mortality is reduced to 0
- Anaemia in child, adolescent and women is reduced to 0
- Pucca houses are provided to 32% deprived population
- Individual household toilets are provided to 25% deprived population
- Clean cooking fuel is provided to 23% deprived population

Sustainable and inclusive human development will ensure economic growth and prosperity of the state.

References

i Karnataka economic survey

ii GDP performance and value forecast

iii Human Development committee