STRUCTURAL FRAMEWORK FOR ACCESSIBLE URBAN INFRASTRUCTURE IN SMART CITIES

Foreword

We are happy to share with you the report on 'Structural Framework for Accessible Urban Infrastructure in Smart Cities' produced jointly by Federation of Indian Chambers of Commerce & Industry (FICCI) and National Centre for Promotion of Employment for Disabled People (NCPEDP). We thank Oil and Natural Gas Corporation Ltd (ONGC) for supporting the study.

In order to successfully achieve the Sustainable Development Goals (SDGs), it is imperative to encourage an inclusive environment with accessibility at its core. People with disabilities encounter lack to access of basic urban services due to inadequate information, communication and most importantly, non-inclusive policies. Such an environment acts as a barrier for inclusive growth. Accessibility is an investment that significantly contributes towards social and economic development leading to equitable growth.

Government of India in the recent times has widely recognized the necessity for disable-friendly policies. Unique Disability ID (UDIDs); "Accessible India Campaign"; Transport accessibility initiatives; Skilling programme for disabled; Increased reservations in government jobs to 4% from the earlier 3% for a certain class of people with disability along with several other benefits and facilities have been some of the welcome initiatives. It is however equally important to create ongoing policy dialogues amongst the key stakeholders for championing the cause of improving accessibility leading to economic and social development of the country.

Smart Cities Mission, the flagship programme of Government of India is another very relevant platform for addressing accessibility. While the investments are being made, it is important to create adequate awareness, planning and vision at the initial stages of structuring and design for bringing smart city benefits to all citizens - including those with disabilities. Smart urban Infrastructure & Facilities, ICT Accessibility, Digital Inclusion, Transport and Mobility convenience for the disabled are proposed to be embedded in the master plan for Smart Cities.

The report studies the infrastructural framework proposed in select cities, which are to be developed as Smart Cities, and recommends the reference framework for building accessible Urban Infrastructure in Smart Cities.

We hope you will find this report useful. Your suggestions and feedback are welcome.

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Foreword

Over 70 million people in India live with disabilities – the largest minority and yet for the longest time the most invisible - deprived of their basic, fundamental rights and held hostage to an inaccessible environment around them. And this status quo now stands to change. This disruption is being caused by the new Rights of Persons with Disabilities Act 2016 that is changing the focus from a charitable, 'do good' approach to one that talks of rights of persons with disabilities and responsibilities of all stakeholders - whether Government or the private sector, providing a legal framework and definite timelines for its implementation.

It was indeed fortuitous for us that several developments happened almost simultaneously. The Hon'ble Prime Minister flagged off the Accessible India Campaign in December 2015, shifting focus to the very urgent issue of accessibility faced by people with disabilities in their everyday life. The Smart Cities Mission launched in the same year, focuses on the most pressing needs of the people and on the greatest opportunities to improve their lives. And we, in the disability sector, believe that this is the one opportunity to make India accessible, disabled friendly so that its disabled citizens can lead a life of dignity , independence and equality. The challenge is now for us to reach out to the 100 cities with our message. The greater challenge is also to explain the accessibility in its entirety, beyond the built infrastructure to also include ICT and IT enabled services – the greatest enabler for persons with disabilities. We, at NCPEDP, with support from the Smart City Mission at the Ministry of Urban Development, Mphasis and Cisco have been organising a series of stakeholder seminars in select cities across India with our message of inclusion and accessibility.

Now, as developments take place in the Smart Cities, it is important that they be viewed for compliance from the lens of the RPWD Act. We, at NCPEDP, work closely with the Government to ensure that appropriate Guidelines/Standards are in place. We have worked with the Ministry of Consumer Affairs, Food and Public Distribution to make the National Building Code 2016 a truly world class standard for the built environment and are working with the Ministry of Electronics and Information Technology to revise the Guidelines for Government Websites, to ensure it encompasses not just websites but also mobile apps. All that is now required is 'implementation' and that will be ensured is when accessibility for people with disabilities becomes a mandatory clause for all procurement.

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Introduction

The population explosion and the rate of urbanisation have caused an immense pressure over the existing urban scenario. The cities are changing their form and structure at the advent of decreasing resources, a large influx of population, increasing infrastructural demands and deteriorating environmental conditions. In 2016, an estimated 54.5% of world's population lived in urban settlements and is projected to be about 60% in 2030. (United Nations, 2016)[1]. To combat this mounting pressure and to manage the resources more efficiently in order to provide better services, the concept of Smart Cities evolved. The origin of the concept of Smart Cities finds its trace back to the smart growth movement like in the city of Portland, Oregon. (Donnelly)[2] The idea is to integrate technology-based innovations in the existing urban systems for better functioning and efficient service delivery. The ideology of smart city varies globally from place to place. There lies a range of conceptual variants relating to the idea of Smart Cities such as Digital City or Intelligent City. (Center for Study of Science, 2015)

Disability and the legal framework for accessibility

According to the World Health Organisation (WHO), about 15% of the world's population lives with some form of disability. The number of persons with disabilities is increasing due to medical developments, the rise of ageing population and the spread of chronic diseases. Though the Census 2011 puts the population of people with disabilities at a mere 2.21% of the population, disability activists put this figure between 7 -10% of the total population.

The newly enacted Rights of Persons with Disabilities Act, 2016 recognizes a total of 21 disabilities, given below. Multiple disability refers to a person having two or more of the recognized disabilities. The last category refers to any disability that maybe notified by the Government in the future.

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[1] *United Nations, (2016). The World's Cities in 2016, Data Booklet.*

[2] *Donnelly, C. H. A Theory of Smart Cities .*

1. Locomotor disability
2. Muscular Dystrophy
3. Leprosy cured
4. Dwarfism
5. Cerebral Palsy
6. Acid attack victim
7. Low vision
8. Blindness
9. Deafness
10. Hard of Hearing
11. Speech and Language Disability
12. Intellectual Disability
13. Specific Learning Disability
14. Autism Spectrum Disorder
15. Mental illness
16. Chronic Neurological Conditions
17. Multiple Sclerosis
18. Parkinson's disease
19. Haemophilia
20. Thalassemia
21. Sickle Cell disease
22. Multiple Disabilities
23. Any other category as may be notified by the Central Government.

This large population, which is already marginalised, is at risk of being further excluded if accessibility and inclusion are not considered while designing the smart facilities and services.

The Right of Persons with Disabilities Act, 2016[3] makes accessibility, inclusion and non – discrimination mandatory. Under sections 40, 41, 42, 43,44,45,46, the Act emphasizes on accessibility of educational institutions, public buildings, new construction, sanitation facilities, transportation, documents, information, websites and mobile apps, products and services setting defined time lines for each.

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[3] http://www.disabilityaffairs.gov.in/upload/uploadfiles/files/RPWD%20ACT%202016.pdf

The Act requires the government to:

- Develop and adhere to standards/ guidelines for accessibility for the physical environment, transportation, information and communications, including appropriate technologies and systems, and other facilities and services provided to the public in urban and rural areas.
- Undertake steps to ensure:
    - All transportation is accessible
    - Roads are accessible
    - Aids and assistive devices for personal mobility are available at affordable cost.
    - All forms of media, electronic goods and equipment to be made accessible for people with disabilities
- Encourage development, production and distribution of universally designed consumer products and accessories.
- No establishment will be given permission to build or be issued a certificate of completion if the building does not adhere to Standards.
- All existing public buildings should be made accessible as per standards within a period of five years.
- Government and private service providers should provide services in accordance with the accessibility standards in time period of two years
- Government should formulate and publish an action plan for providing accessibility in buildings/spaces providing essential services.

Globally too, the **United Nations Convention on the Rights of Persons with Disabilities** (UNCRPD)[4], on which the RPWD Act 2016 is based under Article 9 details the need to enable persons with disabilities to live independently and participate fully in all aspects of life through measures, which shall include the identification and elimination of obstacles and barriers to accessibility applying to:

a) Buildings, roads, transportation and other indoor and outdoor facilities, including schools, housing, medical facilities and workplaces;

b) Information, communications and other services, including electronic services and emergency services.

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[4] http://www.un.org/disabilities/documents/convention/convoptprot-e.pdf

In more recent times Goal IX of the **Sustainable Development Goals** clearly mandates making cities and human settlements inclusive, safe, resilient, and sustainable, committing to providing by 2030, access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons and providing them universal access to safe universal and accessible, green and public spaces.

Access for All is no longer a matter of choice or charity. It is now the basic human rights of every citizen in the country including people with disabilities. It is only appropriate therefore that all new Smart Solutions for Smart Cities must take into consideration special requirements and needs of people with disabilities, the elderly and others.

Smart Cities in India

There exists no universally accepted definition of a smart city, with different groups and hierarchy of people the perception of smart city changes. The understanding of smart city will therefore vary from city to city depending upon the cities requirement and citizen's expectations, willingness to adapt changes and reforms. The main purpose of a smart city is to revive the cities on the ground of competitiveness and service delivery. To combat the mounting pressure of urbanization with the use of technology based innovations in order to provide better services and quality of life to its citizens is the main goal. According to a survey by UN State of the World Population Report in 2007, by 2030, 40.76% of country's population is expected to reside in urban areas. There resides a pressing need to use the resources more efficiently for sustainable development and smart cities can act as a major tool in addressing such problems. The smart city initiative could be a game changer in the recently found neglected and decentralized development objectives in cities in the country.

Smart Cities Mission, the flagship programme launched by Government of India in 2015, embarked upon creating a sustainable and an inclusive development through the provision of core infrastructure and a decent quality of life for 100 selected cities. Each selected city was assessed on their smart city proposal and thus accordingly attaining round wise ranking and funding.

Duration:
The Mission will cover 100 cities and its duration will be five years (FY2015-16 to FY2019- 20).

Strategy:
Broadly the smart city proposal comprises of area-based and pan-city proposal.

Components of Area Based Development:

The strategic components of area-based development in the Smart Cities Mission are:

1. City improvement (retrofitting)
2. City renewal (redevelopment) and
3. City extension (greenfield development) plus a Pan-city initiative in which Smart Solutions are applied covering larger parts of the city.

Below are given the details of the three models of Area-based smart city development:

- Retrofitting will introduce planning in an existing built-up area to achieve smart city objectives, along with other objectives, to make the existing area more efficient and liveable. In retrofitting, an area consisting of more than 500 acres will be identified by the city in consultation with citizens. Depending on the existing level of infrastructure services in the identified area and the vision of the residents, the cities will prepare a strategy to become smart. Since existing structures are largely to remain intact in this model, it is expected that more intensive infrastructure service levels and a large number of smart applications will be packed into the retrofitted smart city. This strategy may also be completed in a shorter time frame, leading to its replication in another part of the city.

- Redevelopment will effect a replacement of the existing built-up environment and enable co-creation of a new layout with enhanced infrastructure using mixed land use and increased density. Redevelopment envisages an area of more than 50 acres, identified by Urban Local Bodies (ULBs) in consultation with citizens. For instance, a new layout plan of the identified area will be prepared with mixed land-use, higher FSI and high ground coverage. Two examples of the redevelopment model are the Saifee Burhani Upliftment Project in Mumbai (also called the Bhendi Bazaar Project) and the redevelopment of East Kidwai Nagar in New Delhi being undertaken by the National Building Construction Corporation.

- Greenfield development will introduce most of the Smart Solutions in a previously vacant area (more than 250 acres) using innovative planning, plan financing and plan implementation tools (e.g. land pooling/ land reconstitution) with provision for affordable housing, especially for the poor. Greenfield developments are required around cities in order to address the needs of the expanding population. One well known example is the GIFT City in Gujarat. Unlike retrofitting and redevelopment, greenfield developments could be located either within the limits of the ULB or within the limits of the local Urban Development Authority (UDA).

Pan-city development

Pan-city development envisages application of selected Smart Solutions to the existing city-wide infrastructure. Application of Smart Solutions will involve the use of technology, information and data to make infrastructure and services better. For example, applying Smart Solutions in the transport sector (intelligent traffic management system) and reducing average commute time or cost of citizens will have positive effects on productivity and quality of life of citizens. Another example can be waste water recycling and smart metering which can make a huge contribution to better water management in the city.

The smart city proposal of each shortlisted city is expected to encapsulate either a retrofitting or redevelopment or greenfield development model, or a mix thereof and a Pan-city feature with Smart Solution(s). It is important to note that Pan-city is an additional feature to be provided. Since smart city is taking a compact area approach, it is necessary that all the city residents feel there is something in it for them also. Therefore, the additional requirement of some (at least one) city-wide smart solution has been put in the scheme to make it inclusive. For North Eastern and Himalayan States, the area proposed to be developed will be one-half of what is prescribed for any of the alternative models - retrofitting, redevelopment or greenfield development.
A Pan-city proposal comprises of a city-wide ICT based solution (as shown in Figure 1) aiming to resolve various urban problems.5

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5 *http://smartcities.gov.in/upload/uploadfiles/files/SmartCityGuidelines(1).pdf*

Figure 1 - Smart Solutions under Pan city Proposal

The Smart Cities Mission aims to drive economic growth and improve the quality of life of people by enabling local area development and harnessing technology, especially technology that leads to Smart outcomes. So far, proposals from 90 cities have been selected in Phase 1, 2 & 3 and remaining cities are yet to compete in the next round.

The mission states the fulfillment of basic needs through following elements:

- Adequate and clean water supply,
- Assured electricity supply,
- Sanitation facilities, including solid waste management,
- Efficient urban mobility and public transport,
- Affordable housing, especially for the poor,
- Robust IT connectivity and digitalization,
- Good governance, especially e-Governance and citizen participation,
- Sustainable environment,
- Safety and security of citizens, particularly women, children and the elderly, and
- Health and education

The implementation of the Mission at the City level will be done by a Special Purpose Vehicle (SPV) created for the purpose which will be headed by a full time CEO and shall have nominees of Central Government, State Government and ULB on its Board. The SPV will plan, appraise, approve, release funds, implement, manage, operate, monitor and evaluate the Smart City development projects. The execution of projects may be done through joint ventures, subsidiaries, public-private partnership (PPP), turnkey contracts, etc. suitably dovetailed with revenue streams.

The SPV appoints Project Management Consultants (PMC) for designing, developing, managing and implementing area-based projects. SPVs may take assistance from any of the empanelled consulting firms in the list prepared by MoUD and the handholding agencies. For procurement of goods and services, transparent and fair procedures as prescribed under the State/ULB financial rules may be followed.

Smart Cities Mission and Disability

Smart Cities focus on their most pressing needs of the people and on the greatest opportunities to improve their lives. They tap a range of approaches – digital and information technologies, urban planning best practices, public-private partnerships, and policy change – to make a difference. They always put people first. And 'people' by definition must include ALL the diverse groups that constitute the population of a city – women and children, people with disabilities, the elderly and the infirm and only when we include their needs in the planning and execution of our plans will Smart Cities become truly sustainable.

In India, approximately 7-10% people live with disabilities and an equal number rapidly acquiring disability on account of medical conditions, accidents and old age. The Hon'ble Prime Minister's Smart Cities Mission is the greatest opportunity to ensure their inclusion and participation in ALL new developments that will now take place in India, weaving together the provisions of the Digital India and the Accessible India Campaign to create an inclusive landscape that leaves no one behind.

The mission with its notion of inclusiveness and convergence fails to integrate disability as a key issue in the smart city proposal. In December 2015, the Prime Minister of India launched the Accessible India Campaign (AIC) for making India accessible for people with disabilities. However, after a year of its launch, it seems like an isolated campaign of Ministry of Social Justice and Empowerment (MSJE) with a very limited vision of making 'x' number of buildings and websites accessible. There is little/no action to explicitly integrate accessibility in other campaigns and programmes, like Swachh Bharat or Smart Cities Mission. The core infrastructure elements in a Smart City do not include accessibility for persons with disabilities. The diagram given below where the different campaigns of Government of India are mentioned around the Smart City,

Accessible India Campaign is missing. It is quite evident that accessibility is not on the radar of the Smart Cities Mission.

The mention of disability under the Mission statement and guidelines only lie on the part of citizen consultation which has failed to ensure the component of universal accessibility in every proposal.

The proposals of top 20 winning cities paint a poor picture in the inclusion of disabled population in above elements. They are invisible and excluded in components like safety and security, health, education, e-governance, affordable housing, etc. Cities are moving towards advanced, digital or smart services and yet the disabled population has to struggle hard to achieve basic needs, widening the social stratification. Poverty and disability are complementary; former cannot be alleviated without addressing the latter as a key issue in the Mission. Cities like Udaipur have incorporated the features for disability whereas cities like Jabalpur find no mention for the disabled population. The top 20 winning cities have completely neglected the role of digital inclusion for persons with disabilities in their proposal. While several of the city proposals talk about disabled friendly pathway design or barrier free walkways, almost all of them have neglected the access to IT enabled solutions like e-governance and citizen services.

City-wise proposal based disability audits

This section represents the disability audit of the top 22 Smart City Proposals. The smart city proposals for each city were audited for purposes of accessibility of the built environment and ICT. The positive aspect is that majority i.e. 17 out of 22 proposals have incorporated accessibility features in the area based solutions, for retrofitting and redevelopment focusing largely on improved walkability, accessible pathways and footpaths. Udaipur and Varanasi addressed tourism by incorporating Accessible Heritage walks and accessible Ghats respectively. Cities in

convergence with the Swacch Bharat Abhiyan e.g. Pune and Solapur incorporated the component of barrier free toilets. Surat, that planned its proposal for Smart area in convergence with the Accessible India Campaign focused on development of all sections with a special focus on persons with disabilities thus enhancing access to the physical environment, public transportation, knowledge, information and communication for achieving inclusiveness. Though accessibility is mentioned in the proposals, however, based on our visits to Smart Cities, like Varanasi, Pune, Udaipur, Guwahati, etc., it was found that the officials involved in the Mission did not have a plan or the knowledge to implement them. Many have not budgeted for the same.

Almost all other cities failed to provide for accessibility for people with disabilities in their ICT related or IT enabled services and almost all proposals have no mechanisms to ensure incorporation of these features. There seems to be a greater knowledge gap when it comes to IT accessibility among the officials. The concern is that if digital solutions are not accessible, it will further increase the inequality between people with and without disability.

1.   Ahmedabad Smart City Proposal Analysis

The city focuses on creating a vision for providing efficient, affordable, equitable and customized governance for all citizens. Creating accessibility options for persons with disabilities is a key goal.

The participatory planning process of the proposal highlights enforcing norms for disabled access and to enhance connectivity at all levels. The retrofitting and redevelopment proposal will be based upon the Development Control Regulations covering features for persons with disabilities like appropriate signages and accessible infrastructure for entrances, parking, toilets, etc. The area based development ensures adequate features for disabled population under built environment as per the Control Regulations.

The proposal talks about convergence of smart applications with pan-city solutions for persons with disabilities. Pan city proposal comprises of two major components that is Smart Transit and Command Control Centre. The Integrated Transit Platform would be developed such that the application would be easily accessible in multiple languages and voice enabled. The proposal covers the aspect of persons with disabilities in the ICT-led solutions for only mobility but does not ensure provisions for them in other ICT driven services.

2.   Amritsar Smart City Proposal Analysis

Amritsar smart city proposal aims at achieving sustainable infrastructure, safer public transport, accountable e-governance and inclusive growth.

The area based proposal will retrofit and redevelop the walled city area. It involves the provision of universal accessibility features for persons with disabilities like ramps, reserved parking lots, and wheelchairs at crossings. Apart from ensuring barrier-free paths and crossings there lays no

provision for persons with disabilities in other infrastructural facilities like real time display of transport information.

The pan-city proposal underlines smart solutions for traffic and mobility, solid waste management, e-governance and gas network distribution system. There is no mention of accessible technology for persons with disabilities. They will be left out in almost all ICT-based smart interventions like access to online public portals, mobile applications for real-time display of information of public transport, information portals for service delivery, application for tourists, etc. The proposal only highlights intervention in the sector of pedestrian mobility while completely neglecting the digital inclusion for persons with disabilities.

3.   Belagavi Smart City Proposal Analysis

Belagavi smart city proposal highlights the concept of HEAL city (eminent destination for Health, Education, Ancillary industry and Logistics sectors) by being inclusive, livable and culturally vibrant. The proposal broadly focuses on the development of physical and social infrastructure, intelligent transport system and e-governance.

Citizen's feedback analyzed for the proposal identified facilities for persons with disabilities as one of the priority sector but has not been covered comprehensively in the proposal.

The area based proposal states the provision of disabled friendly infrastructure for access to services like kiosks and ATMs; information and navigation maps; emergency phones and response system; ramps; etc. However, there is no mention of provision for intelligent transport system or other amenities. The pan-city proposal negates the need for citizens to physically go to government offices to pay bills or get services but does not state that these ICT-enabled solutions like smart phone apps with infrastructure provisioning would be accessible and disabled friendly. The proposal completely ignores the digital inclusion of persons with disabilities in aspects of e-governance and effective service delivery.

4.   Bhopal Smart City Analysis

The smart city proposal of Bhopal focuses on transforming the city into a leading destination for smart, connected and eco-friendly communities based on education, research, entrepreneurship, and tourism.

The area-based development aspires at providing compact, walkable and sustainable spatial morphology but mentions very few provisions for persons with disabilities under the heads of safety and social impact. These provisions do not, however, state the specific features that are going to be incorporated. There are no elements that ensure the accessibility of persons with disabilities to places like public plazas, vehicle free zones, hubs or facility centres.

Persons with disabilities are completely excluded from the pan-city proposal which focuses on maximizing the reuse of existing infrastructure, creating a backbone for smarter initiatives and modernizing service delivery. There is no mention of accessibility to the ICT-enabled solutions like city apps for information dissemination and service delivery. Holistically, the proposal lacks provisions in area-based and pan-city proposal both for persons with disabilities, excluding them from accessing the smart city features.

5. Bhubaneswar Smart City Proposal Analysis

Bhubaneswar aims at becoming livable, eco-friendly, transit oriented, regional economic centre and child-friendly city.

The area based development envisions retrofitting and redeveloping its city's core into vibrant space by promoting walk ability; mixed land-use; green infrastructure; pro-business environment and social equity. There is provision for accessible pathway designs for persons with disabilities and plans for urban regeneration of streets will include elements like slopes, ramps, installation of auditory traffic signals, engravings on surfaces at zebra crossings, Braille and tactile maps for bus transportation systems and directional signs.

The pan-city solutions include provision of guidance on barrier-free access points in public spaces, auditory signals and ergonomically designed bus queue shelters, allowing universal access. The notion of universal access to infrastructure and technology for all fails to integrate component of accessible technology for persons with disabilities.

The proposal fails to address the needs of persons with disabilities in its various projects like Project Swabhiman (multi-skill centre); Project Kusum (early childhood care centre); Project Kutumb (social equity centre); etc. The proposal only focused on the aspect of mobility while neglecting other sectors for persons with disabilities.

6. Chennai Smart City Proposal Analysis

The proposal creates a vision for Chennai as "City for Everyone". It focuses on social inclusion based on the principle of universal design, improved access, sustainability, mobility and social and economic empowerment.

The area-based development proposes retrofitting equipped with smart features setting as a global example for balanced and self-sustained mixed use. The component of pedestrianization, traffic calming and public transportation incorporates features for persons with disabilities like making streets 100% accessible for wheelchair users. The pan-city proposal focuses on improving the service delivery and efficiency of the physical infrastructure using technology. Yet services like online application portals, smart applications for tourists, applications for real-time information and other e-governance facilities with no mention of accessible technology.

The proposal has covered the aspects for persons with disabilities only in the sector of non-motorized transportation while neglecting provisions in all other sectors. The goal of robust IT connectivity and digitization through multiple platforms completely excludes disabled population by not involving them in the participatory planning process for efficient service delivery.

7.   Coimbatore Smart City Proposal Analysis

The Coimbatore smart city aims to be an inclusive, secure and effectively governed metropolis that offers the highest quality of life for its citizens. The vision of proposal revolves around the following five major themes: provision of best in class services, seamless mobility, sustainable environment, transparent ICT-LED governance and citizen engagement and a vibrant economy.

None of the above themes fully capture the criteria for persons with disabilities apart from citizen engagement. Although the primary focus of area based proposal is on retrofitting, based on the theme of environment, pedestrianization and universal access to services but there are no provisions for persons with disabilities. They are left out in all essential features of the area based development like integrated development of Lake Network, eco-mobility corridor, construction of toilets, re-configuring of arterial roads, creation of green spaces, pedestrian safety, etc.

Similarly, IT enabled solutions based on web-enabled e-governance applications to interact and transact with citizens do not ensure their accessibility for the disabled population.

8.   Davanagere Smart City Proposal Analysis

The proposal of Davanagere focuses on uniform growth and development of the city especially in terms of basic infrastructure. The Smart sustainable interventions aim at creating a city level impact by providing opportunities for all sections of the society. The Davangere Smart City Mission aims at providing a city that is liveable in safety and convenience, inclusive, financially vibrant and futuristic and aims at 'edutainment', economic prosperity and environmental friendliness.

The aspect of built environment and transportation in the proposal covers the provision for persons with disabilities- such as like voice data enabled services for visually impaired people, ramps for parking plazas, low floor city buses, etc. But the proposal in its retrofitting project involving components like vocational and skill training offers no economic opportunities for the upliftment of persons with disabilities.

The components of pan-city initiatives focus on smart mobility and ICT crowd mapping. There exists no mention of accessibility to these ICT-based smart initiatives for persons with disabilities. They would be excluded from public engagement platforms involving real time online community applications and websites. Digital inclusion for persons with disabilities cannot be ensured from the proposal despite the major focus being on creating an inclusive environment.

9. Guwahati Smart City Proposal Analysis

The smart city proposal of Guwahati creates a vision to become a world-class destination, promoting Eco-Tourism, Eco-Mobility, flood resiliency and sustainable model for urban renewal.

The area-based development involving the retrofitting approach will have barrier-free access features. The Eco-Mobility corridor and riverfront development will comprise of the barrier-free components like ramps, special parking lots, pelican signals, tactile paving, etc. In order to have a comprehensive development, the initiatives have been collaborated with AMRUT andinclude physical infrastructure around bus-stops, toilets, development of green spaces, etc which will incorporate universal access.

The demand assessment highlights few accessibility features in pan-city proposal. It will incorporate smart facilities at smart bus-stops like the announcement of the arrival of buses on Braille Information Boards. However, the inclusion of persons with disability finds no mention in ICT-enabled solutions like mobile applications for tourism or e-governance. There are also no provisions made in the component of flood resiliency and skill development. Holistically in the proposal, the inclusion of persons with disability is limited only to built environment but no provisions are made on the part of other services.

10. Indore Smart City Proposal Analysis

The Indore Smart City incorporates elements of sustainable urban mobility, environment, infrastructure, inclusive urban governance and citizen services, incubation of urban work force and investment opportunities broadly.

The components of transport and walkability covers several features for persons with disabilities under retrofit-redevelopment proposal of area-based development to the extent of pedestrian safety, barrier free universally accessible pathways, public spaces, crossings, streets and junctions. However, the other project activities and sectors have failed to cover features for persons with disabilities.

There is no consideration of persons with disabilities under the section on economy and employment with the establishment of incubation and skill development centres, on accessibility to IT-enabled government services, mobile based applications for solid waste management, electronic common mode of payment, smart classrooms, etc for improved service delivery. The proposal has only incorporated some measures for built environment while completely neglecting other sectors, especially digital inclusion for persons with disabilities.

11.   Jabalpur Smart City Proposal Analysis

The vision of the proposal focuses on transforming Jabalpur by developing four nodes: commerce, governance, tourism and education.

The proposal finds only mention of persons with disabilities in the part on citizen engagement and universal accessibility features for smart urban form. The proposal highly undermines the role of persons with disabilities in almost every goal like the generation of employment and sustainable travel options. The area based development talks about features like universally accessible spaces, pathways, facilities and crossings but fails to incorporate adequate provisions in the proposal.

Citizen engagement under the pan-city proposal of solid waste management through mobile applications and public domains will be inaccessible for persons with disabilities. There exists no inclusion of disabled population under the major nodes of the vision and the proposal only covers the aspect of mobility succinctly but does not highlight any exclusive proposal for persons with disabilities.

12.   Jaipur Smart City Proposal Analysis

The vision of the Jaipur Smart City proposal is to improve the quality of life of citizens through innovative and inclusive solutions, focusing on heritage and tourism. Major goals of the proposal involve smart multi-modal mobility; smart heritage and tourism; smart and sustainable civic infrastructure; and solid waste management.

The area based development under the component of Smart Mobility states provision of walk ability and ensuring barrier-free access. The proposal converges with the AMRUT Scheme which aims at providing safe road infrastructure for persons with disabilities. The essential features also highlight 100% coverage of barrier-free footpaths, universal access to public transport and raised pedestrian crossings for non-motorized transportation

The pan-city solutions fail to incorporate provisions for persons with disabilities, excluding them from the usage of public engagement platforms and mobile applications like heritage apps.

13.   Kakinada Smart City Proposal Analysis

The smart city proposal of Kakinada focuses on a sustainable development which is imperative and inclusive at the same time. The strategic focus is that the city should be livable, a place where every citizen including people with disabilities, compromising 1% of its total population, can lead a safe, healthy and prosperous life.

Although, the blueprint and vision of proposal talk about persons with disabilities but fail to mention accessibility features. The proposal fails to explain how the proposed services could be accessed by persons with disabilities. There are no considerations in the components and features

like pedestrian and NMT facilities; digital learning, commercial centres; pathways; smart signalization etc

The proposal also states the social impact for persons with disabilities like in the sector of skill development and creation of safe environment but does not state ways to accomplish it.

14.   Kochi Smart City Proposal Analysis

The strategic focus of the Kochi Smart City proposal is to creation of a cohesive society by ensuring the quality of life and universal access to smart urban services.

The key components of area based development involve seamless multi-modal transportation, reconstitution of urban forms and provision of smart urban services embedded with smart solutions. Kochi has 1200 registered persons with disabilities and the component of seamless mobility with barrier free elements will be an integral part with features like ramps, Braille equipped signs, soft landscaping, smart signages, etc. Provision is made for making five schools catering to the area, disabled friendly

The pan-city proposal has nothing to offer to the disabled population. In the absence of accessible technological solutions, people with disabilities are excluded from the ICT-based solutions like Government to Citizen Services; integrated mobile platforms, access to real time information, smart cards and other information systems. The proposal has incorporated persons with disabilities under area based development but has neglected them under ICT-based solutions.

15.   Ludhiana Smart City Proposal Analysis

The vision of the Ludhiana Smart City envisages enhanced quality of life to citizens along with accelerated growth and sustained prosperity. Major thrust areas of the proposal are non-motorized transportation; reduction in pollution; e-governance; public safety & health and creation of a green city.

The area based development concentrates on the aspects of walk ability and sustainability by the creation of a bicycle friendly and green city. It will incorporate features for improved streetscape and urban infrastructure. While the streetscape improvement will involve barrier-free design elements like ramps, grade for sidewalks and will mandate barrier-free designs for street guidelines, other facilities in landscape improvement and transportation improvement finds no provisions for persons with disabilities.

The pan-city proposal comprises of developing Smart E-Rickshaws and GIS enabled integrated information system. However, there exists no provision for accessible technology for persons with disabilities, who will be excluded from several services like the ease of payment, web-based interfaces and mobile applications.

16.   New Delhi Smart City Proposal Analysis

NDMC smart city envisages the vision of inclusive cities with a focus to address the needs of vulnerable groups including disabled population.

The vision has been incorporated in the area based proposal where it talks about universal access to the city centre with the special focus on persons with disabilities and achieving the global benchmark for accessible infrastructure for them. However, the ICT-enabled solutions fail to involve the vision for the disabled. The components of the pan-city proposal such as e-governance and smart health find no mention of persons with the disabilities except smart education where people with disabilities will be able to access digital libraries and specially designed courses.

The features of e-governance like mobile citizen applications, smart display of real-time information of buses, accessibility to government data, online portals for government services have no provision to ensure the accessibility of these services by persons with disabilities. Similarly, the disabled population is also excluded from the component of Smart Health which included online medical advice and virtual medical services.

17.   Pune Smart City Proposal Analysis

The proposal aims at becoming the most livable city in India. Its strategic focus being to improve the infrastructure, create an effective business environment and make neighbourhoods clean, green and fully livable.

The area based development concentrates on providing the best-in class global services in the sector of mobility, water management, employment and citizen services. One of the key componentis making pathways 100% accessible for persons with disabilities. Also, under sanitation, the design of the toilet would be as per the needs of persons with disabilities.

The pan-city solution focuses on the transportation system and water availability and offers special serviceproviding location-based services and CCTV technologies to notify authorities and family members of the disabled population. There exists no provision for accessible technology for smart applications and online portals for empowering persons with disabilities. Overall the proposal covers few aspects for persons with disabilities under sanitation, healthcare and mobility but completely neglects their inclusion under the ICT-based smart solutions with no accessible technology.

18.   Solapur Smart City Proposal Analysis

The city aims at providing a sustainable environment by ensuring efficiency of resources; clean and efficient infrastructure services; inclusive mobility options and by promoting a healthy

lifestyle. The vision of the city states Solapur as clean, efficient and progressive. The inclusive mobility options will also cater for a barrier free infrastructure for people with disabilities.

The proposal seeks convergence with the Swachh Bharat Mission and to meet the objective of no open defecation emphasizes on the construction of barrier-free toilets. The features of area based development highlight solutions for persons with disabilities like barrier-free pathways; footpaths enabled with ramps and prioritized signaling.

However, the pan-city development lacks features for the disabled population. They will be excluded from the responsive and accountable governance mechanism (multiple digital platforms) as there is no provision for accessible ICT based solutions for persons with disabilities. The proposal covers features for the disabled population under built environment and transportation but neglects their digital inclusion in other smart solutions

19.   Surat Smart City Proposal Analysis

The proposal focuses on enhancing the potential of the city for enhanced quality of life and providing equal access to best quality infrastructure. One of the goal highlights ensuring the development of all section of the society with a focus on persons with disabilities.

The area based development concentrates on efficient physical infrastructure, affordable housing and inclusiveness along with smart city systems. It proposes convergence of SMART area with the Accessible India Campaign, retrofitting all buildings (including private buildings and establishments) under the area as per the strategy of Accessible India Campaign. The proposal also highlights the implementation strategy for the convergence. Other facilities like textile markets, bus stops, signages and railway station will be made accessible through proper regulations.

The pan-city solution comprises of components like smart cards, Connected Surat, integrated transport mobility administration centre and smart city centre. Accessible India Campaign under pan-city solution will also ensure that information sharing through various means like mobile app; social media etc. is also taken up effectively for these schemes so as to have extended outreach. Features like the appointment of self-help coordinator in smart kiosk under integrated transport and connectivity for persons with disabilities makes pan-city solutions more comprehensive. Overall the proposal enhances access to the physical environment, public transportation, knowledge, information and communication for achieving inclusiveness.

20.   Udaipur Smart City Proposal Analysis

The Udaipur smart city proposal aims at becoming World's favourite lakeside Heritage City with a concept of "Eternal Udaipur." The smart initiatives are broadly covered in sectors of tourism; public transport and walkability; intelligent transport management system; and physical and social infrastructure.

The accessibility features for persons with disabilities have been incorporated into the area-based initiatives. The proposal has integrated the component of universal accessibility and inclusive design for persons with disabilities. Development of application that charts out information on disabled friendly establishments, availability of wheelchairs, audio guides, etc is an innovative feature in the components. The pedestrianization proposals are based upon fundamentals of 'universal access' to heritage walks and will have special provisions for persons with disabilities.

However, the accessibility features are dedicated to tourism only and are not fully covered in other smart initiatives. Social infrastructure like smart classrooms and smart clinics has ignored these aspects. Accessibility to ICT-enabled business processes and e-governance by persons with disabilities is also not ensured. Overall, the proposal has included accessibility features only in tourism sector but has failed to make provisions in other sectors and services.

21. Varanasi Smart City Proposal Analysis

The Varanasi smart city proposal focuses on rejuvenating the city by conserving and promoting its rich heritage through innovative inclusive solutions. The strategic goals of the city are to maintain the religious and heritage component of the city, making the city clean, to provide seamless mobility, to promote local entrepreneurship and smart services through use of ICT.

The area-based development succinctly covers disabled friendly interventions on the part of disabled friendly pathways, barrier free footpaths and disabled friendly toilets. The initiative is converged under the Accessible India Campaign and HRIDAY in order to make the selected ghats and roads disabled friendly. Apart from the transport sector there are no provisions for persons with disabilities under various categories like skill development centres, smart bus shelters, heritage walks, etc.

The pan-city development highlights interventions in the sector of Urban Mobility and E-governance. It introduces several features like e-Kashi app, smart card, community engagement portals, digital wallet, e-bookings, etc. The pan-city initiatives fail to integrate accessibility features for digital inclusion of persons with disabilities. Overall the proposal caters some disabled friendly interventions related to mobility but completely neglects the accessibility features for ICT-driven solutions.

22. Vishakhapatnam Smart City Proposal Analysis

The Vishakhapatnam proposal caters a vision of a resilient and a healthy metropolis for its people. With the focus of a mixed land-use planning and strong diverse social fabric, the city aims at creating a vibrant neighbourhood by minimizing the environmental footprint.

The area based development involves beach beautification project leading to a better environment for public engagement. It states to involve universal design elements for mobility by incorporating

features like tactile guides, obstruction free footpaths with ramps, bollard spacing for wheelchair users, audio signals for crossings, etc. However, the area based development neglects the needs of persons with disabilities under the component of affordable and equitable education.

The pan-city proposal states the establishment of Central Control and Command Centre focusing on disaster management system, e-governance and city operations. Disabled population is excluded from the ICT-based components like citizen engagement platforms and applications without accessible technology. The notion of universal accessibility in the proposal fails to address the traditionally ignored issue of digital inclusion for persons with disabilities with limited focus only on the built environment.

Challenges to Smart City Accessibility

The key challenges vis-à-vis accessibility for people with disabilities are:

1. Lack of awareness regarding need for improved accessibility for persons with disabilities by the stakeholders – the SPVs, the Project management Consultants and the vendors- whether for built infrastructure or for ICT.

2. The complex bidding pattern based on valuation on technical competence and the financial proposal often causes the bidder to cut corners on accessibility.

3. Area Based Development under Smart Cities implies that development will be limited to only certain sections of the city with well paved roads and pavements etc. But that accounts for a very small percentage of the physical area of the city. Thus accessibility features too remain disjointed across the city.

4. Poor coordination between various Governmental agencies. Most Smart Cities have a nodal officer for the Accessible India Campaign or a Commissioner for Persons with Disabilities and they should be necessarily involved in the decision making process.

5. Poor understanding of the laws and policies making accessible mandatory in Smart Cities planning and their poor implementation.

6. Absence of a specific regulatory authority to ensure accessibility features in each and every project under the Mission.

7. Empanelment of PMCs who are not familiar with accessibility guidelines/features and bureaucratic challenges to getting any changes implemented .

8. Absence of benchmarks for accessibility features as in the case of other services.

9.   Lack of cohesive leadership across all sectors- Government, corporate and civil society

10.   Absence of expertise within the country – whether in the area of the built infrastructure, ICT, documents and media, transportation, products and services – there is dearth of expertise within the country.

What is meant by improved accessibility in Smart Cities?

- Making public spaces/ infrastructure fully accessible. This includes Government buildings, educational institutions, public housing, places of tourist interest, places of religious interest, parks, shopping areas, hospitals and health centres, airports, railway stations and bus stops, boat jetties, kiosks, ATMs etc.
- Ensuring accessibility of new ICT based solutions and systems ranging from being able to read price tags, to physically entering a hall, to participating in an event, read a pamphlet, understand a train timetable or view webpages. Ensuring Government websites, all mobile apps and documents developed are accessible for people with disabilities as per the standards.
- Promoting accessibility of services physical and digital and other service and knowledge centres.
- Last but not the least, involving persons with disabilities in the development of policies and plans.

Recommendations:

1.   Create an Accessibility Cell within the Smart City Mission of Ministry of Urban Development.

2.   Create an Accessibility Committee/ core group of experts on disabilities to monitor the developments in each Smart City.

3.   Create a knowledge centre for providing necessary expertise in the area of accessibility.

4.   Involve local communities including people with disabilities/ accessibility experts involved in framing project proposals and involved in decision making.

5.   Provide awareness and training at different levels for appropriate stakeholders- bureaucrats, engineers, architects, IT professionals, auditors etc.

6.   Mandate accessibility as a clause for ALL public sector procurement.

7. Public Private partnerships to boost accessibility features especially where budgets have not been pre- fixed.

8. Ensure compliance with national and global standards. In case of the RFPs where accessibility was not mandatory, the vendor must be asked to submit a Voluntary Product Accessibility Template (VPAT) – a self declaration evaluating the accessibility of a particular product.

9. Devise mechanisms for monitoring developments. This could be a score card or an accessibility index developed on various parameters.

Conclusion

Our cities are profoundly unequal places and disability is increasingly an important urban struggle, especially in 'service' and 'being part of city'. (Steven Friedman) The Mission should be seen as an opportunity for the upliftment of persons with disabilities rather than making them more vulnerable by excluding them from the Smart City services. Along with the built environment, technology is a key enabler in the Mission and is a major means to achieve the ends of the Mission. Initiatives are needed to be taken in the current stages of the Mission so that this exclusion does not come up with a big price both socially and economically in the future. Internationally, there are initiatives being undertaken to develop guidelines, standards and tools for making Smart Cities inclusive for persons with disabilities. These tools/standards/guidelines should be adopted and implemented. Accessibility of persons with disabilities should be included in the Smart Cities Mission in India and relevant measures should be adopted in the Indian context along with building the capacities of all the stakeholders.

The main focus is to incorporate the accessibility features in both, area-based and pan-city proposal and to ensure digital inclusion for persons with disabilities in all developments under the Smart Cities Mission. This is now a mandatory requirement after the passage of the Rights of Persons with Disabilities Act 2016.

The Rules of the RPWD Act make references to the following standards:

1. **Standards for public buildings**: Harmonised Guidelines and Space Standards for Barrier Free Built Environment for Persons with Disabilities and Elderly Persons as issued by the Government of India, Ministry of Urban Development in March, 2016. The revised National Building Code 2016 (Part 3, Section 13) too is a world class standard and should be used for reference.
2. **Standards for Websites**: Guidelines for Indian Government Websites (GIGW), undergoing revision and in final stages. The latest version of Web Content Accessibility

Guidelines (WCAG6) and the European Standards - EN 301 5497 too are excellent guidelines for reference.

3. **Standards for Documents**: Electronic Publication (ePUB) or Optical Character Reader (OCR) based PDF.

4. **Standards for Bus Body**: Code for transportation system as specified in the notification of the Government of India in the Ministry of Road Transport and Highways, vide number G.S.R. 895(E), dated 20th September, 2016. Low floor buses are more accessible than those with high floors and should be given preference.

Beyond the focus on mandatory compliances, the discourse needs to move to one that is rights based and puts the interest and basic rights of people above all others, that demonstrates how universal design is central to a meaningful, productive and participatory life for ALL.

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[6]https://www.w3.org/WAI/intro/wcag
[7]http://mandate376.standards.eu/standard

About the partners:

National Centre for Promotion of Employment for Disabled People (NCPEDP): The National Centre for Promotion of Employment for Disabled People (NCPEDP) is a cross-disability, non-profit organization, working as an interface between the Government, Industry, International Agencies, and the Voluntary Sector towards empowerment of persons with disabilities. Registered in 1996, NCPEDP has since then, successfully advocated several policy changes that have positively impacted the lives of people with disabilities, working across to encourage employment of disabled people; increase public awareness on the issue of disability; empower disabled people with knowledge, information and opportunities; and ensure easy and convenient access to all public places, products, services and technologies.

Federation of Indian Chambers of Commerce and Industry (FICCI): Established in 1927, FICCI is the largest and oldest apex business organisation in India. Its history is closely interwoven with India's struggle for independence, its industrialization, and its emergence as one of the most rapidly growing global economies. FICCI provides the platform for networking and consensus building within and across sectors and is the first port of call for Indian industry, policy makers and the international business community.

Oil and Natural Gas Corporation Ltd (ONGC): Maharatna ONGC is the largest producer of crude oil and natural gas in India, contributing around 70 per cent of Indian domestic production. The crude oil is the raw material used by downstream companies like IOC, BPCL, HPCL to produce petroleum products like Petrol, Diesel, Kerosene, Naphtha, Cooking Gas-LPG. ONGC is India's Top Energy Company and ranks 20th among global energy majors and 14th in 'Oil and Gas operations' and 220th overall in Forbes Global 2000. Acclaimed for its Corporate Governance practices, Transparency International has ranked ONGC 26th among the biggest publicly traded global giants. ONGC has a unique distinction of being a company with in-house service capabilities in all areas of Exploration and Production of oil & gas and related oil-field services. Winner of the Best Employer award, a dedicated team of over 33,927 professionals toil round the clock in challenging locations.

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