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Smart cities in India and Germany

A comparative perspective on data governance and digital participation

by

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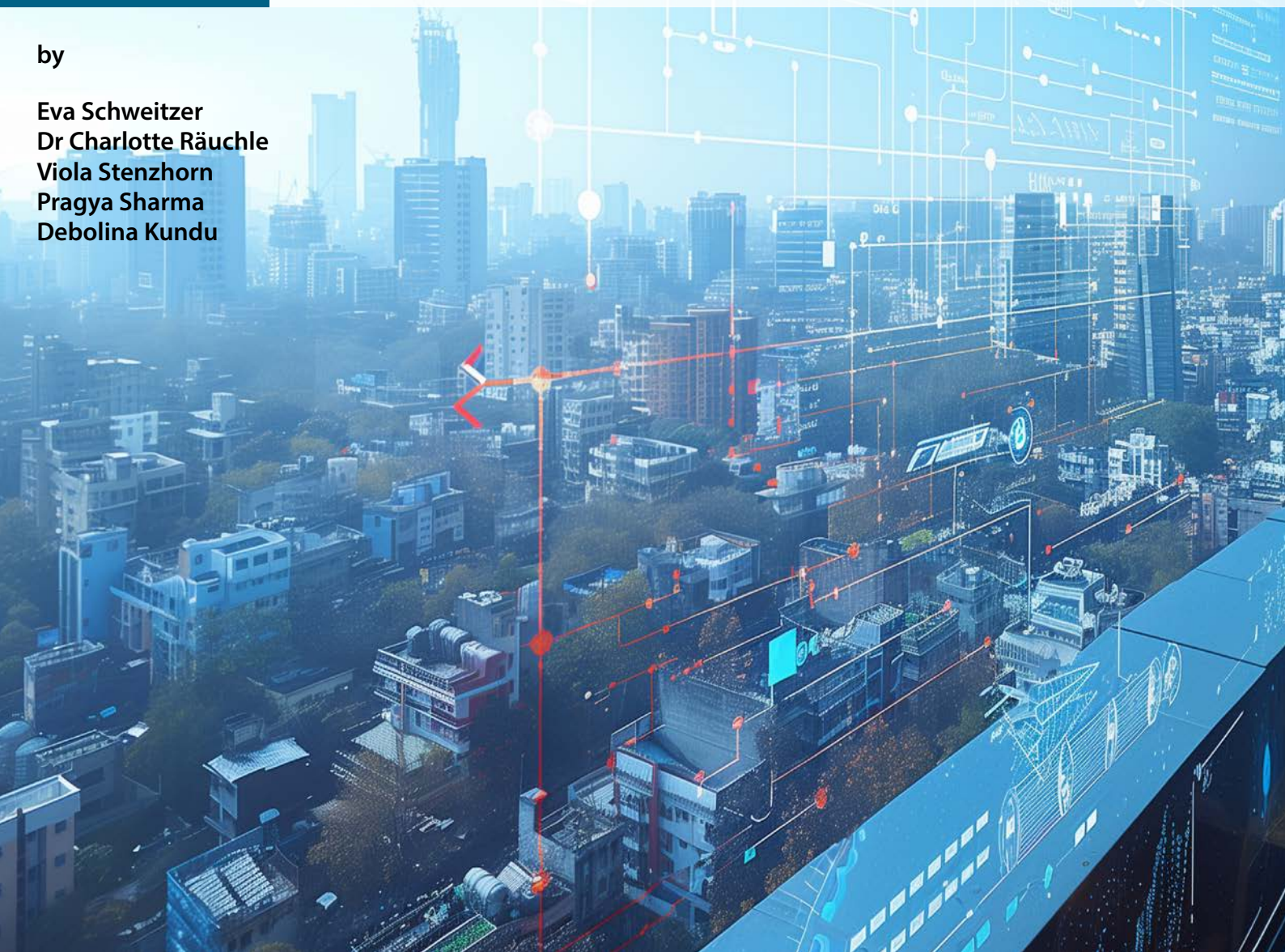

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by Dr Charlotte Räuchle, Pragya Sharma, Debolina Kundu

There is no universally accepted definition of a smart city, as it is a term that takes on diverse meanings depending on the perspective of various stakeholders and local contexts. The interpretation of a smart city varies from one city to another and from one country to another, shaped by factors such as the city's current level of development, its openness to transformation and innovation, available resources and the aspirations of its residents. In addition, approaches to smart cities are influenced by national and international guidelines. Consequently, the concept of a smart city in India may differ significantly from its interpretation in Europe, reflecting the unique contextual and regional dynamics at play.

In general, urban digitalisation towards smart cities holds a great and universal promise. Digitalisation and digital management will enable cities and districts to improve the integration of urban public service infrastructures, their data bases, management of planning activities and to increase the design efficiency of urban development processes. Simply put, since the 1990s two perspectives have dominated the global discourse on this: on the one hand, a technology-centred perspective suggests advanced information and communication technologies (ICTs) are the most efficient basis for urban transformation processes. On the other hand, urban ICTs raise the fear of an invasive technology taking control over urban development and citizens. That results in a second universal approach to smart cities: the right of "smart citizens" to keep control over their own city (Cardullo et al. 2019; Engelbert et al. 2019). However, most academics agree that there is no such thing as "the smart city". Research on smart cities has thus shown that one-dimensional and universal approaches cannot do justice to the nationally and locally diverse path-dependent development of smart cities in all its complexity.

This paper aims at a comparative analysis of Indian and German smart cities in terms of concepts, strategies, structures and forms of digital urban transformation. In the first section, framework conditions and key challenges of the digital transformation at a national level will be described and compared, i.e. national strategies, funding mechanism and institutional mechanism across the countries as a precondition for urban digitalisation (Chapter 1). In a second step, two thematic blocks are addressed in greater detail: (1) data governance (Chapter 2) and (2) digital participation and competences (Chapter 3).

Germany currently provides an interesting example for examining smart city approaches as well as their materialisation in municipal settings: on the national level, the Smart City Charter adopted by the German government in 2017 provides the official normative framework for smart city development (NDSC/BBSR/BMUB 2017). This charter also offers the conceptual background for the national funding programme Model Projects Smart Cities (MPSC), which has been running since 2019. The programme has been set up to place "new technologies … at the service of people and the common good" and to use them in such a way "that they not only benefit individual interests, but also the urban society as a community" (Schüle/Räuchle 2022: 6).

Similar to Germany, the Indian government launched the Smart Cities Mission (SCM) in 2015 with an objective to promote cities that provide core infrastructure, a clean and sustainable environment and afford a decent quality of life to their citizens through the application of smart solutions. One of the fundamental principles guiding the mission is the harnessing of "technology as means" which involves "careful selection of technology, relevant to the context of the city" (Ministry of Urban Development 2015). The aim of the mission was that cities would utilise technology, information and data to transform infrastructure and service development in a comprehensive manner, leading to the creation of 100 smart cities. To extend the SCM's urban digitalisation beyond the 100 cities, in 2021 the Government of India launched the National Urban Digital Mission (NUDM). The NUDM aims to create an ideal space to harness synergies from the domain of urban development and

technology towards creating a citizen-centric governance. It will build shared digital infrastructures that will strengthen the capacity of the urban ecosystem to solve complex problems at scale and speed.

Indian and German smart cities in research and practice

Up to now, there have been very few comparisons in research (1) and political cooperations between smart cities in India and Germany (2).

(1) The few existing comparative studies analyse, for instance, issues around smart governance to learn how urban agglomerations in India and Germany can become more resilient through smart approaches (Bose 2019). More specifically, studies on the (smart) Industry 4.0 focusing on different historical developments and policy directions in the diverging economies of the Global South and North (Agrawal et al. 2020; Toppo et al. 2016). A comparative perspective on smart grids, the future of electricity using highly automated and digital operation for real time applications, analyses driving factors for projects at national level (Sharma et al. 2017). Lastly, the issue of smart mobility has been comparatively addressed, highlighting the opportunities this market opens up for Indo-German economic collaboration (Tiwari 2012).

(2) Regarding political cooperation, both India and Germany reaffirmed their governments' determination to strengthen and reform multilateralism to tackle current and future challenges (Federal Foreign Office 2022). Both governments agreed to continue the regular meetings of the Joint Indo-German Working Group on sustainable urban development, acknowledging the significant role of sustainable and resilient cities to achieve the objectives laid out by the Paris Agreement and the Agenda 2030. Furthermore, both India and Germany reiterated their intention to continue their successful cooperation on urban development within the International Smart Cities Network. In order to promote multilateral sharing and learning experience on the subject of smart cities, they arranged a mutual Smart City Online-Symposium in 2022 (Prime Minister's Office India 2022). During the consultations, both governments acknowledged the importance of digital transformation as a key driver for technological and economic change. They agreed that the Indo-German Digital Dialogue will be an important instrument to facilitate cooperation on digital topics such as internet governance, emerging technologies and digital business models.

Briefly summarised, even if there are initial approaches in research and politics for comparison and cooperation in the field of smart cities in India and Germany, these are still in their infancy and not systematised. This applies to a variety of smart city topics. Examples of what has been left out include questions of data governance, the societal consequences and essential requirements for a socially just digital transformation oriented towards the common good. The present paper aims to contribute to filling these gaps.

The degree of digitalisation at a national level

At a national level, conditions and key challenges related to digital (urban) transformation vary between India and Germany. This applies to technical infrastructures and equipment and access to different types of digital technologies, i.e. broadband supply and the use of mobile devices alike (Schüle et al. 2021). Spatial and socio-demographic differences characterise the degree of digitalisation both within and between the two countries, and hence the starting point for smart cities.

Availability of digital infrastructures in Germany and India

The technical availability of good digital infrastructures focuses on the extent to which social groups in different regions and cities have access to internet (Schüle et al. 2021). Germany's government acknowledges digitalisation to be the driving force for progress, climate protection and a higher quality of life. The federal

government is therefore aware of the importance of a high-performance broadband infrastructure (Maretzke/Pütz 2023: 3f.). As part of its gigabit strategy, the German government has formulated the goal of expanding such an infrastructure nationwide by 2030, with a particular focus on rural areas (BMDV 2024).

However, in reality the numbers look a little different: At the household level, in 2022 around 91.4% have internet access and 7.3% do not. For the latter group, however, this is not due to technical limitations, but rather a question of low household income. For 1.3% of households there is no information on internet access (Statistisches Bundesamt 2022: 9). However, almost 100% of households are connected to the internet-enabled mobile phone network (Maretzke/Pütz 2023: 17). With regard to the differences in internet availability between urban and rural areas, it is difficult to make any definite statements. When a distinction is made between urban and rural areas in Germany, it is usually a question of internet speed: Although 90.2% of households were connected to a broadband connection that enables an internet speed of 100 Mbps or more in mid-2022, a pronounced urban-rural and city size difference is evident here (Maretzke/Pütz 2023: 9). In June 2020, the average coverage (i.e. the proportion of households supplied) with at least 1,000 Mbps was 82% in large cities, around 27% in small towns and around 21% in rural communities (Schüle et al. 2021: 8).

As a part of its Digital India campaign, the Government of India placed a strong emphasis on expanding internet and broadband access throughout the nation, with a particular focus on rural areas. This recognises the pivotal role of internet and broadband infrastructure in stimulating economic growth and fostering social development. [1] The Digital 2024: India report published by Datareportal in 2024 shows that internet penetration stood at 52.4% of the total population in January 2024. While the median mobile internet connection speed via mobile networks was 94.62 Mbps an increase by 76.36 Mbps (+418 %) in one year, fixed internet connection speeds in India increased by 9.51 Mbps (from 49.09 Mbps in 2023 to 58.62 Mbps in 2024) during the same period. At the household level, data can be drawn from the National Family Health Survey (NFHS), which shows that the share of household with internet access is 48.8%. Further, there is a marked rural-urban divide in access to internet facilities, as 64.6% of households in urban areas have access to internet facilities as compared to 41.0% in rural areas (NFHS-5).

Material availability of digital devices in Germany and India

In addition to the availability of existing infrastructure, the question arises as to which different groups in Germany and India have digital devices and the extent of progress in the societal diffusion of digital technologies: More specifically, which households are equipped with computers or smartphones, which are key for digital participation? Which households are clearly underrepresented?

In Germany, the availability of digital devices, particularly smartphones and laptops, has increased massively in the last decade. As the D21 digital index shows, 90% of the whole population above the age of 14 used a smartphone in 2023, around 69% a laptop (Initiative D21 2024a, b). However, even if figures continue to converge, there is a slight digital divide across different population groups for instance based on their socio-economic status. The general rule is: the higher the monthly net household income, the higher the average number of digital devices, i.e. laptops and mobile phones (ibid.). For example, 79% of low-income households use a smartphone and 98% of high-income households (ibid.). There is also a clear age gap, even if more and more people are tapping into the digital world. However, while 99% of 14 to 42-year-olds use a smartphone, the figure is still 77% for 68 to 77-year-olds and only 42% for those aged 78 and over (ibid.).

1 The data on digital infrastructure and its use in India has been collected through multiple surveys by different government and non-governmental organisations. At national level, the data from these multiple sources is compiled and published as annual reports by Datareportal. https://datareportal.com/data-sources; https://datareportal.com/reports/digital-2024-india [retrieved on 07.07.2024]

In India, mobile devices, especially smartphones, have become one of the easiest available devices for accessing internet and broadband, improving connectivity across the country. According to the "Digital 2024: India" report published by Datareportal, 78% of the total population in India use a mobile phone for connecting to any mobile network. In comparison: among the internet users aged 16 to 64 years, 90.6% use mobile phones (which includes smartphones and feature phones) to access the internet. A laptop or desktop is used by nearly 58% of internet users (aged 16 to 64 years) to access the internet. Furthermore, at household level, NFHS-5 data revealed that, 93.3% of households in India possess mobile phones. The share of households possessing mobile phones is slightly lower in rural areas (91.5%) as compared to urban areas (96.7%). Additionally, data published in 2022 by Oxfam, a non-governmental organisation, highlighted the digital divide across different population groups based on their socio-economic status, caste, gender, education, employment, region and religion. For instance, there is a 30% gap in the ownership of mobile phones between men and women in India. Based on employment, 94% of salaried persons owned a mobile phone, whereas only less than half of the unemployed were in this category.

Degree of internet use in Germany and India

The international research literature on the digital divide or digital exclusion shows that opportunities for participation in the digital city are often unequally distributed, since different population groups are exposed to different technical and socio-economic prerequisites for access, use and the acquisition of internet skills (Hargittai 2008; Alvarez-Icaza Longoria et al 2022; van Dijk 2005, 2020).

In Germany in 2023, 94% of the German population used the internet (Initiative D21 2024b), which means that the share has increased for another consecutive year. However, there are differences in terms of gender, level of education and age of the users: older population groups in particular, women, those are less educated, level of employment, and also people living in rural areas are generally less digitally included (Initiative D21 2022: 17). For example, 95.5% of men use the internet, while this applies to 93.5% of women (Statistisches Bundesamt 2022: 13). While 99% of the population with a high level of education use the internet, this applies only to 83% with a low level of education (Initiative D21 2024b). Also, there is an obvious age gap: only 52% of the over-78 years of age use the internet. In the age groups below, between 99.9% and 86% are active internet users (ibid.). There is also a difference between employed and non-employed persons (97.8% of the employed and 92.5% of the unemployed are internet users; Statistisches Bundesamt 2022: 15), as well as an east-west divide to the disadvantage of the eastern German federal states (Initiative D21 2022: 18).

There is limited information on the degree of internet use in India. According to a report on internet adoption in India published in 2021 (IAMAI/Kantar 2021), at an individual level, 43% of the total Indian population were active internet users (i.e. used the internet at least once in the last one month before survey). The report highlighted the rural-urban divide of 67% active internet users in urban regions compared to only 31% of rural population using the internet for the same year. However, the growth of active internet users in rural India was higher between 2019 and 2020 (13%) compared to their urban counterparts (4%). In terms of gender, only 42% of females were active internet users in India, compared to 58% of male active internet users during this period. Combining the factors gender, education, rural-urban, the following can be stated: The individual level information from NFHS, shows that more than half (52%) of women (aged 15-49) and 66% of men (aged 15-49) in urban areas have ever used the internet, compared to only a quarter of women and 43% of men in rural areas. Internet use increases with the level of educational attainment, with 72% of women and 75% of men with 12 or more years of education using the internet, compared to 8% of women and 24% of men with less than five years of schooling.

Comparing German and Indian data

Overall, the figures are not easy to compare and are based on different sources, years of data collection and time periods. However, at least some trends can be outlined (see also Table 1):

- Both countries have national programmes to promote widespread access to the internet and/or a stronger internet connection.
- In Germany, there is over 90% access to the internet per household, in India the figure is just under 50%.
- In Germany, around 94% of the population use the internet, in India 43%.
- In general, the urban-rural divide in India is significantly more to the disadvantage of rural areas.
- Large sections of the population in both countries use smartphones, although the figures are significantly higher in Germany.
- In both Germany and India, there is a difference between men and women when it comes to the level of internet use. Education and income are also decisive factors.

Table 1
Comparative analysis on the degree of digitalisation

Indicator	Germany	India
Internet access at household level	91.4%	48.8%
Urban-rural divide in internet access at household level	90.2% of households → possible broadband connection of 100 Mbps or more, but urban-rural divide	Urban areas: 64.6% Rural areas: 41%
Internet access via mobile devices	90% of the whole population over 14 years use smartphones	90.6% of internet users between 16 to 64 years use smartphones or feature phones
Degree of internet use/whole population	94%	43%
Internet use by gender	Men: 95.5% Women: 93.5%	Men: 58% Women: 42%

Source: own presentation

National smart city strategies and funding programmes

For some years, the governments of both India and Germany have developed national strategies and funding schemes to foster targeted smart city development in their respective countries. Both national initiatives build on the idea of model projects, i.e. specific cities in which smart city applications are to be tested.

Germany's Model Projects Smart Cities

Understanding smart cities in Germany requires two disclaimers: First, smart city development at national and local level is significantly influenced by initiatives, strategies and regulations at the European Union (EU) level. Here, central topics include the handling of data, digital services and markets, key technologies and security and resilience. The overarching goal is to ensure the significance of the EU's fundamental values and rights, that the EU and its member states gain digital sovereignty, and that the share of companies in the global digital economy based in the EU increases significantly. Second, the German approach to smart cities does not

explicitly focus on the digitalisation of public administration (see Chapter 2). Rather, "smart city" refers to the application of digital technologies in the context of urban development and planning, even if the digitalisation of the administration is of course always part.

In Germany, the adoption of the Smart City Charter in 2016/2017 marks the beginning of the systematic and strategic engagement with smart city topics at the federal level (NDSC/BBSR/BMUB 2017): To address the opportunities and challenges of digitalisation for urban development, the federal government set up the National Dialogue Platform Smart Cities (NDSC) in 2016, a committee of 75 experts from various ministries, federal states, municipalities, private and public associations, academia and civil society. This body discussed the potential and risks of digital urban development and developed guidelines for a sustainable digital transformation oriented towards the common good.

In order to achieve this goal within the context of city and community development, the Smart City Charter suggests four guidelines:

1. Digital transformation needs goals, strategies and structures.

2. Digital transformation requires transparency, participation and co-creation.

3. Digital transformation requires infrastructure, data and services.

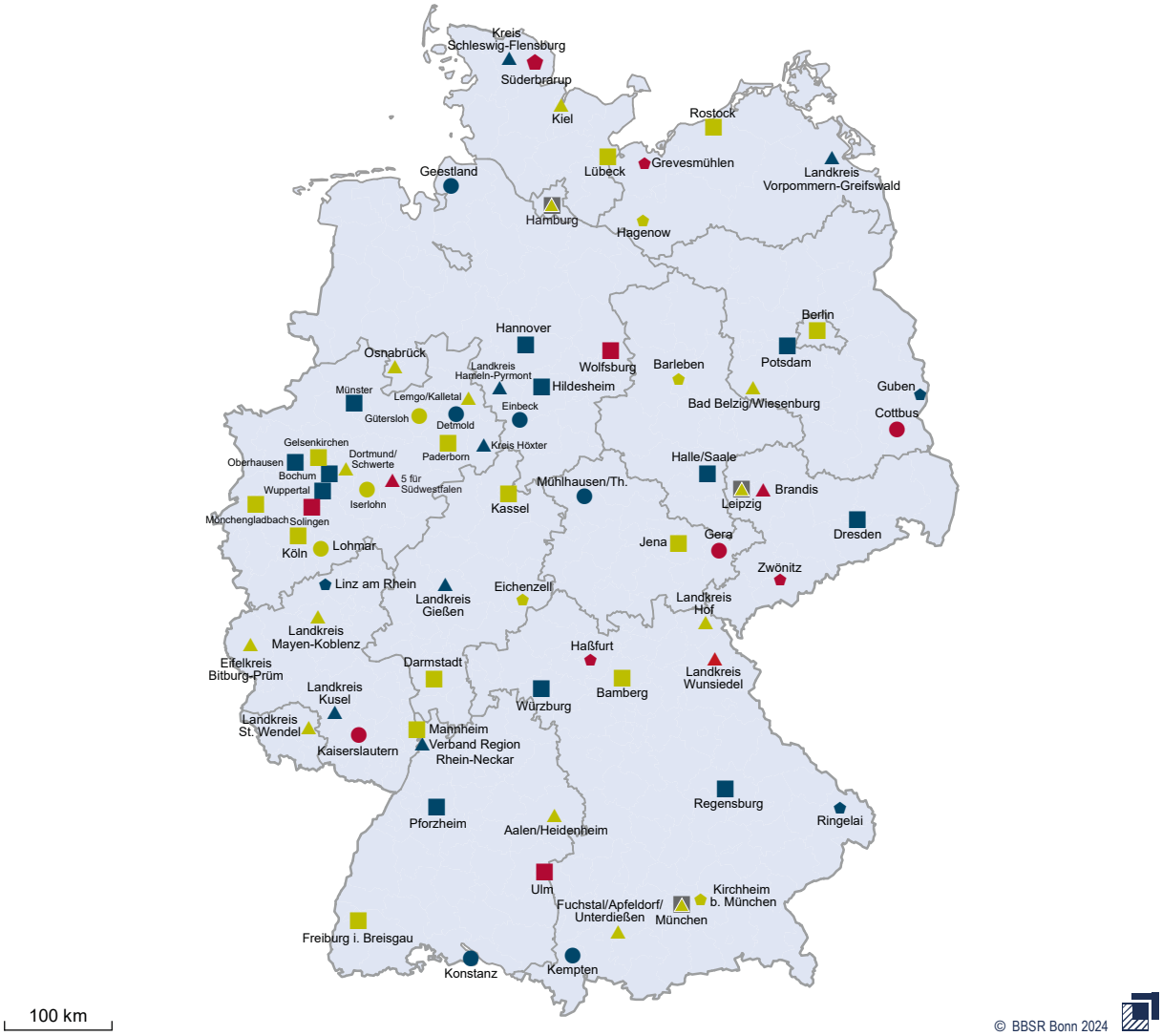
4. Digital transformation requires resources, skills and cooperation.

Against this background, in 2018/19 the federal government launched the funding programme Model Projects Smart Cities (MPSC). With a programme volume of €820 million up to 2030, it is the largest funding initiative to support the digital transformation of cities, municipalities, intermunicipal cooperations and regions in Germany. Since 2019, 73 model projects have been funded across Germany. These 73 model projects were selected in three seasons between 2019 and 2021 based on a competition. A national jury consisting of representatives from academia, politics and other fields, led by the Ministry of Construction, evaluated the applications in three phases. The selection focused on sustainable, integrated urban development with place-based approaches and transferability. The first season, which started in 2019, was the smallest with 13 Smart City model projects. The second season from 2020 included the most model projects (32), followed by the third season from 2021 with 28.

The federal government's central funding goals include the digital modernisation of municipalities and the use of digital technologies that contribute to increasing the quality of life in economic, ecological and social terms. However, knowledge transfer is fundamental. Municipalities are supported to develop and implement an integrated smart city strategy to foster liveable and effective communities. New or digital technologies should be used in the interests of the common good and model solutions should be tested that generate added value for the entire municipal landscape in Germany. Knowledge transfer is therefore a central aspect of the funding programme. The Smart City Charter defines the overarching normative framework.

The 73 funded projects can be divided into different spatial typologies (see Figure 1): 28 MPSCs and thus the majority (around 40%) of the 73 MPSCs are large cities (e.g. Wolfsburg, Dresden and Ulm). 23 MPSCs are classified as inter-municipal cooperations (e.g. cooperation between Hamburg, Leipzig and Munich or the Hof district with its 27 towns and municipalities). Medium-sized cities (12 MPSCs) followed by small towns and rural communities (10 MPSCs) form the smallest groups. The MPSCs classified as medium-sized cities include Bamberg, Cottbus and Iserlohn. Süderbrarup, Linz am Rhein and Guben count as small towns and rural communities. A differentiated regional view of the MPSCs shows an overall broad regional spread throughout Germany. However, the majority of the model projects are in the old federal states.

Figure 1
Model Projects Smart Cities in Germany



Categories of model projects

- Large cities
- Medium-sized cities
- Small towns und rural communities
- Intermunicipal cooperations and counties
- Intermunicipal cooperation Hamburg - Leipzig - Munich

- Start in 2019
- Start in 2020
- Start in 2021

Source of data: Continuous Spatial Monitoting System of the BBSR
Geometric basis: Municipalities and Counties (generalized), 31/12/2022 © GeoBasis-DE/BKG
Editing: T. Pütz

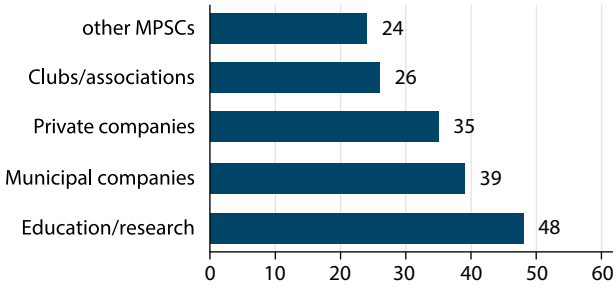
Source: own presentation

Funding mechanism and governance mechanisms for the MPSCs

Compared to the Indian Smart City Mission, the Smart Cities Model Project programme is rather small in terms of financial volume. In total, the German federal government agreed to make €820 million available for all 73 model projects between 2019 and 2030. The federal states do not contribute to the financing. The state funds only cover a portion of the respective smart city projects, so remaining funds are expected to be financed by the municipalities themselves. In a first step, the projects receive money for developing a digital strategy, and only after that, for the implementation of digital solutions.

The municipalities chose different governance models for the implementation of the smart city projects, i.e. they created new administrative units. Cooperations outside the administration are crucial for the success of local smart city projects. Regional actors from education and science, as well as municipal companies, are among the most important cooperation partners, as emphasised by 65% of the municipalities. In over half of the MPSCs, local/regional universities, technical colleges and research institutes cooperate with the MPSC (see Figure 2). The second largest share, nearly 40%, of the cooperation partners are the municipalities' in-house or municipal companies, such as the municipal utilities. There are further cooperations with economic development companies. Companies like IT service providers are in third place.

Figure 2
External cooperation partners of the Model Projects Smart City (



Source: Prognos AG (2023), N=72, Own presentation based on the monitoring data of the DLR)

Significant progress has been made in the implementation of smart city solutions. Table 2 shows the degree of development of 650 measures by mid-2023 (key date: 30 June, 2023). While all strategies are already finalised, the project implementation is ongoing.

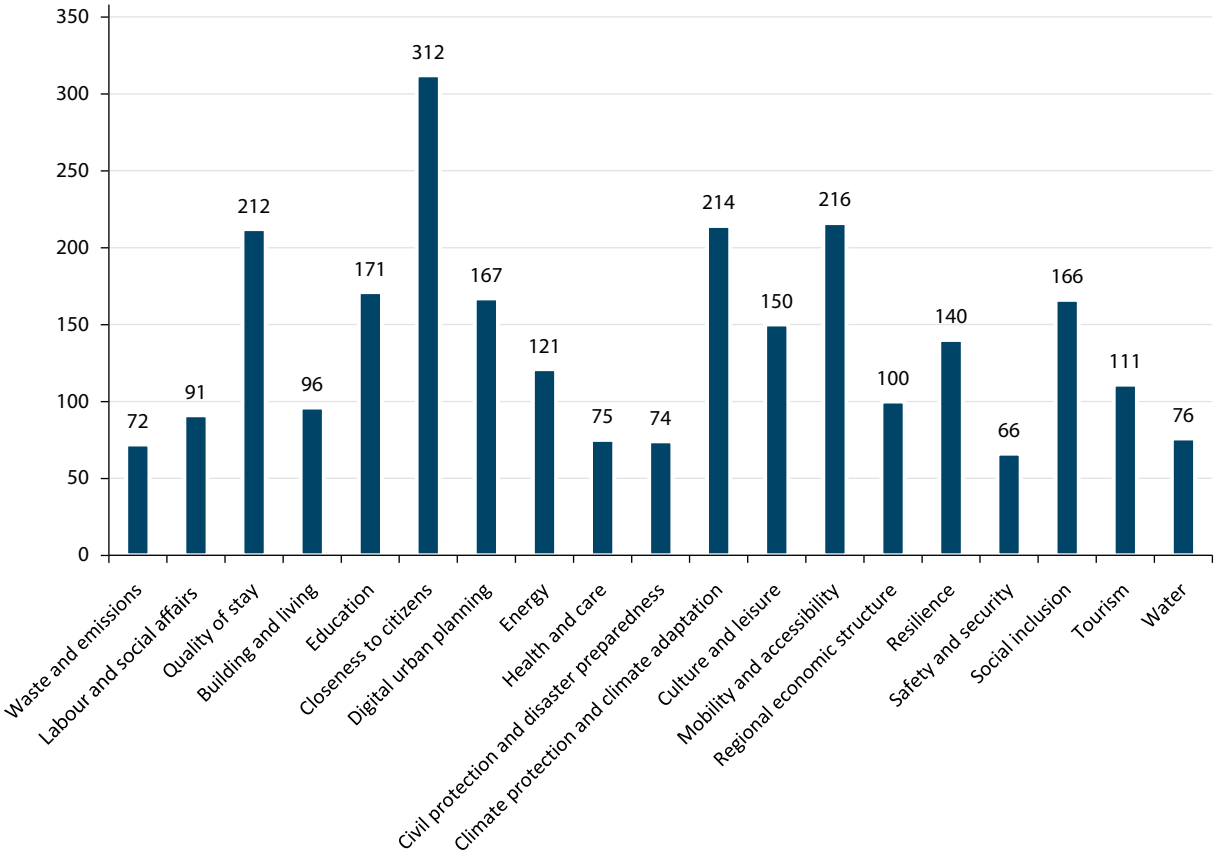
Table 2
Individual measure by phase and degree of development

	Planning not yet started	In planning	In piloting	In implementation	Finalised	No longer pursued
In the strategy phase	0	25	11	43	34	11
In the implementation phase	80	143	17	81	9	30
Started in the strategy phase and continued in the implementation phase	0	43	38	79	6	0

Source: Prognos AG (2023), N=650, Own presentation based on the monitoring data of the DLR

The measures are distributed differently across the different fields of urban development (see Figure 3; n = 659; reference date: 2 February, 2024; multiple allocations possible). Most measures are assigned to the keyword "closeness to citizens" (312), followed by "mobility and accessibility" (216), "climate protection and adaptation" (214) and "quality of stay" (212). The least number of measures are assigned to "safety and security" (only 66).

Figure 3
Allocation of individual measures to different fields of integrated urban development, reference date: 02/02/2024



Source: own presentation, based on database of the MPSC funding programme

The Smart Cities Model Projects coordination and transfer office (Koordinierungs- und Transferstelle Modellprojekte Smart Cities) or KTS, serves as the central contact point for the Smart Cities model projects and all municipalities in Germany. It designs and fosters the transfer of smart city solutions into broad municipal practice. The KTS takes on the following tasks:

- Individual support of the model projects smart cities
- Support of the MPSC in the implementation of their projects
- Structuring, strengthening and expansion of mutual knowledge transfer
- Accompanying research and scientific evaluation of research results, taking into account opportunities, risks and trends in urban development and digitalisation
- Derivation of knowledge for the entire municipal practice
- Mediation of newly obtained and existing specialist knowledge
- National and regional events for exchange and networking
- Establishment of central infrastructures such as digital and analogous spaces for cooperation

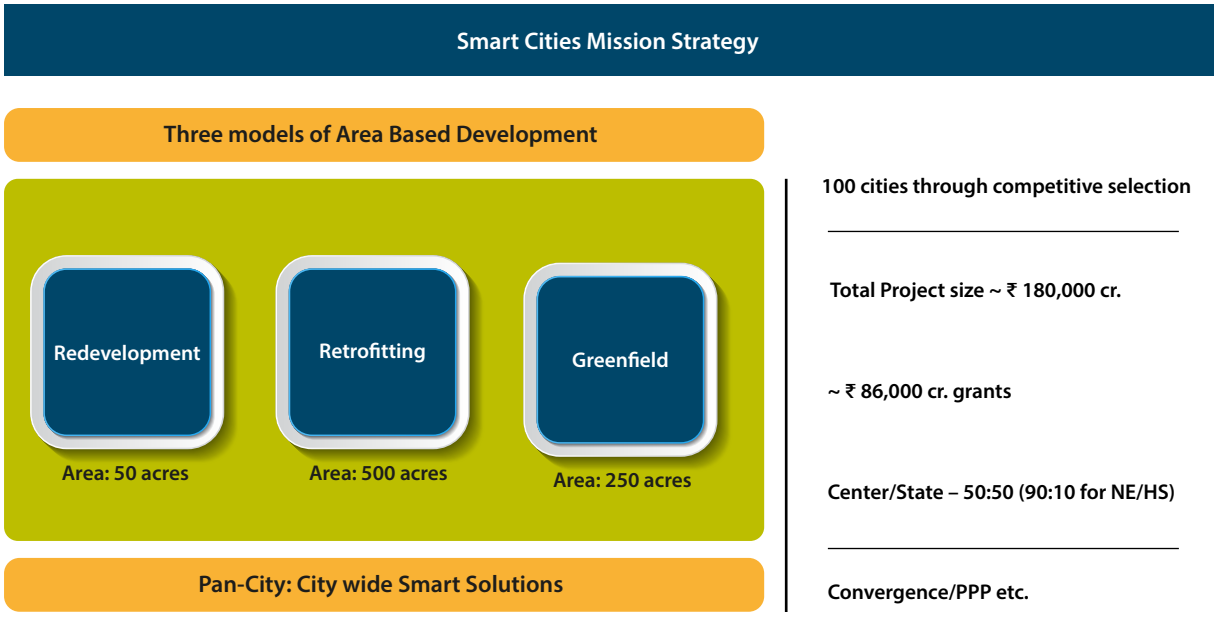
India's Smart City Mission

The Smart City Mission (SCM) was launched in June 2015, with the objective of promoting cities that provide core infrastructure and provide a decent quality of life to their citizens, a clean and sustainable environment, and the application of smart solutions. It was a bold and new initiative meant to seed integrated and innovative projects that can be replicated both within and outside the smart city. At the launch of the program, the guidelines defined two strategic components along which 100 cities were meant to develop projects - 1) area-based development and 2) pan-city development (MoHUA 2015).

1) **Area-based development** (see Figure 4): This approach encompasses improvement (retrofitting), city renewal (redevelopment) and city extension (greenfield development). Retrofitting involves the strategic planning of existing built-up areas to attain smart city objectives, while simultaneously pursuing other goals aimed at enhancing the efficiency and liveability of the existing urban environment. In retrofitting, an area consisting of more than 202 hectares 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". Anticipated outcomes of the retrofitting process include the incorporation of more intensive infrastructure service standards as they are supposed to be implemented on existing infrastructure and a large number of smart applications within the upgraded smart city. Redevelopment involves the replacement of the existing built-up area and enables co-creation of a new layout with enhanced infrastructure using mixed land use and increased density. Redevelopment envisages an area of more than 20 hectares, identified by municipalities in consultation with citizens. Greenfield development introduces most of the smart solutions in a vacant area to meet the needs of the expanding population.

2) **Pan-city development** includes the application of selected smart solutions to the existing city-wide infrastructure. The application of smart solutions involves the use of technology, information and data for improved infrastructure and services. Examples of this include the implementation of smart solutions in the transportation sector, such as an intelligent traffic management system, with the goal of reducing the average commuting time and costs for citizens, which in turn will lead to increased productivity and better quality of life.

Figure 4
Smart Cities Mission Overview



Source: NIUA

Guiding Principles and Project Typologies

At the broadest level, the Smart City Mission addresses three core issues: liveability, economic ability and sustainability. To achieve this, the concept of smart cities in the Indian context is woven around the following six key principles: a) more from less, (b) cooperative and competitive federalism, (c) Citizen at the core, (d) technology as a means, not an end, (e) convergence, and (f) inclusiveness (MoHUA 2021). Under SCM the 100 Smart Cities have the flexibility and autonomy on choice of projects based on local needs. However, these can be categorized into eight beachheads - (i) smart governance, (ii) smart mobility, (iii) economic infrastructure, (iv) water and sanitation, (v) vibrant urban spaces, (vi) social infrastructure, (vii) smart energy, and (viii) public private partnerships.

Selection of 100 Smart Cities

The two-stage **selection process** of 100 smart cities between 2016-2018 was based on the idea of competitive and cooperative federalism. It was the first time in the history of urban areas in India that cities were selected based on competition. The cities were chosen in four phases on state/union territory (UT) and national level.[2] A comprehensive exercise of citizen engagement laid the foundation for preparing Smart City Proposals (SCPs) for participating in a national level competition.[3] The major issues which confront urban areas as expressed by most citizens were: urban mobility, affordable housing, water and waste-water management, sanitation, safety and security, health and education, etc. These aspects were linked to how citizens rated the quality of life in their cities.

Funding mechanism for the Smart Cities Mission

The 100 cities under the SCM are implementing 8,042 projects worth € 177.88 billion[4] since 2015 from their respective dates of selection. Central Government proposed to give financial support to the extent of € 51.89 billion over the mission period i.e. an average of € 0.54 billion per city over the Mission period. Matching share is to be provided by State Government/ULB and the rest of funds from external/internal sources. The combined funds from the centre and state were only intended to meet a portion of the SCM cost, so remaining required funds were supposed to be generated from other sources such as public-private partnerships, own resources of Urban Local Bodies (ULBs), development charges, market borrowings etc. The funds were distributed into: 93% as the project funds and the remaining 7% as funds for administrative and office expenses (A&OE).

Since the cities were to provide the capital investment plans along with the smart city proposal, the analyses of the distribution of funding envisaged from different sources in 100 smart cities proposals were as follows:

- Central and state government: ~ €9.25 billion (52%)
- Convergence funding from other missions, programmes of the central/state governments and/or ULBs: ~ €5.16 billion (29%)
- Funds from PPPs: ~ €0.890 billion (5%)

2 100 smart cities were first distributed among the states and UTs on the basis of equitable criteria. In the first stage, states/UTs short-listed potential smart cities on the basis of certain preconditions and scores. The cities that emerged from the first-stage entered a second-stage in an inter-state competition. In the second stage, all the potential smart cities had to prepare a smart city proposal detailing the chosen models (or their combination) for area-based and pan-city development, including a revenue model for financing the smart city plan.
3 The SCP is a one-time exercise undertaken by cities themselves, with technical assistance from national and international agencies selected by the Ministry of Housing and Urban Affairs of the Government of India.
4 For conversion purposes 1€ = 92.5 Rupees based on September 2024 rates.

- Loans/debt: ~ €0.355 billion) (2%)
- Own sources: ~ €0.890 billion (5%)
- Other sources: ~ €1.245 billion (7%)

Smart City Mission's governance and implementation

The implementation of the Smart City Mission and the channelling of the funds were facilitated by the formation of special purpose vehicles (SPVs), which were designed to "plan, appraise, approve, release funds, implement, manage, operate, monitor and evaluate the smart city development projects" (MoHUA 2015). These SPVs were set up at the city level in each 100 cities, in the form of limited companies under the Indian Companies Act of 2013, where the state/UT and the Urban Local Body were the joint promoters with 50:50 equity shareholding. The private sector or financial institutions could be considered for taking an equity stake in SPVs, provided the state/UT and the ULB shares are equal to each other, and the state/UT and ULB together have a majority shareholding and control of the SPV.

The funds given by the central government to the SPV are tied grants kept in a separate grant fund. These funds are to be utilised only for the purposes as planned in the SCPs (see above). The SPVs are headed by a chief executive officer with a board of directors, who are usually the various local, state and national level stakeholders, engineers, and experts. It was to be ensured that "(a) a dedicated and substantial revenue stream is made available to the SPV to make it self-sustainable and could evolve its creditworthiness for raising additional resources from the market and (b) Government contribution for Smart City is used only to create an infrastructure that has public benefit outcomes" (MoHUA 2015).

After selection, each smart city has to set up a SPV and start implementation of their smart city proposal. Project management consultancies support the smart city SPVs in the process of awarding work and implementation of projects. As of 20th September 2024, work orders were issued in 8,042 projects worth around €177.88 billion, of which 7,252 projects worth €157.58 billion have been completed. Table 3 shows the progress of projects established/completed since 2015.

Table 3
Project progress under Smart Cities Mission by beachheads (September 2024)

	Completed	In Progress
Smart Governance	628	60
Smart Mobility	1,522	186
Economic Infrastructure	810	127
WASH	1,394	145
Vibrant Urban Spaces	1,268	127
Social Infrastructure	815	75
Smart Energy	662	32
Public Private Partnership	196	3

Source: own presentation

Smart cities in India and Germany compared

In sum, a comparison of the two funding programmes reveals both similarities and differences:

- In principle, both programmes promote integrated urban development, although the focus in India is broader. However, the smart city projects are intended to serve the wider population and the common good.
- Social, economic and ecological issues are addressed, whereby specific needs are very diverse due to the different conditions in both countries.
- Both funding programmes focus on model projects that are intended to test exemplary solutions.
- In Germany, the national state and the individual municipalities, in particular, are involved in funding the projects, whereas in India, Central Government provides an extend of financial support with matching share being provided by State Government/ ULB and the rest of funds from external/internal sources. This is also noticeable in the different governance models.

Against this national background, the following chapters focus in greater detail on the topics of data governance as well as digital participation and competences, thereby also shedding light on different smart city examples.

2 Data governance

by Eva Schweitzer, Pragya Sharma, Debolina Kundu

The following chapter describes the different Indo-German approaches to handling municipal data. In this context, "data governance" refers to both: regulations and rules on the actual state of digitalisation of public and municipal data (digitalisation per se) and regulations on the methodical and theoretical handling, the governance, of municipal data.

Digitalisation of public administration in Germany

From the 1970s to 2017 (cf. Merschmann 2022)

The digitalisation of public administration has a long tradition in Germany and dates back to the 1970s, when the Cooperation Committee for Automated Data Processing (KoopA ADV) was responsible for developing common principles in information technology at all federal levels. The KoopA was made up of representatives from the national level, federal states and local authorities.

In 1997, the Signature Act imposed regulations on the use of electronic signatures. In 1998, the Media@Komm pilot project of the federal government began searching for applications for electronic signatures. By 2003, 300 applications had been trialled and developed, 180 of which used the qualified signature. These included register information, business registration and many more. Around two-thirds of the applications were aimed at citizens, 40% at businesses and around 10% at internal exchanges with authorities. As part of Media@Komm, the cities of Bremen and Nuremberg trialled signature applications in the administration. In 1999 the Bremen Online Services Limited Company (now: Governikus Limited) developed the Online Service Computer Interface (OSCI). The OSCI transport protocol enables legally binding and confidential data transfer by both signing and encrypting the data. Today, OSCI is one of the standards that is being used in intra-authority data traffic.

Parallel to Media@Komm, the German BundOnline e-government initiative was launched in September 2000 with the aim of modernising the federal administration and reducing bureaucracy. With the Standards and Architectures for E-Government Applications (SAGA), a basis for interoperability was created at federal level. By 2005, 440 e-government services had been developed. These included numerous government portals, online information centres and databases, as well as such prominent procedures as the reimbursement of the federal grants of the Federal Training Assistance Act/ Bundesausbildungsförderungsgesetz (BAföG), and the registration for the "Riester pension"[5]. Access to the electronic tax declaration (ELSTER) was also simplified. In general, in 2005, the focus of digitalisation and standardisation was on large central federal programmes, not on the digitalisation of local administrations.

From 2017 onwards

In 2017, the Online Access Act (OZG) was passed, obliging the federal government, federal states and municipalities to "also offer their administrative services electronically via administrative portals" by the end of 2022 and to "link these together to form a portal network". By 2023, this was even an EU-wide requirement by the member states for the 75 most important services (EU Single Digital Gateway Regulation). The federal

5 Pension according to the provisions of the Retirement Savings Contracts Certification Act.

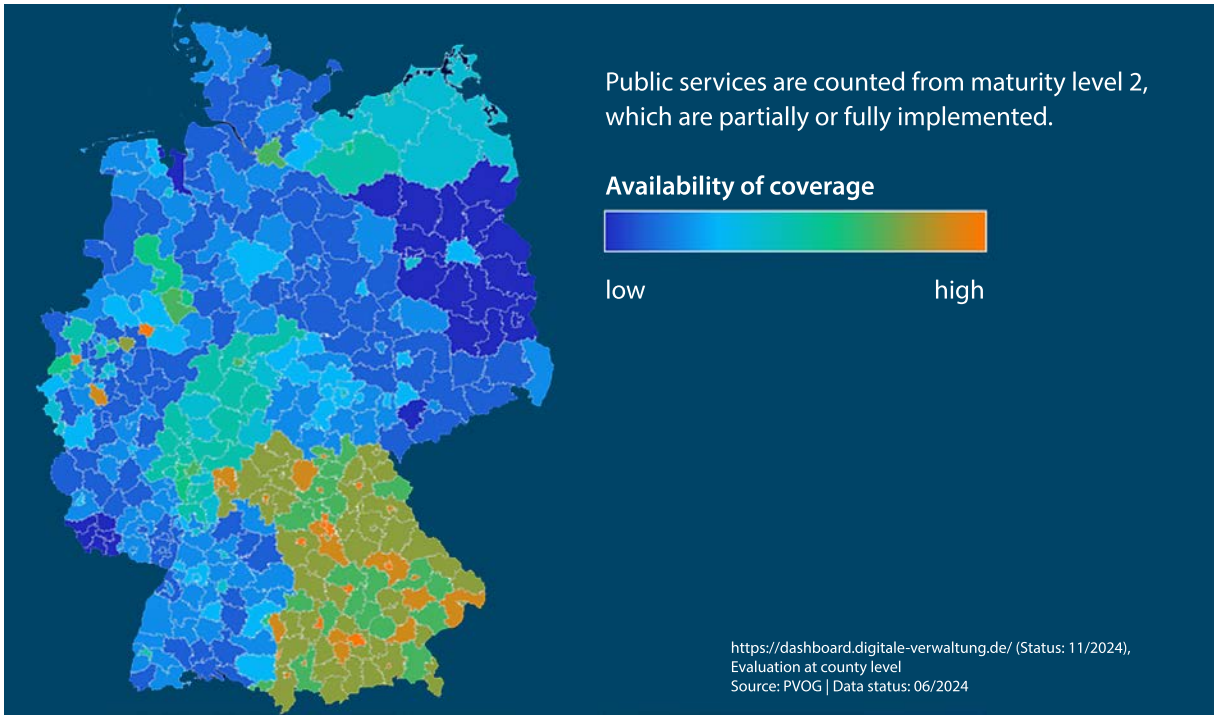
government recently provided an additional €3.3 billion for the implementation of the OZG and the modernisation of registers.

The OZG was supposed to ensure the extensive implementation of digital services for citizens and businesses, but, by the end of 2022, only 105 of the 575 services listed under the law had been implemented on time. The One for All strategy was then drawn up, meaning that certain federal states and municipalities are responsible for initially developing a service that can be subsequently adopted by all other federal states and municipalities. The legislative framework is actually being revised and updated; the so-called OZG 2.0 formally consists of the OZG Amendment Act (BMI, 2023a), which is currently in the legislative process, in conjunction with the E-Government Act (EGovG) and the IT Network Act (ITNetzG). As part of the planned law (OZG Amendment Act), the Federal Government can define implementation priorities for accelerated processing. The OZG Amendment Act was passed on 14 June 2024 and will come into effect in July 2024 (cf. BMI 2024).

A key issue for administrative digitalisation is the modernisation of registers. The so-called once-only principle would allow administrations to access the data records that are kept in different state-run registers (e.g. birth certificates) and therefore abolish the need for multiple legitimations by citizens and businesses.

The following map shows the different degrees of access to public services on a regional level (blue: low access rate, orange: high access rate).

Figure 5
Access to public services on a regional level



Source: BMI n. d.

German national guidelines on urban data governance

Data strategies for common good-oriented urban development

In 2017, the **"Data Strategies for common good-oriented urban development"** (ISCN 2022) were developed by the National Dialogue Platform Smart Cities. The National Dialogue Platform is a committee of 75 experts from various ministries, federal states, municipalities, private and public associations, academia and civil society. This body discusses the potentials and risks of digital urban development and develops guidelines for a sustainable transformation that is oriented towards the common good. The data strategies specify the guidelines of the national Smart City Charter and are thought to give orientation to the cities funded in the Smart City funding programme (ibid.). They aim to sensitise the federal government, the federal states and the municipalities to the sustainable and inclusive use of data in the context of common good-oriented urban development. The following seven guidelines were developed:

1) A purposeful use of data

This guideline emphasises the importance of purposeful use of data in urban development for the common good. It suggests that data strategies should be based on the needs of urban society and contribute to integrated, sustainable development goals. The recommendations address governmental bodies to create policies and funding for integrated urban development, urging collaboration among various stakeholders to use data purposefully, integrating data strategies into overarching urban development plans to actively contribute to digital transformation.

2) The development and enhancement of data literacy

This guideline focuses on the importance of developing and enhancing data literacy for the responsible and purposeful use of data in common good-oriented urban development. It emphasises the need for digital skills and comprehensive data literacy among authorities and urban society at various levels. The recommendations include incorporating specific requirements related to urban development in educational and training services, developing sound data literacy in collaboration with stakeholders and obtaining the necessary expertise and resources.

3) A value-based approach to data

The guidelines promote a value-based approach to data, emphasising jointly determined fundamental values and principles governing the handling of personal and non-personal data. This approach extends beyond legal compliance, addressing **data ethics, protection, security, stewardship, and informational self-determination** across the entire data process chain. Stakeholders should develop practical knowledge and awareness of digitalisation risks, fostering responsible use. The guidelines stress the need for a consensus-based process at various government levels to support the greater good.

Recommendations for **data ethics** include transparent and controlled data collection, prioritising the municipality's common good and preventing unjust discrimination. Automated decision-making systems require public documentation, checks by independent specialists and risk assessment measures.

Data protection recommendations emphasise compliance with the European General Data Protection Regulation (GDPR), the development of municipal-specific data protection standards and testing innovative concepts to strengthen the right to informational self-determination.

Regarding **data security**, confidence in protection objectives is crucial, with baseline security serving as a practical tool. Data stewardship recommendations call for responsible handling, transparency and accounta-

bility in data use, especially with increasing data quantities. Antitrust legislation may need revision to prevent emerging data monopolies, and data-based applications should not infringe on fundamental rights or replace democratic processes.

Overall, these guidelines advocate for a comprehensive, ethical and responsible approach to data management in the context of digitalisation and smart city development.

4) Creating access to data

This guideline underscores the significance of providing access to data for municipal administrations and enterprises to **ensure digital sovereignty** and innovation. The guideline advocates for guaranteed access and processing of data in the public interest when services are outsourced, with corresponding guidelines and contracts. The federal government is urged to consider concerns in European legislation, promoting shared data use from private-sector stakeholders. Additionally, municipalities are encouraged to facilitate data access for civil-society contributors.

5) Adding value to municipalities through data, improving public services and facilitating local business approaches

The text underscores the potential benefits of data sharing in smart cities for innovation and sustainable development. It acknowledges challenges posed by regulated data disclosure obligations, emphasising the need for clear regulations and financial support. Recommendations include financial backing for municipal initiatives, collaboration between governments and municipalities for policy conditions, and measures at various government levels to promote necessary infrastructures. The case study of Upstream Mobility in Vienna exemplifies successful data sharing among transport providers.

6) Establishing data partnerships to create added value for common good-oriented urban development

The guidelines emphasise the significance of data partnerships for advancing integrated and sustainable urban development, fostering collaborations between various stakeholders such as municipal administrations, companies, private entities, scientific bodies and civil society. A culture of data sharing is crucial, necessitating co-creation, support and continuous development among partners. Municipal administrations should play a role in establishing accountabilities and technical responsibilities for data partnerships, collaborating with governments for consistent data architectures, and implementing urban data platforms (UDPs) for accessible municipal data sharing. Recommendations also stress the importance of data partnerships within urban society and across regions, promoting collaboration for sustainable business models and digital services.

7) Fostering a culture of transparency and enabling participation and co-creation

The guidelines emphasise the importance of fostering a culture of transparency and enabling participation and co-creation for the sustainable development of municipalities. A collaborative effort is required to adapt data strategies to the fast pace of development, promoting transparency through publicly accessible data and creating a shared basis for co-creation. Recommendations include making data vendor-independent, machine-readable and open-standard to encourage civic tech initiatives. The guidelines stress the role of municipal administrations and enterprises as enablers for urban society, offering solutions and platforms for participation and co-creation. Additionally, the guidelines highlight the collaborative development of data strategies in the public interest, urging municipalities to involve urban society in conceptualising and implementing data-based projects and strategies.

Observations on the current state of data strategies at municipal level

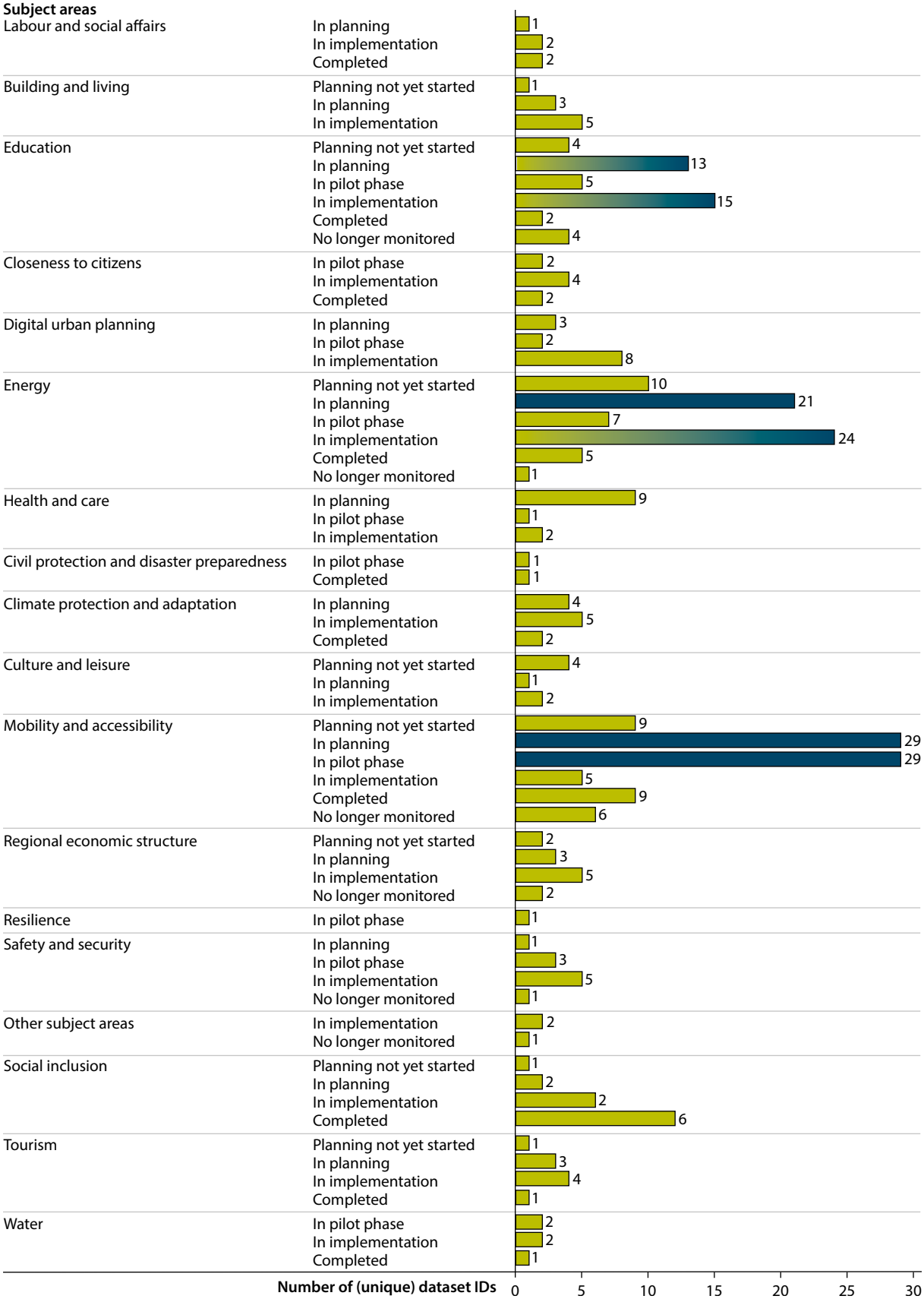
In 2023 these guidelines were further concretised in a BBSR study on "Data Strategies in Municipalities" (Helder/Libbe/Ravin 2023). The study identified both central instruments for municipal practice and examined the current status of the Smart Cities model projects on these topics (ibid.). The study focuses on developing guidelines for **implementing** municipal data strategies, aiming to ensure data sovereignty at the local level and maximising the potential of digital services. Central topics addressed and analysed were questions of data sovereignty, data skills, data responsibilities/data ownership and data cooperatives.

Key factors identified for successful municipal data governance include defining standards, interfaces, and usage rights for data sovereignty, promoting data competencies among staff, optimising the organisational handling of data responsibilities and analysing models for building data partnerships between public and private entities, with corresponding recommendations.

In summer 2023, 27 of the 73 MPSCs were already actively working on or were planning to develop **data strategies** for smart city initiatives (without being obliged to do so). Some cities, such as Bamberg, Berlin, and Bochum are in the process of developing their data strategies, involving collaboration with stakeholders for further refinement. Cities like Darmstadt, Dortmund, and Freiburg have existing data strategies, focusing on areas like open data, geodata infrastructure, and data governance. The Rhein-Neckar Metropolitan Region recently adopted a data strategy, while others like Haßfurt, Kaiserslautern and Oberhausen are actively working on their strategies (ibid.: 49 ff.).

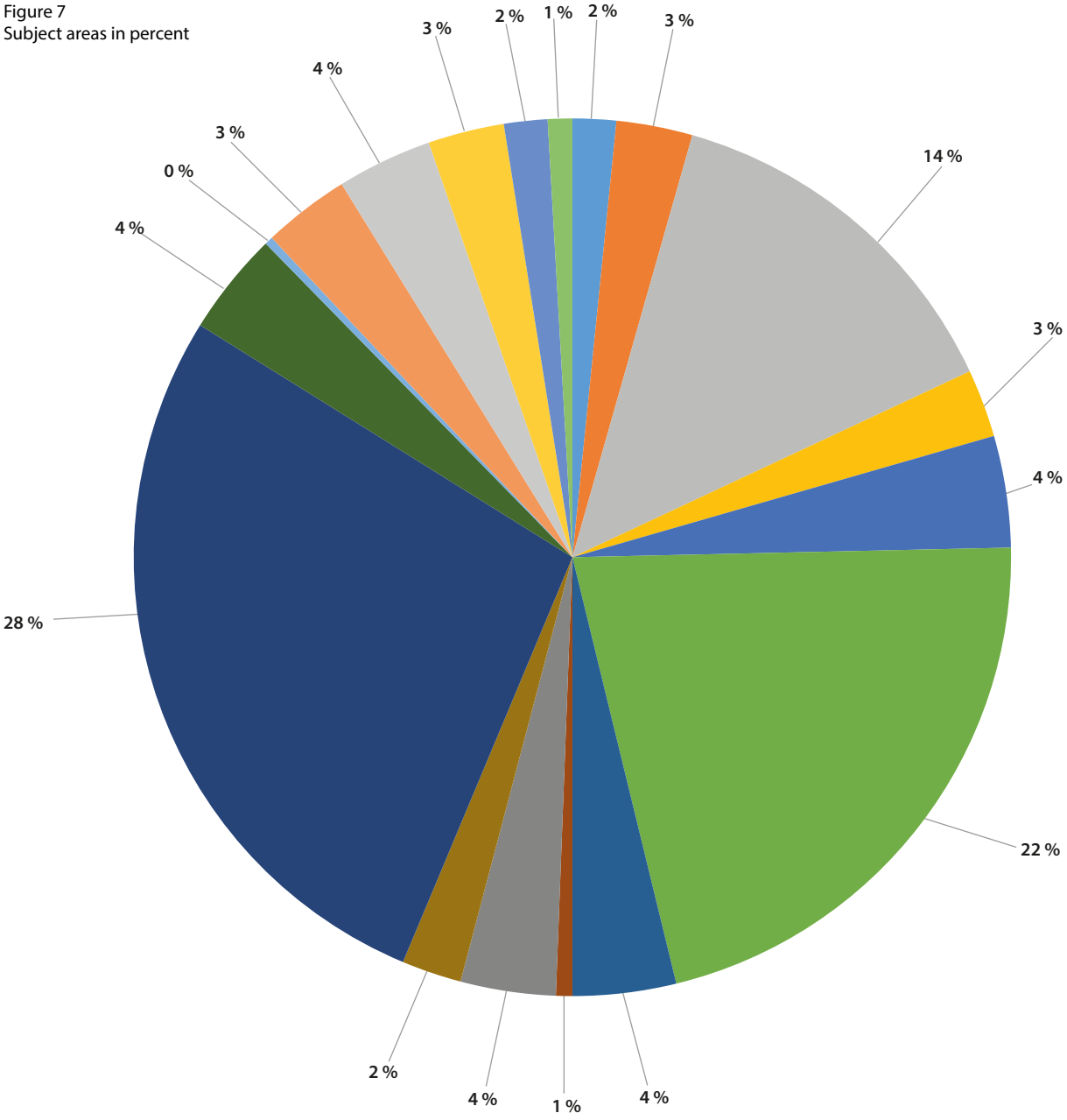
Regarding the national MPSC programme, the majority of the 69 MPSC-funded cities are developing **data platforms** for different kinds of topics, e.g. climate, mobility and other datasets. Major topics are: mobility and accessibility (27.5%) as well as energy (21.5%)

Figure 6
Maturity levels of projects in the MPSC funding programme by subject area



Source: Database of the MPSC funding programme: maturity levels: from planning to implementation, data: 3/2024

Figure 7
Subject areas in percent



Note: Regarding the implementation of the MPSC projects/data applications, 43 out of 73 MPSCs are cooperating with scientific institutions

Source: own evaluation

Data strategies at national and municipal levels: India

The presence of urban data governance at the city level in India has been in existence since 1990, when ULBs were encouraged to computerise their records and use enterprise software. In early 2000, various digital governance initiatives were undertaken including the National e-Governance Plan (NeGP), e-governance reform under the Jawaharlal Nehru National Urban Renewal Mission (JNNURM), GIS-based mapping and state initiatives for online billing and issuance of certificates to citizens.

However, substantial impetus to data governance and digital interventions was given through the launch of the Smart Cities Mission in 2015. As previously stated, the mission encouraged 100 selected cities to implement smart solutions for urban governance and set up digital infrastructures for citizen services. These 100 cities were seen as "lighthouse" cities, expected to create technology-centric solutions that could be replicated in other cities.

The Ministry of Housing and Urban Affairs (MoHUA) launched the National Urban Digital Mission (NUDM) in 2021. The NUDM aims to extend the vision of the SCM beyond 100 smart cities to other ULBs in India. Therefore, at present, there are two policies for cities that push for urban data governance and have an overlap of objectives, institutions and processes.

To understand the trajectory of urban data governance in India, and thereby understand the current scenario, it is important to discuss the policies and initiatives taken with regard to data-driven governance and e-governance prior to 2015.

Pre-2015

Like the Smart Cities Mission, the JNNURM launched in 2005 was also a mission-mode urban renewal programme. The mission targeted 65 cities and a few small cities and towns through a subsidiary mission. The central government's funding to the cities was conditional on implementation of a set of 23 governance reforms. E-governance was one of the mandatory reforms. It aimed at improving the system of governance through use of information technology. There were eight modules, which were to be implemented by the ULBs. At the end of the mission in 2015, only 27 cities were able to implement all eight modules. Although cities were unable to implement all the e-governance modules, despite there being supplementary guidelines, toolkits, and platforms issued by MoHUA, they nevertheless realised the importance of digital technology in transforming the functioning of ULBs.

The National e-Governance Plan was launched in 2006, with the aim of improving delivery of government services to citizens and businesses. One of the components, "e-municipality", was designed to improve the functioning of the ULBs through greater application of Internet and ICT-enabled management information systems (MIS) in providing government-to-citizen (G2C) services like issuing birth and death certificates, payment of utility bills, issuing licenses etc.

Another important initiative in creating a digital ecosystem in India was the launch of the National Data Sharing and Accessibility Policy (NDSAP) and Open Government Data (OGD) Platform in 2012. The National Data Sharing and Accessibility Policy aims to facilitate access to government-owned shareable data and information in both human-readable and machine-readable forms through a nationwide network in a proactive and periodically updatable manner. The NDSAP is applicable to all data generated using government funds by various ministries, departments, as well as those of the state governments. The NDSAP defines standards and templates for publishing datasets. It also recommended that datasets should be published in an open format, which can be accessed without the need for a software license and should be machine-readable. The Open Government Data (OGD) Platform India (https://data.gov.in/) has been set up to provide collated access to resources (datasets/apps) under catalogues published by different government entities in open format.

Recognising that data is a high-value asset and could help India's ambitions of becoming a $5 trillion digital economy based on its ability to harness the value of data, the Government of India will soon be launching their National Data Governance Policy.

Post-2015

Under the Smart Cities Mission launched in 2015, cities were encouraged to adopt smart solutions, though no specific digital technologies or solutions were prescribed. While the guidelines mentioned components like e-governance, IT connectivity, and digitalization, the responsibility of devising specific interventions was left to individual cities. Consequently, many cities interpreted the mission primarily as an infrastructure development initiative. Reports from monitoring committees highlighted that the data being collected by cities was often inconsistent, lacked granularity, and was insufficient for detailed analysis. Thus, MoHUA decided to prepare additional guidelines and frameworks to help smart cities develop a clearer vision for digital technologies for data governance. The additional guidelines and frameworks prepared by MoHUA can be grouped into three categories. First, guidelines that advise and assist cities in creating digital strategies (DataSmart Cities Strategy); second, guidelines to push for setting up standards to ensure common technologies and compatibilities (Smart Cities Standards); and third, a framework for the monitoring and evaluation of the progress of cities (Data Maturity Assessment Framework).

The **DataSmart Cities Strategy** (DSC) was initially launched for the existing 100 smart cities to enable key urban stakeholders to imbibe a data culture in smart cities. It was assumed that these cities would become the lighthouses for all other cities and towns across the country that aspire to emulate a paradigm of data-driven governance.

The objectives of the DataSmart Cities Strategy are to:

- **Facilitate City Data Alliance**: To assess the data available in all Government and non-Government entities for better planning and functioning of the city and to engage them in the understanding, creation, and promotion of data-driven solutions for the city. The 'quadruple helix' comprising of communities, industry, academia and the Government will be constituents of the City Data Alliance.

- **Adopt appropriate data platforms**: Cities are to adopt and create robust, secure and intuitive data exchange platforms, which will lead to the effective sharing and management of city data. Such platforms are to have common programming interfaces, data representation formats and data models that are interoperable.

The DataSmart Cities Strategy clearly defines the digitalisation pathways that cities could follow. **The strategy is built on three foundational pillars, namely people, process and platform.** These act as key enablers to facilitate a data culture at the city level.

Under the **'people'** heading, the focus is on institutionalising the data governance structure. The strategy advocates for the appointment of a City Data Officer (CDO) who will lead data governance at the city level and develop the City Data Policy (CDP). The CDO will work alongside data champions or coordinators from various government departments and agencies to ensure horizontal coordination across sectors. Additionally, the CDO is tasked with setting up a city data cell staffed with experts in fields like data science, ICT, and network technology.

To encourage broader participation, the strategy also recommends forming city data alliances, bringing together citizens, industry, and academia to foster innovation and data-driven collaborations. Similar governance structures are proposed at the state and national levels, ensuring a complementary, non-hierarchical approach across these three layers of government. Each level operates with the autonomy necessary to meet its specific goals while contributing to a cohesive national data governance structure..

The **'process'** component of the DataSmart City strategy details how to collect, store and manage data for cities. It also prescribes processes for data standardisation, categorisation and classification in line with the National Data Sharing and Accessibility Policy (NDSAP) and Personal Data Protection Bill (2018). The policy requires the city authorities to adopt a privacy-first approach while collecting, processing and sharing city data.

Under the **'platform'** component, the objective is to create a shared digital infrastructure accessible to all stakeholders. The MoHUA has created a digital infrastructure, **National Urban Innovation Stack (NUIS)**, based on a deep understanding of the urban ecosystem. The key objective of NUIS is to integrate data across departments within cities and across cities, state and central levels. The NUIS also aimed to make data more accessible, to put certain guidelines and standard operating procedures in place and bring together all stakeholders for the collective improvement of India's urban landscape.

The NUIS can be understood as a collection of technological interventions and platforms that all Indian cities can access and contribute to. This is the "stack-based" approach, where cities can build components on common foundational blocks and adapt interventions to their needs. For this, the NUIS laid down some principles, standards and specifications in order to ensure accessibility, privacy and interoperability between technologies.

Once the DSC was launched, the MoHUA partnered with various data ecosystem players to initiate the stacking of various platform layers of NUIS. This led to the creation of the following: – Open Data Platform (ODP) – India Urban Data Exchange (IUDX) – India Urban Observatory (IUO) – National Urban Learning Platform (NULP).

As an extension to the OGD, MoHUA launched a Smart Cities Open Data Portal (SCODP), a digital data repository for cities to publish their respective data in machine-ready format. It also has features of data visualisation, widgets to share filtered sets of data along with user participation through blogs and discussion forums. As of November 2023, the portal has more than 3,571 data catalogues across different sectors from 100 smart cities. India Urban Data Exchange (IUDX), is an open-source software platform that facilitates the development of standards, specifications, certifications, systems and tools for urban stakeholders to share data effectively for informed decision-making. India Urban Observatory (IUO) has been established to collect and manage data from multiple sources, including city Internet of Things (IoT) data platforms, non-IoT data sources, social media, open data and other third-party sources. The platform, envisaged as the main data analytics and management hub of MoHUA, correlates and analyses data to extract key insights and uses it for planning and evidence-based decision-making. It also measures and tracks key operational and performance metrics and enhances the accessibility of urban services. Additionally, the National Urban Learning Platform (NULP) was launched to address the training and skill development needs of different ecosystem actors.

DSC strategy and NUIS outlined broad principles for standardization, but these lacked specific technical details. To ensure the compatibility and functionality of platforms, software, sensors, devices, and other digital infrastructure, it became essential to develop technical standards. This standardization was crucial for enabling interoperability between different technologies and platforms, as well as facilitating efficient data sharing across systems. In 2020–21, a total of 15 smart city standards were developed and launched to address these needs, ensuring a unified approach across cities.

A few more assessment frameworks to measure the progress of data culture in cities were also established. Some of these evaluation frameworks require self-monitoring or self-reporting supervised and regulated by MoHUA, while others are third-party evaluations.

The **Data Maturity Assessment Framework (DMAF)** evaluates the progress of cities' data readiness on two tracks, systemic and sectoral maturity. The framework consists of two pillars – systematic and sectoral. Under each of the pillars, there is a comprehensive set of indicators that assess the city's readiness in respect of data.

The first cycle of DMAF was conducted in 2019, in which 99 cities participated on a systematic pillar across five components of people, policy, process, technology and outcomes which includes 26 indicators. Maturity in the components of the systemic pillar will help these cities to build a solid foundation which will serve as the base for cities to create an effective data ecosystem. Once the cities reach a common minimum threshold, they will be assessed on their sectoral data readiness, i.e. the sectoral maturity pillar with data availability, data usage, data shareability and data management as its components. Currently, three cycles of DMAF have been conducted with sectoral maturity pillar being introduced in the third cycle.

The **Integrated Command and Control Centre Assessment Framework (IMAF)** was introduced in 2021 and significantly pushed integration of digital components set out in the NUIS. Since all digital infrastructure connects to the ICCCs, the IMAF is aimed at evaluating maturity of ICCCs established across Smart Cities. It also highlights good practices implemented by cities in relation to traffic, surveillance, disasters and emergencies, and geospatial analysis as exemplars for other cities to replicate. The first version of IMAF focused on assessing ICCCs on four key parameters and as it was required to evaluate the ICCCs on a broader spectrum of capabilities over time, IMAF 2.0 has been introduced which expands the assessment parameters to ten pillars and assess the on-ground impact of use cases in cities.

Urban Outcomes Framework 2022 is an initiative to develop a transparent and comprehensive database based on cross-city outcomes across 14 sectors, namely demography, economy, education, energy, environment, finance, governance and ICT, health, housing, mobility, planning, safety and security, solid waste management, water and sanitation.

The UOF is a different approach from the indices as the latter aims at the evaluation of cities, whereas the former will create an open dataset which, with regular updating, will provide scope for formulating new frameworks and indices for assessment. UOF comprises of 440+ data points designed in such a manner that the data points pertaining to four frameworks and some additional ones are bundled together in a single framework. These frameworks include Ease of Living (EOL), Municipal Performance Index (MPI), Climate Smart Cities Assessment Framework (CSCAF) and Data Maturity Assessment Framework (DMAF).

Undoubtedly, India has made progress in promoting data-driven governance through strengthening the data ecosystem at various levels. The DSC recommended administrative structures to roll out digitalisation, NUIS provided the design and architecture for platforms, Smart City Standards created technical standards for the implementation of technology – all of which are noteworthy initiatives. However, the implementation of digital technologies and their standardisation is in a nascent stage. Only 4 cities out of 100 have been able to achieve the highest level certification under the DMAF second round of assessment, whereas 58 cities are just beginners and 19 cities are initiators. Nevertheless, the Smart Cities Mission is paving a new pathway towards transforming urban management with the power of digital technologies and its standardisation. Cities will soon be able to embark on a journey towards optimised performance, citizen satisfaction and a sustainable future.

Comparison of German and Indian Approaches to Data Governance

Digitalisation of Public Administration

Germany:

- **Historical Development:** Digitalisation in Germany dates back to the 1970s with the establishment of the Cooperation Committee for Automated Data Processing (KoopA ADV). This committee developed common IT principles across federal levels.
- **Initiatives:** Key initiatives included the Signature Act (1997) for electronic signatures, the Media@Komm pilot project (1998) and the BundOnline e-government initiative (2000). These initiatives aimed to modernise federal administration and reduce bureaucracy.
- **Recent Developments:** The Online Access Act (OZG) of 2017 mandated electronic access to administrative services, aiming for an EU-wide implementation by 2023. Despite this, only 105 of the 575 services were implemented by the end of 2022. The OZG 2.0 act is currently being updated to address these shortcomings, emphasising the modernisation of registers and the "once-only principle" for data access.

India:

- **Historical Development:** Urban data governance in India began in the 1990s with efforts to computerise urban local body (ULB) records. The National e-Governance Plan (NeGP) and e-governance reforms under the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) in the early 2000s further promoted digital governance.
- **Initiatives:** The Smart Cities Mission (SCM) in 2015 significantly boosted data governance, encouraging 100 cities to implement smart solutions. The National Urban Digital Mission (NUDM) in 2021 aimed to extend these efforts to all ULBs.
- **Recent Developments:** The DataSmart Cities Strategy (DSC) launched post-2015 focuses on institutionalising data culture, driving data governance and adopting data platforms like the Open Data Platform (ODP), India Urban Data Exchange (IUDX), and India Urban Observatory (IUO). These platforms aim to facilitate data sharing and management across cities.

National Guidelines on Urban Data Governance

Germany:

- **Data Strategies:** The "Data strategies for common good-oriented urban development" developed in 2017 focus on purposeful data use, enhancing data literacy, a value-based approach to data and creating access to data. These strategies promote collaboration among various stakeholders and emphasise data ethics, protection and security.
- **Implementation:** The study on "Data Strategies in Municipalities" in 2023 identified key factors for successful municipal data governance such as defining standards, promoting data competencies and optimising data responsibilities. Cities like Darmstadt, Dortmund, and Freiburg have developed or are actively developing or data strategies focusing on open data and data governance.

India:

- **Data Strategies:** The DataSmart Cities Strategy (DSC) outlines a framework for data governance at the city level, emphasising institutional data governance structures, data collection and management processes and the adoption of shared digital infrastructure.

- **Implementation:** The DSC strategy is supported by People (City Data Officer, Data Champions/Coordinators); Process (City Data Policy, Assessment Frameworks); Platforms (Open Data Platform (ODP), India Urban Data Exchange (IUDX) and India Urban Observatory (IUO).

Summary

Germany's approach to data governance has evolved over the decades since the 1970s, focusing on interoperability and federal-level initiatives. Recent legislative updates aim to address implementation gaps, emphasising data accessibility and modernisation. Conversely, India's data governance gained momentum with the Smart Cities Mission in 2015, emphasising smart solutions and digital infrastructure. The DataSmart Cities Strategy and associated platforms and assessment frameworks reflect a structured approach to embedding data culture and governance at the municipal level. Both countries prioritise data security, ethics and stakeholder collaboration but differ in their historical trajectories and specific strategic implementations.

Differences can be seen in the following aspects: Germany emphasises the use of data for common good-oriented urban development, focusing on sustainability, inclusiveness and ethical use. India, on the other hand, focuses more on smart city initiatives and technology-centric solutions to enhance urban governance and infrastructure. Additionally, India launched a series of assessment frameworks (DMAF, IMAF) to evaluate and ensure the progress of data readiness and integration of digital components. Both countries emphasise the importance of digital skills, with India focusing more on structured training programmes and skill development through platforms like NULP.

Overall, while both Germany and India strive for robust data governance frameworks, their strategies are shaped by their unique historical contexts and developmental priorities.

3 Digital participation and competences

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Introduction

In addition to everyday tasks and digital services of municipalities, participation processes are also increasingly being digitalised (e.g. hackathons or urban prototyping). Digital skills are necessary to enable the participation of all citizens in the increasingly digitalised city. At the same time, the digital transformation is taking place at high speed and is characterised by enormous complexity, which increases the demands on citizens to keep pace with this change (BBSR 2017b). But not all people or population groups have the same resources to do so. There is therefore a need for digital literacy programmes to enable citizens to articulate their interests, participate and use digital services (BBSR 2016; Schüle et al. 2021; Schweitzer 2017). This necessity is reflected in the Smart City Charter of the German Federal Government, which describes normative guidelines and concrete recommendations for action for the digital urban transformation. The German funding programme Model Projects Smart Cities also attaches great importance to this. In a similar way, right from its inception stage, the Indian Smart Cities Mission brought citizen participation into focus through the use of technology in all 100 cities. The mission identified good governance through e-governance and citizen participation as one of the core elements of a smart city.

Based on this, the following chapter will examine the role of digital competences and participation in German and Indian smart city initiatives. While civil society participation is a central criterion for the funding programme in Germany, the teaching of digital skills is promoted to a lower extent. This also applies to India, although the focus here is even more strongly on participation. The following chapter therefore looks at examples of approaches to teaching digital skills in Germany and approaches to citizen participation in India. The chapter focuses on German and Indian approaches set against a brief overview of the state of research on the digital divide and participation in the smart city.

Digital competences and participation in the smart city

In addition to providing and securing digital infrastructures, municipalities should also take on the task of promoting educational opportunities for the development of digital skills and initiating and promoting educational cooperation between various local actors (NDSC/BBSR/BMUB 2017: 13). This is the basis for equal participation and involvement in smart cities.

The digital divide

Namely, an overview of the research literature on the digital divide identifies different challenges (see also Chapter 1). Opportunities for participation in the digital city are often unequally distributed, as different population groups face unequal technical and socio-economic preconditions for accessing, using and acquiring skills related to the internet (Hargittai 2008; Alvarez-Icaza Longoria et al. 2022; van Dijk 2005, 2020).

The research literature distinguishes between three different levels of the digital divide. The first level refers to individual access to information and communication technologies (ICT). The factors of autonomy and continuity of use play an important role here (van Dijk 2005). With the increasing expansion of access, especially in western societies (for Germany: Initiative D21 e.V. 2021), the "second and third levels of the digital divide" are coming to the fore. This refers to digital skills and individual usage behaviour (second level) as well as the expected outcomes of internet use (third level) (DiMaggio et al. 2004; van Deursen/van Dijk 2014; van Deursen/

Helsper 2015). However, a uniform definition of the term "digital divides" or a theoretical frame of reference has not yet been established (Alvarez-Icaza Longoria et al. 2022; Scheerder et al. 2017; van Deursen/Helsper 2015). Empirical studies on the digital divide continue to confirm the assumption that socio-economic inequalities are also reflected in the digital sphere (van Dijk 2020). Thus, factors like income, gender, age and education have a significant influence on the access people have to ICT, how they use the internet and to what extent they are able to use digital applications to their advantage (van Deursen/van Dijk 2014; Ragnedda et al. 2022).

As a result, some population groups are particularly affected by the digital divide. Older people in particular are among the disadvantaged groups (Hargittai/Dobransky 2017; Hargittai et al. 2019; König et al. 2018), but skills are also differently distributed among younger groups of people. Despite an improvement in access opportunities for women in recent years, (lack of) financial resources and socio-cultural norms continue to pose obstacles to women's equal participation in the digital society (Mariscal et al. 2019). Likewise, the health status (e.g. limitations due to a disability) as well as the occupational status (pension, unemployment or unpaid care work) negatively influence the access, use and outcomes of these groups (Dobransky/Hagittai 2006; Pautasso et al. 2011). Currently, however, there is only very limited empirical evidence on the exclusion of individual population groups, in particular marginalised women, refugees, unemployed and/or single parents as well as people with disabilities (Pérez-Escolar/Canet 2022; Alvarez-Icaza Longoria et al. 2022), which will require further demographic-specific research in the future.

Teaching digital skills at the municipal level

The complexity of digital inequality described above necessitates a target-group-oriented approach in the context of digital competence transfer. Following the three levels of the digital divide, both access to ICT and the ability to use it are equally important. In order to be able to provide target group-specific offers at the local level, the most important requirement is for small-scale analyses at the regional and municipal level that show the distribution of digital skills in the population. Only on the basis of such a survey can needs be identified and offers developed (Schweitzer 2017). However, it is for instance, difficult to reach older people, refugees and people living in educationally disadvantaged neighbourhoods (BBSR 2022). So far, it has been shown that for instance in-person teaching can bridge this gap. It is suitable for imparting knowledge and digital skills and for building digital competences in digitally excluded population groups (Schweitzer 2017). The Digital Index also shows that low-threshold user interfaces and personal contact can have a positive effect on internet use. Furthermore, it makes sense for municipalities and districts to build on existing offers and to cooperate with institutions that have become active in this area (e.g. local adult education centres, initiatives, care institutions and other educational actors).

Participation in the smart city

All in all, adequate digital competences are the precondition for full participation in smart city projects. Simplified, smart city research has been very focused on city participation and co-creation (Engelbert et al. 2019). Ambitious participation and inclusion goals are central for many smart city strategies: Municipal concepts of digital urban development explicitly formulate the aspiration to allow citizens to increase their participation in planning processes and decisions. Cardullo and Kitchin (2019) present a systematic typification of forms and levels of participation in a smart city using the city of Dublin as an example. On this basis, at least two levels can be distinguished in the relationship between the municipality and citizens:

- Participation and involvement are based on citizens' options for gaining access to information to shape their living environment. In this context, social participation describes the possibility of being able to participate fully in the digital data and information services offered by a municipality. Municipal approaches can be identified here on three levels: Access to public digital data and services, localised information provision via digital screens and display totems, and direct information provision via citizen apps. In Cardullo and Kitchin's system, this can be categorised under the participation form of "tokenism" (information/recipient).

- A more active role for citizens is opened up through the possibility of direct participation in urban and neighbourhood development projects and processes. This includes participation in creative and learning centres of the creative city as well as participation in digital planning processes. The spectrum ranges from participation in individual projects to participation options in specialised planning and strategic urban development topics for shaping the living environment (BBSR 2017c). In Cardullo and Kitchin's system, this can be categorised as tokenism (consultation/tester) or citizen power (partnership/co-creator), depending on the design of the project.

However, there is still the challenge of not limiting social participation and inclusion to social groups that are already digitally proficient (e.g. Mariën/Prodnik 2014; Cardullo 2020) or restricting participation to predefined goals and projects (Bauriedl 2018; Engelberta et al. 2019).Thus, better-off groups of people with higher formal educational qualifications, higher incomes and flexible time budgets are clearly overrepresented in municipal participation processes (Selle 2017: 19f.). This creates the danger that other population groups cannot adequately contribute their interests in the participation processes, for example, in the design of their local environment. Consequently, in the area of the digital city, a double problem of addressing the municipal actors arises: on the one hand, only better-off groups of people are mobilised to participate through the conventional participation procedures. On the other hand, less digitally skilled groups of people are becoming increasingly excluded in the increasingly digitalised city and can make less or only very limited use of municipal digital services and participation opportunities to articulate their interests. A key question is how citizens can be empowered to participate in municipal planning processes and development projects (Schüle et al. 2021: 7). This is the subject of the next chapters.

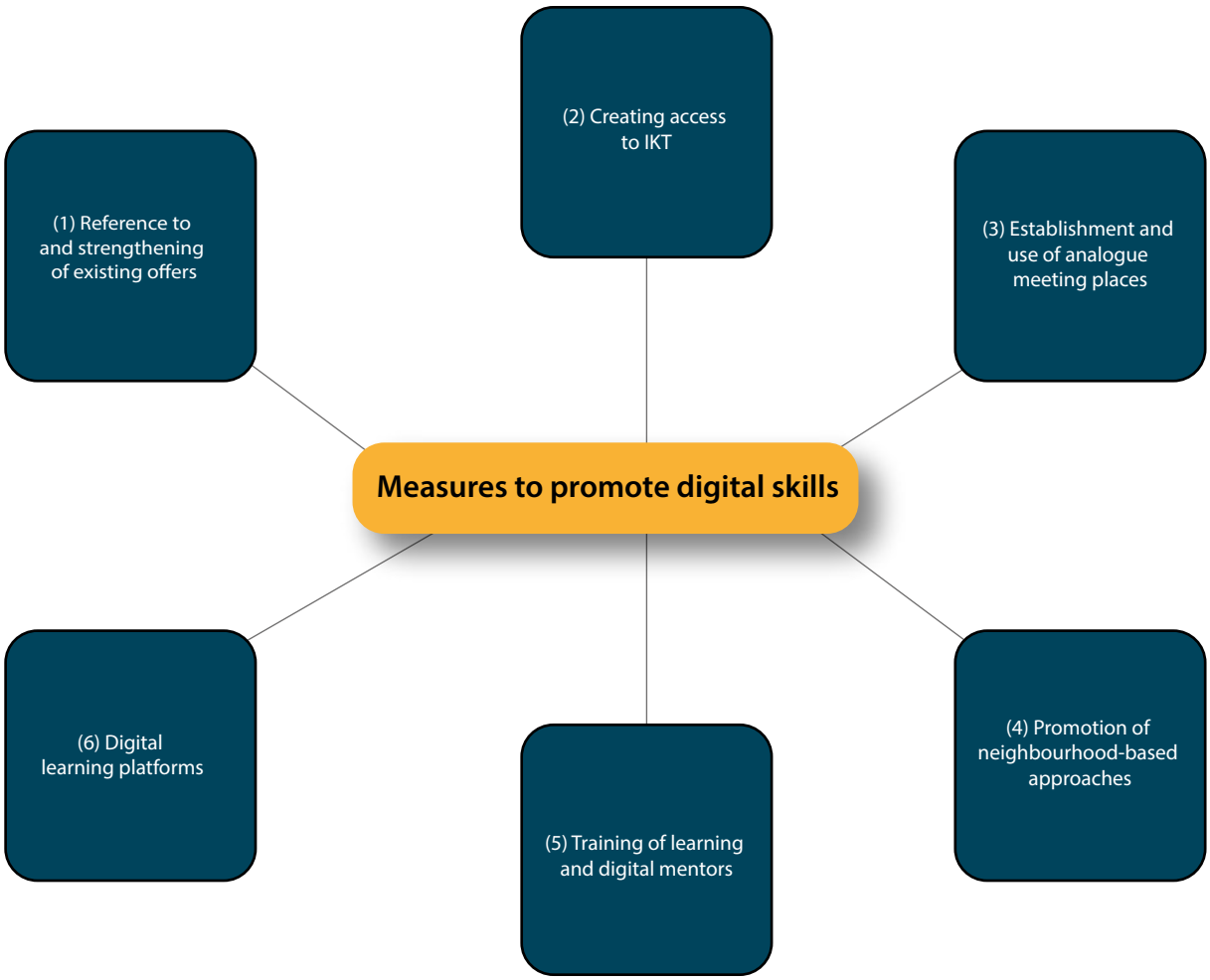
Digital literacy in the German MPSC municipalities and counties

Overview of the entire seasons

In addition to comprehensive participation opportunities for all citizens, the German Smart City Charter calls on the federal government, federal states and municipalities to promote cross-generational and cross-class learning of digital skills (NDSC/BBSR/BMUB 2017). Similarly, municipalities should use digitalisation to mitigate existing social and economic inequalities and demographic challenges and to promote democratic processes. Target group-specific and inclusive educational formats in schools, at work, in old age and in public spaces in neighbourhoods are a first step towards achieving these goals. They are also taken up by the Smart Cities model projects.

After a review of the applications of the 73 funded pilot projects, it becomes obvious, how model projects at least aim at disseminating digital skills within the population (see Figure 8).

Figure 8
Measures to promote digital skills in the Model Projects Smart Cities



Source: own presentation

(1) It becomes clear that, in a first step, those responsible for the MPSC collect and structure existing offers. In addition to referring to existing educational offers, a large number of the funded model projects are dedicated to the expansion or bundling of existing offers by municipal and non-municipal actors such as adult education centres or associations. Based on this, some pilot projects try to maintain and strengthen the existing offers. This is possible, among other things, through the expansion of existing courses or workshop series or the permanent provision of hardware that can be used for educational offers (e.g. Gießen or Würzburg).

(2) Another popular measure in terms of low-threshold access to the internet is equipping town and city centres with area-wide WLAN or WLAN hotspots (e.g. in Guben).

(3) In the area of skills transfer, the creation or use of analogue meeting places or the establishment of local digital skills centres (e.g. city district workshops in Mühlhausen / Thuringia) is a frequently chosen measure.

(4) In terms of a spatial approach, a few MPSC municipalities also rely on neighbourhood-based solutions, such as the projects Smart Gaarden in the Smart Kiel Region, which focus on disadvantaged neighbourhoods in order to ensure that all citizens are involved in the transformation.

(5) In addition to these two spatially related measures, other MPSCs rely on training of learning and digital mentors, who act as multipliers and impart competences through a personal and target group-oriented approach (e.g. in the district of Schleswig-Flensburg or digital pilots in the district of Hameln-Pyrmont).

(6) In connection with the measures presented above, some pilot projects also set up digital learning platforms that make various online teaching and learning formats available to the general public (e.g. the Wolfsburg Lupe, see below).

Often, the model projects do not plan to use only one measure to advance the teaching of digital competences, but link several measures together. Of course, this also depends on the already existing structures, networks and offers in the respective MPSCs. Even after an initial review, it is clear that the topic of digital skills not only concerns the broad civil society. Some model projects address individual groups of actors with their measures, where they recognise a particularly high need or lack of competences. Municipal administrations (e.g. in Guben) are particularly frequently addressed, but other groups of actors are also to be empowered, such as small and medium-sized enterprises in the district of Höxter. It is also evident that the model projects do not see the task of imparting digital competences and lifelong learning solely as an educational task, but also take measures to strengthen acceptance of the smart city / municipal digitalisation and to address and reduce existing resistance and fears (e.g. in the district of Vorpommern-Greifswald).

Seen against the background of the described demographic-specific digital divide, it is interesting to note that the two most frequently mentioned target groups are children and young people (or the reference to learning in school), for example in Freiburg, and senior citizens, as in Solingen or Oberhausen. It is often stated in the applications that the measures will reach all generations and social groups, even disadvantaged groups. Against the background of the overlap between population groups that are not very digitally skilled and those that are excluded from participation, it is questionable to what extent these strategies work and whether there is not a need for a more targeted approach to individual groups of people (e.g. refugees or unemployed people). To respond to this, a few municipalities chose a broad approach to teach digital competences, as shown by the following example.

Case study: Smart City Wolfsburg

Wolfsburg is a city in Lower Saxony, Germany, with around 125,000 inhabitants. It has been funded in the programme Model Projects Smart Cities since 2019. As part of its smart city strategy, it focuses on digital skills development. The background to this is the idea that the digital urban transformation has changed the requirements for shaping essential future-proof skills. For this reason and to mitigate the digital divide, Wolfsburg's Smart City Strategy formulates the empowerment of urban society as an overarching goal. Central to this is the declared aim that by 2025, everyone in Wolfsburg will have access to a modern infrastructure for education in the digital world, free access to education at any time and place and an offer to acquire digital media skills.

The strategic goal of Smart City Wolfsburg is therefore to develop a comprehensive package of measures to promote digital participation and acquisition of digital skills throughout the learning life cycle. The basis for this is networking with all relevant educational stakeholders in Wolfsburg, including the City of Wolfsburg Department of Digitalisation and Economy, Wolfsburg adult education centre, the city library, daycare centres, schools and local IT companies.

Wolfsburg is implementing various measures. For instance, the city introduced the European Digital Competence Framework (DigComp) as a standard tool for measuring digital skills in Wolfsburg's educational landscape. By April 2024, a total of 1,308 people had taken part in the self-test to assess their digital skills. In turn, the Library Lab aims to give citizens easy access to the digital world by promoting media skills in a fun way. To this end, it offers various events in the areas of STEM, gaming, sustainability and self-learning. In addition, the city has developed a central digital platform, the Wolfsburger Lupe (Wolfsburg's magnifying glass), for educational

and counselling services. This enables citizens to quickly and easily search for a suitable offer. More than 1,000 visitors use the Wolfsburger Lupe every month (see Figure 9).

Figure 9
Wolfsburger Lupe (Wolfsburg's magnifying glass) (Source: Stadt Wolfsburg)

Source: own evaluation

The Wolfsburg example makes it clear that the following aspects are important for the successful teaching of digital skills at the local level:

- The development of a municipal local education landscape based on the European Reference Framework for Digital Competences is successful if it is holistic, organised and networked throughout the learning life cycle.
- The introduction of the European Digital Competence Framework as a standard for all education providers in Wolfsburg enables the uniform, standardised monitoring of citizens' digital skills. This is the basis on which customised educational offers can be made.

Digital Participation and Competences in India

Digital participation and competences in cities in India have also been evolving in response to the government's push for digital transformation. Efforts have been made to improve digital infrastructure, including high-speed internet connectivity, sensors and communication networks. Initiatives aimed at digital inclusion seek to ensure that all segments of the population can actively participate in the digital ecosystem. Smart cities often emphasise e-governance solutions to enhance the efficiency and transparency of government services. Citizens can participate digitally by accessing government services, paying bills online, and engaging with civic authorities through digital platforms. The deployment of smart services, such as smart transportation, waste management and utilities, encourages digital participation. Citizens can interact with these services through mobile apps, online platforms and other digital interfaces. Some smart cities have implemented public Wi-Fi initiatives to provide widespread internet access in key areas. In many of the major railway stations, public Wi-Fi

initiatives have increased digital participation by enabling people to connect to the internet. Internet usage in India has been growing rapidly, driven by factors such as the increasing affordability of mobile phones, improving internet infrastructure and various government initiatives promoting digital inclusion (see also Chapter 1).

Citizen Participation in the Smart Cities Mission

Initially, urban development policies and programmes in India were top-down and did not have much scope for citizen participation. Though the process of citizen engagement was laid out in the state municipal acts, participation was limited to suggestions or raising objections on the draft development/master plan prepared by the cities. The process was rather perfunctory since it only seeks participation after the draft plan is prepared, and thus lacks meaningful citizen consultations (Mahadevia et al., 2014). It was only in 2005, through the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) that citizen participation in policy and programme development was institutionalised. The city development plans prepared under JNNURM required citizen participation in the form of public consultations. These efforts, however, were met with limited success. It is the Smart Cities Mission that brought citizen participation into focus, through the use of technology right from its inception stage in all 100 cities (Kumar et al 2016). The mission identified good governance through e-governance and citizen participation as one of the core elements of a smart city. The Mission guidelines mentioned that the development of smart cities proposals should be "citizen-driven from the beginning, achieved through citizen consultations, including active participation of groups of people, such as residents welfare associations, tax payers associations, senior citizens and slum dwellers associations. During consultations, the issues, needs and priorities of citizens and groups of people will be identified and citizen-driven solutions generated" (Ministry of Urban Development 2015: 22). Thus, citizen consultation became an important pillar of the Smart Cities Mission.

The ULBs were encouraged to engage citizens as they worked on their respective smart city proposals and recommended the MyGov platform, the Indian government's online citizen engagement portal, as the core platform for digital citizen consultation. According to Indian government estimates, more than 15 million people were reached during the first cycle of the competition. More than 2.4 million responses were received on the MyGov platform. The ULBs used a combination of in-person, print media, social media and online engagement methods to generate awareness, receive feedback from citizens and co-create solutions. Means of citizen engagement included focus group discussions, ward-level meetings, surveys, online engagement, opinion polls and public events.

For example, in Bhubaneswar city, a Citizens Connect Initiative was launched by the municipality to "inform, consult, involve, collaborate and empower" citizens. The municipality involved various stakeholders including NGOs, foundations, and multilateral organisations, and engaged citizens at various stages of proposal development. In Davanagere city, ward-level meetings in all of the 41 city wards formed a key pillar of their engagement strategy. Local elected officials played a significant role in engaging citizens through these ward meetings.

The MyGov platform facilitated citizen consultation for the Smart Cities Mission in two stages. During the first stage, it offered cities a range of citizen consultation methodologies, such as discussion forums, online polls, public talks and blogs. These tools served as a catalyst for citizens to participate in the Smart Cities Mission and offered suggestions for the development of their city. During the second stage of the mission, the shortlisted ULBs used MyGov to collect suggestions from citizens on their vision for a smart city to incorporate these into draft proposals. Of the 98 cities, 57 put the draft proposals online for further comments and input from the citizens. Overall, the proposals received a total of 142,000 comments.

MyGov- Digital Platform

MyGov was launched in 2014 by the Government of India as a citizen engagement platform to engage people in policy formulation and seek their opinion on issues and development topics.

MyGov stands as an internet-enabled digital platform, facilitating citizens from all corners of India or abroad to actively engage in the democratic processes of ideation, feedback, and participation in the formulation and execution of policies. The Ministry of Electronics and Information Technology oversees the design, development, hosting, and management of this platform.

Since its launch, it has more than 20 million registered users. Around 1.1 million submissions have been made in 1,108 tasks and around 5.1 million comments have been received in 906 discussion forums. Almost all central ministries and government departments leverage the MyGov platform for their citizen engagement activities, consultations for policy formulation and also to disseminate information to citizens on various government schemes and programmes. MyGov enables ministries and departments to harness the knowledge and talent of citizens not just to refine policy documents, but also to solicit creative inputs such as logos, mascots, videos and songs for upcoming projects or policies.

Source: https://www.mygov.in/compliance-report/ (MyGov Compliance Report)

Many experts agreed that these activities were triggered by the structure and incentives provided by the Smart Cities Challenge, in which 16% of the evaluation criteria were based on citizen engagement. Through guidelines and workshops explaining the competition format, the message was received locally, thereby pushing cities to engage citizens in the development of their proposals.

Citizen engagement also was enhanced by recent improvements in technology, enabling cities to use social media and online platforms for engagement. Many cities even created free Wi-Fi hotspots in crowded areas so that people could access the internet and submit suggestions. However, this also brought its risks. In particular, feedback from digitally literate citizens, who have access to the internet and digital technology, had more say in the process.

Nevertheless, citizen participation under the Smart Cities Mission presents important learnings with respect to the discourse on citizen participation in cities. Above all, it shows that the central government's active role in facilitating greater citizen participation at the local level was critical, and has immense potential to improve developmental outcomes. Given the concerns related to the depth of engagement and the short-term nature of the exercise itself, it is equally important to simultaneously institutionalise participation, build local capacity, and improve accountability mechanisms for more meaningful participation in the long term. The selected 100 cities now have the opportunity to build and carry forward these processes of citizen engagement in future programmes and act as a lighthouse for other cities. In India, however, there are also various examples of how the relationship between cities and their residents can be improved in the long term through digital solutions.

Case Study: PMC Care: A Smart Way of Interacting with the Government

PMC Care is an award-winning initiative of Pune Municipal Corporation (PMC), introduced to provide improved service delivery to citizens of Pune. Living up to its name, Citizen Assistance Response and Engagement (CARE), it is a digitally driven, citizen-centric initiative to provide an integrated, internet-based platform which streamlines various services, including grievance redressal, citizen engagement, payment gateway, and satisfaction surveys. By providing these tools, PMC CARE is dedicated to creating a more efficient and responsive governance system that caters to the diverse needs of more than 4 million Pune city residents. Available both as a website (Portal Citizen Engagement Platform) as well as a mobile application (PMC Care Mobile Application) on Android and iOS platforms, it also has convenient SMS and WhatsApp services.

PMC Care provides a convenient platform for diverse services, including filing complaints (public grievance redressal), making online income tax payments, paying utility bills (cashless strategy), obtaining birth and death certificates, facilitating marriage registrations, obtaining various licences, permits, certificates and no objection certificates (right to services portal), purchasing tickets for public places and participating in tenders. Additionally, citizens can access information about various activities, projects, and programmes implemented by PMC and can contribute blogs and articles.

Through the PMC Care platform, ULB officials receive timely information about government decisions, circulars, and other relevant updates. The platform ensures that citizens' complaints are addressed promptly, and a dedicated complaint dashboard is provided for transparent tracking and resolution. Additionally, residents of Pune from all age groups can access a comprehensive range of information, covering education, entertainment, city updates, health, and food, ensuring a complete citizen engagement platform on a single convenient platform.

The distinctive user sentiment analysis feature monitors user responses following complaint resolutions to evaluate whether the service has left them feeling dissatisfied, satisfied or delighted. The Feedback Management Cell effectively communicates citizen feedback and suggestions to the relevant authorities, ensuring a swift resolution of complaints for the residents. This intervention not only allows the residents to file their complaints but also invites them to design effective solutions, prioritising a balanced citizen-involvement approach. Citizens experience a sense of being acknowledged and receive a timely response to the concerns they raise.

The intervention has proved effective in connecting citizens with PMC without any physical visit and saving valuable time and resources. Over time, the initiative has been successful in making the city of Pune more liveable and citizen-friendly. The provision of co-creation between the city administration and the citizens is a noteworthy feature.

Outlook

The digital divides in Germany and India extend beyond a mere technological challenge, they also mirror other socio-economic inequalities. It is interesting to note that in both Germany and India, the promotion of digital skills and participation in smart city projects has been supported at the national level. This has certainly had positive effects at the local level.

Initiatives for digital inclusion should prioritise enhancing the capabilities of all segments of the society. This necessitates a dedicated focus on elevating educational levels, socioeconomic status and digital literacy. Without such targeted efforts, the full advantages of digitalisation cannot be realised. It is crucial to acknowledge that a smart city cannot thrive in isolation from the broader society, it requires deliberate actions to address the challenges faced by under-resourced urban areas and marginalised communities. The ultimate objective should be the creation of a smart society aligned with the principles of Society 5.0, wherein technology serves to uplift the well-being of all members of society. The following are the areas which need to be strengthened:

- **Digital Inclusion:** Bridging the digital divide by expanding **access** to **affordable** internet access and technology in rural and remote areas and the underserved population residing in urban areas.
- **Data Protection:** Strengthening data protection laws and frameworks to safeguard citizens' privacy and personal information.
- **Interoperability:** Ensuring that different e-governance systems and platforms can seamlessly communicate with each other to provide a more unified experience for citizens.

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