

## TRENDS Germany

# Global smart cities will raise a market beyond \$ 2 trillion by 2025

Smart cities are definitively a hot topic, although apparently different conceptions and definitions are applied according to the respective political framework and the cultural context. Fast-paced urbanization, high vehicle density, an obsolete infrastructure and high traffic-related emissions encumber the urban mobility ecosystem.

According to market research company Frost & Sullivan, 80% of the world population in industrialized countries will live in cities by 2050. In developing countries, estimations predict a 60% margin. Smart cities are anticipated to create huge business opportunities with a market value of over \$ 2 trillion by 2025, says the study. The decisive technological cornerstones of smart cities of the future include artificial intelligence (AI), smart healthcare, robotics, smart transportation systems including advanced driver assistance systems (ADAS) and smart energy supplies.<sup>[1]</sup>

Due to recent engagements of the European Commission, Europe will most probably have the largest number of smart city project investments globally. By 2025, the Asia Pacific region will be the fastest growing region when it comes to smart energy. More than 50% of the smart cities in Asia will be found in China. However, a smart city can mean something different depending on the cultural and political context prevailing in countries such as China.

Transportation inefficiencies cost cities billions of dollars.  
Can cities look to innovation to address escalating urban mobility issues?



Global demand of passenger mobility is increasing copyright Frost & Sullivan

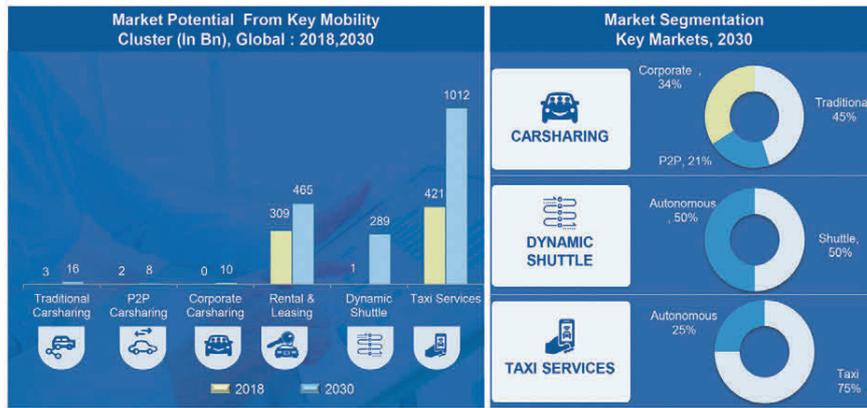


Future City © LAVA, Fraunhofer IAO



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### Revenue from the taxi cluster alone expected to exceed \$1 trillion in 2030



New mobility solutions market will grow to around \$2tr market by 2030 © Frost & Sullivan

### “An intelligent city is proactive in terms of creating added value for humans”

Smart city concepts in Europe are generally geared to enhance the quality of life of citizens. Sarwant Singh, managing partner at Frost & Sullivan, recently conducted a study called “Future of Mobility in Smart Cities globally and Opportunities for the UK”.

London is certainly pioneering when it comes to new mobility solutions, with fleet sizes of 40,000 for ride-hailing, 3,355 for car sharing and 11,900 for bike sharing, just to mention the major ones. London is also one of the first cities with smart ticketing solutions, such as the oyster card that gives easy access to different types of public transportation.

Frost & Sullivan defined a smart city as one that has an active plan and projects in at least five of the eight following functional areas: energy, buildings, mobility, technology, infrastructure, healthcare, governance and citizens. These specific components define the “smartness” of a city. In his book “Smart Cities, smart mobility: Transforming the way we live and work”, Lukas Neckermann defines a smart city as follows: “A smart city, in combination with smart mobility, offers residents, visitors and

stakeholders a quality of life and an ease of experience that pre-emptively address their needs, desires and transport requirements [...]. The smartest of the cities are the ones that are willing to fight against a century of car-centricity, and for a refocusing on quality of life. An intelligent city is proactive in terms of creating added value for humans.”[2]

- Smart city concepts in Europe reflect the cultural diversity.

The key focus is always a bit different according to the public needs and requirements.

Whereas in London the primary focus is on intelligent mobility and security, in Hamburg intelligent street lighting is a major topic, in Copenhagen and Barcelona traffic calming is an issue and in Oslo, smart, green transport solutions.

The Norwegian capital Oslo has been selected as the European Green Capital for 2019. The jury praised Oslo for granting its citizens an active role in the green transition.

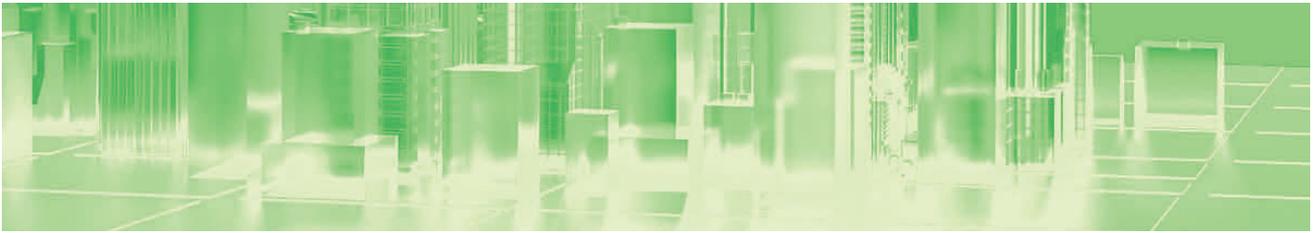
There is transparency given in litter and emission flows and who assumes the responsibility.[3] Neckermann also refers to the enormous costs due to traffic congestion (\$ 305 billion in the US in 2017), that suggest a change to smart mobility. An average American spends 34 hours each year stuck in traffic, what a waste of time.

[4]

“Currently, most smart city models provide solutions in silos and are not interconnected. The future is moving towards integrated solutions that connect all verticals within a single platform. The Internet of things (IoT) is already paving the way to allow for such solutions,” Vijay Narayanan, Visionary Innovation Senior Research Analyst at Frost & Sullivan states.[5]

### Morgenstadt initiative: Government, industry, research and municipalities are working together for the city of the future

“Appealing, connected, sustainable”, these are major features of the smart city of the future according to smart cities expert Alanus von Radecki. Alongside his role as head of the urban governance innovation team at Fraunhofer IAO, he is lead expert for the URBACT Network SmartImpact, advising various European cities such as Stockholm, Manchester, Eindhoven, Porto, Dublin and Zagreb, on how to adapt their governance systems to future requirements. There are a variety of projects within the framework of the Smart and Sustainable Cities (SCC) initiative of the Horizon 2020 European research programme, including Triangulum, Grow Smarter and Smarter Together. Von Radecki and Fraunhofer are involved in quite a few of them. “Morgenstadt: City Insights” is an initiative of the German Fraunhofer Society that develops solutions for the city of the future together with partners from industry and municipalities. With this innovation network, Fraunhofer is supporting the German government in its action plan for the Hightech Strategy 2020. Partnerships with frontrunning companies such as Bosch, OSRAM, DOW Chemicals, IKEA, SAP and others have been established so far and the network is growing steadily.[6]



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### Interview



**Alanus von Radecki** is head of the Competence Team Urban Governance Innovation at the Fraunhofer IAO and head of the Innovation Network “Morgenstadt: City Insights”. In addition to his activities in project coordination and control, his work focuses on urban governance and on complexity and innovation research with a direct relationship to urban systems.

Further to his role at the Fraunhofer IAO, he advises cities and companies on the digital transformation of urban systems, for example in his role as lead expert at URBACT. Since 2017, he has also served as CIO of the Fraunhofer spin-off BABLE UG, a digital marketplace for smart city technologies. © Fraunhofer IAO

#### JCM: Where do you see the biggest differences in the design and implementation of smart city concepts in Asia, the US and Europe?

**Alanus von Radecki:** In Europe, smart city concepts are strongly driven by the European Commission's initiative and European politics, therefore with a clear focus on Europe's political targets. Until now, significant investments have been made in the creation of new markets, sustainable urban development, CO<sub>2</sub> neutrality, smart buildings and smart energy concepts. Although new markets have been created, the innovation process is rather slow, since you always have to respect procurement laws. Administrations are involved and it is an ongoing private-public discussion. Particularly in Germany, we are rather slow and still lagging behind.

In China, on the other hand, the economic impulse is in my opinion much stronger than reflections on sustainability. Smart city concepts are pushed forward to be used for political ends. In the US, smart city concepts are mainly corporate driven. Sidewalk Labs, the urban innovation company of Google's parent company Alphabet, based in Toronto, is conceived as a new business model and has engaged a controversial debate in the US. It plans to invest \$ 900 million in a high-tech district on Toronto's waterfront, kind of a test-

ing platform for emerging technologies. People are concerned it may be mainly about collecting personal data and exploiting them commercially.

#### Where do you see the biggest barriers for the implementation of smart cities?

**A.V.R.:** We have high barriers in municipal administrations. They are not quick enough to change and adopt new processes, for example, to allow a broader participation of citizens. Further political courage is lacking to invest in new ideas such as reducing private traffic or parking in cities. Politicians avoid uncomfortable issues, since they want to be re-elected. Often, regulatory preconditions are missing to implement innovative processes. Existing regulations are no longer suitable with the new digital mindset. The energy systems of the future need to be self-sufficient. But at present, if you want to transfer energy from one house to another, network charges must be paid. This does not correspond to the innovative concept at all. Many sectors, such as buildings or traffic, still work with these regulatory systems of the past, and change takes time.

#### In your opinion, which are the existing smart cities that offer an extremely high quality of life?

**A.V.R.:** Quality of life is not a di-

rect outcome of smart city concepts. It depends on a variety of aspects. For me, Copenhagen and Vienna are good examples for a high quality of living. They do have some of the smart city features, but there are other parameters that count when it comes to quality of life. 30% of the housing space in Vienna is dedicated to social housing, with the result that there are still affordable prices per square metre. Green zones and a cheap and well-organized local public transport system are a few concrete examples.

#### Against the background of your expertise, what is your personal plea to the parties involved?

**A.V.R.:** On a national level, we primarily have to address the topic of data sovereignty to avoid the emergence of a multitude of different data platforms that are not compatible in various cities. I would recommend that we create a national initiative related to the “digital city” topic geared to achieve a harmonization of standards and solve the data exchange issue. However, this initiative should go even further, inciting public funding that could trigger further private investments. We need a holistic approach and should take the so-called “packaging” system implemented on the European EU as a model. In Germany, we are still far from addressing issues this way. Topics and solutions related to smart city concepts need to be addressed, elaborated and structured on an abstract level, irrespective of existing providers in the market.

Municipalities could take these neutral proposals as a blueprint for their procurement and planning. Suppliers could then adapt their products accordingly.

It is a very complex market with diverse industries, standards and regulations involved.



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Fig. 2: Autonomous driving and the city of tomorrow [see Fraunhofer IAO's AFKOS study [7]]  
© LAVA, Fraunhofer IAO



### “Let's not take the Asian model as a blueprint”

The German government is fostering Smart City projects on a large scale. The IMPACT RheinMain project of the University of Applied Sciences Hochschule RheinMain in Wiesbaden/Rüsselsheim, Germany, is one of 29 projects in Germany that are part of the Innovative University initiative. The aim of IMPACT RheinMain as a strategic and interdisciplinary transfer project is to bring together all the parties involved - citizens, industry, government and public entities – so that they actively participate in the decision-making process, which is the purpose new technologies for smart cities should serve. The project focuses on three interdisciplinary cross-cutting topics: Smart Energy, Smart Home and Smart Mobility.

### Interview



**Prof. Dr. Thomas Heimer** is chair in innovation & project management at the RheinMain University of Applied Sciences in Rüsselsheim since 2009 and is an honorary professor at the Frankfurt School of Finance and Management in Frankfurt am Main, Germany. Since 2018, he has been leading the IMPACT RheinMain project sponsored by the Federal Ministry of Education and Research. The project runs until the end of 2022.

**JCM:** How comes that the University for Applied Sciences RheinMain is engaging in a project related to smart cities?

**Thomas Heimer:** The assignment of a higher education institution is to conduct research in new fields. The development of smart city concepts is an exciting topic for every university, no matter which discipline, since smart cities will change living conditions in our societies fundamentally. Smart city concepts are the result of a

previous societal negotiation process; based on which parameters you want to modify in relation to the respective social environment. We currently experience big differences. An example is the social scoring system in China, which is extremely controversial in Europe. A smart city concept can be conceived totally differently however, inviting to much more communicative spaces. In this context, I like to refer to the different ways of social interaction that existed in medieval

times at the royal courts in France and England. Smart city concepts may be as different as those.

**Songdo in South Korea has a 30% lower energy consumption than conventional cities. How do you assess the energy saving potential in a smart city?**

**T.H.:** If energy saving is the main objective, there is of course an enormous potential. You can install decentralized energy systems that adjust themselves according to the wishes of the users. However, I feel bound to warn against taking the Asian model as a blueprint. It is tied to the Asian history and culture. The majority of the Chinese population endorses the social points system, whereas it would not be



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feasible in European democracies. As Europeans, we have to be cautious not to take the wrong path when developing smart city concepts. Detailed monitoring may not be the major impact. We do not need to know what an individual person is doing; it is more about collecting data about flows and about optimizing processes. There is no contradiction between smart cities and the protection of personal privacy rights. Smart city concepts in Europe are quite diverse. For example, as far as intelligent imaging and image evaluation are concerned, London is by far the most advanced smart city. It has put the major focus on security. Valencia claims to be the first fully-integrated smart city in Spain with 45 different public services combined on a cloud platform. All the municipal services can be handled paperless via the online platform.

### How would you define a smart city model for Europe?

**T.H.:** I would always define a smart city as an optimization of process flows in different societal application fields. These may be energy or traffic flows as well as social flows, for example the interaction between humans. Smart cities are no firm templates. They are the result of an active participation of the citizens and a preceding public-private discussion of what citizens really want and need. And this is exactly what the IMPACT project is channelling: inviting the public to participate in the entire innovation

process. Smart city concepts can create digital village squares to comfort the growing number of single households. Mobility aspects and intelligent traffic regulation systems are highly relevant too, with intelligent parking management systems or intelligent information systems that indicate construction sites or accidents. Smart city concepts are far from substituting human intellectual intervention, they should on the contrary support and enhance human intellectual performance. This is the only way smart city concepts may find acceptance in democracies by not patronizing citizens.

### Which timeline do you foresee for the implementation of smart city concepts worldwide?

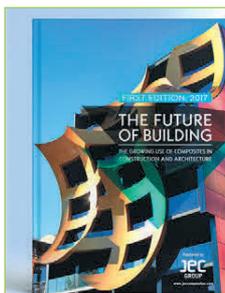
**T.H.:** China is undeniably pioneering in smart city concepts, since they have the support of the world's leading technology partner Huawei. They know how to take advantage of a digital infrastructure to maintain their influence.

China is the frontrunner, followed by Europe in second place. As far as applications are concerned, we are lagging behind the US since we do not have the GAFAs (Google, Apple, Facebook, Amazon). However, we are taking the lead when it comes to a master plan of intelligent infrastructures. I would say countries like France, Germany, Benelux, Scandinavia and the Baltic Republics will be at the forefront in the future. □

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