

Adoption of Standards in Smart cities - Way forward for India

Globally, the pace of urbanization is increasing exponentially. The world's urban population is projected to rise from 3.6 billion to 6.3 billion between 2011 and 2050, a solution for the same has been development of sustainable cities by improving efficiency and integrating infrastructure and services.¹ It has been estimated that during the next 20 years, 30 Indians will leave rural India for urban areas every minute, necessitating smart and sustainable cities to accommodate them.² The Smart Cities Mission of the Ministry of Urban Development was announced in the year 2014, followed by selection of 100 cities in the year 2015 and 20 of them being selected for the first Phase of the project in the year 2016. The Mission lists the “core infrastructural elements” that a smart city would incorporate like adequate water supply, assured electricity, sanitation, efficient public transport, affordable housing (especially for the poor), robust IT connectivity and digitisation, e-governance and citizen participation, sustainable environment, safety and security for citizens, health and education.³

With a paradigm shift towards the concept of “Smart Cities’ globally, as well as India, such cities have been defined by several international standardization bodies and countries, however, there is no uniform definition adopted globally. The envisioned modern and smart city promises delivery of high quality services to the citizens and will harness data capture and communication management technologies. The performance of such cities would be monitored on the basis of physical as well as the social structure comprising of smart approaches and solution to utilities and transport.

The glue that allows infrastructures to link and operate efficiently is standards as they make technologies interoperable and efficient. Interoperability is essential and to ensure smart integration of various systems in a smart city, internationally agreed standards that include technical specifications and classifications must be adhered to. Development of international standards ensure seamless interaction between components from different suppliers and technologies.⁴

Standardized indicators within standards benefit smart cities in the following ways:

1. Effective governance and efficient delivery of services

¹ International Electrotechnical Commission, “Orchestrating infrastructure for sustainable Smart Cities” , <http://www.iec.ch/whitepaper/pdf/iecWP-smartcities-LR-en.pdf>

² IBM, “India needs sustainable cities”, http://www.ibm.com/smarterplanet/in/en/sustainable_cities/ideas/

³ Venky Vembu, “Smart cities mission: Welcome to tomorrow’s world”, 28th January 2016, <http://www.thehindubusinessline.com/economy/smart-cities-mission-welcome-to-tomorrows-world/article8163690.ece>

⁴ International Electrotechnical Commission, “Orchestrating infrastructure for sustainable Smart Cities” , <http://www.iec.ch/whitepaper/pdf/iecWP-smartcities-LR-en.pdf>

2. International and Local targets, benchmarking and planning
3. Informed decision making and policy formulation
4. Leverage for funding and recognition in international entities
5. Transparency and open data for investment attractiveness
6. A reliable foundation for use of big data and the information explosion to assist cities in building core knowledge for city decision-making, and enable comparative insight.

The adoption of standards for smart cities has been advocated across the world as they are perceived to be an effective tool to foster development of the cities. The Director of the ITU Telecommunication Standardization Bureau Chaesub Lee is of the view that “Smart cities will employ an abundance of technologies in the family of the Internet of Things (IoT) and standards will assist the harmonized implementation of IoT data and applications, contributing to effective horizontal integration of a city’s subsystems”.⁵

Smart Cities standards in India:

National Association of Software and Services Companies (NASSCOM) partnered with Accenture to prepare a report called ‘Integrated ICT and Geospatial Technologies Framework for 100 Smart Cities Mission’⁶ to explore the role of ICT in developing smart cities, after the announcement of the Mission by Indian Government.⁷ The report, released in May 2015, lists down 55 global standards, keeping in view several city sub-systems like urban planning, transport, governance, energy, climate and pollution management, etc which could be applicable to the smart cities in India.

Though NASSCOM is working closely with the Ministry of Urban Development to create a sustainable model for smart cities⁸, due to lack of regulatory standards for smart cities, the Bureau of Indian Standards (BIS) in India has undertaken the task to formulate standardised guidelines for central and state authorities in planning, design and construction of smart cities by setting up a technical committee under the Civil engineering department of the Bureau. However, adoption of the standards by implementing agencies would be voluntary and intends to complement internationally available documents in this area.⁹

⁵ “New global platform to help cities become sustainable and smart”, 15th January 2016, <http://www.iso.org/iso/news.htm?refid=Ref2042>

⁶ Moulishree Srivastava, “Nasscom partners Accenture to form ICT framework for smart cities”, 13th May 2015, <http://www.livemint.com/Companies/5Twmf8dUutLsJceegZ7I9K/Nasscom-partners-Accenture-to-form-ICT-framework-for-smart-c.html>

⁷ Sandhya Malhotra, “NASSCOM Creates Framework For Smart Cities Project”, 22nd May 2015, <http://www.exotoday.com/story/nasscom-creates-framework-for-smart-cities-project/>

⁸ *Supra Note 6*

⁹ Vimukt Dave, “In a first, BIS to come up with standards for smart cities”, 5th June 2015, http://www.business-standard.com/article/economy-policy/in-a-first-bis-to-come-up-with-standards-for-smart-cities-115060400931_1.html

Developing national standards in line with these international standards would enable interoperability (i.e. devices and systems working together) and provide a roadmap to address key issues like data protection, privacy and other inherent risks in the digital delivery and use of public services in the envisioned smart cities, which call for comprehensive data management standards in India to instil public confidence and trust.¹⁰

Key International Smart Cities Standards

Following are the key internationally accepted and recognized Smart Cities standards developed by leading organisations and the national standardization bodies of several countries that India could adopt or develop national standards in line with these.

- The International Organization for Standardization (ISO) smart cities standards:

ISO is an instrumental body advocating and developing for smart cities to safeguard rights of the people against a liveable and sustainable environment.

The ISO Smart Cities Strategic Advisory Group uses the following working definition: A ‘Smart City’ is one that dramatically increases the pace at which it improves its social, economic and environmental (sustainability) outcomes, responding to challenges such as climate change, rapid population growth, and political and economic instability by fundamentally improving how it engages society, how it applies collaborative leadership methods, how it works across disciplines and city systems, and how it uses data information and modern technologies in order to transform services and quality of life for those in and involved with the city (residents, businesses, visitors), now and for the foreseeable future, without unfair disadvantage of others or degradation of the natural environment.¹¹

The ISO Technical Committee 268 works on standardization in the field of Sustainable Development in Communities to encourage the development and implementation of holistic, cross-sector and area-based approaches to sustainable development in communities.¹² The Committee comprises of 3 Working Groups¹³

¹⁰ Eloise Bradley, “Financing Tomorrow's Cities: How Standards Can Support the Development of Smart Cities”, <http://www.longfinance.net/groups7/viewdiscussion/72-financing-financing-tomorrow-s-cities-how-standards-can-support-the-development-of-smart-cities.html?groupid=3>

¹¹ ISO/TMB Smart Cities Strategic Advisory Group Final Report, September 2015 (ISO Definition, June 2015)

¹² ISO/TC 268 Sustainable development in communities, http://www.iso.org/iso/iso_technical_committee?commid=656906

¹³ Patricia McCarney, WCCD and ISO 37120 Indicators for city services and quality of life, November 2014, http://cityminded.org/wp-content/uploads/2014/11/Patricia_McCarney_PDF.pdf

- **Working Group 1:** System Management ISO 37101- This standard sets requirements, guidance and supporting techniques for sustainable development in communities. It is designed to help all kinds of communities manage their sustainability, smartness and resilience to improve the contribution of communities to sustainable development and assess their performance in this area.¹⁴
- **Working Group 2 :** City Indicators- The key Smart Cities Standards developed by ISO TC 268 WG 2 (City Indicators) are:
 - **ISO 37120 Sustainable development of communities — Indicators for city services and quality of life:**

One of the key standards and an important step in this regard was ISO 37120:2014 under the ISO's Technical Committee 268¹⁵, providing clearly defined city performance indicators (divided into core and supporting indicators) as a benchmark for city services and quality of life, along with a standard approach for measuring each for city leaders and citizens.¹⁶ The standard is global in scope and can help cities prioritize city budgets, improve operational transparency, support open data and applications.¹⁷ It follows the principles set out and can be used in conjunction with ISO 37101.¹⁸

ISO 37120 was the first ISO Standard on Global City Indicators published in the year 2014, developed on the basis of a set of indicators developed and extensively tested by the Global City Indicators Facility (a project by University of Toronto) and its 250+ member cities globally. GCIF is committed to build standardized city indicators for performance management including a database of comparable statistics that allow cities to track their effectiveness on everything from planning and economic growth to transportation, safety and education.¹⁹ The World Council on City Data (WCCD)- a sister organization of the GCI/GCIF- was established in the year 2014 to operationalize ISO 37120 across cities globally. The standards encompasses 100 indicators developed around 17 themes to support city services and quality of life, and is accessible through the WCCD Open City Data Portal which allows for cutting-edge visualizations and

¹⁴Clare Naden, First draft of ISO's standard for sustainable communities reaches CD stage, July 2014, <http://www.iso.org/iso/news.htm?refid=Ref1877>

¹⁵ Working on Standardization in the field of Sustainable Development in Communities

¹⁶ Doug Cooley, "New ISO standard gives cities common performance yardstick", 21st June 2014, <http://smartcitiescouncil.com/article/new-iso-standard-gives-cities-common-performance-yardstick>

¹⁷ "Dissecting ISO 37120: Why this new smart city standard is good news for cities", 30th July 2014, <http://smartcitiescouncil.com/article/dissecting-iso-37120-why-new-smart-city-standard-good-news-cities>

¹⁸ ISO 37120:2014- Sustainable development of communities -- Indicators for city services and quality of life, http://www.iso.org/iso/catalogue_detail?csnumber=62436

¹⁹ Global City Indicators Facility, <http://www.cityindicators.org/>

comparisons. Indian cities are not yet listed with WCCD.²⁰

The indicators are listed under the following heads:

1. Economy
2. Education
3. Environment
4. Energy
5. Finance
6. Fire and Emergency Responses
7. Governance
8. Health
9. Safety
10. Shelter
11. Recreation
12. Solid Waste
13. Telecommunication and innovation
14. Transportation
15. Urban Planning
16. Waste water
17. Water and Sanitation²¹

This International Standard is applicable to any city, municipality or local government that undertakes to measure its performance in a comparable and verifiable manner, irrespective of size and location or level of development.

City indicators have the potential to be used as critical tools for city managers, politicians, researchers, business leaders, planners, designers and other professionals.²² The WCCD forum highlights need for cities to have a set of globally standardized indicators to:

1. Manage and make informed decisions through data analysis
2. Benchmark and target
3. Leverage Funding with senior levels of government
4. Plan and establish new frameworks for sustainable urban development

²⁰“World Council on City Data and Hatch forge global partnership”, 8th December 2015, <http://news.dataforcities.org/2015/12/world-council-on-city-data-and-hatch.html>

²¹ ISO 37120: List of Indicators, <http://www.urenio.org/wp-content/uploads/2014/06/ISO-37120-List-of-indicators.pdf>

²² ISO 37120 briefing note: the first ISO International Standard on city indicators, http://www.iso.org/iso/37120_briefing_note.pdf

5. Evaluate the impact of infrastructure projects on the overall performance of a city.²³
- **ISO/DTR 37121- Inventory and review of existing indicators on sustainable development and resilience in cities**

The second standard under ISO TC 268 WG 2 is ISO 37121, which defines additional indicators related to sustainable development and resilience in cities. Some of the indicators include: Smart Cities, Smart Grid, Economic Resilience, Green Buildings, Political Resilience, Protection of biodiversity, etc.²⁴

- **Working Group 3:** Terminology- There are no publically available documents so far, giving details about the status of the activities of this group.

The ISO Technical Committee 268 also includes Sub Committee 1²⁵ (Smart Community Infrastructure), comprising of the following Working Groups:

- WG 1 Infrastructure metrics
- WG 2 Smart Community Infrastructure

The key Smart Cities Standards developed by ISO under this are-

- **ISO 37151:2015 Smart community infrastructures — Principles and requirements for performance metrics:**

In the year 2015, a new ISO technical specification for smart cities- 37151:2015 for Principles and requirements for performance metrics was released. The purpose of standardization in the field of smart community infrastructures such as energy, water, transportation, waste, information and communications technology (ICT), etc. is to promote the international trade of community infrastructure products and services and improve sustainability in communities by establishing harmonized product standards.²⁶

²³ World Council on City Data, <http://www.dataforcities.org/wccd/>

²⁴ The complete list can be viewed here: [http://resilient-cities.iclei.org/fileadmin/sites/resilient-cities/files/Webinar_Series/HERNANDEZ - ICLEI Resilient Cities Webinar FINAL .pdf](http://resilient-cities.iclei.org/fileadmin/sites/resilient-cities/files/Webinar_Series/HERNANDEZ_-_ICLEI_Resilient_Cities_Webinar_FINAL_.pdf)

²⁵ http://www.iso.org/iso/iso_technical_committee?commid=656967

²⁶ ISO/TS 37151:2015, Smart community infrastructures — Principles and requirements for performance metrics, <https://www.iso.org/obp/ui/#iso:std:iso:ts:37151:ed-1:v1:en>

The metrics in this standard will support city and community managers in planning and measuring performance, and also compare and select procurement proposals for products and services geared at improving community infrastructures.²⁷

This Technical Specification gives principles and specifies requirements for the definition, identification, optimization, and harmonization of community infrastructure performance metrics, and gives recommendations for analysis, regarding interoperability, safety, security of community infrastructures.²⁸ This new Technical Specification supports the use of the ISO 37120.²⁹

- **ISO/TR 37150:2014 Smart community infrastructures -- Review of existing activities relevant to metrics:**

This standard addresses community infrastructures such as energy, water, transportation, waste and information and communications technology (ICT). Smart community infrastructures take into consideration environmental impact, economic efficiency and quality of life by using information and communications technology (ICT) and renewable energies to achieve integrated management and optimized control of infrastructures. Integrating smart community infrastructures for a community helps improve the lifestyles of its citizens by, for example: reducing costs, increasing mobility and accessibility, and reducing environmental pollutants.

ISO/TR 37150 reviews relevant metrics for smart community infrastructures and provides stakeholders with a better understanding of the smart community infrastructures available around the world to help promote international trade of community infrastructure products and give information about leading-edge technologies to improve sustainability in communities.³⁰ This standard, along with the above mentioned standards supports the multi-billion dollar smart cities technology industry.³¹

²⁷ Maria Lazarte , “How to measure the performance of smart cities”, 5th October 2015,

http://www.iso.org/iso/home/news_index/news_archive/news.htm?refid=Ref2001&utm_medium=email&utm_campaign=ISO+Newsletter+November&utm_content=ISO+Newsletter+November+CID_4182720c31ca2e71fa93d7c1f1e66e2f&utm_source=Email%20marketing%20software&utm_term=Read%20more

²⁸ *Supra Note 22*

²⁹ New ISO/TS 37151 – Smart Cities Metrics, <http://standardsforum.com/isots-37151-smart-cities-metrics/>

³⁰ ISO Briefing Note-Smart community infrastructures, http://www.iso.org/iso/executive_summary_iso_37150.pdf

³¹ *Supra Note 29*

Several other ISO Working Groups developing standards applicable to smart and sustainable cities have been listed in our blog [here](#).

- The International Telecommunications Union (ITU) : The ITU is another global body working on development of standards regarding smart cities.

- A Study group was formed in the year 2015 to tackle standardization requirements for the Internet of Things, with an initial focus on IoT applications in smart cities to address urban development challenges,³² to enable the coordinated development of IoT technologies, including machine-to-machine communications and ubiquitous sensor networks. The group is titled “*ITU-T Study Group 20: IoT and its applications, including smart cities and communities*”, established to develop standards that leverage IoT technologies to address urban-development challenges and the mechanisms for the interoperability of IoT applications and datasets employed by various vertically oriented industry sectors.³³

- ITU-T also concluded a focussed study group looking at smart sustainable cities in May 2015, acting as an open platform for smart city stakeholders to exchange knowledge in the interests of identifying the standardized frameworks needed to support the integration of ICT services in smart cities. Its parent group is ITU-T Study Group 5, which has agreed on the following definition of a Smart Sustainable City:

“A smart sustainable city is an innovative city that uses information and communication technologies (ICTs) and other means to improve quality of life, efficiency of urban operation and services, and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social, environmental as well as cultural aspects”.³⁴

- UK-British Standards Institution:

Apart from the global standards setting organisations, many countries have been looking at developing standards to address the growth of smart cities across the globe.

³² ITU takes on Internet of Things standards for smart cities, 12th June 2015, <http://smartcitiescouncil.com/article/itu-takes-internet-things-standards-smart-cities>

³³ ITU standards to integrate Internet of Things in Smart Cities, 10th June 2015, https://www.itu.int/net/pressoffice/press_releases/2015/22.aspx

³⁴ Focus Group on Smart Sustainable Cities, <http://www.itu.int/en/ITU-T/focusgroups/ssc/Pages/default.aspx>

In the UK, the British Standards Institution (BSI) has been commissioned by the UK Department of Business, Innovation and Skills (BIS) to conceive a Smart Cities Standards Strategy to identify vectors of smart city development where standards are needed. The standards would be developed through a consensus-driven process under the BSI to ensure good practise is shared between all the actors. The BIS launched the City's Standards Institute to bring together cities and key industry leaders and innovators to work together in identifying the challenges facing cities, providing solutions to common problems and defining the future of smart city standards.³⁵

- **PAS 181 *Smart city framework- Guide to establishing strategies for smart cities and communities*** establishes a good practice framework for city leaders to develop, agree and deliver smart city strategies that can help transform their city's ability to meet challenges faced in the future and meet the goals. The smart city framework (SCF) does not intend to describe a one-size-fits-all model for the future of UK cities but focuses on the enabling processes by which the innovative use of technology and data, together with organizational change, can help deliver the diverse visions for future UK cities in more efficient, effective and sustainable ways.³⁶

- **PD 8101 *Smart cities- Guide to the role of the planning and development process*** gives guidance regarding planning for new development for smart city plans and provides an overview of the key issues to be considered and prioritized. The document is for use by local authority planning and regeneration officers to identify good practice in a UK context, and what tools they could use to implement this good practice. This aims to enable new developments to be built in a way that will support smart city aspirations at minimal cost.³⁷

- **PAS 182 *Smart city concept model. Guide to establishing a model for data*** establishes an interoperability framework and data-sharing between agencies for smart cities for the following purposes:
 1. To have a city where information can be shared and understood between organizations and people at each level
 2. The derivation of data in each layer can be linked back to data in the previous layer
 3. The impact of a decision can be observed back in operational dataThe smart city concept model (SCCM) provides a framework that can normalize and classify information from many sources so that data sets can be discovered and combined to gain a better picture of the needs and behaviours of a city's citizens (residents and businesses) to help identify issues and devise solutions. PAS 182 is aimed at organizations

³⁵British Standards Institution, Smart Cities, <http://www.bsigroup.com/en-GB/smart-cities/>

³⁶ British Standards Institution, PAS 181 Smart city framework, <http://www.bsigroup.com/en-GB/smart-cities/Smart-Cities-Standards-and-Publication/PAS-181-smart-cities-framework/>

³⁷ British Standards Institution , PD 8101 Smart city planning guidelines, <http://www.bsigroup.com/en-GB/smart-cities/Smart-Cities-Standards-and-Publication/PD-8101-smart-cities-planning-guidelines/>

that provide services to communities in cities, and manage the resulting data, as well as decision-makers and policy developers in cities.³⁸

- **PAS 180 Smart cities Vocabulary** helps build a strong foundation for future standardization and good practices by providing an industry-agreed understanding of smart city terms and definitions to be used in the UK. It provides a working definition of a Smart City- “Smart Cities” is a term denoting the effective integration of physical, digital and human systems in the built environment to deliver a sustainable, prosperous and inclusive future for its citizens.³⁹ This aims to help improve communication and understanding of smart cities by providing a common language for developers, designers, manufacturers and clients. The standard also defines smart city concepts across different infrastructure and systems’ elements used across all service delivery channels and is intended for city authorities and planners, buyers of smart city services and solutions, as well as product and service providers.⁴⁰
- **Spain:** AENOR, the Spanish standards developing organization (SDO), has issued two new standards on smart cities: the UNE 178303 and UNE-ISO 37120. These standards joined the already published UNE 178301.
- **UNE 178301 on Open Data** evaluates the maturity of open data created or held by the public sector so that its reuse is provided in the field of Smart Cities.⁴¹
- **UNE 178303** establishes the requirements for proper management of assets of the city, which enables local authorities, according to its strategic plan, manage best, sustainable and effective its assets, its performance, the risks and the associated costs throughout the life cycle of the various assets. This document is addressed to all kinds of local entities (municipalities, associations of local authorities, county, etc.), regardless of their size, their complexity or technology that it possesses. The entity has the liberty to establish the extent of assets, the level of detail of the inventory and associated information, of each asset.
- **UNE-ISO 37120** reflects international indicators of urban sustainability have joined the already published standard ISO 37120.⁴²

³⁸ British Standards Institution, PAS 182 Smart city concept model, <http://www.bsigroup.com/en-GB/smart-cities/Smart-Cities-Standards-and-Publication/PAS-182-smart-cities-data-concept-model/>

³⁹ ISO/IEC JTC 1 Information Technology, Smart Cities Preliminary Report 2014, http://www.iso.org/iso/smart_cities_report-jtc1.pdf

⁴⁰ British Standards Institution, PAS 180 Smart cities. Vocabulary, <http://www.bsigroup.com/en-GB/smart-cities/Smart-Cities-Standards-and-Publication/PAS-180-smart-cities-terminology/>

⁴¹ New Set of Smart Cities Standards in Spain, <https://eu-smartcities.eu/content/new-set-smart-cities-standards-spain>

⁴² AENOR has published two new rules on smart cities, 15th June 2015,

http://administracionelectronica.gob.es/pae/Home/pae_Actualidad/pae_Noticias/Anio2015/Junio/Noticia-2015-06-15-nuevas-normas-AENOR-ciudades-inteligentes.html?idioma=en#.VrxVCv197IU

- Germany: Member of European Innovation Partnership (EIP) for Smart Cities and Communities DKE (German Commission for Electrical, Electronic & Information Technologies) and DIN (German Institute for Standardization) have developed a joint roadmap and Smart Cities recommendations for action in Germany. Its purpose is to highlight the need for standards and to serve as a strategic template for national and international standardization work in the field of smart city technology. The Standardization Roadmap highlights the main activities required to create smart cities and can be accessed [here](#).

The ISO, ITU and BSI are most widely accepted and recognized standard setting bodies regarding Smart Cities currently. However, national standard setting organisation of several other countries like Spain, China, Germany, Singapore, etc. are in the process of developing smart cities standards for building safe and secure smart cities in their respective countries, and have been listed [here](#).

Analysis and Recommendations

With regard to adoption of international standards, or developing national standards in line with these global standards, it is suggested that India must consider global efforts for creation of smart cities standards to develop interoperable standards as they provide guidance, a common language, frameworks and specifications enabling city planning, management and development.

Due to the increasing complexity and mounting challenges a city will face in the future, the need for common solutions (standards and guidance) and the ability to share best practices more effectively will only grow.⁴³

Building a framework along the lines of ISO 37120 will enable cities to work with a standardized set of indicators to measure their performance in the overarching theme of Smart Cities, draw comparative lessons from other cities globally, share best practices and help cities innovate and find technological and knowledge base solutions to address their main challenges.⁴⁴

India envisions fostering economic growth and makes cities more livable by improving standards of living by harnessing technology. Standards will empower this vision since it brings a sense of

⁴³ ISO Strategic Advisory Group on Smart Cities – Demand-side survey 2015, http://www.platform31.nl/uploads/media_item/media_item/41/62/Toelichting_ISO_Smart_cities_Survey-1429540845.pdf

⁴⁴ Matthew Lynch, “A Dialogue on Smart Cities in India”, June 2015, http://media.wix.com/ugd/672989_02b7cb8d9a4249029a9cda7cac15e313.pdf

safety and security, and leads to greater economic growth. It is important to realise that today, not only products but processes and services, are also standardized.⁴⁵ Also, many international standard setting organisations as well as national standards setting bodies of many countries have defined what they mean by a “smart city”. Adhering to a globally accepted standards or developing national standards in line with it will help India devise a definition to bring clarity in thought and uniformity in views of multiple sections of the society. In addition to that, since the Government has welcomes a Public-Private-Partnership model where private companies shall partner with the government to make the cities “smart”, it is suggested that India must adopt standards like ISO 37120 and the likes to ensure smooth implementation of the Project by having ISO standards certification for sustainable communities, cities and secure networks and systems to be developed in an Indian city in the future. This also requires awareness amongst stakeholder about the standard, use and applicability as well.

Similarly, adoption of ITU-T standards would require India to develop a framework on IoT applications that may be installed in the future smart cities, understand its use and risks to develop a standard according to the need for smooth interoperability of IoT applications and datasets employed in the city subsystems.

On the other hand, adoption of these international standards has several disadvantages as well, which may hinder India’s efforts to adopt such a framework for Indian cities. For example

- The standards on smart cities broadly cover indicators on smart urban infrastructure and does not address other relevant standards which relate to city services. This reflects lack of integrated standardization process and partially evolved domain for smart cities standards globally.
- Lack of consistency in indicators for smart cities is another issue which India may face since there is no accepted methodology for ranking cities as smart. The lack of standardisation across indicators may create uncertainty for aspiring cities in choosing the right path to become a ‘smart city’.
- Additionally, inadequate attention has been paid to privacy, security, resilience and sustainability concerns . There is no clarity on the suitability of regulatory frameworks to ensure the privacy of citizens and data in a certain societal and geopolitical context.⁴⁶

⁴⁵ The German Standardization Roadmap Smart City Version 1.1, May 2015, https://www.vde.com/en/dke/std/documents/nr_smartcity_en_v1.1.pdf

⁴⁶ Centre for Study of Science, Technology and Policy, Shrimoyee Bhattacharya, Sujaya Rathi, Sonali Anusree Patro, Niepukhrie Tapa, “Reconceptualising Smart Cities: A Reference Framework for India”, September 2015, http://niti.gov.in/mgov_file/CSTEP%20Report%20Smart%20Cities%20Framework.pdf

Though a framework in line with universally accepted standards will instill confidence and trust in the citizens in terms of safety and security of systems and technologies used in a city subsystem, India faces the challenge of adoption because of some of the above listed reasons. India would need to consider the varied demographics of every city develop standards to suit Indian sensibilities in terms of infrastructure, standards of living and services.

The Global Cities Institute (GCI) has undertaken a mission in the year 2015 to align with the national standards development body in India-the Bureau of Indian Standards regarding development of standards of smart cities and also to forge relationships with Indian cities in light of ISO 37120.⁴⁷This will be beneficial to India due to high level of estimated investments and India's shortage of city-level data.⁴⁸

⁴⁷ Palakh Chhabria Global Cities Institute, "GCI Mission to India- FALL 2015-A Dialogue on Smart Cities In India", June 2015, http://media.wix.com/ugd/672989_b9cfd99abaea467ba3486c198db65b4b.pdf

⁴⁸ Report of the Smart Cities in India Thematic Roundtable: A Dialogue on Smart Cities In India, June 2015, http://media.wix.com/ugd/672989_131aae47fdea43bf80ea12f5ea46f274.pdf