

Conceptualising Smart Cities in the Japanese Planning Culture

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1 ABSTRACT

Smart cities have been a field of action in spatial development for quite some time. Building on the societal trend toward digitalization, the nexus of digitalization and spatial development has been planned and researched since the turn of the millennium (Hollands 2008). In the highly competitive segment of smart cities, platform solutions from large IT and consulting companies are often applied (Hollands 2015). In addition, an international discourse emerged in research that critically reflects on the smart city concept itself (Grossi and Pianezzi 2017). Today, all over the world many cities are applying smart solutions, and position themselves as smart cities, but how are smart cities conceptualized in different planning cultures?

The Japanese planning culture is characterized by strong centralization with the central government being the main actor in development (Pallagst et al. 2018; Martinez-Fernandez et al. 2016). In addition, the Japanese society is highly challenged by demographic change and ageing. Consequently, the aspect of ageing plays a role in all Japanese policies, also in the context of smart cities (interview with staff at the German Institute for Japanese Studies, Tokyo, July 2023). Yet how are smart cities conceptualized in the Japanese planning culture, what are the main drivers and goals, who are the main actors, and which policies are at hand? And – given the societal context of demographic change and ageing in Japan – how is the aspect of ageing taken into consideration in the concept of smart cities in Japan?

This paper will shed light on conceptualizing smart cities in the Japanese planning culture. Starting with a brief introduction to the concept of planning cultures with a special emphasis on Japan, it will present two cases of smart cities in Japan, trying to answer the questions outlined above.

The research presented here is part of the project ‘Ageing Smart’ carried out by a consortium at RPTU Kaiserslautern-Landau funded by the Carl-Zeiss-Foundation. This particular part of the project aims at scrutinizing the application of smart cities in different planning cultures, among others Japan – discussing their potentials and detecting possible best practice examples.

Keywords: Japan, planning, culture, governance, smart cities

2 SMART CITIES AND PLANNING CULTURES

Spatial planning systems are based upon different institutional and cultural conditions. While these may present comparable features, these planning systems were designed to operate in distinct cultural, normative and spatial situations (Pallagst 2010). Meanwhile, a considerable discourse on planning cultures has emerged with a range of definitions about what planning cultures could comprise (Knieling and Othengrafen 2009; Levin-Keitel and Othengrafen 2017; Sanyal 2005). Pallagst et al. (2021) suggested an operative definition of planning culture as follows: “Planning cultures encompass the societal aspirations towards planning – its processes and its outcomes. It refers to the values and shared beliefs of stakeholders involved in planning, and the methods and tools they are applying and producing. Planning cultures are not static but constantly evolving in line with societal changes or planning related challenges. Planning cultures as we see it can be attached to specific territorial entities, be it nations, sub-nations, regions, or cities – most likely but not necessarily within administrative boundaries. In addition, they can be attributed to cities or regions having to face specific planning problems”.

In order to expand empirical research on topical planning cultures, Pauly and Pallagst (2023) proposed investigating possible changes in planning cultures in conjunction with digitalization. In order to derive a typology of planning cultures applicable for a variety of planning contexts, the authors modified Othengrafen’s culturized planning model (Othengrafen 2010). This model offers layers of planning culture such as “societal context”, “planning context”, and “planning toolset”.

The author’s previous research made clear that planning cultures can be investigated by evidence based research utilizing for example shrinking cities, or border areas. In general, spatial planning offers many subjects which might offer windows of investigation for planning cultures. Research by Sorensen (2015)

suggests that planning cultures might change when faced with “critical junctures of institutional change and innovation in planning systems” (Sorensen 2015). One of these critical junctures might be the context of digitalization. In order to conceptualize planning cultures and digitalization, the authors suggested a research frame involving digitalization in the facets and layers of planning culture (Pauly and Pallagst 2023).

The research on changing planning cultures in view of digitalization is a novel field, and – since digitalization is a very broad arena – it can be attributed to several factors of digitalization. One of them could be smart cities. The authors suggest that the use of digital tools such as AI, visualizations and platform solutions poses new requirements for spatial planning in terms of conceptualizations, decision-making and participation processes. This, in turn, has consequences for the planning tools and the competencies of spatial planners and other actors in the planning and development process. In general, implementing smart cities already might have initiated changes in planning cultures, which is one of the main hypotheses of this paper.

When looking at the Japanese planning culture the planning system is highly centralized with a focus on economic development and market orientation (Martinez-Fernandez et al. 2016; Mallach et al. 2017; Sorensen 2011). Plans, programs and policies are developed on national level, and the implementation appears to be strictly top down. Plans and policies are implemented on regional and local level with only basic adaptation towards the specific location. Although planning documents on national level refer to regional or local best practice examples, the selection of those cases seems not transparent since there is no system of developing those best practices within defined parameters (Interview with Norio Miki, Nomura Research Institute, 2018).

Moreover the Japanese planning culture is challenged by several societal transitions. In particular preparing for disasters and for demographic change and the path towards an ageing society have longstanding impact on policy-making in Japan (interview with staff members from the German Institute for Japanese Studies, Tokyo, 2023). Population data by the United Nations, Department of Economic and Social Affairs, Population Division (2024) shows that ageing is a force the Japanese society needs to account for since many years and for the years to come. For this reason, the planning cultural context needs to involve societal aspects such as the aspect of ageing.

The following paragraphs will shed light on the smart city context of Japan with some emphasis on the specific requirements of an ageing society, and the potential implications on the Japanese planning culture.

3 SETTING THE SCENE FOR SMART CITIES ON NATIONAL LEVEL: SOCIETY 5.0

The “Science and Technology Basic Plan”, which is updated every five years (MEXT n.d.), resembles the basic framework and vision for the future technological development of the Japanese economy and society, and therefore also for the cities. The fifth edition of this plan, presented by the Japanese government in January 2016, refers to various IT initiatives in China, the USA and Germany (Germany: “Industry 4.0”) and can also be seen as a response to these. The Japanese concept from 2016 goes deeper than the transformation of the economy and, against the backdrop of a rapidly ageing society, presents the vision of a “super-smart society”, a “Society 5.0” (Waldenberger 2018).

Society 5.0 describes the desired future form of society, based on the “merging of cyberspace and physical space” (Hitachi-UTokyo Laboratory 2018), following the ‘hunter-gatherer’, ‘agrarian’, ‘industrial’ and “informational society”. The city structure is also changing from a ‘network city’ in the current “informational society” to an ‘autonomous decentralized city’ in Society 5.0 (Hitachi-UTokyo Laboratory 2018). The “Comprehensive Strategy on Science, Technology and Innovation” (STI) prioritizes the initiatives listed in the Science and Technology Basic Plan on an annual basis (Cabinet office 2017). The 2017 update characterizes Society 5.0 as the “vision of future society (...) [that] will be a human-centered society that, through the high degree of merging between cyberspace and physical space, will be able to balance economic advancement with the resolution of social problems by providing goods and services that granularly address manifold latent needs regardless of locale, age, sex, or language to ensure that all citizens can lead high-quality, lives full of comfort and vitality.” (Cabinet Office 2017: (STI) for 2017, as cited from: Hitachi-UTokyo Laboratory 2018)

The central motif of Society 5.0, the merging between cyberspace and physical space, means in terms of implementation the comprehensive collection of data, the merging and processing of this data by AI in integrated systems and the use of the data by public or private end user applications (Deguchi et al. 2018).

Among all the problems to be addressed by Society 5.0, the demographic change in Japanese society, which is causing a declining workforce and thus also declining productivity, is given a special significance (Audrey, Kusuma Paksi 2022). Society 5.0's fields of action include among other the extension of the healthy lifespan, realization of the mobility revolution, etc. In these areas, technologies already known from Society 4.0, e.g. the Internet of Things (IoT) or artificial intelligence (AI), are to be used to create the conditions for maximizing productivity, for example through fewer sick days or a later retirement age due to better health. The inclusive approaches of the Society 5.0 concept, on the other hand, aim to increasingly integrate groups into the workforce, who are not yet fully available to the labor market, such as women (Fukuyama, Mayumi 2018).

Society 5.0 aims to transform not only the industry (see "Industry 4.0 in Germany") or cities, but society itself, with the necessary structural and technical changes to "merge the cyberspace and the physical space" taking place in people's living environment. An existing concept that has already been implemented in some cities to link new technologies with the built environment is the 'smart city'. The smart city approach in Japan over the past two decades has had a clear focus on the introduction of new technologies, particularly in the energy sector (Deguchi 2028). Based on the challenges that cities are already facing, such as an ageing society, far-reaching requirements for the design of a smart city can be derived from Society 5.0. Key points that must play a greater role in smart city concepts in the future according to Society 5.0 include the human-centered approach and the solution of social problems as well as sensor-based data collection and the increased use of the Internet of Things (Deguchi 2018). As concrete approaches for implementation of technology, the Cabinet Office's "Smart City Guidebook" cites real-time data collection for disaster prevention, the cashless society, autonomous transportation and logistics, and improving health through the use of ICT (Information and Communications Technologies) (Cabinet Office 2021). On the other hand, strengthening bottom-up initiatives with 'citizen-based technology' in smart city projects is seen as a way to implement the abstract goal of a 'human-centered society' with a focus on solving social problems (Deguchi 2018).

Two approaches for implementing smart city projects have established themselves so far: the 'government-initiated type' at city level and the 'area management type' at neighborhood level, whereby in the past the initiative in many cases came from public authorities (Cabinet Office 2021).

Smart city initiatives of the government initiated type are concerned with the entire city or larger sub-areas. The focus lies on the performance and efficiency of the administration, as well as improving the provision of various public services. The process is usually organized by a committee led by the city (Cabinet Office 2021), with close cooperation between the public and private sectors often playing an important role despite public leadership (Deguchi 2018). The main tasks of the city include the development of the objectives and strategy, the organization of the committees and working groups as well as the administration of the entire process (Cabinet Office 2021). So far, good results have been achieved when the smart city project was embedded in city-wide (integrated) strategy and planning, including the participation of residents and stakeholders (Deguchi 2018).

On the other hand, there is the area management type, which relates to a specific neighborhood with its specific problems and challenges. As the initiative in this case often comes from the neighborhood itself, smart city projects usually aim to improve the quality of life of residents and strengthen local businesses. The process is organized in a neighborhood management/development council consisting of public and private stakeholders. Similar to the government initiated type, the task of the city government is to initiate, set up and support this council, however in contrast, the local private actors are mostly involved in drawing up the strategy (Cabinet Office 2021). Finally, the concluded measures are implemented in close cooperation with local stakeholders such as businesses and residents, often in the form of a public-private partnership (Deguchi 2018).

The following two chapters take a closer look at one example each of a smart city of the government initiated and the area management type.

4 TWO EXAMPLES OF SMART CITIES IN JAPAN

4.1 A management initiated smart city initiative: OMY-district

4.1.1 Background

The districts of Otemachi, Marunouchi and Yurakucho (OMY-district) are located between the grounds of the Imperial Palace (Edo castle) and the Tokyo station built in 1914 (Tokyo Omy Council n.d.a). Large parts of the site were originally used by the army and were sold to the first president of the Mitsubishi Company in 1890 (Mitsubishi Estate 2022). In the following decades, the area was developed into Japan's first office district and due to its numerous red brick buildings it was given the nickname 'London Block'. The remaining state-owned areas were privatized in 1955 (Tokyo OMY Council n.d.a). In the subsequent economic boom, the area was 'remodeled' and a modern office district was created (Mitsubishi Estate 2022).

At the height of the "bubble economy" of the 1980s, the property owners of the OMY districts organized themselves with the founding of the 'OMY District Redevelopment Project Council', later renamed the "Council for Area Development and Management of Otemachi, Marunouchi, and Yurakucho" (here: "the council") (Tokyo OMY Council n.d.b). This first merger came about against the backdrop of an overheated real estate market, increasing competition between the districts of Tokyo and major plans by real estate companies such as the "Marunouchi Redevelopment Plan", later also referred to as the "Manhattan Plan" (Dimmer 2012). When this bubble burst, the ambitious real estate development plans were put on hold and a reorientation took place. The aim was now to revitalize the existing stock, so that the focus shifted to attracting foreign companies and developing a high-quality working environment, particularly in view of various demographic trends and the expected shortage of staff. It was also intended to shake off the image of an old, monofunctional office district (Dimmer 2012). In 1995, the governor of the Tokyo Metropolitan Government drew up a plan to revitalize the city center, which focused, among others, on the street between the station and the Imperial Palace in the heart of the OMY district (Dimmer 2012). At the same time, the "OMY Advisory Committee" was founded in 1996. Its members include the Tokyo metropolitan government, the Chiyoda ward, the East Japan Railway Company and the Council for Area Development and Management of Otemachi, Marunouchi, and Yurakucho (Tokyo OMY Council n.d.c). The overarching goal of this committee is to discuss the future development of the district between the public planning authorities and the property owners. The result of this public-private partnership is the "Guideline for the Redevelopment of the Area" (here: "the guideline") published in 2000, in which key development goals were laid down, such as the appearance of the skyline (Dimmer 2012). This guideline is regularly updated, most recently in 2021 (Tokyo OMY Council n.d.b) and continues to set groundbreaking goals for the development of the district. The non-profit organization 'OMY Area Management Association', founded in 2002, also integrates the tenants of the commercial properties and the community into the urban development process. The tasks of this NPO consist of "integrated management" of the public space and the implementation of projects for the community (Dimmer 2012).

Since the 2010s, the response to increased global competition between cities as a result of globalization became increasingly important. This led to the need to create attractive and vibrant neighborhoods to attract foreign companies (The Real Estate Companies Association of Japan 2022). The Smart City Vision based on the guidelines and jointly formulated by the council, the city of Tokyo and the Chiyoda district in 2019 should be viewed against this backdrop.

4.1.2 Organization

The OMY-district emerged as the first office block in the history of Japan (Tokyo OMY Council n.d.a) and is still an important commercial area centrally located between Tokyo Station and the Imperial Palace. As the largest property owner, owning 33% of the land in the OMY district (Mitsubishi Estate Co., LTD. n.d.), the Mitsubishi Estate company is a major player in the development of the district. The first remodeling plan was drawn up by Mitsubishi back in 1959, and today the company plays a leading role in the Council for Area Development and Management of Otemachi, Marunouchi, and Yurakucho and thus continues to have a major influence on the development of the district (Mitsubishi Estate 2022).

As already mentioned, the council represents the property owners of the OMY district and can be regarded as the central body for project-orientated neighborhood development. Full members are therefore exclusively companies based in the OMY district; the Chiyoda ward and various public agencies are listed as supporting

members (Tokyo OMY Council n.d.d). The council has set itself the goal of promoting growth through urban planning, particularly in public spaces, and sees its tasks in the implementation of neighborhood development projects. The objectives and projects are coordinated with local stakeholders and public authorities through the regularly updated Guidelines for the Redevelopment of the Area (Tokyo OMY Council n.d.e). The projects are ultimately developed in committees, including the ‘Committee for Smart City Planning and Promotion’, whereby the Mitsubishi Estate Company, as a major player, provides the chairperson or deputy chairperson in almost all of the committees (ibid.). The council is supplemented by the Ecozeria in the field of social projects and sustainability, the Area Management Association, which is primarily concerned with the community and the management of public space, as well as various other organizations (Tokyo OMY Council n.d.c).

The council therefore performs important urban planning tasks at district level and drives development forward in a project-oriented manner. However, the public planning authorities of the Chiyoda district and the Tokyo Metropolitan Government do have an influence on the development of the neighborhood. For this purpose, the OMY Advisory Committee, a public-private partnership between the council, the Tokyo Metropolitan Government, Chiyoda ward and the East Japan Railway Company (ibid.), was founded. Through the work of this committee, the project-oriented planning at neighborhood level can be embedded in the overarching urban development planning.

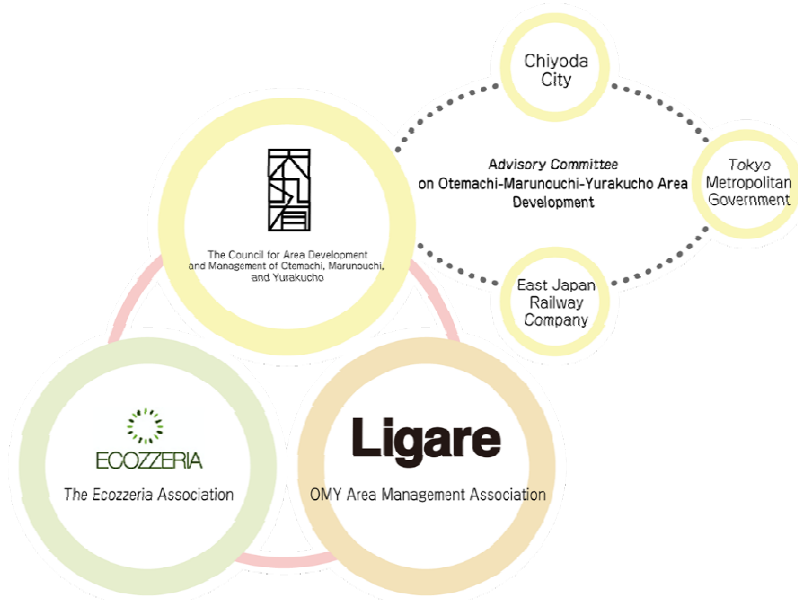


Fig. 1: OMY Public-Private Partnership (Tokyo OMY Council n.d.c)

4.1.3 Smart city approach

As mentioned at the beginning, profiling as a modern and attractive place to work became increasingly important in the urban development of the 2010s and also found its way into the guidelines. Under the motto “Smart and Walkable”, development goals such as “Cultural area, that attracts and bustles with people” or “Convenient, comfortable area, that people can walk around” (Tokyo OMY Council n.d.f) bear witness to this new orientation. With the goal “Smart area, that utilizes cutting-edge technologies and data” (ibid.), the guideline sets the course for smart city projects and shows that the smart city has the potential to achieve the ambitious development goals.

Cooperation between the state institutions and private organizations in the OMY district as a public-private partnership in the form of area management is considered crucial for the implementation of the objectives, including the smart city (ibid.). The cooperation between public and private actors, organized in the “OMY Area Smart City Promotion Consortium”, mainly relates to public relations and the coordination of the smart city project with the ideas of politics and administration. At the center, however, is the Committee for Smart City Planning and Promotion based at the council, which is also the contact address for the numerous collaborations. In addition to the aforementioned cooperation with public authorities, there is also contact with universities, the Ministry of Land, Infrastructure, Transport and Tourism and, above all, organizations operating at a city-wide level (Tokyo OMY Council n.d.g). Another partner is the Tokyo Marunouchi

Innovation Platform, a network of government, academia, various companies of the OMY-district and the local community in form of the council etc., aiming to connect the businesses and to support the demonstrations of (smart city) projects in the area (TMIP n.d.).

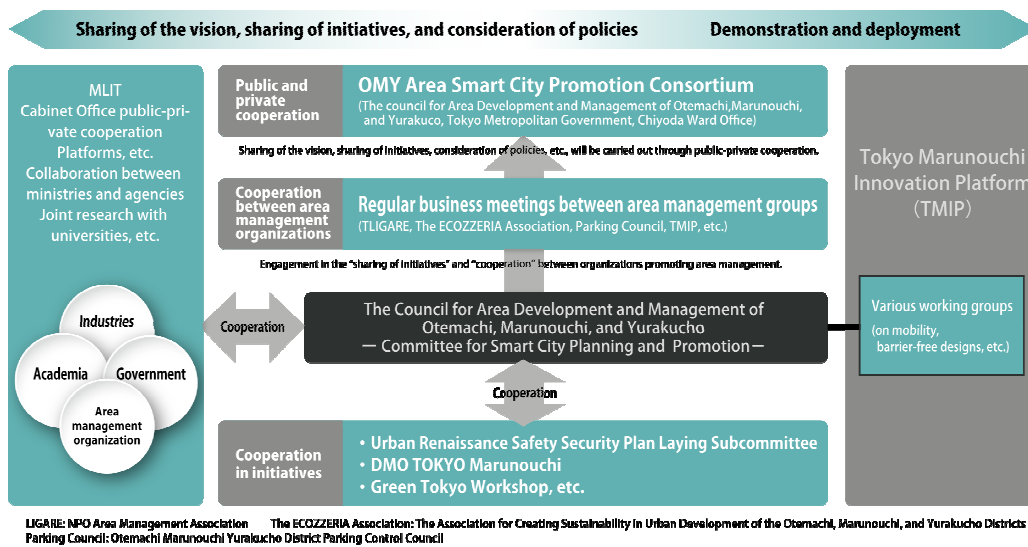


Fig. 2: Organizational chart of the OMY smart city initiative (The Council for Area Development and Management of Otemachi, Marunouchi, and Yurakucho n.d.)

The objectives for neighbourhood development are coordinated with the city and the district through the guidelines and therefore also define the objectives and framework conditions for the smart city. In relation to national initiatives it should be mentioned, that the smart city concept is not derived directly from Society 5.0, but rather stands alongside it. Therefore the implementation of these concepts is primarily aimed at increasing the attractiveness of the district for workers and increasing resilience to disasters and diseases (Advisory Committee 2023). In the 2023 update of the guidelines, the idea of the smart city is further elaborated. The cross-sectoral orientation, the importance of public-private cooperation and implementation by the area management are emphasized here. However, the focus of the guidelines is on the introduction of new technology such as AI, IoT and extensive data collection and usage. For the citizens and workers, the smart city can be experienced through new data and digital services and the renewal of public space. In the spirit of Society 5.0, the aim is also to change people's values and behavior (Advisory Committee 2023).

The system

The design of the data and IT system is based on the goal of creating a data-based area management model. To do this, the available data, generated by apps or sensors for example, is first brought together on a data utilization platform and entered into a digital twin, a 2D or 3D version of the OMY-district. Various applications can now access this collected and processed data. Services for area management, such as a dashboard for visualizing the data or various simulations for district development, can access the data directly, while applications for individuals and companies, as well as the public, have access to open data through the 'Data Library' (OMY Area Smart City Promotion Consortium 2020).

In the area of private applications, the Oh My Map! app, which provides information on mobility, events, etc. in the neighborhood can already be used. As a public application, the Area Management City Index is also already being used as a tool for visualizing area management activities and the beta version of the OMY dashboard presents relevant information and serves as a data basis for area management (Tokyo OMY Council n.d.h).

Another important project is the redesign of public spaces according to the motto "Smart and Walkable", based on the "Mobility as a Service" concept, which also introduces new forms of mobility such as self-driving buses. In order to increase the attractiveness of the area, there is an increased focus on concentrating transport infrastructure in mobility hubs and creating walkable streets with flexible use (OMY Area Smart City Promotion Consortium 2020).

4.1.4 Discussion

Due to several factors, the smart city initiative in the OMY-district is unique and resembles an “extreme form” of the area management types discussed in the Society 5.0 chapter. With the Mitsubishi Estate company the area has a dominant, professional owner, which holds a large part of the land and has been managing it since the end of the 19th century. The smart city initiative was also launched from this position to respond to existing problems, aiming to make the area competitive as an office district for the coming decades and to secure and increase the value of the properties and the profits generated. Against the backdrop of a changing and increasingly diverse workforce, revitalizing and increasing the attractiveness of the district, in the sense of transforming it from a monofunctional office district into a vibrant working district with a high quality of life, is seen as the best way to achieve these goals. The smart city concept in OMY is designed accordingly and places great emphasis on visualizing the plans and the milestones already achieved as well as on creating a new image and promoting the initiative.

These structures are also evident in the organization of the initiative. The framework and objectives were developed in a public-private partnership (OMY Area Smart City Promotion Consortium), so that the ideas on urban development of the Chiyoda district and the Metropolitan Tokyo Government are considered in the design of the smart city. However, the Council for Area Development and Management of Otemachi, Marunouchi, and Yurakucho and thus the owners of the OMY district are responsible for the development and implementation of the individual projects. A clear division of tasks between public and private actors is therefore evident. It should be noted that public-private partnerships and joint urban development in the district were already established with the founding of the OMY Advisory Committee in 1996. To be able to finance the smart city initiative in the long term, public and private players plan for a joint funding. Therefore, the added value generated by the smart city, e.g. the increased tax revenue or the increased turnover and profit of the companies, should be reinvested in the smart city and thus ensure sustainable financing based on growth (OMY Area Smart City Promotion Consortium 2020).

However, the OMY smart city initiative is not geared towards society or the city as a whole but has a clear focus and a limited user group and as a result, many important aspects of the smart city such as housing, schools, etc., are not addressed. What significant effects and advantages the smart city initiative actually has for the city or the district and its specific user group, in addition to the advertising aspect, remains to be seen as the implementation of the vision and projects progresses.

Due to the special circumstances, findings are only transferable to a limited extent, especially because only the working age group is considered in the OMY smart city initiative. However, the case study shows very well the potential of public-private partnerships and area management, as well as the importance of local stakeholders for urban development. In addition, individual projects, and above all their implementation within the framework of area management, show possible applications of ICT technologies in urban areas. The new mobility concepts and the redesign of the public space aim at increasing the attractiveness of the district for workers in the OMY district but are just as relevant for other groups such as the ageing resident population in other districts.

4.2 A government initiated smart city initiative: Smart City Takamatsu

4.2.1 Background

For its future, the city of Takamatsu sees the declining birthrate, the super-aging society and the transformation of the economy, with far-reaching consequences for the city and its population, as the determining trends and challenges for urban development. The implementation of a smart city concept as a part of sustainable urban development is seen as an opportunity to respond to these challenges by increasing the attractiveness of the city, improving administrative efficiency, and maintaining citizen services. The potential of the smart city is seen above all in the use of ICT technologies and services (Takamatsu City General Affairs Bureau Information Policy Division ICT Promotion Office 2019). In addition to these social challenges, the focus of Takamatsu's smart city vision is on disaster management. In 2004, a typhoon caused massive damage in the city, and since then great efforts have been made to protect the population from natural disasters. This topic area was therefore also placed at the center of the concept in the city's smart city vision (Mochizuki et al. 2020).

The process was also initiated by the “Declaration to Create the World's Most Advanced Digital Nation” published by the Japanese government and the associated “Basic Plan for Promoting Public and Private Sector Data Utilization”, which encourages municipalities to digitize and provide data. For this purpose, the “ICT Promotion Office” within the Information Policy Division of the General Affairs Bureau was established in 2017 (Takamatsu City General Affairs Bureau Information Policy Division ICT Promotion Office 2019). In addition, the smart city Vision serves the implementation of Society 5.0, with the goal "to create a digital government that promotes collaboration" (Takamatsu City General Affairs Bureau Information Policy Division ICT Promotion Office 2019).

4.2.2 Organization

Also in 2017, the Smart-City Takamatsu Promotion Council (here: “the council”) was founded as the central organization for the creation and implementation of the smart city vision. The main task of the council is the promotion of a common data platform in order to solve issues through cooperation of the industry, the government, academia and the community (Cabinet Office 2022). In this function, it is also seen as a platform for an open exchange of ideas and innovation. To this end, the council enjoys extensive autonomy, although it was initiated by the city, is chaired by the mayor and the city administration takes on administrative tasks. The original 14 members of the council, government agencies, companies and NPOs, are organized in the general assembly as the decision-making body with a supervisory function (Oga/Kobayashi 2018). The Steering Committee is subordinate to the general assembly and is made up of elected representatives of the general assembly. It is responsible for defining key topics, setting up working groups for these topics and processing the results of the working groups to present them to the general assembly. The establishment of one of the aforementioned working groups can be proposed by all members of the council on specific topics (JASCA n.d.a). The council is supported by external experts and the ICT Promotion Office, which takes on administrative tasks such as the publication of the Smart City Takamatsu Promotion Plan and serves as a secretariat for the council (Cabinet Office 2022).

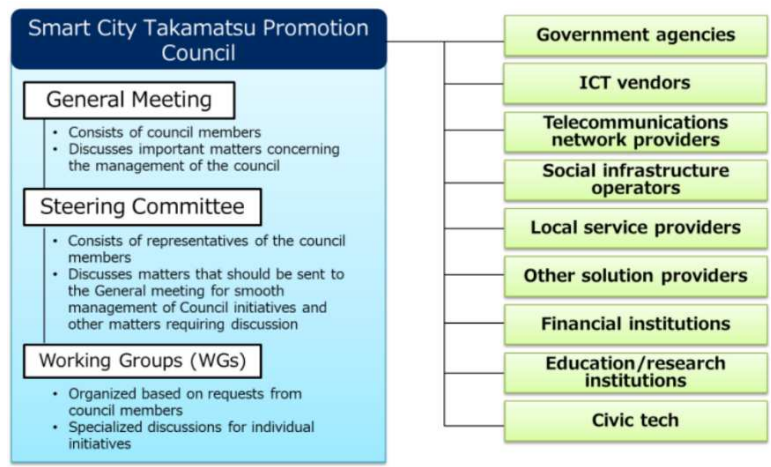


Fig. 3: Organizational chart of the Takamatsu smart city initiative (JASCA n.d.a)

However, the council's function is not only to work on the vision and concepts, it also serves in particular as an idea multiplier, by establishing contacts and exchanging ideas between the members. The communication of the smart city vision and the exchange between the individual members and the local community, as well as participation and public relations work, are also essential for the work of the council (Oga/Kobayashi 2018).

4.2.3 Smart City approach

Behind the vision of a smart city, presented in the Smart City Takamatsu Promotion Plan, and other urban development projects in Takamatsu, is the desire to counter the current trends such as declining population, declining birthrate, and super-aging society and to achieve sustainable growth despite these prospects. The utilization of ICT and data as well as a firm collaboration of various entities is seen as the key to achieve this vision. The main areas of application are seen as reforming and digitizing administration, creating new civic services, and increasing their efficiency, particularly in light of the rising demands of the population and increasing complexity in planning. By considering the 6th Takamatsu City Comprehensive Plan, the Smart

City Takamatsu Promotion Plan was integrated into cross-sectoral urban development planning (Takamatsu City General Affairs Bureau Information Policy Division ICT Promotion Office 2019).

The Common IoT platform

The Smart City Takamatsu Promotion Plan calls in particular for the increased use of ICT and the digitalization of administration. As part of disaster management, one of the first projects was the creation of a common IoT platform, which can be used to collect, process, and visualize sensor data (Mochizuki et al. 2020). Up to this point, for example, water levels in the harbor etc. were regularly measured by hand and the data was then entered into the system (Mochizuki et al. 2019). As one of the first projects to be implemented, the common IoT platform is at the heart of the smart city. However, the platform can and will also be used for a range of other applications (Ishii, Atsushi 2018). The platform is based on technology from Fiware, a product of the EU's Future Internet Public-Private Partnership (fi-ppp) program, with the aim of supporting municipalities in setting up smart city initiatives. Fiware is already widely used in Europe, but Takamatsu is the first Japanese city to implement this technology (ibid.).

All of the required data is supplied by sensors, for example for recording water levels in the port and rivers, cameras for recording traffic and pedestrian flows, or provided by external sources such as weather data. As this data is available in different formats, it is first collected on the server and then converted into a unified and standardized format so that the various applications can access it. Once the data has been converted, the common IoT platform provided by Fiware is responsible for the management, processing, and deployment of the data. Finally, the processed data is shared with the applications via Application Programming Interface API (Mochizuki et al. 2020). A distinction is made between public applications such as the dashboard for visualizing data for the city and the public (Takamatsu City Dashboard and Citizen Dashboard) and applications provided by third-party providers (JASCA n.d.b.). The public applications can access and process all available data, for the applications offered by third parties, even if they serve the provision of public services, a demonstrative environment for the common IoT platform has been created. Through this separate platform, partners from industry and academia, government agencies and the community will be able to freely access the data provided and create new projects and applications for the city and the community (Takamatsu City n.d.). This platform was initially tested with open data and information on traffic safety, such as accidents (JASCA n.d.b.). However, further use in the areas of disaster prevention, tourism, welfare, and transportation is planned (Takamatsu City n.d.).

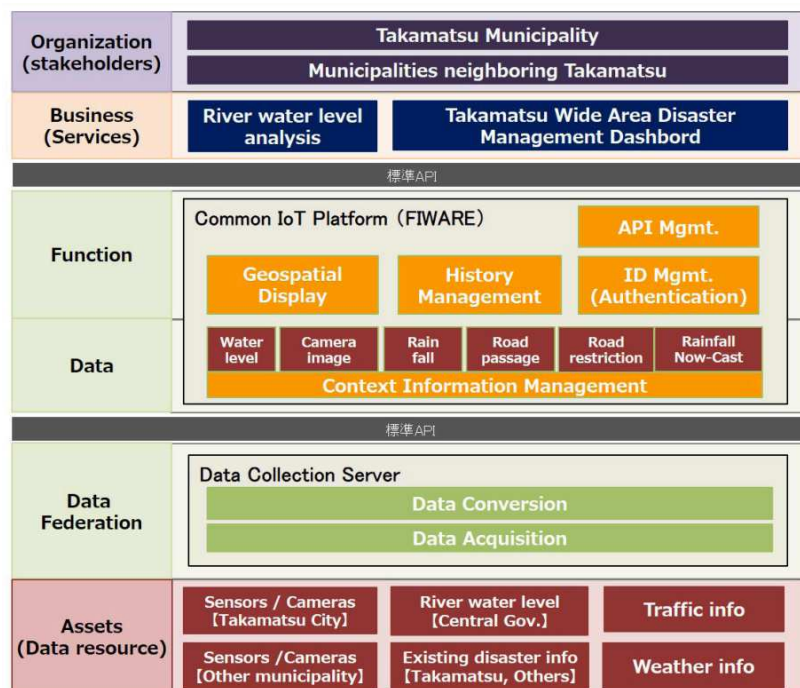


Figure 4 - System Architecture of Wide-Area Disaster Management Service

Fig. 4: Functional scheme of the common IoT platform (Mochizuki et al. 2020)

The platform is particularly relevant in the area of disaster management, as the real-time recording of water levels and the combination of this data, including the Japan Meteorological Agency's rainfall forecast, which

is updated every 5 minutes, has greatly improved the city's ability to provide early warnings. In addition to the collection of data concerning the water levels, recorded by sensors and surveillance cameras installed in the city, data on traffic and the capacity of shelters is collected as well. The data collected and processed by the common IoT platform can now be accessed by Takamatsu's administration via the 'Takamatsu wide area disaster management dashboard' and used to make quick decisions based on this real-time information and, above all, on up-to-date and precise data. Concrete examples of application include early warning, efficient traffic management depending on the trafficability of the roads and the distribution of the population to the shelters. In addition to these aspects of safety, there is also the possibility of saving on personnel, which will become increasingly important in the coming years due to demographic change (Mochizuki et al. 2020). In addition, the information can be made available to the population via the "My Safety Map" so that Takamatsu residents can take a direct route to safety (JASCA n.d.b.). The Smart City Takamatsu Promotion Plan particularly emphasizes the importance of cooperation. A good example of the implementation of this cooperation is the initiative for wide area disaster resilience launched in 2020, in which the City of Takamatsu joined forces with Kan'onji City and Ayagawa Town to better respond to wide-area disaster events such as typhoons or floods (Mochizuki et al. 2020).

However, other services are already being offered and tested via the platform as well. One example is the spatial analysis of traffic accident data and the timely warning of drivers of dangerous or accident-prone sections of the road network. Another application is the provision and advertising of rental bikes in the city, as it has been established that user behavior differs depending on the country of origin of the tourists. The "Watch over Elderly" programme though, which aims to monitor the elderly through wearable devices, for example to detect falls and reduce the response time of the ambulance, will be of the greatest importance in the coming years (Mochizuki et al. 2020). Drawing on this pioneering project, there is still a lot of potential in this area, by building a monitoring system to offer elderly people in particular a better quality of life and prevent loneliness (Takamatsu City General Affairs Bureau Information Policy Division ICT Promotion Office 2019).

In the area of cooperation and the implementation of Takamatsu Smart City Vision projects, the "Town Data Laboratory" is a particularly interesting example. In this project, the citizens of Takamatsu and Kagawa Prefecture can program their own prototypes of applications based on the common IoT platform and test and evaluate those of the other participants. To implement the project, the city of Takamatsu, which provides the data and interface to the common IoT platform, is cooperating with Kagawa University and the Information and Communication Exchange Center "eTopia-Kagawa". In addition to gaining new ideas for applications and their design, the university's aims at promoting local talent whereas eTopia-Kagawa's is given the task of improving the ICT literacy of the citizens of the prefecture. By providing a "set of programming libraries and sample applications (called prototyping support tools)" (Cabinet Office 2022), the barriers to participation are kept as low as possible so that, in principle, all citizens who have some experience with Microsoft Word, including schoolchildren, for example, can contribute their ideas. One example for an idea that emerged from the project is the publication of data from the city cleaning service on the quantity, location and time of collected leaves, so that cleaning work can be better coordinated with street festivals and costs can be saved (Cabinet Office 2022).

4.2.4 Discussion

With the establishment of the Smart City Vision Takamatsu, the city is attempting to respond to significant social trends, such as the ageing of society, with a comprehensive strategy by ensuring to maintain the overall attractiveness of the city and boosting the efficiency of the administration in terms of the provision of civic services through the increased use of ICT technology. However, in the early phase of the smart city initiative, the focus is on solving specific issues through independent projects, such as improving disaster management. To implement the vision, the city has set up the Smart City Takamatsu Promotion Council, in which it is involved as an equal member. This gives the city a dual function in the promotion of the smart-city vision. On the one hand it supports networking between industry, academia and government and strengthens public-private cooperation concerning the smart city vision, by establishing and participating in the council. On the other hand, the city provides the council with certain guidelines, including the Comprehensive Plan, for coordination with the city's overall development and is the driving force behind the implementation of most projects. This means that the city is primarily responsible for financing projects,

especially the common IoT platform. It also provides financial support to small and medium-sized enterprises, which are often interested in participating but do not always have the necessary resources to go digital (Takamatsu City 2021). In addition, many other projects are already being implemented or at least tested, but in some cases, there are difficulties due to financing and economic viability, for example with the wearable devices in the Watch over Elderly project (Takamatsu City 2021).

Whether the smart city initiative can actually bring about comprehensive changes beyond individual applications and make a significant contribution to solving the problems arising from demographic trends will only become apparent as the number of successfully implemented projects increases. In the area of project-oriented application of ICT technologies in the city, however, Takamatsu plays a pioneering role and can be seen as a field of experimentation. Findings from the watch over elderly program, for example, should be taken into account when setting up smart city initiatives in other cities. Furthermore, planning for the elderly is a cross-sectional task, meaning that the elderly as a vulnerable population group that places special demands on the design of the city, need to be given special consideration in the smart city initiatives and the projects that implement it, such as in the disaster management via the common IoT platform.

5 CONCLUSIONS

Smart cities in the Japanese context is driven by broad societal transformations and it showcases symptoms of a planning culture which operates by a hierarchical mode in a top-down planning system. But, as broadly as smart cities is applied as a concept in Japan, it is also relevant to ask, if it has the potential to initiate change in the Japanese planning culture. This chapter demonstrated that the aspect of ‘smart’ has a large impact on the Japanese society through the policy area Society 5.0, setting the framework for large societal changes. This policy operates in a hierarchical mode. But also the two cases of the OMY-district and of the smart city Takamatsu represent the strong role of the government both in planning and in smart cities.

We also observed that smart cities are facilitating existing and new networks of stakeholders in planning such as public-private-partnerships, and/or neighborhood groups. Smart cities also target specific societal problems such as disaster preparedness and ageing. In terms of the challenge of Japan being an ageing society, we learned that smart cities is facilitating elderly people by specific policies and smart solutions, but smart cities is also utilized in order to make cities more attractive for younger people – most likely with the goal to attract new people or to keep younger people from moving out.

For that, the smart city provides planners with new tools like, above all, the extensive collection and subsequent merging and visualization of data in order to make better and faster decisions, save costs in administration and maintain or improve the range of civic services. In general, smart cities might make planning processes in Japan more transparent and facilitate the governance of planning processes. Yet it seems to operate within the existing planning culture and it also seems to contribute to sustaining it.

At the same time, however, the two examples described with partial very ambitious goals, also raise a number of questions that have yet to be investigated further. For example, it is not clear how the mechanisms for making work processes more efficient will actually succeed in the various use cases and thus solve socio-demographic challenges. At a technical level, too, the question often arises as to where already well-known technologies contain a new innovative approach through the smart city initiatives

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