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Smart-Eco Cities in Germany: Trends and City Profiles

SMART-ECO CITIES IN GERMANY: TRENDS AND CITY PROFILES

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DFG Deutsche Forschungsgemeinschaft

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INTRODUCTION

THE SMART-ECO PROJECT

This report forms part of a series also covering China, France, the Netherlands, and the UK, and draws on preliminary findings from a three-year (2015-2018), partly DFG-funded research project titled *Smart Eco-cities for a Green economy: A Comparative Study of Europe and China*. The project is being coordinated by the University of Exeter, in collaboration with an interdisciplinary team of researchers from King's College London, the Universities of Westminster, Plymouth and Cardiff (UK); TU Delft and Utrecht University (the Netherlands); the French Centre for Scientific Research (CNRS) and the University of Toulouse (France); Freiburg University (Germany); the University of Nottingham Ningbo China, and Taiwan National University. As well as its funding from the German Research Foundation DFG, the research is supported by the national funding agencies of China, France, the Netherlands and the UK.

The focus of our research is the 'smart-eco city'. The smart-eco city concept captures the recent trend of future-oriented urban development schemes that display both 'green' and 'smart' ambitions. More precisely, the smart-eco city is defined as "an experimental city which functions as a potential niche where both environmental and economic reforms can be tested and introduced in areas which are both spatially proximate (the surrounding region) and in an international context (through networks of knowledge, technology and policy transfer and learning)". The idea of the 'experiment' in this definition consciously refers to recent work identifying a tendency for new urban technologies and ways of working to be trialled at a limited scale, often through cross-sectoral partnership approaches and with the aim of learning lessons, in cases where traditionally firmer policy commitments might have been expected (see e.g.: Bulkeley & Castán Broto 2013; Karvonen & van Heur 2014; Evans *et al.* 2016). The concept of the 'niche' is taken from the expanding field of 'socio-technical transitions' scholarship, which studies the processes through which innovations come about and are taken up in society more widely (for an introduction, see e.g.: Geels 2002; Kemp *et al.* 2007).

Each of the national reports in this series profiles a series of cities, selected on the basis that they have relatively substantial smart-eco ambitions and/or activities already taking place. This selection was made following a wider 'horizon scan' of smart and eco initiatives taking place in each country (see this report's Appendix for the method adopted in Germany). The intention is not to promote the profiled cities as necessarily representing the 'best

practice' examples in the field, but rather to illustrate the variety of 'actually existing' smart-eco cities in each country. The profiles provide a contextual overview of each city's aims, relevant policies, and the key actors involved, along with short descriptions of some of the main activities or projects taking place on the ground. For more information on the SMART-ECO research project, please visit our website.

> URL
> WWW.SMART-ECO-CITIES.ORG

THE GERMAN SMART-ECO LANDSCAPE

Already during the 1980s, environmental concerns had a significant influence on urban policies in some German cities. During the 1990s, the notion of sustainability gained importance in debates about urban development in most cities across the country. Many municipalities officially aimed at sustainable development and some cities were explicitly positioned as (international) frontrunners in environmental policies – even though relatively few of these efforts were ever explicitly labelled as 'eco-city' or *Öko-Stadt* initiatives.

The term 'smart city' has been used extensively in debates about the development of German cities since around the year 2013. Due to concerns about the negative connotations of the term for a German audience, many city administrations, namely those of Berlin and Hamburg, later decided to call related plans 'Digitalization Strategies' instead.

We started the research for this report by attempting to identify smart city debates and activities in large German cities. Scanning the official websites of all 'large cities' in Germany, i.e. of all 80 cities with a population of over 100,000, we first aimed to identify all activities that related to a *smart city ideal* or to proactive *digitalization strategies*. Classifying the cities according to the number of strategic digitalization activities and whether these were conducted in multiple sectors or not as well as whether any form of coordination of these activities was visible, we identified three groups of cities with different 'smart city characteristics'. In a second round of scanning the official city websites, we identified those cities that reported a significant number of ambitious, up-to date *environmental policies* as well as efforts to coordinate these activities in consideration of long-term strategies. This allowed us to roughly reclassify the 80 cities into three groups with regard to their performance against our indicators for 'Eco-City characteristics'. Further details of the approach adopted are provided in the Appendix of this report but, in summary, we then cross-referenced our two lists to identify a list of 10 cities which clearly displayed strong credentials both in their

'smart' and 'eco' policy-making and related programmes of practical activities.

This list was then 'triangulated' through interviews with experts in the field, and by comparing our findings with those in other reports that cover various German cities. On this basis, our final list contained the following ten cities:

- Berlin
- Frankfurt am Main
- Hamburg
- Karlsruhe
- Leipzig
- Mannheim
- Munich
- Nuremberg
- Regensburg
- Stuttgart.

For the present report, we decided to focus our further research on three of these cases in particular. Maybe not surprisingly, these are Berlin, Hamburg and Munich — Germany's three biggest cities.

Some of the smart city activities in Berlin are motivated specifically by the fact that Berlin is Germany's capital and biggest city. Consequently, it is considered the most suitable place for showcasing smart city solutions to potential customers from around the word. Hamburg was once heralded to become Germany's primary smart city, partly due to its large port being a driver of respective innovations. Finally, Munich, the third largest German city, won funding as a 'lighthouse city' together with Vienna and Lyon back in 2015, and has since developed ambitious plans to develop a new district and refurbish existing infrastructure in an exemplarily smart way.

This report aims to provide a selective overview of smart and eco activities in large German cities, with a focus on these three cities. We do not claim to be comprehensive and up to date throughout. We also remain largely descriptive, leaving a deeper analysis to future publications, which will be announced on our project website.

> URL:
>
> WWW.SMART-ECO-CITIES.ORG

It should also be noted that our methodological approach, agreed upon by the international consortium, leads to an emphasis on projects that are widely promoted by municipalities and corporate actors on their websites. Some more grassroots oriented initiatives, which relate to smart and eco-city discourses as well, are currently being examined in a different project (smartknowledgepolitics.com).

SUPPORT FOR SMART CITY DEVELOPMENTS AT FEDERAL LEVEL

There is relatively little coordination of local smart city initiatives at a federal level in Germany. The federal government has decided on some fundamental principles of a digitalization policy called "digital agenda" (Bundesregierung 2014, 2015, 2016, 2017; The Federal Government 2014). As a key forum for discussing digital policies in Germany, a steering group has been formed in which the state secretary of the federal Ministry of Economic Affairs (which is primarily responsible for the digital agenda), meets with the state secretaries of the Ministry of the Interior and the Ministry of Transport and Digital Infrastructure. Furthermore, an annual "National IT-Summit", renamed "Digital Summit" in 2017, is regularly used to establish a dialogue between government, economy, science and civil society. At the National IT-Summit in 2015, a working group had already produced a programmatic paper on Smart Cities and Regions (Nationaler IT-Gipfel 2015).

Thus, while there is clear attention and commitment from several ministries and steering groups to co-shape digitalization strategies in German cities, there is not yet any substantial program to financially support the implementation of smart city initiatives at a federal level. Smart-city related research and experimentation, however, has been funded on many occasions, mostly through programs of the Federal Ministry of Education and Research. In 2015, when this Ministry initiated the development of an Agenda for Urban Research and a series of related events under the title *Zukunftsstadt - City of the Future* (BMBF 2015), a big push was given to such research and significant public attention was directed to smart city initiatives and related research.

Some important research projects on the relationship between digitalization and (participatory) urban planning have been commissioned by the Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR) within the research program Experimental Housing and Urban Development (EXWOST).

There are several initiatives to coordinate and aggregate research on Smart Cities, including the Fraunhofer Society's *Morgenstadt-Initiative* (www.morgenstadt.de/en.html) and an association for all German-speaking people and companies interested in Smart Cities (www.bundesverband-smart-city.de).

On basis of a joint research project, PricewaterhouseCoopers (PwC) and the University of Bonn (Prof. Claus-C. Wiegandt) came to the conclusion that digitalization is likely to increase the polarity between prosperous and declining cities in Germany (PWC 2015:38).

In a series of four reports, PWC, BBSR and Fraunhofer IAO describe governance challenges facing the pathway towards digitalization with a focus on actor constellations, structural change, public participation and digital integration respectively (BBSR/PWC/IAO 2017 a-d).

The ongoing research project ABIDA (http://www.abida.de/en/) "explores social opportunities and risks of the generation,

linking and analysis of huge amounts of data and develops options for political action, research and development". While the research questions are expressed in generic terms, all research partners are German and hence focus largely on the German (legal) context.

In March 2015, the above-mentioned group of state secretaries decided to start a dialogue between representatives from German governments at all governance levels, civil society, research and practitioners. Five meetings with around 60 participants were held in 2016 and 2017. The process resulted in May 2017 with the publication of the "Smart City Charter" which reports on the dialogue and includes "guidelines" for shaping digitalization in the context of sustainable urban development in Germany:

"Ensuring that digital transformation – understood as the transition of cities into smart cities – is sustainable, requires that digital technologies are used for pursuing the goals of the sustainable European city. To this end, the following four key guidelines were established:

1. DIGITAL TRANSFORMATION REQUIRES GOALS, STRATEGIES AND STRUCTURES
2. DIGITAL TRANSFORMATION REQUIRES TRANSPARENCY, PARTICIPATION AND CO-CREATION
3. DIGITAL TRANSFORMATION REQUIRES INFRASTRUCTURES, DATA AND SERVICES
4. DIGITAL TRANSFORMATION REQUIRES RESOURCES, SKILLS AND COOPERATIONS" (BBSR 2017:25).

Also in 2017, the Federal Ministry of Economic Affairs and Innovation (BMWI) published a white paper specifically on how to develop and regulate digital platforms in order to ensure the two "key objectives" of a) "achieving inclusive growth by means of investments and innovation" and b) "ensuring the protection of individual rights and data sovereignty" (BMWI 2017:9).

URLs:

WWW.MORGENSTADT.DE/EN.HTML

WWW.BUNDESVERBAND-SMART-CITY.DE

HTTP://WWW.ABIDA.DE/EN/

WWW.BMUB.BUND.DE/P4620/

CRITICAL DEBATES ON SMART CITY DEVELOPMENT IN GERMANY

There has been a controversial debate about the role of (inter)national standards in smart city initiatives and urban planning in Germany (Lojewsky/Munzinger 2013, Libbe 2014). While (technical) standards are considered necessary, the standardization of urban governance and planning processes is considered inappropriate in the German context, even if it would help save transaction costs and allow for more cost-efficient development of semi-standardized products e.g. in the field of cross-sectoral information exchange.

In 2014, the German Standardization body DIN/DKE published "The German Smart City Standardization Roadmap" to provide "a snapshot of the current situation and insight into international developments" (DIN/DKE 2015). However, in general, public administrations currently seem to be rather hesitant about deciding on fundamental changes and larger investments regarding informational infrastructure. This is partly justified by the need to satisfy public interests and may be amplified by widespread scepticism among civil society about the benefits, costs and risks involved in such changes. As a consequence, activities undertaken to date do not usually go beyond clearly delineated and explicit "experiments".

Also, scepticism seems to be particularly widespread in Germany when it comes to clearly technology-oriented initiatives. All developments need to be justified against the long-standing objectives of urban development: sustainability, openness, and justness.

The issues that are currently perceived as very urgent in many German cities are to

- build affordable housing (or cope with shrinking cities)
- make cities ever more liveable
- integrate new inhabitants
- reduce carbon and material flows
- make infrastructure more reliable/ resilient.

SMART CITY DEVELOPMENT IN GERMANY: KEY OBSERVATIONS

1. Experiments in recent years have been strongly shaped by the ambition of German city administrations and connected consortia to gain 'lighthouse' status and respective funding in the context of the Horizon2020 SCC calls.
2. Particularly around 2014/15, the administrations of the biggest German cities announced Smart City ambitions and the development of respective strategy papers.
3. Since around 2015/16, reference to the term 'Smart City' has often been

avoided and replaced (e.g. by 'active digitalization' in Berlin and Hamburg).

4. Activities under the banner of 'Smart City' or 'active digitalization' alike are often used to demonstrate the innovation-orientation and competitive economic strength of cities.

5. The big German cities, Berlin and Munich (and to some extent also Hamburg), are competing to host the headquarters and development departments of big international technology and service providers (IBM, Siemens, CISCO, Microsoft etc).

HYPOTHESES ON THE DEVELOPMENT OF SMART CITY POLICY IN GERMANY

1. Compared internationally, the German debate regarding smart city developments is one of rather tempered optimism.

2. Most people involved appreciate both the great potential of new urban technology (optimized management resulting in efficiency gains and comfort as well as business opportunities) and simultaneously great risks and uncertainties involved in connecting and digitizing urban infrastructures (vulnerabilities, privacy concerns, danger of lock-in, dependence on single providers etc.).

3. People from industry and consultancies tend to emphasize the potentials, whereas people from governments and academia tend to focus on the concerns.

4. Basically, all actors agree on the need to carry out experiments in order to prepare for informed decisions. It is currently unclear how long this experimentation phase will last (e.g. in particular fields of development like ITS etc).

5. Acknowledging that digitalization of infrastructure bears significant risks, German public authorities currently try to postpone large investments and respective decisions, while still aiming to demonstrate comparative 'leadership'.

6. In Germany, like in the UK (Joss *et al*. 2017) and elsewhere (Vanolo 2016), Smart City and Digitalization efforts are usually pursued by experts on behalf of citizens, not by or with them, despite there being a pronounced rhetoric about the necessity of such activities being people- and participation-oriented.

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b) "Die Weisheit der Vielen - Bürgerbeteiligung im digitalen Zeitalter".

c) "Digitalisierung und die Transformation des urbanen Akteursgefüges".

d) "Mind the Gap - Digitale Integration als Basis für smarte Städte".

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BERLIN

Berlin is the capital of Germany and, at the same time, one of the country's 16 federal states (*Bundesländer*). Whereas the city itself is home to roughly 3.5 million citizens, 4.4 million live within the larger agglomeration and Berlin's EU-assigned 'metropolitan region' has 6 million inhabitants.

In March 2014, a group of mostly private-sector actors finalized the "Smart City Charta" as the founding members of Berlin's official smart city Network. This document expresses a clear commitment and outlines a common basis of understanding about the objectives, topics and processes for smart city development in Berlin. It also includes a list of requests from the city administration to bring the topic forward (Berlin Partner GmbH 2016). The charter was followed by the city's *Smart City Strategy*, which intended to "set out an innovative strategic policy approach aimed at serving the common good by expanding and ensuring the future sustainability of Berlin" (SenSU 2015a:3), and was approved by the Senate in April 2015. These represent two important steps amongst the ongoing activities driven by the governance network that has emerged around 'Smart City Berlin'. The multiple actors with different interests create a complex political landscape driving smart city activities.

Figure 1: Building Berlin differently - The Holzmarkt Project
Photograph: Philipp Späth (2017)

In Berlin, we can observe the emergence of a particularly market-oriented smart city with emphasis on growing a local ecology of enterprises in the capital including many large and some publicly owned companies. Because of the city's financial situation along with other material constraints, the focus on the potential for growth and job creation seems to outweigh the objectives related to a more fundamental transformation of urban systems to achieve sustainability-related objectives.

Echoing the experience of Barcelona, the more recent formation of a new government in Berlin led to the reconsideration of the *Smart City Strategy*. This is mirrored by many websites (some of which took years to get updated after the elections) and interviewees who confirm that it is an ongoing process to demonstrate an even more people-centred and inclusive approach to smart city development that also tries to support various private bottom-up initiatives.

EXAMPLES OF ECO CITY / ENVIRONMENTAL SUSTAINABILITY PROJECTS

With about 13% of its area made up of public green spaces, 18,4% of forest areas, and 11% of agricultural spaces and open water (in 2014), Berlin is a remarkably green metropolis (Berlin SenUVK 2017a,b). Ecology and sustainability projects are regularly displayed very prominently on the city website.

> URL:
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> WWW.BERLIN.DE

ENERGY TRANSITION LAW – EWG BERLIN 2016

In 2016, the law EWG Berlin (Berliner Energiewendegesetz) came into force. It regulates the planned large-scale transition to renewable energies by 2050. According to this law, the state of Berlin will reduce its CO_2 emissions by 85% by 2050, with milestones being a reduction of 40% by 2020 and 60% by 2030 (compared with CO_2 emissions in 1990). The law is legally binding only for institutions of the state of Berlin (Berlin SenUVK 2017a). Some corresponding agreements have been made with other public and private institutions (Berlin SenUVK 2017b).

LEGAL STRUGGLE OVER RESPONSIBILITY

However, the transition process is currently somewhat shapeless due to an ongoing legal struggle about the concession of the Berlin energy grid, which officially ended in 2014 but will remain active until a new grantee has been selected. The current grantee, *Stromnetz Berlin GmbH,* an affiliate of the major Swedish power company *Vattenfall*, has recently submitted several legal complaints about the granting procedure[2] and thus remains owner of the grid for the time being.

Besides *Vattenfall* represented by *Stromnetz Berlin GmbH*, two other contesters are applying for ownership of the grid: The federal state of Berlin itself represented by the state-run company

Berlin Energie and the citizens' initiative *Bürger Energie Berlin* (BEB). *BEB* aims to acquire the grid in cooperation with the state of Berlin as the majority shareholder (*Bürger Energie Berlin* 2017a-c). Each competitor claims to be the best choice for a successful transition to renewables.

Historically, the Berlin grid was under the operation of *BEWAG*, a company owned mainly by the state in West Berlin which then acquired its Eastern German counterpart *EBAG* in 1991 (Vattenfall GmbH 2017a). In 1997, the city state started selling its shares with Vattenfall GmbH eventually acquiring 100% of the company in 2003 (Vattenfall GmbH 2017b).

Before the expiration of the last concession period, an official referendum was initiated and handed to the senate. It demanded a re-municipalisation of the grid. However, this referendum did not reach the threshold for becoming legally binding. (Becker *et al.* 2016). Claims made by *Berlin Energie* that it promotes the re-municipalisation of the grid have been contested.

BEK 2030 – ENERGY AND CLIMATE PROTECTION PROGRAM

In spite of these discussions, the Berlin senate has passed a strategy for the first phase of the energy transition: BEK 2030, the Berlin energy and climate protection program *(Berliner Energie- und Klimaschutzprogramm),* aims to reduce CO_2 emissions by 85% by 2050 according to the goals stated in the *EWG Berlin* law. The program outlines specific measures and a schedule up to the year 2020, and sketches planned developments until 2030.

In public-private agreements, Berlin enterprises have also committed to the municipal climate aims (SenUVK 2017b).

URLs:

HTTP://WWW.BERLIN.DE/SENUVK/KLIMASCHUTZ/ENERGIEWENDEGESETZ/DE/KLIMANEUTRAL2050.SHTML

HTTP://CORPORATE.VATTENFALL.DE/UBER-UNS/ENGAGEMENT-REGIONALES/WIR-IN-BERLIN/ENERGIEVERSORGUNG-BERLIN/.

CLIMATE CHANGE ADAPTION PLAN (AFOK)

The 'Adaptation to Climate Change Impacts in Berlin Concept' (AFOK) was developed between the end of 2014 to early 2016 on behalf of the Berlin Senate Department for Urban Development and Environment (Berlin SenSU) and was funded by the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (*Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit, BMUB*). The plan states that Berlin must actively adapt in order to reduce the damages from future climate change, but also to exploit the future opportunities that climate change might bring: "It is in no way sufficient to wait and see, or hope for the spontaneous adaptive capacity of the urban society. The latter will be needed. But it cannot be activated without reliable future climate scenarios, without a detailed analysis of vulnerabilities and coordinated

adaptation strategy by the Senate of Berlin. AFOK forms a basis for all this." (Reusswig *et al.* 2016:4).

AFOK lays out current global and regional scenarios that describe the climatic changes that Berlin is facing in the near (2050) and distant (2100) future. In a second step, vulnerabilities in various socio-ecological sectors are identified. On this basis, the concept offers strategic starting points and concrete proposals for measures that aim to actively counteract future challenges and possibly reduce related damages. AFOK was developed in a participatory manner by including the expert community and administration via stakeholder interviews and three workshops.

URLs:

HTTP://WWW.BERLIN.DE/SENUVK/KLIMASCHUTZ/KLIMAWANDEL/DE/ANPASSUNGSKONZEPT_BERLIN/INDEX.SHTML

HTTP://WWW.STADTENTWICKLUNG.BERLIN.DE/UMWELT/KLIMASCHUTZ/KLIMAWANDEL/DOWNLOAD/AFOK_ZUSAMMENFASSUNG.PDF

HTTP://WWW.BERLIN.DE/SENUVK/KLIMASCHUTZ/KLIMAWANDEL/

LANDSCAPE PLANNING AND PROTECTION OF BIODIVERSITY (LAPRO)

A centralized planning system for Berlin's urban space has existed since 1920 and has included close attention to green spaces. In the 1980s, West Berlin implemented a strategy for landscape planning and biodiversity (*Landschafts- und Artenschutzprogramm*) as a result of national efforts. After the German reunification in the 1990s, this strategy was extended to the entire city. The strategy has since seen several phases of reconceptualization and has been challenged especially by the fast and ongoing growth in the city's population that requires both new living and open spaces (SenUVK 2017b). As of March 2012, the Berlin Senate enacted a new strategy for the preservation and support of biodiversity in the city (Berlin SenSU 2012). These efforts are in accordance with a national strategy.

From 2012 to 2015, a total of €10 million was invested by the Berlin City Parliament in several landscape planning projects. These included the creation and further development of public parks and gardens, as well as urban agricultural projects (city gardens) and refurbishment of bat wintering grounds (Berlin SenSU 2015a).

URL:

HTTP://WWW.BERLIN.DE/SENUVK/NATUR_GRUEN/BIOLOGISCHE_VIELFALT/DE/BERLINER_STRATEGIE/INDEX.SHTML

BAF – BIOTOPE AREA FACTOR

The "biotope area factor" (BAF) enables a particular approach to securing "green qualities" in the city centre. It was specifically developed to assess the quality of planning regarding the basic goals of Berlin´s landscape program: respecting ecosystems and protection of ecosystems and species as well as aesthetic and recreational values of landscapes. The BAF was established for particular development zones by ordinance (Berlin SenUVK 2017a): “Similar to the urban planning parameters used in development planning, such as the gross floor area, the site occupancy index, and the floor space index, which regulate the dimensions of built structures, the BAF expresses the area portion of a plot of land that serves as a location for plants or assumes other functions for the ecosystem” (Berlin SenUVK 2017b).

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> HTTP://WWW.BERLIN.DE/SENUVK/UMWELT/LANDSCHAFTSPLANUNG/BFF/INDEX_EN.SHTML

EXAMPLES OF SMART CITY / DIGITALIZATION PROJECTS

EINSTEIN CENTER DIGITAL FUTURE AS PUBLIC-PRIVATE PARTNERSHIP

The Einstein Center Digital Future (ECDF), which opened in Berlin’s governmental district in November 2017, is a public-private partnership for research on the digitalization of societies. By bringing together several Berlin universities, non-university research institutes, and industrial enterprises, as well as the regional and federal ministries, it aims at fostering innovative interdisciplinary research within the fields of information technology, applied computer sciences and digitalization. This will be carried out by the establishment of 50 new professorships in the fields of Digital Humanities and Society, Digital Industry and Services, Digital Health, as well as Digital Infrastructure, Methods and Algorithms. Focal areas include smart housing, smart cities, smart mobility, digital education, bioinformatics, personalized medicine, digital diagnostics and new methods in genome data analysis and biomedical imaging as well as semantic data intelligence, identity management, the physical foundations of IT security, the Internet of Things and wearable technologies. The appointment procedures are ongoing, or even already completed.

These professorships and their research will be financed through the sponsorship of 20 commercial partners like the Berliner *Wasserbetriebe* (BWB), the *Bundesdruckerei*, Cornelsen, German-Turkish Advanced ICT Research Center, Intel, SAP, Telekom, Viessmann and Zalando. For each euro contributed, the state of Berlin will add 50 cents through the Einstein Foundation Berlin, which was founded in 2009 by the State of Berlin. Through this procedure, the influence of the commercial partners on the scientific

institutes should be buffered. "The Foundation aims to promote science and research of top international calibre in Berlin and to establish the city as a centre of scientific excellence." (Einstein Foundation Berlin n.d.)

The scale of this public-private partnership is unique in Berlin's history, as it provides €38.5 million for research until 2023. The participating scientific institutions (four universities and eight non-university research institutes) account for €8.5 million, while the commercial partners (together with two federal ministries) contribute €12 million and the Berlin Senate €18 million.

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> HTTP://TAZ.DE/!5395862&S=SMART+CITY/
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> HTTP://WWW.DIGITAL-FUTURE.BERLIN/#OP-3
>
> HTTPS://WWW.EINSTEINFOUNDATION.DE/EN/FOUNDATION/ABOUT-US/

OPEN DATA BERLIN

The Berlin administration has been pioneering the provision of public data on an open data platform. As in the USA and many other European countries besides Germany, government officials and activists aim to make publicly collected data available in the form of 'open data' in order to enable active involvement of citizens in governance processes and for business opportunities.

After a pluralistic debate in early 2011, the municipal/state government of Berlin developed a pilot data platform with 18 public datasets (mainly from the Department of Statistics), which was publicly released in September 2011 (Schulzki-Haddouti 2011). Various stakeholders had previously requested this and now welcomed it. Since June 2016, §13 of the law on E-government in Berlin (EGoVG Bln) has binded all parts of the municipality to provide datasets for the platform by default (if no privacy rights speak against it).

Also in 2011, the external experts from Fraunhofer FOKUS who had developed and operated the pilot platform were commissioned to develop an open data strategy for the city (Both and Schieferdecker 2012).

Objectives

For many years, Berlin's city administration has been notorious for providing very bad services (user-unfriendly, dispersed procedures, long waiting times, unclear responsibilities, etc.). As a federal city-state as well as the capital and biggest city in Germany, a pioneering role in the move towards open data and E-government has been demanded from and taken up by Berlin's city administration.

Initially, emphasis was placed on governance processes (bills, proceedings, call for tenders, contracts regarding infrastructure operation etc.), but now many other potential providers from the commercial and private sphere are motivated to provide and use datasets.

The focus has now been redirected from the provision of public data by the

administration to the additional inclusion of data from private sources (Seibel 2016) and the building of a vibrant community of public, private and commercial users.

The portal was designed to provide all interested parties with easy access to all information that is generated in governance processes, so long as there is no legal requirement to keep this information confidential. This includes spatial information in various geographical information systems, which can also be used freely for the visualization of political arguments in maps. In this way, it allows and incentivizes an involvement of government 'outsiders' in data analysis and governance processes. It thus intends to democratize the knowledge basis upon which decisions are made. This again counters the idea that e.g. the informational basis of infrastructural decisions is accessible only to experts from within the city administration.

Governance arrangements

The Portal is financially supported by European Structural Funds (EFRE) and through the *Projekt Zukunft* program within the framework of the *ServiceStadt Berlin*, which funds projects to improve services provided by the city state administration via a special internal fund.

As reflected in statements of the independent foundation *Technologie-stiftung Berlin* 2016 and press coverage (Schulzki-Haddouti 2011), the early and pioneering initiative for open data provision in Berlin did not primarily come from within the city state administration. The latter, however, did quite quickly implement a pilot project in 2011, and external actors (FHG-FOKUS) were commissioned to develop an open data strategy for the city (Both/Schieferdecker 2012). This is implemented by the city administration with the support of various experts from research organizations (FHG-FOKUS) and civil society.

Current state of affairs

Initial praise for the opening of the Berlin Open Data Portal (on 14 September 2011) turned out to be transitory. The criticism was soon made that the 18 datasets provided were "mere examples" and lacked open data license registration (ibid.).

The official website contains plenty of evidence that various measures have been taken to motivate and enable potential users of the datasets, such as workshops for members of the administration and various hackathons. An apparently lively debate about the provision and usage of the data is reflected on the website of the portal itself https://daten.berlin.de/interaktion and https://daten.berlin.de/faq. However, the extent to which recent efforts will also be successful in motivating private and commercial producers or collectors of data to share these data on the portal remains unknown.

In December 2015, the open data monitor ranked Berlin's open data portal 4th out of 11 observed portals in Germany based on the overall metric quality. This assessment further claimed that in November 2014, 79% of the 104 datasets or 157 MB of data volume were machine readable. As of 22 December 2016, the portal listed 14,827 datasets for the federal city state of Berlin, compared with 21,895 datasets for the federal city state of

Hamburg and 8,802 datasets for the city of Munich. Further recent information is available on www.govdata.de and www.opendatamonitor.eu.

> URLs:
>
> HTTPS://DATEN.BERLIN.DE/
>
> HTTPS://WWW.EUROPEANDATAPORTAL.EU
>
> OPENDATAMONITOR.EU

EUREF CAMPUS

Built around the historical site of the first gas plant in Berlin, EUREF Campus is an initiative to create a hub for research, development and employment of advanced sustainability technologies. The former gas plant located in Berlin-Schöneberg had been in storage use until 1995 and is under preservation orders since 1994. As of 2007, EUREF AG (*Europäisches Energieforum*) has been developing the EUREF Campus site with a size of just over 5 hectares. After the acquisition in 2007, renovation and construction started in 2009 (Berlin SenWEB 2017). The constructions are scheduled to be completed by 2018 with usage at the site amounting to "around 25 buildings […] including a residential share of up to 15%" (Berlin SenWEB 2017).

EUREF AG rents out available spaces to individuals, large enterprises as well as start-ups, research and educational institutions. Since 2011, TU Berlin has offered five postgraduate courses located on the EUREF Campus. The campus offers spaces for "work, research, education and living". Major institutions located there are TU Berlin, Cisco, Schneider Electric and Deutsche Bahn. A public listing states more than 100 residential companies and institutions (EUREF-Campus 2014).

Constructions are to be "characterised by optimal energy-efficient building technologies, a local micro-smart grid and low running costs through the use of regenerative energies" (EUREF AG 2017).

On the campus, six major utility companies also join forces in a co-working & co-creation project named infralab (http://infralab.berlin/about/).

Objectives

One main objective of the EUREF Campus is to be a hub for the development of advanced concepts and technologies in the field of energy management and smart technologies. As such, EUREF AG also points out that the infrastructure in place aims to be "as carbon-neutral as possible". On a local scale, it already met the nation-wide climate targets for 2050 in 2014 (EUREF AG 2017).

A micro-smart grid, furthermore, manages energy production, storage and consumption. Generation capacity is provided by wind turbines, deep geothermal energy, biogas and solar panels. For storage, large-scale batteries, vehicle batteries and a power-to-heat container (100 cubic meters of water) are employed (EUREF-Campus 2014). According to official accounts, these technologies are the main sources of electricity, heating and cooling on the site (Euref-Campus, n.d. a).

Besides the efforts to achieve carbon-neutral operation of its infrastructure,

research on EUREF Campus intends to bring forward new technologies and allow different actors within the field to be in close contact with each other. The investment amounts to approximately €600 million, and the development aims at providing space for around 6,000 new jobs. Finally, EUREF AG also identifies E-mobility as one of its focus areas.

Governance arrangements

The site is owned and administered by EUREF AG, which rents out spaces to individuals and organizations. However, services on site are partially run by resident institutions that are therefore included in infrastructural planning. The Senate Department for Economics, Technology and Research supports the development as a central demonstration site "for ecologically and economically sustainable urban development".

The EUREF campus is particularly keen to promote the advantages it offers in having research institutions, large corporations, venture capital in energy and start-ups in close vicinity.

Current state of affairs

The third and final construction phase is ongoing and scheduled to be completed by mid-2018 (Euref-Campus n.d.) with funding of about EUR 600 million (EUREF AG 2017). As part of WindNODE, a four-year project to explore smart technologies for better distribution and storage of renewable energy, the EUREF Campus will function as part of a larger network with sites in all six former East German federal states and Berlin (Euref-Campus n.d. c).

URL:

HTTPS://WWW.EUREF.DE/DE/STANDORT-ENTWICKLUNG/

TXL TEGEL: THE URBAN TECH REPUBLIC

The project TXL Tegel has been initiated as a plan to develop a new district for innovation-oriented businesses and research organizations ("co-development") on what is now the airfield of Berlin Tegel international airport.

Tegel airport was supposed to close when the new Berlin Airport BER opened (initially planned for 2011, though still surrounded by uncertainty). This would free up an area of 495 ha in north-west Berlin, 15 minutes from the city centre, for development.

As the site will probably remain an object of interest, developers imagined a research and industrial park growing in its place – for the city of the future. This would offer a place for founders, students, investors, industrialists, and researchers to meet and develop the cities of tomorrow. At Berlin TXL, urban technologies would be designed, produced, and exported.

Plans developed in 2015 and 2016 stipulated that the area should be used by universities, businesses and "innovation areas". It should also include an industrial area with on-site production and a natural area in combination with "experimental areas" where "connected solutions" and new technologies could be tested to create applications for the city of the future

(Hawxwell 2016:75, von Radecki and Pfau-Weller 2015).

Objectives

The construction of a new, single airport for Berlin/Brandenburg (BER) could make it possible to close the currently operating Tegel airport, which is located just 15 minutes from the city centre, and to develop a new research and industrial park there. Additionally, a new residential area for 10,000 people with a focus on affordable housing (Kurt-Schumacher-District) has been planned for the area. The concrete planning process for re-using Tegel airfield started in 2008, culminating in the decision on a Masterplan in 2013. Overall, the project sought to attract investments in a perceived competition between places.

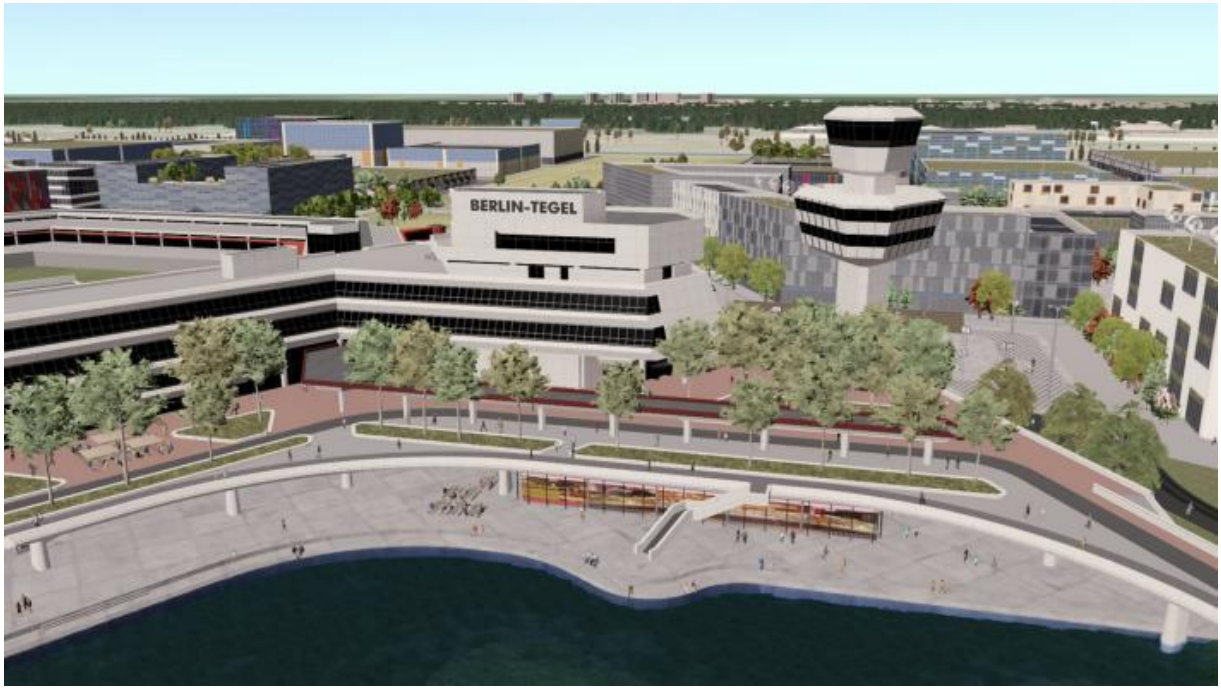

Figure 2: Berlin-Tegel Airport
Source: Tegel Projekt GmbH

Governance arrangements

Formal responsibility for the development planning lies with the city/state administration Berlin SenSU (*Senatsverwaltung für Stadtentwicklung und Umwelt*). Tegel Projekt GmbH, a limited company, completely owned by the city/state of Berlin, has been assigned the task of developing, marketing and managing the ground and infrastructure in the industrial area.

The most important actors are the city state administration Berlin SenSu and Tegel GmbH. An international team of architects, as well as city and landscape planners, have been commissioned (having won a competition) to develop plans. “The public” has been consulted in a so-called co-development process (eight site conferences), while research institutes such as the Fraunhofer IAO and consultants including slapa & die raumplaner GmbH

have also played important roles in shaping the plans for the district and the consultation process. Interestingly, this project has been heralded at times as the one most sophisticated exemplar of a smart city project in Berlin (Hawxwell 2016:76).

Current state of affairs

Since 2016, and particularly in the run-up to the national elections in September 2017, an initiative – originally crafted by the Liberal Party (FDP) – in favour of keeping Tegel airport in operation after the opening of BER airport has increasingly gained support.

In a city-wide referendum on the day of the national elections, a majority of voters expressed support for keeping Tegel airport in operation. However, the vote did not reach a quorum, which would have made it binding for the authorities to act on it.

URLs:

WWW.BERLIN-BRAUCHT-TEGEL.DE

HTTP://WWW.STADTENTWICKLUNG.BERLIN.DE/STAEDTEBAU/PROJEKTE/TEGEL/KONTAKT/INDEX.SHTML

HTTP://WWW.BERLINTXL.DE/EN/ABOUT-BERLIN-TXL.HTML

HTTPS://WWW.RBB24.DE/POLITIK/WAHL/TEGEL/INDEX.HTML

EXAMPLES OF SUSTAINABLE MOBILITY PROJECTS

BERLIN'S URBAN DEVELOPMENT PLAN ON TRANSPORT 2025

The "Urban Development Plan on Transport 2025" (StEP Transport) was adopted in 2011 as a "guide book of the Berlin transport policy". It outlines the action and time frame for the practical planning and measures concerning the city's changing traffic-related challenges. Regarding priorities for its implementation, the "Mobility Program 2016" was developed as an action plan for the first five years with more than 40 individual measures. The overall objectives of the program were to facilitate mobility for all population groups, to ensure good access to the city and its different parts, to strengthen the city's economic performance and to reduce the negative effects of motorized traffic. These objectives served to strengthen non-motorized traffic – i.e. cycling and pedestrian traffic – for example, through the implementation of a comprehensive cycling strategy and the improvement of conditions for walking. It remains a key challenge to adapt urban traffic to the requirements of an ageing society and to ensure equal mobility opportunities for all. In continuation of the "Mobility Program 2016", StEP Transport calls for an increase in traffic safety and for a reduction of air pollution caused by traffic, e.g. through the use of e-mobility on the basis of renewable electricity as well as by integrating public transport and car sharing or bicycle rental systems. Since the development of StEP

Transport and the publication of the last interim report in 2014, the transport policy conditions have changed drastically and a new government of the federal state of Berlin has been formed. The Senate recognizes that technical innovations and new environmental targets also require a change in priorities in the implementation of the mobility program. An update of StEP Transport therefore began in April 2016 with 2050 being the new year of reference. According to this new time frame, this update of StEP Transport will develop a more extended long-term perspective on the mobility of the future. The draft resolution on StEP Transport to the Senate of Berlin is expected in summer 2018.

> URL:
>
> HTTP://WWW.BERLIN.DE/SENUVK/VERKEHR/POLITIK_PLANUNG/STEP_VERKEHR/DOWNLOAD/MOBILITAETSPROGRAMM2016.PDF

MOBILITY IN BERLIN'S SMART CITY REPORT

Berlin's Smart City Strategy for 2015 states that: "Mobility is a precondition for social participation. Consequently, ensuring mobility has particular significance in Berlin" (Berlin SenSu 2015:28). Facing the growing challenges of an increased number of citizens and traffic volume alike, the city's integrated transport policy, including the previously mentioned StEP Transport 2025, managed to halt the trend of growing motorization by promoting public transport, vehicle sharing, improved bike- and footways as well as electric motors. Nevertheless, enhancing accessibility, quality and safety of urban transportation is still a key concern. Therefore, Berlin's Smart City Strategy is promoting the use of innovative mobility technology in order to successfully achieve the StEP Transport goals, expand technical know-how, create new jobs and achieve a higher quality of life in the city.

However, it is already implied by the wording of the Smart City Strategy that these innovations cannot and will not be implemented by the city single-handedly, but rather outsourced to private enterprises: "It is intended that Berlin's reputation as a laboratory and good example in the area of smart e-mobility should be further extended as part of Smart City Berlin. (….) This will be achieved by giving targeted support to local companies and R&D [research and development] facilities, by developing and testing innovative projects and products and by holding on to or attracting (international) companies and talents to Berlin" (Berlin SenSU 2015:29). Therefore – as elaborated below – there are two main institutions collaborating with the city of Berlin to manage and coordinate efforts towards innovative mobility.

PUBLIC-PRIVATE PARTNERSHIPS IN MOBILITY BY BERLIN PARTNER

The public-private partnership Berlin Partner for Business and Technology collaborates with the Berlin State Senate as well as 270 companies engaging in different economic sectors. Berlin Partner's overall goal is marketing the city of Berlin in order to promote its economic growth.

This is pursued by offering business and technology support for companies,

investors and scientific institutions willing to settle and operate in Berlin. While the enterprises gain the advantage of Berlin Partner's services and networking, the city benefits from the transfer of knowledge between the economic and scientific community, in the hope of boosting its reputation and competencies as the alleged "German Silicon Valley" (Berlin Partner GmbH 2016).

> URL:
>
> HTTPS://WWW.BERLIN-PARTNER.DE/EN/

CLUSTER OF TRAFFIC, MOBILITY AND LOGISTICS

As one of the seven economic sectors in which Berlin Partner is involved, the Cluster of Traffic, Mobility and Logistics is quite obviously the most viable when it comes to smart mobility issues and innovations. According to Berlin Partner, Electromobility is demonstrated through more than 200 joint projects with a focus on driving, loading, storage and networking, consolidating Berlin's status as an international showcase for electromobility and as a technologically advanced region.

The Transport, Mobility and Logistics cluster active in both the federal states of Berlin and Brandenburg comprises more than 17,000 companies with around 201,000 employees in the industrial fields of action Automotive, Aerospace and Railway Engineering as well as in the cross-sectional areas of Logistics and Traffic Telematics. Not unlike Berlin Partner, the cluster's aim is to advise companies to develop and apply new and innovative solutions for the mobility of the future. This is achieved through the transfer of technological potential to concrete projects. The focus is on integrated approaches based on the close collaboration between companies and research institutions across traditional industry boundaries. The management of the cluster, which is based at Berlin Partner and Brandenburg Economic Development (WFBB), supports the networking and development of cooperation projects at regional, national and international levels.

> URL:
>
> HTTPS://WWW.VML-BB.DE/EN

EMO – BERLIN AGENCY FOR ELECTROMOBILITY

The Berlin Agency for Electromobility (eMO) is an agency of the State of Berlin that acts on behalf of Berlin Partner for Business and Technology. In alignment with the aims of Berlin Partner, eMO aims to turn Berlin into an international model for smart mobility. As a nodal point for stakeholders in smart mobility in the German capital region, it "brings together expertise and actors from business, science, politics and administration, and supports the initiation, execution and marketing of regional, national and international innovation projects in the field of smart mobility" (eMO n.d.).

The three action fields of eMO are Vehicles, Mobility & Energy Transition and Urban Mobility. Within these fields, key topics in 2017 included –to name just a few

– the automation of (electric) vehicles, digitalization of driver functions as well as an initiative for lightweight electric vehicles, researching and developing energy storage systems and technologies, or digitalization, automation and electrification of urban transport services in connection with smart infrastructure.

The list of ongoing projects is extensive. We only summarize a selection here (eMO n.d.):

Vehicles:

- Electrification of double-decker buses for tourism purposes
- iHub: Intelligent IT-based platform for electro-mobile, sustainable and efficient infrastructure and fleet management for logistics hubs
- Route Charge: Battery changing system for the analysis of medium-distances traveled by e-commercial vehicles while providing delivery to branch locations

Mobility & Energy Transition

- "Baden und Laden": go swimming and charge up in Brandenburg
- eMobility-Scout: cloud-based IT solution for operating electric vehicles and sharing private charging infrastructures
- ImplaN: Initial Infrastructure for hydrogen mobility based on predictable consumers
- Load management in e-car sharing
- Sleep & Charge

Urban Mobility

- Car-2-Lab: innovative VET-learning model to convey digital competences in the automotive sector
- DIGINET-PS: The digitally networked 'protocol route' – an urban test field for automated and networked driving in Berlin
- Distribut(e): Green city district (Kiez) supply chains for the city of tomorrow
- E-BUS Berlin: Fully electric bus operations including recharging infrastructure
- New Mobility Berlin (NMB)
- Urban District 4.0: The transformation of processes and infrastructures for the design of sustainable and integrated logistics systems in the Berlin Holzmarkt area

> URL: HTTP://WWW.EMO-BERLIN.DE/EN/TOPICS/STRATEGY/

TWO MAJOR PROJECTS COORDINATED BY THE CITY ADMINISTRATION

The two city-run projects outlined below have particular relevance to the topic of smart-eco urban development.

Door-to-Door Information for Air Passengers (DORA)

Objectives

The entire research project DORA, with a budget of €4.7 million, is funded by the EU research program Horizon 2020. The project started in June 2015 and is running over a period of three years. The project aims to develop and test an innovative door-to-door information service for flight travellers, embodied by a

smartphone app. Besides the flight and duration data, landside transport and the situation at the airport terminal are taken into account, so as to supply the user with real-time information on the shortest travel itinerary.

Governance arrangements

As a prototype during a one-year test phase, the service will be developed for the connection between Berlin and Palma de Mallorca.

The DORA website states: "The essential component is an intermodal routing service based on real-time data on the road, rail and air traffic situation for the departure from and journey to the airport. With newly developed solutions for the mobility inside the terminal such as indoor navigation via smartphone and waiting time detection at the security checks the mobility information provided to passengers will be completed. In case of disruptions, passengers are informed about alternative routes automatically. In addition, the service will be integrated into the information systems of transport companies and airport companies" (Dora Project 2017).

The airport companies' partners in the project are the cities of Berlin and Palma de Mallorca, the operators of the local traffic information centres, the public transport companies, universities as well as technology companies. In Berlin specifically, the Senate Department for Urban Development and the Environment SenSU, public transport VMZ Berlin and *Verkehrsverbund Berlin-Brandenburg* (VBB), Flughafen Berlin-Brandenburg and the Technical University of Berlin cooperated with the private airline company Air Berlin. However, this airline went bankrupt in October 2017. A final evaluation of the DORA experiment is due to be completed in May 2018.

> URLs:
>
> HTTPS://DORA-PROJECT.EU/
>
> HTTP://WWW.BERLIN.DE/SENUVK/VERKEHR/POLITIK_PLANUNG/PROJEKTE/DORA/INDEX.SHTML
>
> HTTP://WWW.BERLIN.DE/SENUVK/VERKEHR/POLITIK_PLANUNG/PROJEKTE/INDEX_EN.SHTML

SMARTSET

In order to achieve the general goal of an energy-efficient and sustainable urban freight transport, SMARTSET analyzed examples from cities and regions of how the "20-20-20" EU target can be achieved with regard to CO_2 reduction and improved energy efficiency.

Ending in April 2016, the project was coordinated by the City of Gothenburg (Sweden) over a period of 36 months. The project was co-financed by the EU's Intelligent Energy - Europe Program (IEE) and consisted of 14 partners from Austria, Germany, Italy, Sweden and Great Britain.

> URL:
>
> HTTP://WWW.BERLIN.DE/SENUVK/VERKEHR/POLITIK_PLANUNG/PROJEKTE/SMARTSET/INDEX.SHTML

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HAMBURG

The 'Big Digital City' meets the 'Green Metropolis by the Water'

With its roughly 1.8 million inhabitants, Hamburg is the second biggest city in Germany. The city region's territory and administration also serves as one of the sixteen German federal states. About 2.8 million people live in the agglomeration of Hamburg, which in turn forms part of the larger "Hamburg Metropolitan Region", home to nearly 5 million people. The city encompasses the port of Hamburg in which up to 140 million tons of goods are processed annually, making it the biggest harbour in Germany and the third largest in Europe. The city has traditionally been characterized as a particularly open, internationally visible one, and the current administration sees it competing with Shanghai and Sydney to be one of the most attractive, innovative and liveable cities by the sea.[1]

During the last decade, several eco and smart city projects have been planned or implemented throughout the city.

The transitional objectives for urban planning in Hamburg were summarized in the slogan "Green, inclusive, growing city by the water" in a programmatic report (Hamburg BUE 2014). Firstly, the city aims at developing "more city within the city", meaning the quality of life should be improved through new residential constructions, new free spaces, physical and social infrastructure as well as mixeduse quarters, making districts more vivid and dense. Second, the state government aims to enable an equitable or "inclusive city" by creating adequate and affordable housing in neighbourhoods with a high quality of life and equal access to educational opportunities. A third aim is to remain a green and environmental-just-city, by sustaining and progressing the environmental quality of urban green spaces, nature and contributions to climate protection. Ecological objectives are to be balanced with social and economic responsibility. Finally, urban development will accommodate Hamburg's role as an economic metropolis, with a major harbour in the midst of the city, and vibrant industrial development. In addition to promoting production and services, the research and development sector will be supported and clustered spatially.

[1] Parts of this chapter, written by the editor, also appear in the following publications: Sengers *et al.* (forthcoming), and Raven et al. (2017).

Between 2011 and 2014, various contracts and memorandums of understanding between the City of Hamburg and large companies were publicly announced. These agreements loudly signalled the will to cooperatively develop smart city pilot projects and applications in public-private partnerships. Since then, however, little information has been made available on how these pilot projects have developed and whether any lessons have been learned. Since 2014, a series of roughly quarterly meetings have already allowed for delegates from state departments, semi-public enterprises and private partners to coordinate their smart city experiments in the city. The Hamburg port authority, the municipally owned development company of the HafenCity district and local universities (most prominently HafenCity University) are included in these discussions as main actors.

When a new Government was formed in early 2015, "digitalization" was a key theme of the coalition agreement between the social democrats and the green party. Just prior to this, the senate had passed a "Digital City Strategy" to bundle, influence and coordinate processes of digitalization in many fields, among them education and health. Consequently, a coordination office (*Leitstelle Digitale Stadt*) was established in the Senate Chancellery to ensure that the governmental and private actors cooperate and that the comprehensive perspective of the municipality is acknowledged in these processes.

Hamburg's lord mayor, Olaf Scholz, has repeatedly argued for an engagement of the state and municipal government in smart city experiments to ensure that the unavoidably digitalized future is co-shaped with the public good in mind (Scholz 2014, 2016). In line with this ambition, the municipality in its role as state government first engaged in bilateral and multilateral negotiations with system providers (IBM, Microsoft, Cisco etc.) and network operators (Vattenfall, Eon-Hanse etc.) to establish visible smart city experiments in Hamburg.

Besides the traditionally strong logistics sector, there is a relatively small industrial base for the forceful development of Smart City technologies in Hamburg. However, some IT companies, the fast-growing game industry, its various (applied) universities, and a remarkable clustering of creative industries in and around Hamburg are considered possible milieus from which innovation and start-up initiatives could be expected to emerge in the future.

FROM 'SMART' TO 'DIGITAL'

The government formed in 2015 made "Digitalization" a cornerstone of the coalition agreement, and continued previous attempts of supporting and coordinating active digitalization in many fields, among them transport and mobility, as well as digital administration, education and health: "The objective of the Senate of Hamburg is to exploit technical innovations to advance the development of the Free and Hanseatic City of Hamburg (FHH) as a

'digital city'. It strives to create the conditions for a climate of innovation that promotes the development of modern digital applications and improves the networking between the firms and institutions involved. Through its actions the Senate aspires to initiate, enable and support innovations." (Hamburg Senate 2015).

Table 1: Hamburg Smart City – Summary Timeline

2009	
	Hamburg Port Authority begins upgrading its core information technology infrastructure (Cisco 2014).
	Hamburg wins competition to become "European Green Capital" of the year 2011.
2011	
Feb:	Social democrats win absolute majority in the senate (new Lord Mayor: Olaf Scholz)
	An IP-based sensor project is launched in the port area, including sensors in roadways and bridges (Cisco 2014).
Nov:	Cooperation agreements signed between city of Hamburg, Vattenfall and Eon-Hanse regarding the development of energy supplies for Hamburg (incl. Smart Grid experiments in HafenCity etc.).
2012	
Oct:	Hamburg Transparency-Law (HmbTG) comes into force, requiring the publication of most data collected and generated by public institutions.
2013	
	A plebiscite for the re-communalization of the energy networks is successful.
2014	
Jan:	1st Microsoft CityNext conference staged in Hamburg (1 of 10 participating cities).
April:	Memorandum of understanding is signed between City of Hamburg and CISCO.
2015	
Jan:	Hamburg's government (Senat) approves the "Digital City Strategy".
Feb:	New coalition administration is formed after elections (social democrats + greens).
	"Digitalization of the big city" is used as a key slogan in the coalition agreement.
	Coordination office Leitstelle Digitale Stadt is established.

2016

Sept: Hamburg's government decides on the "digital first strategy" which provides a unified digital service account for each citizen and gives priority to digital communication when providing any public service in the state of Hamburg.

Oct: As part of the EU2020 Project "mySmartLife", Hamburg is selected "lighthouse city", after two previous applications were unsuccessful.

2017

June: cities4people.eu starts, a new H2020 project in which Hamburg (Altona-Mitte) serves as a site for experimentation and demonstration in sustainable mobility.

Aug: Together with the CityScienceLab of the HafenCity University, the city administration creates a group called "Urban Data Hub" for the integration of data from all departments and state-owned enterprises on an "Urban Platform Hamburg".

DIGITALIZATION: THE KEY ACTORS

Olaf Scholz, Hamburg's lord mayor, argues for a pro-active approach to digitalization, particularly for the involvement of public authorities in smart city experiments (Scholz 2014, 2016). He considers digitalization to be an unavoidable process, which – if properly shaped – offers many opportunities to better achieve the (long-standing) objectives of urban governance.

In Hamburg, many municipal departments interact with semi-public and commercial partners in various sectors (transportation, health etc.) and with various local universities (most prominently HafenCity University) in order to set up pilot cooperation projects. One example is the setting up of a City Science Lab in June 2015 in cooperation between the city of Hamburg, the Hafencity University and the MIT Media Lab in Boston.

The networking activities of the 'co-ording unit digital city' (*Leitstelle digitale Stadt)* have been complemented (and partly shaped) by efforts to be selected and funded as a lighthouse city under the EU funding scheme Horizon 2020. These latter efforts failed twice by a small margin. Only in 2016, the third proposal, entitled mySMARTlive under the leadership of Helsinki, Nantes and Hamburg was granted funding (see project description below).

HAMBURG'S REGULATORY CONTEXT

In the federal state of Germany, the constitution allows for a very high degree of municipal autonomy, which is particularly pronounced in the case of the three city states (Berlin, Hamburg and Bremen). As in all large German cities today, the local government can take responsibility for developing policies in support of a particular economic profile, for the provision of services through socially, economically and ecologically reasonable means and in general for largely formalized

urban planning processes, which usually involve some participatory elements. At the same time, urban actors are naturally constrained in their agency by federal and international level legislation. For example, activities involving commercial actors are regulated by procurement regulation, namely an EU directive which is spelled out in national legislation. The collection and management of data is similarly constrained by national and transnational standards.

During the period from 2011 to 2014, bilateral and multilateral agreements between the city-state and commercial providers of infrastructure (energy grid operators Vattenfall and Eon-Hanse as well as ICT-system provider Cisco) seem to have been the most important drivers for smart city experiments in Hamburg. These agreements were, however, completely non-binding. In 2015, just before and after a new administration had been elected, more substantial institutions were created: An explicit "digitalization strategy", a section of the coalition agreement on "digitalizing the big city", and a coordination office (*Leitstelle Digitale Stadt*). This coordination office reflects the declared ambition on the side of the municipality to facilitate, coordinate and, to a certain extent, control the build-up of know-how and capacity for the proactive digitalization of various economic sectors and public services. Since the signing of a Memorandum of Understanding (MoU) between the municipality and CISCO international limited in April 2014, a good dozen so-called 'pilot projects' have been developed under the coordination of a 'steering board' which meets regularly.

FROM VISIONS TO NEW GOVERNANCE ARRANGEMENTS VIA SMART CITY EXPERIMENTS?

In Hamburg, then, we can observe a sequence of two distinct phases. In the first (2011 to 2014), multiple public-private partnerships with big companies were announced to position Hamburg as a place where smart city developments were actively shaped and experimented with. Just before and after the new administration was elected in early 2015 (to be led by the same lord mayor as previously in office: Olaf Scholz), a more mundane strategy was followed involving a stepwise "digitalizing" of public services and infrastructure to the benefit of citizens and enterprises in the city state. As announced in the memorandums of understanding during the first phase, some pilot projects were developed in public-private partnerships. There has not yet been much publicly visible reporting on the results of these experiments. Nevertheless, involved actors describe these experiments as helpful in the sense that people from organizations with different prevailing institutional logics get to know each other and start to practice cooperating. While much of the early announcements can be understood in the context of international marketing and city branding, it takes time and experimentation for the involved professionals to fully comprehend the opportunities and challenges ahead, the possibilities for intervention, and the need

for coordination and regulation. In this sense, the developments in Hamburg can be interpreted as a learning process in which different roles for diverse public and corporate actors are experimented with in order to be prepared for opportunities and challenges that the future may bring. It hence seems that the difficulties met and the experiences accumulated in the experiments have, in very informal and tacit ways, influenced the reshaping of the institutional framework that is now in place to guide potential future experiments.

THE INTERRELATION OF 'SMART' AND 'ECO' IN HAMBURG

In Hamburg, as in most European cities, an earlier orientation of smart city activities predominantly towards technological infrastructures has been intensely criticized. All strategies now emphasize people-centeredness in addition to the aim of fostering innovation and economic value creation. Besides the aim of improving the accessibility of municipal services, it is also stated repeatedly that digitalization has to help improve the "quality of life", e.g. by improving air quality through managing mobility and transportation needs more efficiently. The focus of smart city activities on smart and renewable energy in other cities – such as Cologne, Mannheim or Zurich – is generally less evident in Hamburg. However, this changed slightly after the referendum of 2013, which forced the administration to re-municipalize the electricity network. While the previous private operator owned by Vattenfall had announced its intention to experiment extensively with smart grid features, e.g. in the ongoing HafenCity development, the new municipal operator Stromnetz Hamburg seems to be placing more emphasis on a smooth and cost-efficient conventional operation of the network without much experimentation, at least for the first years of its existence.

Since the pre-Scholz administration applied for the European Green Capital award in 2009, there have not been many really outstanding acts of environmental policy in Hamburg. There are multiple renewable energy projects, subsidies and incentives programs, an atlas of solar radiation as well as the E-mobility model region activities, but all of these can also be found in various other and smaller cities. As one exception, one could mention the ideas around a green and sustainable Olympic Games that were developed in the context of Hamburg's planned application to host the games in 2024 (which was halted in 2015 by a referendum).

The positioning of Hamburg as a pioneering city in digitalization could hence be seen as a key element of the city's profile, as shaped by the first as well as the second administration headed by Olaf Scholz. Moreover, it partly replaces the ambitions of the pre-Scholz administration to display the most advanced environmental policies.

Compared with smart city developments elsewhere, Hamburg is strongly characterized by the ambition of the senior administration to proactively shape and control the digitalization process for the sake of economic prosperity and a high

standard of living. There is a strong civil society in Hamburg, which successfully adds or removes issues (e.g. transparency of state action, re-municipalization of energy networks, hosting of Olympic Games) from the political agenda. The relationship between civic initiatives and the state authorities remains largely confrontational, and instances of cooperatively shaped policies remain relatively rare.

EXAMPLES OF ECO CITY / ENVIRONMENTAL SUSTAINABILITY PROJECTS

EUROPEAN GREEN CAPITAL 2011

Hamburg's early ambitions with regard to environmental policies culminated in the application for the title "European Green Capital 2011". "[A]pplying for the title was to position Hamburg internationally as a green metropolis offering a high quality of life. In February 2009, Hamburg was designated 'European Green Capital 2011' by the European Commission. Hamburg scored the highest number of points of all 35 participating European cities. This outcome was primarily due to the consistently high scores Hamburg gained in all environmental indicators" (Hamburg BUE 2016:7). In 2009, the government had applied for the title with reference to "comprehensive approaches, policy-commitment and the necessary funding needed to resolve these [urban] challenges". Yet, in 2010, there was a change in government through regular elections and when Hamburg started to act as 'Green Capital' at the beginning of 2011, "the freshly elected government showed comparatively low enthusiasm in really pioneering green urbanism for Europe" (an academic interviewee).

Local climate policy

"In 2013, Hamburg's CO_2 emissions totalled 17.7 million tons, with per capita emissions of 10.2 tons per year. […] The GHG of the economy averages around 178 kg per 1,000 euro of the gross domestic product (GDP). Compared to 2003, it thus decreased by 28.4 per cent" (Hamburg News 2015).

Hamburg follows a comparatively advanced climate policy and the senate passed a new Climate Plan in December 2015, which "follows in the footsteps of 2013's climate master plan. […] By 2030, the city aims to halve CO_2 emissions compared to 1990's levels." (Hamburg News 2015).

While CO_2 emissions in Hamburg have been decreasing since 1990, the current level of roughly 10 tons per inhabitant annually means that there is still a long way to go to reach a globally sustainable level (which is estimated to be about 2 tons per capita and year).

The climate plan of 2015 positions Hamburg as being "on the way towards the climate smart city". In this vision, "climate change mitigation and adaptation are both fundamental components of social cohesion". With its "first integrated climate

plan, Hamburg will consolidate its pioneering role in climate policy" (Buergerschaft Hamburg, 2015:6, translation P.S.).

"Also listed in the climate protection scheme are the following measures to avoid or reduce CO_2 emissions in Hamburg:

- carbon-neutral operation of Hamburg's administration by 203[0]
- municipal fleet to include 50 per cent of e-vehicles (doubling today's size);
- upgrading the building stock's energy performance through energy rehabilitation along a modernization concept set up by 2017, with additional 24.4 million euro allocated for schools and universities;
- promotion of cycling to achieve a 25 per cent share;
- new underground and rapid rail lines; operation of low-emission buses;
- environmental education at schools to win the young generation for active climate protection"

(Hamburg News 2015).

LOCAL ENERGY POLICIES

According to Hamburg's Department for the Environment and Energy, "there are currently [i.e. 2016] almost 1,500 businesses in the Hamburg Metropolitan Region which, together, employ around 24,700 people in the renewable energy sector. They experienced a growth in sales of over 50 per cent between 2008 and 2011. In 2011, during Hamburg's year as European Green Capital, the Renewable Energy Hamburg Cluster (EE HH Cluster) was established on the initiative of the environmental authority. The cluster now acts as a link between more than 180 companies." (Hamburg BUE 2016:48)

After its re-municipalization based on the results of a referendum in 2013, "[t]he electricity grid is again owned fully by the city since the beginning of 2015. Upon granting the electricity concession, the city and *Stromnetz Hamburg GmbH* concluded a cooperative agreement, which is the foundation of energy policy and energy management collaboration between the city and *Stromnetz Hamburg*. The goal of this agreement is to help maximize room for manoeuvre in the interests of a secure, affordable, consumer-friendly, efficient and environmentally compatible power supply and to do so in the context of various projects. These include activities leading to the development of a modern smart grid, the successive introduction of intelligent metering and measurement systems, the expansion of Hamburg's Energy Efficiency Platform, and the development of a recharging infrastructure for electrical vehicles in Hamburg" (Hamburg BUE 2016: 24/25).

The 60 wind turbines located within the city boundaries currently have a capacity of about 60MW, which is soon to be increased to 100 MW through repowering. Hamburg has been one of four German model regions for E-mobility, with a fleet of roughly 1,500 electric cars on the streets. This is said to be the biggest fleet in any German city. By the year 2025, about 525,000 homes will be heated via Hamburg's low-carbon district heating

networks, which are already among the most advanced networks countrywide.

> URL:
>
> HTTP://WWW.HAMBURG.DE/ENERGIEWENDE/3747306/ZAHLEN-ZUR-ENERGIEWENDE/

ENERGY TRANSITION HAMBURG

Under the heading "*Energiewende* made in Hamburg" the energy transition in the city has three focal areas: (1) make better use of less energy and therefore increase energy efficiency by reducing electricity and fuel consumption and avoiding unnecessary energy losses; (2) optimize the energy supply by updating and extending the grid; (3) increase the share of renewable energies in the overall energy mix by investing in power and heat from water, wind, solar and biomass. After a citizen referendum, the city also repurchased the privatized energy grid, meaning that the electricity and gas distribution as well as district heating is once again under public control. All projects are listed under:

> URL:
> WWW.HAMBURG.DE/ENERGIEWENDE/

RENEWABLE ENERGY HAMBURG NETWORK

The EEHH "Renewable Energy Hamburg network" (or "cluster") was set up in order to strengthen and promote cooperation in It works to pool the wide-ranging skills among companies, research facilities and institutions. It also provides a platform for dialogue among stakeholders, and promotes interfaces with other sectors, such as logistics.

> URL:
>
> WWW.ERNEUERBARE-ENERGIEN-HAMBURG.DE/EN/

ENERGY TRANSITION IN THE PORT

In 2013, "the State Ministry of Economic Affairs, Transport and Innovation, the State Ministry of Urban Development and Environment, and the Hamburg Port Authority (HPA) initiated the joint project Energy Cooperation of the Port of Hamburg ('smart port energy') […] [i]n order to bring together suppliers and users of energy technologies" (HPA/BSU/BWVI Hamburg 2013:5).

This project aims to combine "attractive consulting and support programmes offered in co-operation with *UmweltPartnerschaft Hamburg*, an association to promote a sustainable, resource-efficient economy" in order to "motivate the port industry to join Hamburg's efforts to switch to renewable energies" (ibid).

Its declared objectives were to reduce energy consumption by 20% per container to 47.7 kWh by 2020, and to generate on-site power of around 13 million kWh via the Nordex N117 wind turbine (2.4 MW), combined heat and power plant (1 MW) as well as solar installations.

Since 2008, an energy data management system has been constantly collecting data on energy consumption.

> URL:
>
> HTTPS://WWW.HAMBURG.DE/ENERGIEWENDE/ERNEUERBARE-ENERGIEN/4133252/SMART-PORT/

IBA INTERNATIONAL BUILDING EXHIBITION (2006-2013)

The IBA Hamburg ran from 1 September 2006 to 3 November 2013 – seven years that changed the districts of Wilhelmsburg, Veddel, and "Harburg Upriver Port". Seventy projects are being carried out in Wilhelmsburg, Europe's largest river island, along with Veddel and "Harburg Upriver Port", up until 2013 and beyond. An overview of the projects, many of which have had an explicit eco or smart city background, and which addressed different scales from a single building, over a neighborhood to a whole district, can be found via the following:

> URL:
>
> HTTP://WWW.IBA-HAMBURG.DE/EN/NC/PROJECTS/PROJECTS-A-Z.HTML

ENVIRONMENTALLY RESPONSIBLE PROCUREMENT

The goal of the environmentally friendly and resource-saving procurement programme of the city of Hamburg is to build on the history of being the former Green Capital and a Fairtrade City and to provide a role model by developing environmentally just and responsible procurement processes. Since 2006, it has been mandatory for the public sector to consider environmental criteria in any procurement. Moreover, since 2013 there has been a requirement to include an entire lifecycle cost analysis, thereby expanding the concept of economic efficiency and profitability with the aim of achieving energy and resource savings.

> URL:
>
> HTTP://WWW.HAMBURG.DE/UMWELTGERECHTE-BESCHAFFUNG/UMWELTPARTNERSCHAFT

ENVIRONMENTAL PARTNERSHIP HAMBURG

In 2003, the senate and Hamburg's business world established the *Umwelt-Partnerschaft Hamburg*, an environmental partnership programme, which has been working towards the goal of promoting sustainable and resource efficient enterprises. It is open to all businesses in Hamburg, regardless of their size or branch, and tries to smooth the pathway towards increased energy and resource efficiency and related cost savings by offering countless programmes and services. All companies who voluntarily invest in resource-saving or climate-protection activities have the opportunity to become

an "Environmental Partner". A total of 480 companies in Hamburg have already taken advantage of this scheme.

URL:

HTTP://WWW.HAMBURG.DE/UMWELTPARTNERSCHAFT/

COMPANIES FOR RESOURCE CONSERVATION (UFR)

The program *Unternehmen für Ressourcenschutz* (UfR) was launched by Hamburg's Investment and Support Bank in 2001. It sponsors energy system, efficiency and heat supply checks for local companies. The program is open to all production and service companies, as well as crafts enterprises in Hamburg. It aims at utilizing existing saving potentials of energy, water and raw materials. This customer-oriented program incentivizes voluntary investments in resource efficiency measures for climate protection.

URL:

HTTPS://WWW.IFBHH.DE/WIRTSCHAFT/UMWELTSCHUTZ-IN-UNTERNEHMEN/UNTERNEHMEN-FUER-RESSOURCENSCHUTZ-UFR/

AIR QUALITY PARTNERSHIP

The partnership for air quality (*Luftgütepartnerschaft)* is a joint initiative of the City of Hamburg and the business community of Hamburg, aimed at improving air quality and making a contribution to climate protection. The program was initiated in 2012 and renewed in 2016 for another 5 years.

URL:

HTTP://WWW.HAMBURG.DE/LUFTGUETEPARTNERSCHAFT/

HAMBURG FOUNDATION FOR CLIMATE CHANGE MITIGATION AND EDUCATION

This politically independent foundation (*Hamburger Klimaschutzstiftung*) was set up in 2008 with the City of Hamburg in order to promote projects mainly in the areas of climate education, environment, nature and climate protection. The goal is to increase awareness of climate-related issues in the public arena and to support social change.

The main project supported is Gut Karlshöhe, an educational farm in the northern part of the city district.

URLs:

HTTP://WWW.HAMBURGER-KLIMASCHUTZSTIFTUNG.DE/EN

HTTP://WWW.GUT-KARLSHOEHE.DE/STARTSEITE

HAMBURG FUTURE COUNCIL

The Zukunftsrat Hamburg is a public forum and association of over 100 organisations and individuals committed to work for a

future ready Hamburg. One of the main activities is regularly updated assessments of the environmental and sustainability performance of the city (Zukunftsrat 2016, cf. Kopatz 2010).

URL:

HTTP://WWW.ZUKUNFTSRAT.DE/

HAMBURG LEARNS SUSTAINABILITY

Nachhaltigkeitlernen is a citywide initiative across several public authorities, institutions, organizations, networks and individuals who engage in environmental education and awareness campaigns for sustainable development.

URL:

HTTP://WWW.HAMBURG.DE/NACHHALTIGKEITLERNEN

EXAMPLES OF SMART CITY/ DIGITALIZATION PROJECTS

OPEN GOVERNMENT / OPEN DATA TRANSPARENCY PORTAL HAMBURG

Hamburg's transparency law was instigated by an initiative in favour of a plebiscite called "Transparency creates Trust" (*Volksinitiative „Transparenz schafft Vertrauen*"), which submitted a draft legislation in October 2011. According to the resulting transparency law, which passed the Senate in June 2012, a very broad range of information that is, or can be, collected by the city state government has to be made easily available via an open data portal.

Resulting from this law was a relatively early – and in some regards still exemplary – publication of the informational basis of urban governance processes: bills, proceedings, calls for tenders, contracts regarding infrastructure operation, etc.

Objectives

Government officials and activists aim to make the data that are collected in Hamburg by public authorities available in the form of 'open data' in order to allow for transparency, involvement of citizens in governance processes, and business opportunities.

The portal allows all interested parties easy access to all information that is generated in governance processes as far as this does not by law need to be kept confidential. This includes spatial information in various geographical information systems, which can also be used freely for the visualization of political arguments in maps.

This allows and incentivizes an involvement of government 'outsiders' in data analysis and governance processes. It thus intends to 'democratize' the knowledge basis on which decisions are based. This again counters the idea that e.g.

the informational basis of infrastructural decisions is accessible only to 'experts' from within the city administration.

Furthermore, this Open Data Initiative allows for advanced public discussions on confidentiality regulations. The initial publication of government data also paved the way for broader discussions e.g. on data generated by investigating authorities and secret services.

Governance arrangements

Following a civil society initiative, the municipal/state government of Hamburg as a whole has been made responsible for proactively providing all available information and is accountable to the city/state senate.

The law outlines clear responsibilities for data provision. An office of three employees has been charged with the maintenance of the portal. Since January 2015, the operation of the data portal has been secured by a Transparency Coordination Office, staffed by three employees (Staatsarchiv Hamburg n.d.). The portal and the data management are funded from the city state budget (by law).

Usage is open to all who are interested (both commercial and civic actors). There is little evidence on the respective websites, though, that the municipality was engaged in activities to motivate and enable potential users.

The Commissioner for Data Protection and Informational Freedom is attributed the role of a trustee and warrantor.

Current state of affairs

Full implementation was achieved in early 2015. The open data monitor has ranked Hamburg's open data portal "# 5 [of 8] in Germany based on the overall quality metric. Measured in December, 2015". At that time, open data monitor claimed that only 2% of the 9,283 datasets or 7 GB of data volume were machine readable (in September 2015, see www.opendatamonitor.eu). The website www.europeandataportal.eu (on Dec 22, 2016) listed 21,895 datasets for the city state of Hamburg, compared with 14,827 datasets for the city state of Berlin and 8,802 datasets for the city of Munich.

As of November 2017, of the 73,974 datasets available on the transparency portal, only 6,207 (i.e. 9%) were available as pdf only, and hence non-machine readable.

Transparenzranking.de, an initiative co-funded by the Open Knowledge Foundation, placed Hamburg at the top of a list of all German federal states in a comprehensive ranking. Lower rankings were assigned in specific categories related to the exemption of certain institutions from the duty to report their collected and generated data.

The transparency portal provides little evidence of measures that may have been taken to motivate and enable potential users of the datasets.

The page views are counted and monthly statistics are published, including the most frequently used search terms. They show tremendous fluctuations and a trend of decreasing page views, especially of those of an automated nature (via API).

The website contains no information about envisaged learning mechanisms (e.g. how to reduce the effort involved in providing the data) or about how to use the data most productively.

> URLs:
>
> HTTP://TRANSPARENZ.HAMBURG.DE
>
> HTTP://TRANSPARENZ.HAMBURG.DE/MEHR-PORTALE/
>
> OPENDATAMONITOR.EU

FINDING PLACES PROJECT

The "Finding Places" project was an experimental application of a new visualization technology and an innovative workshop format for public participation. In the participatory workshops, the CityScope technology (table-screens for the projection of maps and a Lego-type flexible representation of buildings) served to produce a new representation of the city as well as ways to engage with this representation in order to collectively discuss urban development scenarios—in this case the optimal locations for accommodation of refugees. This potentially enabled the participants to understand and question the selection criteria used by the urban planners.

Objectives

In 2015, Germany experienced a sharp increase in immigration of refugees. Space for development is limited in the growing city of Hamburg, although there is more space available from brownfield developments than in other large German cities.

In a series of workshops conducted from May to July 2016, citizens of Hamburg were asked to identify places in the city that would be appropriate for the location of dwellings for refugees. The task was defined as collectively identifying spaces suitable for the building of dwellings for 20,000 refugees. At total of 161 spaces were identified, of which – after an initial check – the municipality considered 44 to be suitable.

The exercise was additionally designed to serve as a test application – of the CityScope technology – and of the MIT-HCU cooperation called "City Science Lab".

Governance arrangements

A series of workshops was initiated by STEG, Hamburg's public society for urban renewal and city development, and carried out by the *HafenCity* University's City Science Lab, using MIT's CityScope technology. Representatives of Hamburg's districts and of the refuge coordination office attended the workshops as resource persons.

The experiments were funded and conducted under direction of the city state government. The agreements between *HafenCity* University and the city/STEG (as well as MIT) are not publicly available (i.e. we found no traces on www.hamburg.de or at the transparency portal).

Since its foundation, the HafenCity University has had very close links with the municipality. This project was an opportunity to collaborate practically and

to extend this cooperation to the prestigious partner MIT.

Current state of affairs

The workshops were conducted from 26 May to 15 July 2016. The results were reported in a brochure in September 2016.

It was reported that "nearly 400 Hamburgers" participated in the exercise. They collectively recommended spaces to accommodate 6,500 refugees (brochure from September 2016). Eighteen of these spaces have now been assessed in detail (*Bürgerschaft Hamburg* 2016). In a parliamentary (minor) question to the city administration, an MP asked for information on further outcomes, complaining about the contradictory nature of information released to date.

The project received significant attention from the media and politicians. Further experiments may follow. To our knowledge, no concrete plans have been announced so far.

> URLs:
>
> HTTPS://WWW.FINDINGPLACES.HAMBURG/
>
> HTTPS://WWW.HCU-HAMBURG.DE/RESEARCH/CITYSCIENCELAB/

'FABULOUS ST. PAULI' FAB LAB

Fabulous St.Pauli is a community workshop for (among other things) new computer controlled machines like 3D printers, laser-cutters and CNC milling machines. Fabulous St.Pauli is "part of a network of about 600 of such 'fabrication laboratories' worldwide. The concept of FabLabs was invented by Neil Gershenfeld, director of the Center for Bits & Atoms at MIT, in 1998" (Fab Foundation 2016).

Fablulous St.Pauli is, then, part of a social movement, globally connected and in this case strongly embedded in the Sankt Pauli neighbourhood. It runs a 140 m² workshop "in Lerchenstr. 16a in Hamburg's famous quarter St. Pauli, once one of the poorest neighbourhoods in Germany and now heavily affected by gentrification" (ibid.)

Objectives

The objectives of the Fablab in Sankt Pauli are to provide a supportive environment for independent makers as well as to bring production back to the masses and back into the city: "The goal is to provide tools and access for all to a digital production that has been confined to factories until now. And to establish a space in which people can learn together and teach each other the basics of digital production in a casual way. By that, Gershenfeld sought to overcome the "fabrication divide" that has shaped industrial societies for a long time, similar to the relatively new "digital divide" of the information age that got more attention: the gap between those who have access and those who have not. Sometimes we put it this way: High-tech for all! And: The city is our factory (an expression that was coined by artist Christoph Schäfer). Today's western cities have lost many of their production capabilities of the past, mostly through outsourcing to industrial estates or Asian countries. This situation is

neither resilient nor fair." (Fab Foundation 2016)

The project aims to foster learning on two levels: (a) the build-up and exchange of know-how to the production of things through artisan and digital means; and (b) the establishment of decentralized and diverse spaces for production and creativity in the urban environment of Hamburg (in exchange with initiatives in many other places).

The experiment aims at the production of practical knowledge on how to produce things in the sense of a community of practice. In this way, it challenges the notion of a segregation of residential and service-oriented areas on one side and sites of production on the other side. It thus promotes an ideal of the city as a site of individual small-scale and needs-oriented production, which – according to the claims of advocates – should happen very close to residential areas, recalling the pre-modern history of the European city.

Governance arrangements

Fabulous St.Pauli was registered as a formal association (*e.V.*) in 2011. All members have an equal vote in the annual assembly (which, for example, decides on the budget).

The idea for a FabLab in Sankt Pauli emerged in the context of the resistance against the Bernhard-Nocht-Quartier development (Boing & Schipkowski 2016:7) in St. Pauli. Hamburg was also home to Germany's most prominent hackers and the site of very important events of the hackers' organisation "Chaos Computer Club".

The association and the workshop Fabulous St.Pauli draws financially only on membership fees and donations. No public subsidies are received. Projects are co-funded by government bodies (like when the Department of Culture *Kulturbehörde* sponsored the festival "A/D/A – Tomorrow's Utopias for Today's Citizens", ADA 2016)

Current state of affairs

While the organization of the FabLab is stable, the lease for its workshop venue is very short term and probably temporary. There is a regular program and a lively community of makers who co-create and participate. Occasional projects like school programs or the ADA festival in August 2016 attract significant media attention. The projects that are funded by external funders (like the ADA-festival) are usually well documented and presented (after some time) on the website. Nevertheless, the organization relies very strongly on the free time and engagement of unpaid volunteers.

Timeline

- 2009: first Fablab in Germany opened in Aachen
- 2010: summer: A FabLab-Truck from NL visits St.Pauli for several weeks
- 2011: Fabulous St.Pauli is initiated, at various locations; association registered.
- 2015: Fabulous St.Pauli settles in Lerchenstr.16a.
- 2016: ADA-festival, a fusion of arts, digital tinkering and humanities is funded by Hamburg's cultural fund.

URL:

HTTP://WWW.FABLAB-HAMBURG.ORG/ENGLISH/

SMART HAFENCITY

The new *HafenCity* development is located on an island in the Norderelbe River close to the city centre, occupying a total area of 158 hectares of former port and industrial sites. The goal is to create a total space of approx. 232 hectares gross floor area (GFA) above ground. In total, 6000 homes are planned for around 14,000 people plus space for 45,000 jobs (ca. 35,000 desk jobs and 50.000 m² for sales and gastronomic services).

Objectives

By completion (in 2025), the new district is expected to have expanded the area of Hamburg City by 40%. The overall investment in HafenCity is estimated at ca. € 8.5 billion of private investment plus ca. € 2.4 billion of public investment, with the latter being covered partly by the profits that the state makes in selling plots in the area (ca. € 1.5 billion).

The huge development of HafenCity was meant to be turned into a lab for many emerging technologies and various innovations including smart metering etc. In 2014, the city administration aimed to position Hamburg as a primary hub for innovation, consequently turning the flagship development of HafenCity into a window of smart city experiments. The huge waterfront/brownfield development of HafenCity was meant to be given an innovative image by making it a showcase of smart urbanism, thus supporting the positioning of the city as a whole as an economic engine and innovative harbour to the world.

Figure 3: District Overview of HafenCity
Source: Hafencity.com

The project is still promoted as being exemplary on the basis of high ecological building standards, smart mobility solutions, above average building density and a new sustainable energy system. The announced intentions to experiment with smart grids and other digital technologies, however, have been stalled and deleted from the promotional materials.

Governance arrangements

The project development is handled by *HafenCity GmbH*, a wholly owned subsidiary of the Free and Hanseatic City of Hamburg. Public-private partnerships with service providers (a "partner ecosystem") were meant to create this image, representing "the way forward" in urban development, seen also as a clever way to make these experiments less costly for the municipal budget (hamburg.de GmbH & Co. KG, n.d). The operator of the electricity grid, Vattenfall, and the service provider CISCO offered to implement experiments in collaboration with HafenCity GmbH and other actors in Memorandums of Understanding. The experiments were meant to feature in future applications for the H2020 lighthouse calls and assumedly also to serve the (international) marketing of the involved companies.

The energy provider Vattenfall had started a project called "Smart Energy Hafencity" to use the new district as a test area for automatic energy management of individual households and office spaces, as well as management of fluctuating power fed from regenerative energies via intelligent load control (smart grid based on electronic metering). (Vattenfall GmbH, n.d). This project – apart from an ongoing internet presence – was apparently stalled after a referendum achieved the re-municipalization of the energy networks.

However, a "smart traffic concept" has been implemented with an integrated E-mobility solution and the excellent public transport connections should reduce the share of individual motorized transport to 20 to 25 per cent (Hamburg average: 47 percent). The traffic concept actively considered car-sharing, E-mobility, E-bikes etc., making the HafenCity part of the Hamburg electro mobility model region. Several recharging points, including rapid charging (DC) stations have been installed, reducing the recharging times for electric cars from four hours to half an hour for a semi-charged battery (hamburg.de GmbH & Co. KG, n.d).

Current state of affairs

Planning and constructions are proceeding largely as scheduled. A total of 1800 flats have been constructed and 2800 residents as well as around 730 companies have moved to Hafencity as at the end of 2016 (HafenCity Hamburg GmbH 2017a, 2017b).

The development is promoted as "setting new standards – at least in Europe – in successfully integrated urban development that simultaneously takes local requirements and global exigencies into consideration" (HafenCity Hamburg GmbH 2017c).

In 2016, HafenCity Hamburg GmbH was "presenting the full spectrum of successful, urban, sustainable and innovative city development" at the MIPIM international

real estate fair in Cannes (HafenCity Hamburg GmbH 2016).

Building standards are being assessed under a special scheme (Umweltzeichen HafenCity). Plans and achievements concerning e-mobility, reduced parking space and car-sharing are reported. (HafenCity Hamburg GmbH 2017d).

Timeline

- 1997: Announcement of HafenCity project
- 1999: Masterplan competition: winner Kees Christiaanse/ASTOC
- 2001: Construction of buildings begins (SAP, now KLU/MSH)
- 2003: Completion of first building, construction of first neighbourhood (*Am Sandtorkai/Dalmannkai*)
- 2005: First occupants move in
- 2009: Completion of construction of first neighbourhood
- 2010: Revision of Masterplan for eastern HafenCity
- 2012: U4 subway opens
- 2014: Opening of *HafenCity* University (HCU)
- 2017 (January): Opening of the concert hall Elbphilharmonie
- 2017: Construction of southern *Überseequartier* begins
- 2025-2030: Estimated projected completion of *HafenCity* (apart from a few buildings)

URLs:

HTTP://WWW.HAFENCITY.COM/EN/OVERVIEW/HAFENCITY-DEVELOPMENT-FACTS-AND-FIGURES.HTML

HTTP://WWW.HAFENCITY.COM/EN/HOME.HTML

HAMBURG STRATEGY FOR AN INTELLIGENT TRANSPORT SYSTEM (ITS)

The Intelligent Transportation Strategy for Hamburg (ITS-HH) is a political initiative to strategize and coordinate the systematic build-up of top-of-the-range infrastructure and standards for data management and exchange. The strategy passed the Senate in April 2016, starting a two-year period of systematic experimentation with technical solutions. For this testing phase, the Senate decided to invest a substantial amount. The experiments shall then inform decisions made from May 2018 about which technology and standards will be rolled out more broadly and how this should be accomplished (BWVI Hamburg 2016).

Objectives

The strategy relates to the internationally used term ITS and defines this as "transportation infrastructure, ICT and vehicle systems that – by interconnecting vehicles, infrastructure and people (e.g. via mobile phones) and by an exchange of real-time data – contribute to making mobility more reliable, safe, efficient and environmentally sound" (BWVI Hamburg 2016:5, translated by the

editor). The objectives of the ITS-HH are described accordingly as follows: "improve transport safety; reduce environmental impacts of transportation; improve reliability and efficiency; support good and safe data collection and exchange of information, foster innovations" (ibid:p.15).

The strategy builds on the claim that recent technological developments induce fundamental changes in the transport sector: "Currently, a developmental leap is going on due to the megatrends of IT: Internet-of-Things, mobility, cloud, big data and social network" (ibid:5). The document reviews where elements of an ITS are already in place in Hamburg and identifies eight fields of action: data "quality/ interoperability/ safety, authorized management" (ibid:18) and innovation "create a climate that is encouraging experimentation and innovation" (ibid:p.24) are defined and visualized as cross-cutting issues.

"Information, intelligent traffic control, intelligent infrastructure, intelligent parking, mobility as a service and intelligent vehicles" (ibid:18) are depicted as six themes that will structure the work of the diverse actors in addressing the questions that repeatedly arise in all fields: What kinds of data are available, which are needed? […] What level of automation can be applied (e.g. in traffic control)? What strategies and defaults is this based on? […] Which technology is appropriate and in compliance with data security/ privacy regulation? […] How can the long-term utility of investments be ensured (e.g. via non-proprietary solutions)?" (ibid:24f) Answering these questions (within two years from April 2016) is intended to lay the groundwork for the subsequent definition of an IT-architecture for the ITS in Hamburg ibid: (p.25).

Governance arrangements

The strategy implementation plan emphasizes a cooperative approach, which brings "economy, research, public authorities and mobility providers" much closer together than before. "Cooperation in public private partnerships will lead to synergy effects" (p.27). Sixteen "crucial actors in Hamburg regarding the ITS" are described in detail in appendix 2 of the strategy document (pp.55-60). They are envisaged to cooperate and "be coopted" in the form of "individual projects, joint support schemes, workshops, ITS fora, ITS exhibitions and as part of a stakeholder process" (p.27). There are indications throughout the document, however, that the final responsibility for decisions is seen to rest solely with the various public authorities that are involved in the process.

At the same time, the strategy stresses an experimental approach of "piloting innovative developments in prototypes and small projects, and in case they stand the test, employ them more broadly in standard applications" (p.27).

Current state of affairs

The senate decided in April 2016 to invest €1.85 million until 2017, of which €600,000 were reserved for preparing a bid for hosting the ITS-World Congress 2021, which was successful. After stocktaking and conceptualization in 2015/2016, the project is currently in a phase of

experimentation, preparing for decisions on larger investments to be made from 2018 (BWVI Hamburg 2016).

URLs:

HTTP://WWW.ITS2021.HAMBURG/DOWNLOADS/ITS%20STRATEGIE%20HAMBURG.PDF

HTTP://WWW.ITS2021.HAMBURG/

SWITCHH SMART MOBILITY

Switchh is a cooperative initiative between three car-sharing providers and the largest bike rental system in Hamburg, as well as the association of public transport providers in the area (HVV). In one integrated smartphone app, it offers all options for getting around Hamburg and provides access to all identified mobility services on the basis of a single registration process, one access card and a low monthly fee of €8.90. The project is based on the idea of "complementary mobility" and “intermodality” and one of its key objectives is to reduce car traffic in Hamburg. Since October 2013, Switchh has been cooperating with the public transport provider *Hochbahn AG*, the car-sharing provider Car2Go and the car rental company Europcar. Via the HVV app, Switchh users can now easily compare the duration and costs of alternative journeys including bus, train and underground connections, and the rental options provided by Car2Go, a car rental, bike rental, as well as walking or taking a taxi.

One of the elements of Switchh, the bike rental program *StadtRAD*, was started in Hamburg as long ago as 2008. By 2012, it was called “the most successful bike rental system”, with more than 300.000 registered users. Via smartphone app, telephone call or credit card, users today can rent one of as many as 2,500 bicycles at more than 200 docking stations. The first 30 minutes are free, which is listed as one of the success factors of the scheme in addition to its very visible and reliable presence in all parts of the city. *StadtRAD* is part of a bundle of policies which aims to increase the share of bicycle traffic to 25% by 2030 (as compared to 12% in 2008). Riding a bike in Hamburg should be safe, fast, comfortable, easy and attractive. The basis for this is provided by the bicycle traffic strategy, which has been implemented since 2008 (BSU Hamburg 2008, BWVI Hamburg 2015). Measures include the expansion of the cycle path network, improved bicycle parking options and the *StadtRAD* bike rental system.

In order to create Switchh’s integrated services, all partners involved had to adapt and open up their registration and billing processes to allow for the standardized engagement with Switchh users. They also had to agree on the specific way in which the alternative options are displayed within the integrated HVV (local public transport) app. Reflecting the objective of the Senate to reduce car traffic in the city, the listing of options gives slight priority to walking, cycling and public transport.

URL:
HTTPS://WWW.SWITCHH.DE/

HAMBURG SMART PORT

In Hamburg's current seaport area, some pilot experiments address possible infrastructure developments in logistics, transportation and energy, a data integration platform and the development of apps to improve logistics, traffic control and land use. The key driver of these experiments is the Hamburg Port Authority (HPA), a public enterprise with municipal majority. Several private service providers and manufacturers of IT-infrastructure were invited to cooperate in these experiments. In the 2014 memorandum between the city and CISCO, the experiments in the "Smart Port" were promoted as the main demonstrators of such a cooperation.

Objectives

The area under control of the Port Authority (7200 hectares) plus the routes of incoming and outgoing traffic (by road and sea) are treated as a test field both for the rest of the Hamburg metropolitan area and for harbour areas worldwide. The experimental cooperations are considered useful learning fields for public-private partnerships with enterprises. The partners aim to learn about possibilities and challenges of the technological solutions experimented with and, most importantly, about the cooperations set up for the projects.

Timeline

- 2009: Hamburg Port Authority begins upgrading its core information technology infrastructure.
- 2011: IP-based sensor project, including sensors in roadways and bridges, is started in the port area.
- 2014: Memorandum of understanding signed between the City of Hamburg and CISCO emphasizing smart port experiments. HPA is commissioned to coordinate all MoU pilot projects.
- 2016: Port Community and SPL-App are developed with partners and offered to all users.

Governance arrangements

The basis of most pilot projects is the 2014 MoU between the city state and enterprises (most importantly Cisco). HPU is assigned the role of a coordinator of all MoU pilot projects. A roundtable on digitalization with delegates from all relevant departments of the city administration and from all external partners (universities, enterprises etc.) meets regularly (about four times a year) (Kii 2016).

Current state of affairs

Some pilot experiments were conducted; others were dropped. During 2016 and 2017, very little information was publicly available about the progress and results of the projects.

> URL:
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> HTTPS://WWW.HAMBURG-PORT-AUTHORITY.DE/EN/HPA-360/SMARTPORT/

A PLATFORM FOR COLLABORATIVE INFORMATICS: AHOI.DIGITAL

Starting in early 2017, Hamburg University, Technical University Hamburg, HAW Hamburg, HafenCity University and the Department for Science, Research and Equality created “ahoi.digital“ as a platform for collaboration in informatics. They aim to establish Hamburg as a top location for excellent informatics. “As a competence centre and network, the platform gives a push to innovation, collaboration and spin-offs.”

In October 2017, a first batch of seven collaborative research projects has been selected for funding, each receiving €625,000.

> URL:
>
> HTTP://WWW.HAMBURG.DE/PRESSEARCHIV-FHH/9742486/2017-10-20-BWFG-AHOI-DIGITAL-STARTET-ERSTE-FORSCHUNGSPROJEKTE/

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MUNICH

CITY BACKGROUND

Munich is Germany's third biggest city and the capital of the south eastern state of Bavaria. Its current population of 1.55 million (Portal München, 2017a) has been constantly increasing over the last 15 years with an average growth of 0.89 percent per year (Portal München, 2017b). Munich is repeatedly reported to have the strongest economy of any German city, and headquarters of many big international companies like Siemens AG (electronics), BMW (automobile), Linde (gases) and Allianz (insurance) are based there. It is also attracting an ever-increasing number of small and mid-sized enterprises. Furthermore, Munich is renowned for its very strong innovation capacity, for hosting multiple universities of outstanding excellence, and for policies ensuring a very high quality of life.

Despite its great financial potential, however, many of the projects that aim at making Munich a leading smart – and sustainable – city seem to require external funding. By embracing the European Union's offer of funding through programs like Horizon 2020 (Fund for Research and Innovation) and EFRE (European Funding for Regional Development), Munich was able to obtain €15 million for its projects (City of Munich: Referat für Wirtschaft und Arbeit, 2017).

"MUNICH FUTURE PERSPECTIVE": CONTINOUS PARCIPATORY PLANNING

Since 1998, Munich's city development and urban planning have been determined significantly by one progressive initiative: MUNICH FUTURE PERSPECTIVE (*PERSPECTIVE MÜNCHEN*). This is a strategic urban development plan meant to provide a future-oriented framework for policy-making and implementation.

MUNICH FUTURE PERSPECTIVE was adopted in 1998 to replace the existing urban development plans - which were considered too inflexible - with a more process-oriented planning procedure. Under the guiding principle "City in Balance" and with the participation of citizens and stakeholders of the city, four strategic guidelines, sixteen thematic guidelines, ten action areas and sixty lead projects have been identified to date (Lang, 2014; City of Munich: Department of Urban Planning and Building Regulation, 2013).

A central objective of MUNICH FUTURE PERSPECTIVE and the respective division of the Department of Urban Planning and Building Regulation is to improve public and stakeholder involvement in urban planning. Establishing an active culture of participation through dialogue among different interest groups and across all ages is considered a precondition for sustainable urban development. Consequently, much

effort has been invested in creating new forms and means of public participation. A most representative example is the participatory process for an overall update of MUNICH FUTURE PERSPECTIVE in 2012. Prompted by the slogan "Join thinking Munich" (*München Mitdenken*), citizens were invited to contribute ideas and comment on workshops via a newly developed online portal. More than 450 ideas, 1,600 comments and over 12.000 evaluations were received in less than a month. In 2013, this process was awarded the first prize for Online Participation (Landeshauptstadt München, 2017).

According to the long-term development process of MUNICH FUTURE PERSPECTIVE, both smart city and eco city projects are pursued and often combined.

URLs:
HTTP://WWW.PERSPEKTIVE.MUENCHEN-MITDENKEN.DE/

HTTPS://WWW.MUENCHEN.DE/RATHAUS/STADTVERWALTUNG/REFERAT-FUER-STADTPLANUNG-UND-BAUORDNUNG/STADTENTWICKLUNG/PERSPEKTIVE-MUENCHEN.HTML

EXAMPLES OF ECO CITY/ENVIRONMENTAL SUSTAINABILITY PROJECTS

Energy management in both the public and the private sectors, the facilitation of cycling and other mobility alternatives to cars, renaturation efforts, the preserving of green spaces within the city, sustainable concepts for water supply – all these are evidence of Munich's intention to conserve nature despite the city's ever-growing size and population.

In Siemens' ranking of "Green Cities" in 2011 Munich was assessed as "better than average" in five of eight categories, and "average" in the remaining three (Siemens AG & Denig 2011).

The following sections concentrate on a selection of innovative sustainability-oriented projects that propose labelling Munich as an eco city.

INTEGRATED ACTION PROGRAM FOR CLIMATE PROTECTION IN MUNICH (INTEGRIERTES HANDLUNGSPROGRAMM KLIMASCHUTZ IN MÜNCHEN – IHKM)

The Integrated Action Program for Climate Protection in Munich (*Integriertes Handlungsprogramm Klimaschutz in München – IHKM*) is the synopsis of all the measures the city administration is taking to achieve the municipal climate protection objectives. Within the scope of IHKM, the many activities of the city administration are pooled and developed further. Overall, €84.8 million have been invested in the IHKM since 2010.

Objectives

The Ecology Guideline "Climate Change and Climate Protection" of MUNICH FUTURE PERSPECTIVE set out the scale for IHKM. The measures within the IHKM range from environmentally-friendly traffic planning and lighting concepts to housing construction and changing the behaviour of individuals (City of Munich: Referat für Arbeit und Wirtschaft, 2016).

Government arrangements

In 2008, the City Council passed the final draft of IHKM. The first climate protection program was approved in 2010. The IHKM primarily initiates measures that the city administration can directly influence. It is organized in a cross-departmental fashion so that synergies can be used. New measures and initiatives are developed in an interdisciplinary fashion. IHKM is updated twice a year.

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> HTTPS://WWW.MUENCHEN.DE/RATHAUS/STADTVERWALTUNG/REFERAT-FUER-GESUNDHEIT-UND-UMWELT/KLIMASCHUTZ_UND_ENERGIE/KLIMASCHUTZSTRATEGIE/IHKM.HTML

ÖKOPROFIT

Key to achieving energy efficiency and energy saving potentials is the well-established counselling program ÖKOPROFIT, in which 252 companies have participated since the founding of the program 20 years ago (City of Munich: Referat für Umwelt und Gesundheit, n.d).

Objectives

In ÖKOPROFIT, the city authority, its private businesses SWM and waste management, as well as the International Chamber of Commerce are cooperating to advise, support and stimulate enterprises to establish and enhance measures for the protection of environment and climate, such as efficient lighting, construction or mobility (City of Munich: Referat für Arbeit und Wirtschaft, 2016). Participating enterprises go through a ten-step workshop phase as well as five individual coaching sessions in order to reduce their carbon emissions - whilst reducing unnecessary expenses - and obtain the ÖKOPROFIT certificate. In addition to the financial benefits, participating enterprises profit from this professional introduction into sustainable corporate management and the positive publicity. At the same time, the participation fees are marginal and contain an option for sponsorship.

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> HTTPS://WWW.MUENCHEN.DE/RATHAUS/DAM/JCR:EDC34B9B-5D0D-49C1-98F0-7A42781584BC/FLYER_OEKOPROFIT-MUENCHEN.PDF

UTILITIES INVESTING OUTSTANDINGLY IN RENEWABLE ENERGY CAPACITIES

As the biggest municipally owned energy provider in Germany, Munich's public

services *Stadtwerke München* (SWM) have been building on longstanding efforts to expand renewable energy supply since 2008. Their "Renewable Energies Expansion Campaign", which a budget of €9 billion, aims to cover the entire city's electricity consumption needs by 2025. The intention is thereby to make Munich the first solely renewably powered large city worldwide. It has to be taken into account that the renewable power generated in the region around Munich is not and will never be able to meet the complete demand of the metropolis. Even though regional generation is priority, SWM engages in the build-up of renewable power plants all across the continent in order to meet local demand.

> URL:
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> HTTPS://WWW.SWM.DE/ENGLISH/COMPANY/ENERGY-GENERATION/RENEWABLE-ENERGIES.HTML

EFRE: DISTRICT COOLING IN MUNICH'S CENTRAL MARKET HALL

Munich is integrating a district cooling system in the renovation of its central market hall, with an estimated cost of up to €16.5 million. EFRE, the European Fund for Regional Development, is supporting the investments in the innovative cooling system with €1.67 million.

Objectives

District cooling, like district heating, is a sustainable and energy efficient alternative to conventional climate control units. It will emit approximately 50% less CO_2 than a conventional system. As early as July 2015, the city council had decided to renovate the central market hall and its surroundings within the framework of the sustainable urban planning concept. Munich is therefore pursuing the goals of conserving energy and reducing CO_2 emissions in the public sector.

Current state of affairs

In order to successfully complete this project, Munich announced a request for continuous funding in the following programming period for EU structural funds 2021-2027. With Munich being one of the richest regions in Germany, this will probably require strong argumentation and good will on the side of the EFRE funding commission.

> URL:
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> HTTP://WWW.WIRTSCHAFT-MUENCHEN.DE/PUBLIKATIONEN/PDFS/EUROPA-JAHRESBERICHT_2016-EN.PDF

EFRE URBAN PLANNING: INTERREG VB LOS_DAMA!

los_dama! is a project to develop landscape and open spaces in Alpine cities and metropolitan areas. The Department of Urban Planning and Building Regulations is spearheading the project, which was approved by the EU Interreg Vb Alpine Space Program. Co-funded by EFRE since October 2016, the total eligible costs of the project amount to €2,598,520, of which the

EFRE accounts for €2,208,742. The official start was in November 2016 and the project is schedule to end on 31 October 2019.

URLs:

HTTP://WWW.ALPINE-SPACE.EU/PROJECTS/LOS_DAMA/EN/HOME

HTTPS://WWW.MUENCHEN.DE/RATHAUS/STADTVERWALTUNG/REFERAT-FUER-STADTPLANUNG-UND-BAUORDNUNG/STADT-UND-BEBAUUNGSPLANUNG/GRUENPLANUNG/LOS-DAMA.HTML

EXAMPLES OF SMART CITY AND DIGITALIZATION PROJECTS

Digitalization is an important subject in urban planning in Munich. The overall urban development planning process of MUNICH FUTUTRE PERSPECIVE has established that the active shaping of digitalization processes is essential for progressive and attractive urban development. “Smart City Munich”, as one of the thematic guidelines within MUNICH FUTURE PERSPECTIVE, aims to connect urban structural planning with scientific research, technology, the social sphere and economy. A big challenge for this transformation into a smart(er) city is the enabling of new forms of interaction between citizens, the administration and various other local stakeholders.

URLs:

HTTPS://WWW.OPENGOV-MUENCHEN.DE/

HTTPS://WWW.MUENCHEN-TRANSPARENT.DE/DOKUMENTE/3698005

HTTPS://WWW.MUENCHEN.DE/RATHAUS/STADTVERWALTUNG/DIREKTORIUM/IT-BEAUFTRAGTE/PROJEKT-E--UND-OPEN-GOVERNMENT/VERANSTALTUNGEN/OPEN-GOVERNMENT-TAG/REGISTRIERUNG.HTML

7.4.1 M.O.V.E. - MUNICH’S E- AND OPEN GOVERNMENT

M.O.V.E (*Münchner Online-Verwaltungsdienste*) stands for Munich’s online administrative services. It combines E-Government and Open Government by making the municipal administration’s services and data accessible online. It aims to improve the city’s administrative culture by establishing more transparency, participation and collaboration.

For the entire project “E- and Open Government”, the city’s directorate calculated a required budget of roughly €5 million within five years for developing

and operating the relevant systems, as well as for three full-time employees.

Munich's E- and Open Government activities build on a longer history. As a first electronic service, the city of Munich offered custom-made license plates as early as 1998. Today's M.O.V.E is also a follow-up to the MOGDy initiative 2010, a series of events referred to as Munich Open Government Days. It was a process of public consultation on the online future of the city's administration, including a programming competition.

Information on public decision making processes was available in an council information system. This was considered insufficiently user-friendly by the initiative Code for Munich, an project of the Open Knowledge Foundation, which created an alternative interface, called München Transparent (www.muenchen-transparent.de) (BBSR 2017a:21)

Another push towards online administration services came from the federal "Act to Promote Electronic Government" (BMJV 2013), which clarified conditions for municipal actors. In December 2015, the Bavarian law for E-government followed (Bayerische Staatskanzlei, 2015).

Objectives

Under the term of E-Governance, Munich's administration simplified the processing of transactions on the sides of both citizens and enterprises as well as administration employees. Its centerpiece is the web site www.muenchen.de/online-services, an online interface designed for easy usage in order to increase efficiency in administrative processes.

Open Government is the second core of M.O.V.E., enhancing transparency of the administrative processes and supporting public participation in the decision-making process. The Open Data Portal https://www.opengov-muenchen.de/ offers access to 107 datasets (as of September 2017) covering topics like demographics, economy and transport and mobility. The idea is not only to make governance processes more transparent but also to enable members of the administration, citizens, companies and scientists to access and use public data easily in order to combine and analyze them and hence create new knowledge and ideas that contribute to urban planning.

Governance arrangements

The M.O.V.E Munich was implemented by the city administration in 2011, arguably pushed by debates in the city parliament. The city parliament's decisions outline clear responsibilities for data provision. By December 2015, the city parliament had decided on a step-by-step redesigning of the Open Data Portal in synergy with the Bavarian state's open data portal. A reorganization of Munich's portal was decided on in July 2016.

Current state of affairs

The Online Service Portal started operating in November 2013 via the city's website www.münchen.de, and has since then been a basic component of Munich's administration process. The portal also features as one of the elements to be

experimented with in the EU-funded "smarterTogether" lighthouse project.

To promote this project, popular social media channels are employed. By September 2017, the dedicated twitter streams *@opendata_muc* and *@opengov_muc* included 382 tweets and 598 followers and 1.199 tweets and 973 followers, respectively.

URLs:

HTTPS://WWW.MUENCHEN.DE

WWW.MUENCHEN.DE/OPENDATA

HTTPS://WWW.OPENGOV-MUENCHEN.DE/

THE H2020 SMARTER TOGETHER PROJECT (2016-2020)

SMARTER TOGETHER is an inter-city cooperative project under the framework of the Horizon 2020 program for research and innovation. In light of the key energy and resource scarcity challenges faced by many European countries, this program aims to build smart cities and communities through innovating integrated solutions in the energy, mobility and information and communications technology (ICT) sectors, taking into account local specificities, learning exchanges and citizens' involvement.

Figure 4: Smart Munich
Source: muenchen.de

In 2015, Munich, Lyon and Vienna developed a larger consortium and, with their project proposal SMARTER TOGETHER, won a competition for funding. In addition to improving the built environment, citizen and stakeholder involvement is a key objective of the project. As announced in September 2015, the consortium is entitled to a budget of €24.7 million over a five-year period. Of this, €6.85 million will be spent in Munich. Within the three lighthouse cities, demonstration areas have been chosen based on their similarities as well as differences. Santiago de Compostela, Sofia and Venice are designated follower cities, while the non-EU cities of Kiev and Yokohama are designated observer cities. To ensure intensive city-to-city exchanges, three actions will be undertaken under the lead of Fraunhofer IAO: Firstly, project partners will develop a set of written recommendations, best practices will be tested and an online Wiki platform will be developed to serve as an internal exchange interface. Secondly, a range of workshops will be organized on both a local and a trans-local level. Every half a year, a two-week knowledge exchange workshop will be held with all project partners. Lastly, a mobile knowledge carrier will be developed on the basis of a touch-screen table to display innovative projects in each city during the exchange workshops and beyond to promote interactions between project partners and citizens.

Along with Munich's own resources and both private and research funds, the total investment in the 350-hectare project area of Neuaubing-Westkreuz/Freiham is anticipated to add up to €20 million. The municipal utilities *Stadtwerke München* SWM (energy), *Münchner Verkehrsgesellschaft* MVG (public transport) und *Münchner Gesellschaft für Stadterneuerung* (urban redevelopment) are initially partnering with eleven private and academic partners to use the means of latest technologies to enhance the quality of urban living for approximately 50,000 citizens. The project's three operational fields are the improvement of energy efficiency, the responsible collection and use of smart data, as well as innovation in the city's transportation system through the establishment of smart mobility.

Objectives and Status

In March 2016, the project implementation was officially launched at a kick-off meeting in Lyon. In the first two years, lighthouse cities will implement sub-projects focusing on (nearly zero) or low energy districts, Integrated Infrastructures and ICT, Sustainable Urban Mobility and Citizen Engagement. This initial phase will be followed by a three-year monitoring and evaluation phase during which efforts will be made to replicate best practices in both lighthouse and follower cities.

To summarize, the SMARTER TOGETHER project focuses on five fields of action:

- "Living labs" as a format to facilitate the participation of local residents;
- District heating and renewable energy for the targeted low-energy districts;

- Comprehensive and integrated refurbishment to achieve low levels of energy use in public and private construction by local government and relevant cooperatives;
- A platform for smart data management and services in integrated infrastructure installations;
- Sustainable E-mobility.

Actions planned within SMARTER TOGETHER to support e-mobility

Across the cities participating in SMARTER TOGETHER, the objective is to reduce the use of conventional cars through the development of alternative mobility solutions. The intention thereby is to achieve a reduced carbon footprint, as well as less pollution and noise emissions.

"SMARTER TOGETHER will provide sustainable E-mobility solutions co-created with local citizens and dedicated to the end-user needs. These will include:

- E-mobility solutions for citizens, ranging from E-car-sharing powered with renewable energy sources to E-bike-sharing, all of which will be implemented with their respective charging infrastructures
- E-mobility solutions for companies, including E-forklifts deployed in factories and warehouses, E-vans for parcel distribution and cargo-bike-sharing for last mile goods distribution
- Mobility points integrating various means of transportation into multi-modal hubs, linking the new E-mobility solutions with the public transportation system and offering new services to citizens, such as shared reception boxes for parcel distribution
- ICT solutions based on mobility data, such as optimized E-charging parking lots, a car-pooling management tool and real-time mobility apps."

(SMARTER TOGETHER, 2017)

Actions planned within SMARTER TOGETHER to reduce car-dependence

Munich's public transport supplier MVG will be implementing the mobility-related experiments and implementation. The objective is to explore and enhance sustainable mobility in the project area. Eight multimodal Mobility Stations are to provide nodal points for switching between the established public transport system of subway, bus or tram and a new choice of transportation modes like electric car-sharing vehicles or both regular and electric bicycles and tricycles, some featuring significant freight carrying capacity. This will be supplemented with parking facilities for all of the above, an E-taxi stand and a charging station. A central feature of these mobility stations are so-called "Smart Information Pillars". These will provide users with the latest information concerning traffic and the availability of the different mobility options. Hence, data on all these options need to be collected, managed and made accessible on a data platform that will also be established through the SMARTER TOGETHER project.

Secondly, there are several multifunctional "District Sharing Boxes" to be installed at the mobility stations. These boxes (optionally cooled) will serve as round-the-clock accessible exchange and

delivery stations for goods for both delivery services and private users.

To provide easy access to all services at the mobility stations, Munich's public transport supplier MVG will integrate these in their already existing app-service. At the same time, off-line communication will also continuously be offered in the district offices called 'Living Labs'.

SMARTER TOGETHER - Connection to other fields of operation in Munich

Information from the Mobility Stations will be integrated in the 'City App', as one part of the second operational field of Munich's SMARTER TOGETHER, smart data. The 'City App' will provide unified, mobile, quick and safe access to all 'smart services' in the neighborhood, providing a complete overview of all smart city service offerings. This will include personalized user accounts, a personal footprint function, and access to diverse basic services via authentication and mobile payment.

Some of the information that will be incorporated in the app-service will be collected by another cornerstone measure of Munich's SMARTER TOGETHER, the 'Intelligent Light Poles'. These LED-based illumination units offer technical infrastructure to install sensors and other equipment such as actuators or WLAN in the street lighting. Through the application of these sensors, features like adaptive lighting and the measurement of traffic, air pollution, fine dust, etc. are rendered possible.

The objective of these measures is to create central linking points of mobility combined with smart information technology to adequately meet citizens' individual transportation needs while contributing to climate protection and the reduction of carbon emissions.

SMARTER TOGETHER - The approach to (big) data in Munich

On its website, the Department for Labor and Economic Affairs of the city administration of Munich explains the approach that will be taken with regard to the usage of big data: "The intelligent use of information is central to the operational field of technology within the framework of SMARTER TOGETHER. It's a call for Smart Data instead of Big Data - quality instead of quantity. Therefore, only data which offer immediate advantages to citizens or the city as a whole will be collected, analyzed and placed at the disposal of smart services. Protection and integrity of data privacy are given top priority. The so called Intelligent Light Poles, for instance, are, by the integration of sensors, enabled to collect data from their environment, such as on weather or traffic, and can adjust the intensity of the street lighting appropriately. These real-time data are also the basis for diverse applications and mobile services. In the scheme of participation and co-creation, the so-called Living-Labs, citizens will be given insight into what kind of data will be collected and in what ways they will be used for creating solutions in the district. Citizens can furthermore bring in own ideas regarding desirable services on the basis of these data."

Given this as a starting point, SMARTER TOGETHER is developing a mobile application, the so-called 'Smart Neighborhood App'. "This app will integrate information on various services in the neighborhood and allow users to access it easily. It will also comprise a payment option and a personalized log-in to restricted services."

> URL:
>
> HTTPS://WWW.MUENCHEN.DE/RATHAUS/STADTVERWALTUNG/REFERAT-FUER-ARBEIT-UND-WIRTSCHAFT/EUROPA/SMART-CITIES/DATEN-LOESUNGEN-SMARTER-TOGETHER-MUENCHEN.HTML

Governance arrangements

SMARTER TOGETHER project management lies with Munich's Department for Labor and Economic Affairs. At the site of Neuaubing-Westkreuz, the Munich Association for Renewal of the City (*Münchner Gesellschaft für Stadterneuerung MGS*) is coordinating and attending to the actual process and implementation. Their work is predicated on new forms of participation, networking and communication among all stakeholders including – as a matter of course - the citizens. Further city authorities, namely the IT-Department and the council for Building (*Baureferat*), are also involved.

Other related partnership arrangements include the following:

- **Bettervest**, as Germany's first crowd-investing platform solely for energy efficiency projects is undertaking the financing of energy efficient building restoration.
- The scientific research company **Fraunhofer IBP** is concentrating on development, testing, demonstration and consultancy in the area of building physics, and is therefore supporting sustainable and energy efficient building restoration. It is also working on a roadmap as a guideline for future projects.
- **G5** is a counselling company involved in enhancing the decision-making process by offering transparent and amendable information.
- **Münchner Verkehrsgesellschaft (MVG)**, as Munich's public transport supplier, is taking on the mobility solutions, starting with the development of mobility stations and taking into consideration the findings of participatory processes.
- **SWM** plans to equip 400 households in Neuaubing-Westkreuz with smart metering (see section on Smart Metering).
- **Siemens AG** is bringing a data and application platform to the project that will offer the basis for an urban infrastructure for smart data. By this means, service offers in the areas of mobility, energy and living as well as E-government will be operated.
- Car-sharing will be undertaken by the local enterprise **STATTAUTO München**.

- The **Technical University of Munich (TUM)**, especially the Chair of Construction Technologies and Climate Conscious Building, offers the project scientifically elaborated concepts regarding planned innovative, energy conscious building. New forms of public participation that lead to decision making in the SMARTER TOGETHER project are conceptually designed by TUM's Munich Center for Technology in Society.
- The **University of St.Gallen**, represented by the Institute for Technology Management, is involved in the development of business models for the various innovations tested within the scope of SMARTER TOGETHER.

> URLs:
>
> HTTPS://WWW.MUENCHEN.DE/RATHAUS/STADTVERWALTUNG/REFERAT-FUER-ARBEIT-UND-WIRTSCHAFT/EUROPA/SMART-CITIES/DATEN-LOESUNGEN-SMARTER-TOGETHER-MUENCHEN.HTML
>
> HTTPS://WWW.MUENCHEN.DE/RATHAUS/STADTVERWALTUNG/REFERAT-FUER-ARBEIT-UND-WIRTSCHAFT/EUROPA/SMART-CITIES/HINTERGRUND/PARTNER-SMARTER-TOGETHER-M-NCHEN.HTML

SMART METERING

On 2nd September 2016, new legislation on the Digitalisation of the Energy Transition came into force, aiming at the integration of power grids and generation/consumption of electricity. The municipal utilities *Stadtwerke München* (SWM) are actively pushing Smart Metering. Having been relatively recently introduced to the German market, digital smart meters are intended to replace the current analogue ones at a rate of approximately 10% by 2020, with the aim of achieving full coverage within 16 years.

Objectives

On sites with an annual consumption of 6.000 kWh or more, smart meters will serve as data interfaces communicating with the grid operator, the energy supplier as well as "further eligible partners". Instead of notifying the supplier about the energy consumption once a year, the smart meters will automatically measure and report the consumption every 15 minutes. This is justified by the potential for a more flexible and prompt response in favour of efficiency and sustainability.

Governance arrangements

Munich's Department for Labour and Economic Affairs is promoting Smart Metering within its information campaign 'Steering digital. Thinking pro climate' (*Digital lenken. Klimaschutz denken*). The modernization of the required hardware as well as the software solutions will be carried out by SWM.

Status

Even before the legislation, SWM prepared the rollout of Smart Metering in Munich by testing the technical and digital

components of meters, gateways and data transfer in their own testing laboratories.

Furthermore, SWM is planning to host several pilot projects in housing associations, in whose complexes the digitalization of the meters with different kinds of telecommunication options will be tested. However, although this is declared on the SMW website, our web research could not obtain any further information on the status or process of this proposal.

The latest accessible information on the status of this project is the arrangement of an informative public meeting by the Department for Labour and Economic Affairs in October 2016.

URLs:

HTTPS://WWW.SWM.DE/PRIVATKUNDEN/UNTERNEHMEN/INNOVATION/SMART-METER.HTML

HTTPS://WWW.MUENCHEN.DE/RATHAUS/WIRTSCHAFT/NACHHALTIG-OEKO/SMART-SOLUTIONS/SMART-METERING.HTML

IBM: WATSON CENTRE ON THE INTERNET OF THINGS

In February 2017, IBM opened their new global headquarters for “Watson Internet of Things” in Munich, which – at an estimated cost of 200 million USD – was described as IBM’s biggest investment in Europe in two decades. The centre will be home to what IBM is calling "cognitive collaboratories", where multiple companies will collaborate with IBM to work on an optimized networking of everyday technical equipment through the use of the high capacity computer Watson. Companies like Avnet, BMW, BNP Paribas, Capgemini and Tech Mahindra have apparently committed to collaborating with IBM to identify opportunities for using data from IoT sensors to train machine learning and other AI systems to make smarter decisions (IBM, 2015).

Being the headquarters of eight other “Watson IoT Client Experience Centres” across Asia, Europe, and North and South America, the centre in Munich is tasked with providing clients and partners access to technology, tools and knowledge needed to develop and create new products and services using cognitive intelligence delivered through the Watson IoT Cloud Platform.

IBM’s stated rationale behind choosing Munich as the headquarters’ location cites ongoing efforts with Industry 4.0, a large and existing skills base and strong universities in the area, along with already existing IBM infrastructure and staffing in the city.

URLs:

HTTPS://WWW.TECHREPUBLIC.COM/ARTICLE/IBM-LAUNCHES-200M-CENTRE-TO-DOUBLE-DOWN-ON-WATSON-AND-IOT/

HTTPS://WWW-03.IBM.COM/PRESS/US/EN/PRESSRELEASE/48443.WSS

HTTPS://INTERNETOFBUSINESS.COM/IBM-OPENS-WATSON-IOT-HEADQUARTERS-IN-MUNICH/

HTTPS://WWW.TECHREPUBLIC.COM/ARTICLE/IBM-LAUNCHES-200M-CENTRE-TO-DOUBLE-DOWN-ON-WATSON-AND-IOT/

HTTPS://WWW-03.IBM.COM/PRESS/US/EN/PRESSRELEASE/48443.WSS

MICROSOFT: INSIDER-LAB ARTIFICIAL INTELLIGENCE

Also in early 2017, Microsoft started its Insider-Lab for Artificial Intelligence in Munich. In addition to the already existing labs in China and in the USA, the Munich-based lab provides a productive environment for enterprise customers from Europe, the Middle East and Asia (EMEA) to advance IoT and AI projects. At the site, customers have free access to Microsoft's software, to industrial hardware and to the extensive expertise of Microsoft developers, engineers and data specialists. Interested corporate customers can now apply to use the IoT & AI Insider Labs. The software offerings range from the public cloud platform Microsoft Azure to IoT and AI technologies such as the Azure IoT Suite (networking, monitoring and control of devices), the embedded operating system Windows 10 IoT Core, the Cognitive Services (e.g. voice, text, image, emotion recognition) and the Cortana Intelligence Suite (big data application and machine learning services). The machine room of the lab offers equipment for milling, automated pick-and-place, 3D printing and microproduction (nano-printers).

URL:

HTTPS://NEWS.MICROSOFT.COM/DE-DE/IOT-AI-INSIDER-LAB-MUENCHEN/

EXAMPLES OF SMART/ECO MOBILITY PROJECTS

In the field of sustainable mobility, the promotion of E-mobility and sustainable mobility management are several presentable actions taken by the city government in cooperation with the city-owned transportation company *Münchner Verkehrsgesellschaft* (MVG).

THE HORIZON 2020 CIVITAS ECCENTRIC PROJECT

The transportation initiative CIVITAS is also supported by the EU's framework program Horizon 2020 through their budget for Smart, Green and Integrated Transport measures (European Commission, 2014).

Having started its fifth four-year-phase in 2016, the EU CIVITAS Initiative has tested and implemented around 800 measures and urban transport solutions as part of demonstration projects in over 80 Living Lab cities Europe-wide in order to look at ways of building more resource efficient and competitive transport systems.

The research oriented project CIVITAS ECCENTRIC focuses on sustainable mobility and urban traffic planning – specifically in suburban districts or development areas – as well as on innovative urban freight logistics. It is carried out in collaboration of the five European cities Munich, Madrid (Spain), Stockholm (Sweden), Turku (Finland) and Ruse (Bulgaria). The project is dedicated to ten subjects related to sustainable transport mobility:

- Car-Independent Lifestyles
- Clean Fuels & Vehicles
- Collective Passenger Transport
- Demand Management Strategies
- Integrated Planning
- Mobility Management
- Public Involvement
- Safety & Security
- Transport Telematics
- Urban Freight Logistics.

There are 50 projects assigned to these subjects budgeted with €20 million. According to the official CIVITAS ECCENTRIC website, eleven of these projects are carried out in Munich with an allocation of €4 million.

Domagkpark – Parkstadt Schwabing in the north of the city is a highly populated and ever growing city district with 250.000 inhabitants on an area of 79 square kilometers.

Objectives

Munich is facing the challenges of a rapidly growing population and, correspondingly, an increasing need for traffic management. Accordingly, CIVITAS ECCENTRIC's declared goal is the integration of public participation, electro mobility, logistics, shared mobility and mobility management.

By the means of CIVITAS ECCENTRIC, the suburban district of Domagkpark – Parkstadt Schwabing is to be turned into a model quarter where promising digitalized solutions towards a sustainable, modern and adjustable mobility can be tested.

The declared aims are to:

- Demonstrate and test innovative sustainable mobility in suburban areas, combining new policies, technologies and soft measures.
- Demonstrate and test innovative urban freight in urban centers, based on a close cooperation with the research and private sectors.
- Contribute to the knowledge base and capacity building regarding effective mobility solutions with the goal to replicate solutions in other cities.

- Increase the impact of ECCENTRIC through communication, networking and promoting the successful commercial concepts developed.

To pursue these objectives, the existing mobility options are to be complemented and developed into an integrative mobility concept including car sharing, E-mobility, rental bikes and E-bikes with corresponding infrastructure (charging and parking stations, apps for rental operation, communication and information).

The government's objective is to transfer the approaches tested here on other similarly strained districts like Prinz-Eugen-Park, die Bayernkaserne, Freiham or Munich North-East.

Governance arrangements

Responsibilities for CIVITAS ECCENTRIC lie with the project management at the City of Munich, Department of Public Security and Order, Road Traffic (*Kreisverwaltungsreferat*), Division for Strategy and Policy, which collaborates with the Department for Labour and Economic Development. Also involved are the public transport supplier *Münchner Verkehrsgesellschaft* (MVG), the Assocoation of Green City e.V. as well as Green City Projekt GmbH and the DomagkPark cooperative society (*Quartiersgenossenschaft Domagkpark eG*). The Technical University of Munich (TUM), Chair of Urban Structure and Transport Planning is accompanying the project scientifically.

Additionally, the Department of City Planning and Building Regulation is involved in order to coordinate and synchronize CIVITAS ECCENTRIC measures with the two related and concurrent projects of SMARTER TOGETHER and City2Share.

Current state of affairs

The project CIVITAS ECCENTRIC was started in Munich's newly developed area Domagkpark on 27 October 2016 by area administrator Dr. Thomas Böhle. In January 2017, the start of a testing phase with flexible micro-depots and cargo bicycles was announced.

URLs:

HTTPS://WWW.MUENCHEN.DE/RATHAUS/STADTVERWALTUNG/REFERAT-FUER-ARBEIT-UND-WIRTSCHAFT/EUROPA/AKTUELLE-EU-PROJEKTE/CIVITAS-ECCENTRIC.HTML

HTTP://CIVITAS.EU/

HTTPS://WWW.MUENCHEN.DE/RATHAUS/STADTVERWALTUNG/KREISVERWALTUNGSREFERAT/VERKEHR/MOBILITAETSBERATUNG/CIVITAS-ECCENTRIC.HTML

HTTP://CIVITAS.EU/SITES/DEFAULT/FILES/CIVITAS2020-BROCHURE.PDF

HTTPS://WWW.DOMAGKPARK.DE/CIVITAS-ECCENTRIC.HTML

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MOBILITY MANAGEMENT, INTEGRATED INFORMATION, WELCOME SERVICE FOR NEW RESEDENTS: MUNICH GSCHEID MOBIL

In the field of mobility management, the city administration of Munich has branded the slogan "Munich - Gscheid mobil" (Smartly mobile Munich), which links a particular mobility information scheme for new residents, programs for kids and youth and a new web page and app that integrates near real-time information on how to quickly and easily get around the city.

It provides an overview of public transport, Munich's car-sharing vehicles and the bicycles of the MVG's rental system, aiming to adapt to the spontaneous and flexible needs of urban citizens. These services and the central mobility station at Münchner Freiheit will be enhanced as part of the SMARTER TOGETHER project. The website does not appear to support any language other than German.

URL:

WWW.GSCHEID-MOBIL.DE/

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APPENDIX: (SAMPLING) METHODS USED IN GERMAN CASE STUDIES

Our search for smart city related activities and proactive digitalization strategies involved two main approaches:

First, in 2016 we scanned the official websites (www.<cityname>.de) of all 80 cities for relevant activities by scanning each website's menu as well as by entering the terms "smart" and "digital" into the local search function.

Second, we used the search engine Google, combining the city name with "smart" and "digital". This regularly produced links to digital resources or press articles, some of which discussed the smart city ambitions and digitalization activities within the city, which we then assessed and classified. We found no relevant ambitions or activities in 33 of the 80 cities investigated, which is roughly 41% of the sample. In 27 cities, i.e. one third, we identified some activities – often in the field of electric mobility – which were, however, not aggregated into a smart city or digitalization strategy.

These two approaches in tandem gave us a preliminary 'long list' of 20 German cities for which there was clear evidence of relevant activities in multiple sectors, and of efforts to strategically coordinate these. Such activities were (in 2016) most pronounced and visible in Berlin, Dresden, Düsseldorf, Hamburg, Mannheim, Munich, and Nuremberg, but we also identified impressive efforts in Bonn, Braunschweig, Chemnitz, Erfurt, Frankfurt am Main, Karlsruhe, Kiel, Cologne, Leipzig, Müllheim/Ruhr, Regensburg, Stuttgart, and Ulm.

To achieve triangulation, we then compared our results with other researchers' assessments, such as PWC's survey-based ranking of the most digital cities in Germany (PWC 2015). The results generally matched well, with the notable exception that Wuppertal was ranked by PWC among the 10 most digitalized cities, whereas we had not classified it among the top group with regard to its smart city characteristics. Due to significant differences in emphasis and method, the findings cannot be compared directly. Other sources of data, such as the web portal of the European Innovation Partnership on Smart Cities and Communities with its database of "commitments", did not produce any counter-evidence to our classification. Finally, half a dozen 'helicopter-interviews' with German smart city experts also did not produce any indication that other cities should be included in our classification of the highest-ranking cities.

In parallel, we investigated the extent to which German cities highlight environmental policies on their website. In doing so, the main intention was to exclude any cities which display smart/digital ambitions that were not accompanied by (or interlinked with) strong 'eco' commitments.

Of the 53 cities investigated more closely, only six gave no indication of involvement in typical environmental activities, such as local Agenda 21 working groups, programs of free energy consulting for home owners, and/or a Climate Emissions Inventory and Action Plan (often commissioned between 2010 and 2013 and funded by the Federal Ministry of the Environment), while 28 others (or 35%) had some of these standard activities on display, but no outstanding or innovative activities. 19 cities (or

24%) stood out as having a very large number of innovative activities in multiple sectors: Freiburg, Heidelberg, Karlsruhe, Mannheim, Muenster, Munich and Nuremberg stood out in particular. Hamburg (still benefitting from being awarded the title European Green Capital in 2011) and Berlin also display many relevant and continuing activities. When Siemens made a comparative assessment of all 12 German cities with populations over a million in 2011, Berlin, Bremen, Frankfurt am Main, Hamburg, Hanover, Leipzig, Mannheim, Munich, Nuremberg and Stuttgart were found to be "above average Green Cities" (Siemens 2011:5). We had also classified all of these cities as being among the top 25 per cent in terms of eco City characteristics, which can be interpreted as an indication of continuously outstanding environmental policy efforts in these cities.

We then cross-referenced our two lists to identify which cities appeared in the top 25 per cent of both, thereby displaying both strong smart city characteristics as well as strong eco city characteristics. This yielded a set of 10 cities as follows: **Berlin, Frankfurt am Main, Hamburg, Karlsruhe, Leipzig, Mannheim, Munich, Nuremberg, Regensburg** and **Stuttgart**.

In choosing three of these ten for profiling in the current report, we did not value both criteria equally but rather gave priority to their smart city characteristics. Among the seven most articulate smart city candidates, we gave preference to **Munich**, **Hamburg** and **Berlin** mostly because these three largest cities in Germany clearly attract more attention nationwide as exemplary smart cities than the others. In Berlin, this has to do with its status as the capital city (and hence the expectation that it serves as a shop window for German industry). In Munich there is a strong industrial base, and Hamburg was positioned very early on as a primary experimenting space.

It is not intended, that the three cases selected (or our 'short list' of ten) necessarily represent Germany's 'top' smart-eco cities. In the absence of a clear and widely accepted definition of either the 'smart' or the 'eco' with regards to urban initiatives, any ranking exercise is to some extent arbitrary. The three cases selected are characterised, nevertheless, by the relative prominence of 'smart' discourse and practice, interpreted variously depending on context, and interwoven in different ways with clear 'eco' ambitions. We are confident, at least, that the three cities profiled in this report are among the forerunners in smart-eco development in Germany. Taken together, they paint a picture of 'state-of-the-art' policy-making and activity in this area, illustrating some of the variety of the forms that this takes in practice.

Due to particular comparative ambitions within the Smart-Eco project, we undertook (and continue with) a particularly in-depth analysis of digitalization initiatives in Hamburg. As data sources for these analyses, we have so far used interviews and documents as outlined below:

Hamburg	Urban/regional public administrators (7)	Official policy documents (18)
	National public administrators (7)	Reports from knowledge institutes (36)
	Knowledge institutes (10)	Leaflets, such as for branding purposes (11)
	Private actors (5)	Websites (40)
	Civil society (11)	Other: reports comparing Hamburg with other cities (9), speeches (3), thesis (1)

(see Raven *et al*. 2017)

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