



# Smart Cities White Paper

It's All About People™

**Mercuri Urval**



# Executive Summary

Efficient and sustainable smart cities are the next big trend to keep an eye on. With autonomous driving, 5G-optimised public transport and personalised energy solutions, smart cities are fuelled by tech. However, **tech alone cannot make a smart city. More fundamentally, a smart city is created by the people living in it.**

Where are the people in all this buzz about smartness?

This white paper augments the existing discussion by focusing on **how smart people power smart cities as the cardinal resource for their development**, using the Top 3 Smart Cities (Top

3) – Singapore, Helsinki and Zurich – as excellent case studies.

This paper explores the role people play in determining how technology and cities are made smart. Then, a quick and rich dive into how a smart city is built from scratch highlights the opportunities for businesses and governments to contribute. The paper then zooms in to the rapidly growing industries of **smart mobility and smart environment**, focusing on the future of autonomous driving and how urban resource management tackles the environmental concerns of the near future. This paper acknowledges that there are other pillars of smart cities, as shown in

the model below, but chooses to discuss smart mobility and environment as we believe that these are the pillars that are the closest to the core of smart cities, which are smart people.

This paper is made unique by our close collaboration with smart city experts hailing from the Top 3. Their insights into the success of the Top 3 provides a **comprehensive, people-centric view of smart cities**, representing a range of industries from public utilities and telecommunications to governance and academia. **You can be sure to find ideas that resonate with you whatever your industry.**





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## Introduction

Cities generate more than 80% of the global GDP.<sup>1</sup> They are the economic powerhouse of every country and the hubs of population growth. By 2100, the global population will reach 11.2 billion, with 85% living in urban environments.<sup>2</sup>

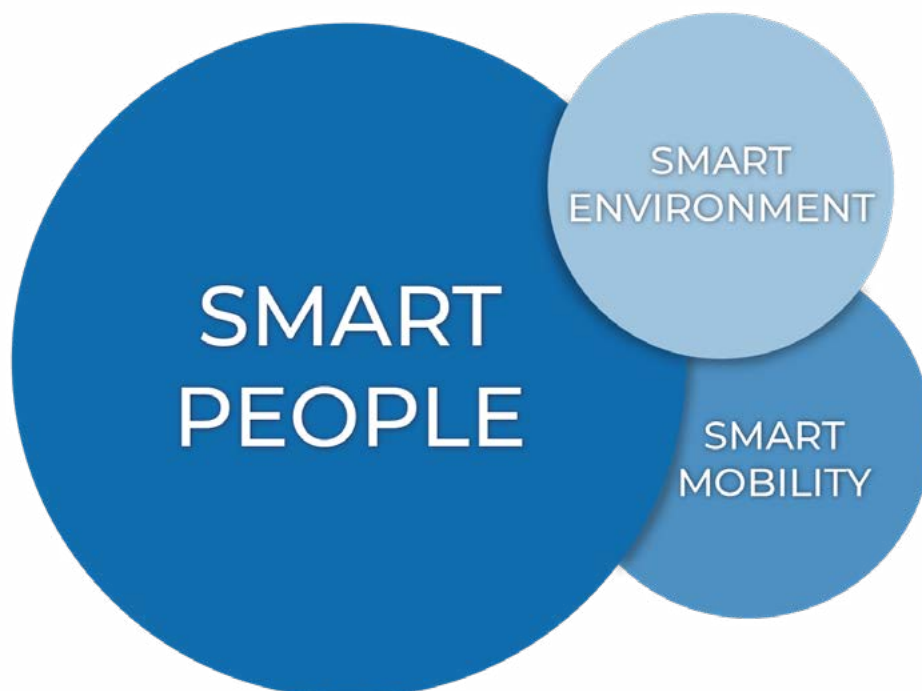
While not a remedy for all potential urban challenges, the development of smart cities is essential to ensure our cities remain liveable as they grow. Smart cities harness technology to create jobs, allocate finite resources and monitor and maintain infrastructure.

The development of a smart city is increasingly important amidst rapid population growth and the Covid-19 pandemic. Cities and companies are struggling to identify and adapt to the new normal of working. These smart developments can not only aid economic growth and the overall quality of life of a city, but also provide solutions to achieve sustainable city development and growth.

To learn from the best, this white paper focuses on smart developments in the three smartest cities in the world – Singapore, Helsinki and Zurich – or as we will refer to as the Top 3 in our paper.<sup>3</sup>

In this white paper, we take a people-centric approach. We believe that smart people form the core of smart cities and hence we have selected smart city experts to discuss what makes a city 'smart'. Then, we dive into the two highly competitive and rapidly growing smart industries – smart mobility and smart environment.

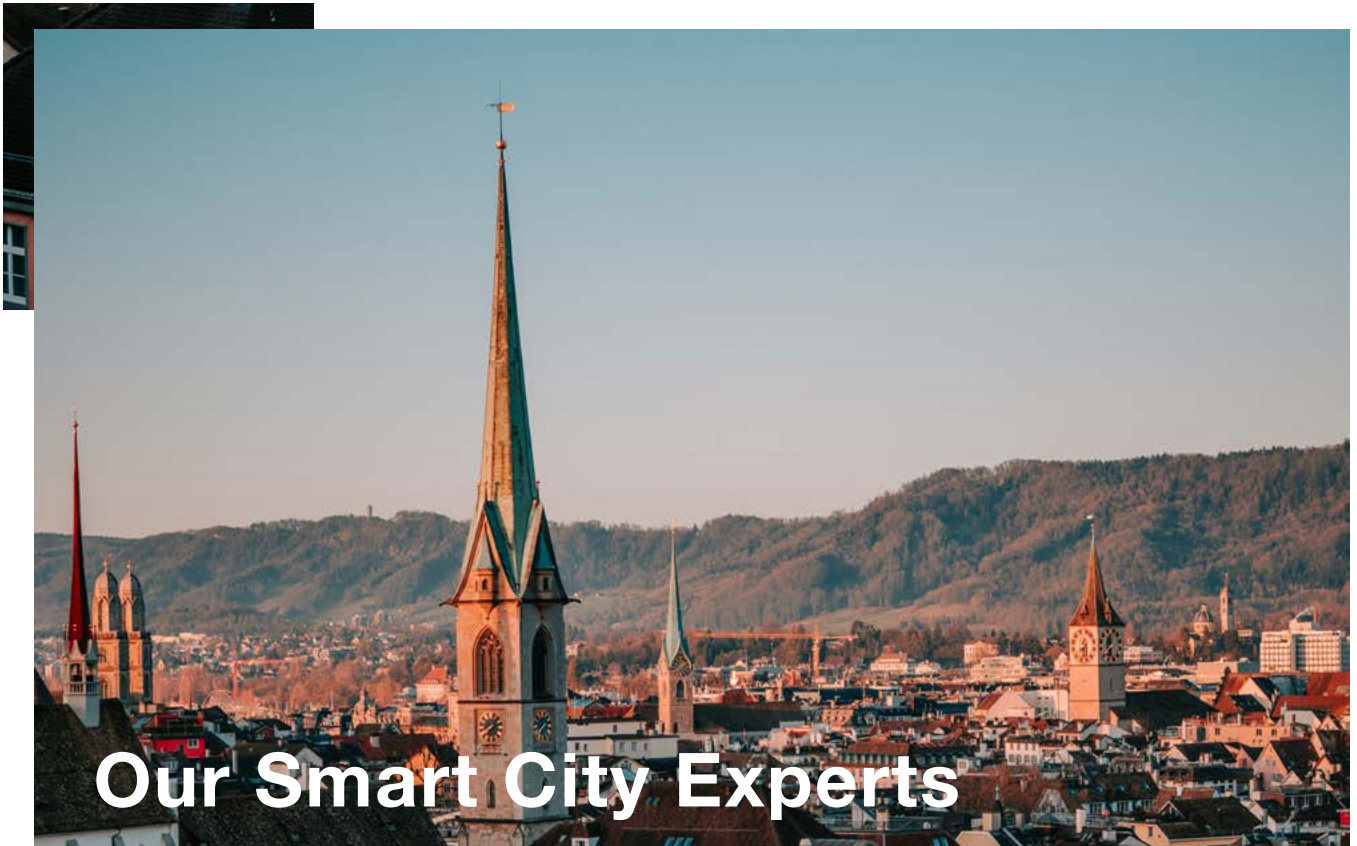
We trust this publication will provide insights into Mercuri Urval's unique people expertise in developing smart cities.



<sup>1</sup> <https://www.worldbank.org/en/topic/urbandevelopment/overview>

<sup>2</sup> <https://ourworldindata.org/future-population-growth#global-population-growth>  
[https://knowledge4policy.ec.europa.eu/foresight/topic/continuing-urbanisation/urbanisation-worldwide\\_en#:~:text=By%202100%2C%20some%2085%25%20of,than%20in%20the%20developed%20ones.](https://knowledge4policy.ec.europa.eu/foresight/topic/continuing-urbanisation/urbanisation-worldwide_en#:~:text=By%202100%2C%20some%2085%25%20of,than%20in%20the%20developed%20ones.)

<sup>3</sup> <https://www.imd.org/smart-city-observatory/smart-city-index/>



We begin by asking the big questions: How does a city become smart? What can businesses and governments do to get involved? What are some tips successful companies and cities can share with aspiring ones?

We reached out to our network of smart cities experts, ranging from the digital services and power industry, to governance and academia.



## Dr. Andreas Hermann

is Director for Customer Insights at the University of St. Gallen (HSG) and visiting professor at The London School of Economics and Political Science (LSE). He has also taught at renowned universities in the United States and China. Andreas has an education in Business, Law and Economics.



*I am sure there would be a **high correlation** between a smart city's **ranking** and the ranking of formality and **compliant behaviour** of people in the city.*

## Marko Kärkkäinen

is Chief Commercial Officer of Clewat Oy, a fast-growing clean-tech company from Finland, focusing on solving pollution in water bodies. He is also the founder of Sagacity Environment, a high-tech environmental protection, health tech and education enterprise that provides and implements individualised environmental management system solutions according to customers' different requirements.



*The **collaboration** between **governments** and **private companies** is the key in building and developing smart cities. One can't function properly without the support from the other.*

## Jukka Salmikuukka

is Director of Partnership Development for Asia Pacific at KONE, a mobility company that enables people to flow in a smart way through the built environment using their elevators and mobility solutions. Prior to joining the corporate world, Jukka was a Senior Research Scientist at VTT, focusing on Maintenance Development, Reliability Management and New Services & Service Development.



*Building an environment where it is **good to be (for people)** will create good opportunities for businesses to establish and to grow.*

## Anja Riedle

served as Head of Smart City at the Swiss Federal Railways from 2016 to 2021 and established their Smart City Lab initiative based in Basel. She is also the Co-Founder & VP of Smart City Hub Switzerland. Prior to joining SBB in 2012, Anja worked for the German Railways (DB). Anja earned a double-degree business administration and tourism and passed an executive education programme at INSEAD.



*For me, the vision of a smart city is one that is **socially inclusive**. Therefore, digitalisation is more a means to an end.*

## Saara-Sofia Sirén

is a Member of Parliament in Finland and has been a member of the Turku City Council since 2009. She joined politics in her early 20s after a short stint as a Product Manager. When she was elected as MP in 2015, she was the youngest MP in her parliamentary group. Saara has an education in Economics and Business Administration as well as Futures Studies.



*Don't just think about 5 years, **think 30 to 50 years ahead**, and set targets accordingly.*

Telenor Connexion is a leading Scandinavian provider of IoT services enabling global industry leaders to connect their products and services on a global scale across every vertical. It is part of Telenor Group, one of the world's major mobile operators. We welcomed two interviewees from Telenor, Seth Ryding and Göran Näslund.

## Seth Ryding

is Chief Sales Officer, Global Sales. Prior to this role, he managed sales in the Asia Pacific region since 2016. Seth has an education in Electronics and Strategic Marketing.



***Simplifying and sharing** are the key drivers for growth.*

## Göran Näslund

is Strategic Segment Manager, Utilities & Smart Cities. Prior to joining Telenor, he has been engaged in Industry 4.0 since 2016 and has a long record of experience in the telecommunications and IT industries since 2002.



***People need to have the right tools** to be smart, good or sustainable citizens.*



## Sau Sheong Chang

is CEO of SP Digital, an energy-tech company part of SP Group, one of the leading utility companies in Asia Pacific. SP Digital builds and sells energytech products to power sustainability, focusing on renewables and energy efficiency. Their customers include utilities, airports, shipyards, and commercial buildings. Prior to joining SP Digital, Sau Sheong has a long career in the tech industry, working in well-known tech firms like Yahoo!, PayPal, HP, and Garena (now known as Sea Group).



*Smartness is not based on pure technology. It is based on **integrating human behaviour** into the technology.*

An aerial photograph of a city with colorful buildings and snow on the ground. A large blue rectangular box is overlaid on the center of the image, containing white text.

These are just nuggets of the wealth of wisdom our experts have shared with us. In our next section, we explore why all experts regardless of industry share the same overarching vision: Smart cities are powered by smart people.



# Expert Opinions

## Visions of a smart city: It's all about people

### A smart city is nothing without smart people

Smart people are forged by three criteria: the individual's high level of professional qualification, the city's inclusivity that fosters innovation and the nation's high national Human Development Index. Switzerland, Finland and Singapore's high HDI and competitiveness in attracting talent are testament to this, proving that smart cities possess the environment that attracts skilled professionals, or what we call 'smart people'.



**Dr. Andreas Hermann**

University of St. Gallen

*A smart city begins by attracting a young, highly educated, liberal and green demographic that will drive the economy and create the community.*

### HDI and IMD World Talent Competitiveness Rankings of our Top 3<sup>4</sup>



HDI: 2<sup>nd</sup>  
IMD World Talent Competitiveness Ranking: 1<sup>st</sup>



HDI: 11<sup>th</sup>  
IMD World Talent Competitiveness Ranking: 9<sup>th</sup>



HDI: 11<sup>th</sup>  
IMD World Talent Competitiveness Ranking: 12<sup>th</sup>

A key magnet for these talents is the presence of future-oriented companies and industries in these smart cities, think Google and Amazon, AI and cybersecurity. With more than 270 million international migrants mobilizing across the world<sup>5</sup> and a projected 2.7 billion living in cities by 2050, the link between smart cities and smart people will only become more lucid. Hence, building a smart city must start from attracting a smart population. In time, these people and businesses will shape a political and economic landscape that encourages smart development.

<sup>4</sup> <http://hdr.undp.org/en/content/latest-human-development-index-ranking>

<sup>5</sup> <https://www.weforum.org/agenda/2020/01/iom-global-migration-report-international-migrants-2020/>





**Anja Riedle**  
Swiss Federal Railways

*Smartness should be pursued not for its own sake, but to **create a more liveable city** for individuals and families. Public well-being is the cornerstone of a smart city with the goal of improving as many lives as possible.*



**Marko Kärkkäinen**  
Clewat Oy

*The smartest cities can connect with their citizens without the impression of micromanagement. Hence, smart technologies that **people like to use** will bolster smart, green behaviours.*

## **Smart technology to achieve smart behaviours: Digitalisation as a means to an end**

Now that a smart city has been distilled into its two main components, how do cities then marry these two distinct concepts of people and technology?

Digitalisation is based on integrating human behaviour and needs into the technology. For example, utility companies in Singapore have given more decision-making power back to the consumers through mobile applications that allow for more accurate meter readings and flexible bill payments.

## Smart cities grow into smart regions

This phenomenon is heavily driven by the ranking system of smart cities. Naturally, city governments want to score well on these rankings, forcing them to allocate resources efficiently to excel. As smart cities are a highly global concept, these smart cities are competing both nationally and internationally. This is a huge opportunity for medium-sized cities to pool resources and grow their smartness together, such as through a smart mobility ecosystem spanning a region and connecting individual cities.



**Dr. Andreas Hermann**  
University of St. Gallen

*Over time, it is expected that the dialogue shifts from smart cities to smart regions as individual smart cities tap on their network with other cities.*

## History of Smart Cities: 3 Generation of Smart Cities

*Technology driven*

*Technology-enabled but government led*

*Citizen and society supported*

**2010**

**2012**

**2015**

**2016**

**2018**

Aims to create a more efficient and innovation-driven city.

Aims to improve quality of life such as to pollution, sanitation and health.

Smart Cities collaborating with citizens to create strategies driving the next generation of smart cities.

*PlanIT Valley initiative in Portugal.*

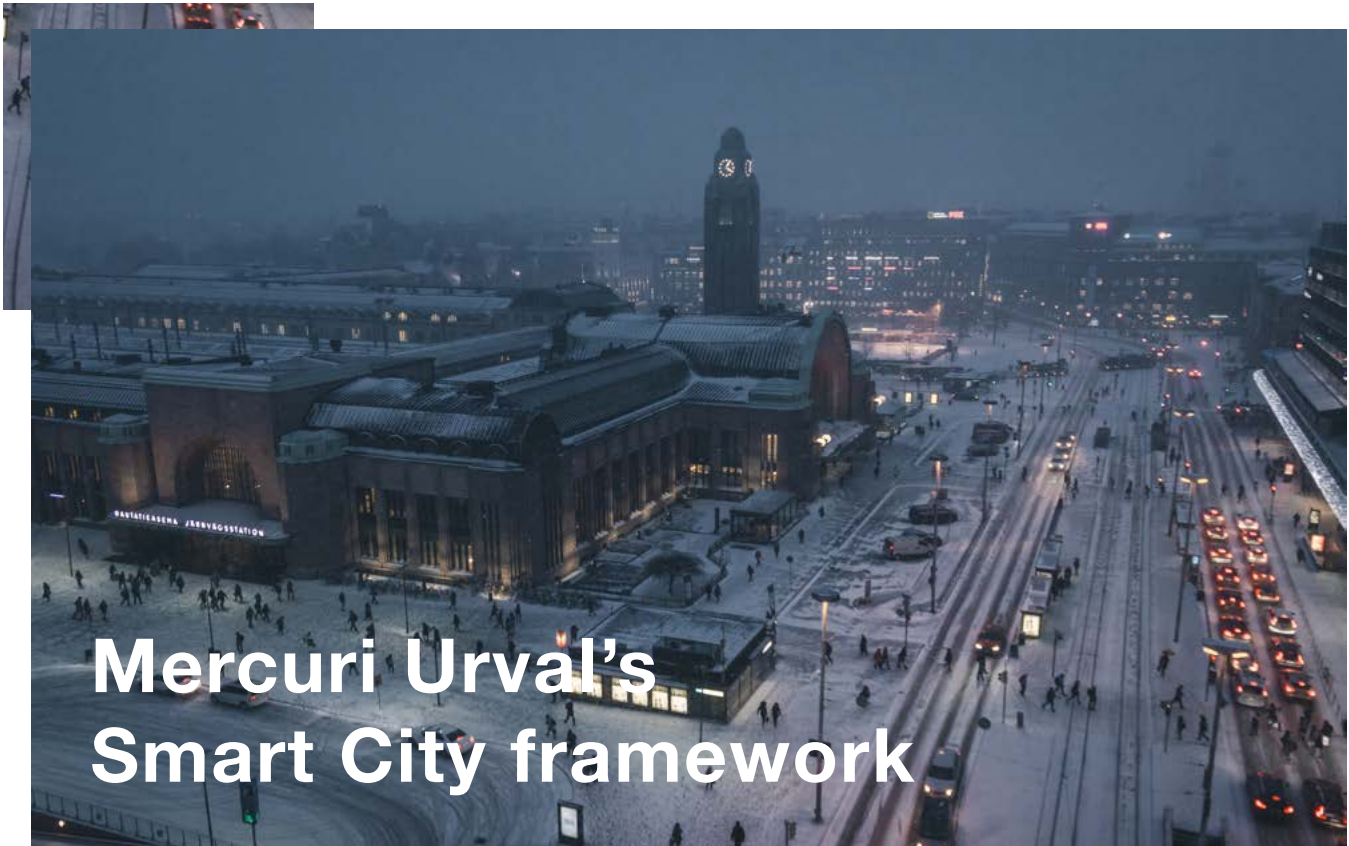
*Rio uses IBM's sensor network to tackle the issue of landslides, leading to the development of real time crime detection and integrated emergency response se*

*US government proposed new 'Smart Cities' plan to tackle transportation, environment and energy issues.*

*Vienna partners with WienEnergy to encourage community participation and becoming contributors to the city's 2050 renewable energy objectives.*

*London proposed the 'Smarter London Together' campaign which involves many private companies to improve the environment, transport and overall quality of life.*





# Mercuri Urval's Smart City framework

Using Boyd Cohen's<sup>6</sup> Smart City framework, this paper will look to focus on smart people, smart mobility and smart environment. While traditionally, Cohen's framework looks at 6 different sectors for a city to be smart, we decided to be people focused as we believe fundamentally, Smart Cities are being built by Smart People and not vice versa.

Based on our 5 decades of experience, Mercuri Urval is capable of searching and selecting leaders that will thrive in the Smart City landscape. Furthermore, with the rise to accessibility of information and technological advancements, people more than often find themselves needing to travel from one place to another at a quicker rate. Hence the impact of smart mobility on the way people travel is crucial in improving the transportation systems.

<sup>6</sup> [http://www.researchgate.net/figure/The-Smart-city-wheel-by-Boyd-Cohen\\_fig3\\_317269039](http://www.researchgate.net/figure/The-Smart-city-wheel-by-Boyd-Cohen_fig3_317269039)

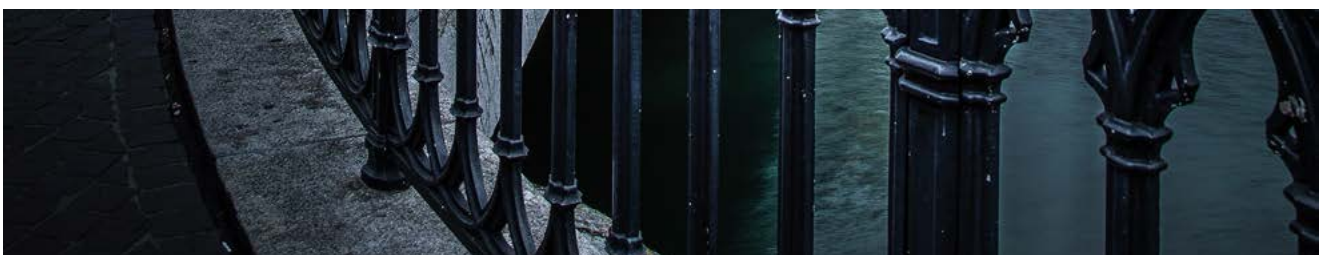
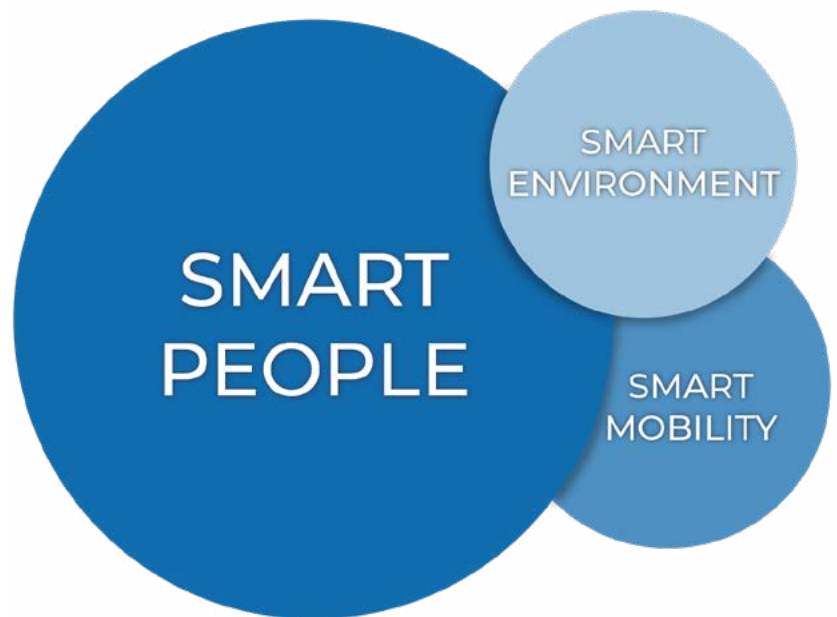




# How does a city become smart?

On the smart city building process, our experts are highly aligned. The journey starts from problem setting then private and public engagement, as the city works towards the end goal of cultivating a culture of smartness.

As people are the core of any city, a cardinal condition for a smart city is a **population with its basic needs fulfilled**. Only then can people develop an affinity for smartness and build up a city's smart capabilities in all other areas.







**Seth Ryding**  
Telenor Connexion

*When this stage is set, the government must be pragmatic. First, it must identify a problem it would like to solve. Then, let people feel involved by showing citizens the value of small digital changes. Even better, encouraging citizens to suggest their own initiatives allows projects to grow from the ground up and scale organically with buy-in.*



**Marko Kärkkäinen**  
Clewat Oy

*This creates a positive cycle where the people themselves **want** to get smart. With time, different initiatives can be connected by integrating silos into systems, clusters into eco-systems*



**Göran Näslund**  
Telenor Connexion

*All the while, leverage on the free market. Create space for innovation with a level playing field that encourages companies to compete while the public sector needs to lead with a good example. A balance of both carrots and sticks will set down a strong foundation for the city.*



# Why should businesses and governments join the smart city movement?

Smart cities may sound futuristic, but their incentives and benefits are tangible in the here and now. Businesses directly benefit from smart city infrastructure. Where there are challenges, these are opportunities for businesses to plug the gaps.

## **Direct benefits of smart city infrastructure**

The smart city eco-system is conducive for business with ample engineering knowledge, a good start-up atmosphere and a well-functioning collaboration across hubs of information, think start-up hubs, businesses, government and universities all working together.

Building smart cities is also about collaboration where it is still new and uncomfortable. For instance, when the Swiss Federal Railways (SSB) built the Smart City Lab<sup>7</sup> in Basel, competitor logistics companies actively shared information – as they understood that together they could get more done in a smarter way.

<sup>7</sup> <https://smartcitylabbasel.ch/>



*Governance in a smart city is more entrepreneurial. It takes a consumer-oriented approach towards its citizens: the smartness is a service and the residents the consumers, so smartness is motivated to stay relevant and accessible.*

*Furthermore, smart cities are a powerhouse for creating job opportunities. According to Enrico Moretti<sup>8</sup> of Berkeley, every smart job created spinoffs of five other employment possibilities. This can be explained by three factors:*

**1. Circular Economy:**

*Highly skilled workers with a higher salary are likely to spend more on goods and services, creating a ripple effect of growth throughout the economy.*

**2. Advanced companies tend to employ more services:**

*Think security, lawyers, janitors and even wellness service providers. More demand for labor, coupled with the attraction of smart city life, means more jobs are created.*

**3. Clustering Effect:**

*Talent recognises talent. The moving of just one highly skilled worker to a smart city contributes to the city's smartness, making it more attractive to other highly skilled workers and technologically advanced companies, and the cycle continues.*



**Dr. Andreas Hermann**  
University of St. Gallen

<sup>8</sup> <https://www.gsb.stanford.edu/insights/enrico-moretti-geography-jobs>

## Challenges for smart cities = Opportunities for businesses

The digital core of smart cities is both its greatest strength and its greatest challenge. Old infrastructure will limit new technologies, so it's up to the city to decide: should it modernise its core infrastructure or begin on a clean slate? Either way, leveraging digital capabilities and creating city-level ecosystems is the goal. This is where businesses' solutions can step in and shine.

Smartness is also helping businesses to develop their role in the industry. For instance, rapid digital development means that

the technology adopted by cities has to be competitive yet still be accessible to its people. Companies are now embracing shifts in their role from service provider to facilitator, bridging relationships between customers and suppliers. How we see mobility is also changing thanks to smart mobility, pivoting from a "station-to-station" perspective to a "Point A-to-Point B" approach. This signals an opportunity to integrate service providers like car-sharing and bike-sharing, with Mobility-as-a-Service (MaaS) promising great potential.

Additionally, space has become more invaluable over the decades. The challenge now is to adapt to the changing demand for space over time. Is there a way to optimise resources in the Central Business District on weekends? How about community space during office hours? When digitalising smart cities, businesses are more than welcome to offer this flexibility.

Smart cities are without a doubt highly promising for those who are willing to take the leap of faith and join the movement.



# How can businesses and governments involve themselves in building smart cities?

## Set Your Focus

Before embarking on a smart city journey, governments must first ascertain if a smart city is the best thing for the country. Changes in politics could undo previous projects. Cities must then create well-planned smart policies that stand the test of political change.

In Finland, for example, the world-leading education system is invaluable in producing a highly skilled workforce, something the country has learnt how to build their smart capabilities on. Singapore, on the other hand, skilfully taps on its affinity for efficient execution and implementation of new initiatives.

The bottom line is identifying and amplifying strengths. Where different cities have different strengths, seek out opportunities to mutually benefit from the other's competitive advantage.



**Jukka Salmikuukka**  
KONE

*Good smart cities then begin with a clear vision: Where do you want to go? What are the strengths that can propel you?*

## Prioritise Collaboration

### The government must work with citizens and within itself

To create the best environment for its people, the government must understand what a smart city means **for the people**. The answer can usually be found by listening to the residents for ways to make their everyday lives smoother. In true smart city fashion, public opinions can be sourced digitally through structured online polls open to citizens. Ideally, all political parties are on-board with the smart city initiative and are working together. This way, viewpoints can be developed together and targets checked for their feasibility and acceptability.

### Combining synergies across and within sectors

Collaboration is the cornerstone of smart cities: cities and companies can only provide the most value by pooling knowledge and resources. For example, SBB combines its roles as railway provider and real estate developer. It converts parts of retired train workshops into commercial and social spaces. Take for instance Zurich's *Europaallee*<sup>9</sup>, which has been revamped to feature shopping, F&B, residential and community facilities all built to high social, economic and ecological standards.

In Singapore, the Land Transport Authority (LTA) and Urban Redevelopment Agency (URA) collaborate in a cross-disciplinary manner to optimise land use in both the short- and long-term.

Yet, many cities separate these two disciplines: it's time to harness synergies.

<sup>9</sup> <https://europaallee.ch/>





# Any tips for those who wish to play a part in developing smart cities?



**Seth Ryding  
& Göran  
Näslund**  
Telenor Connexion

## Define the value of your businesses

Ask yourself what value you are creating for the user. Then, understand your company's role in the existing smart city ecosystems, build well-established networks and partnerships and don't be afraid to share your expertise. This will drive not just your business but the growth of smart cities.



**Saara-Sofia Sirén**  
Parliament of Finland,  
Turku City Council

## Think far

For businesses and government leaders interested in developing smart cities, thinking ahead is invaluable. Don't just think about 5 years, think 30 to 50 years ahead. You do not start from the technology; you start from what you need in the long-term.



**Anja Riedle**  
Swiss Federal Railways

## Harmonise within your business

At SBB, the smart cities team took Boyd Cohen's human-centred smart city wheel and highlighted the areas where SBB was active in. Then, they involved colleagues who were already engaged in all sorts of 'smart' city projects. This enabled them to harmonise internally on SBB's smart city direction while driving their individual initiatives.



**Sau Sheong  
Chang**  
SP Digital

## Break out of the mold

Today's landscape of change demands constant innovation and re-branding. The utility business has evolved greatly under changing regulations, new technologies and more sustainable consumer mindsets. In such an agile world, SP Group has developed an end-to-end standards-based system to manage the largest public EV charging network in Singapore. Additionally, they have deployed smart meters in private owners' facilities to help them manage their tenants while providing insights and monitoring data to assist private owners in managing common area utilities.



**Dr. Andreas  
Hermann**  
University of St. Gallen

## Culture could determine success

The culture of a city is likely to be intrinsically linked to a smart city's development, where high trust and compliance could correlate to a more successful smart city. A lot of cultural topics and human nature are playing into the game of smart cities.

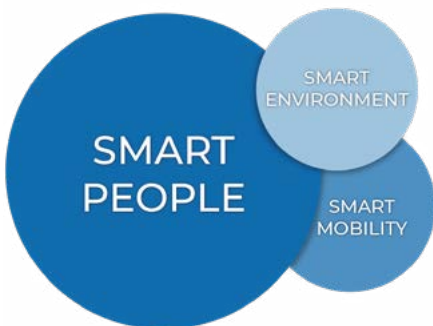


# Smart Mobility

With globalisation allowing people and goods to travel further and faster than ever before, the importance of mobility solutions cannot be understated. In the context of smart cities, smart mobility takes centre stage.

Smart Mobility involves the movement of people, and goods and services around the city through the application of integrating new technology into modes of transportation. It involves optimising the transportation services to achieve a more sustainable society<sup>10</sup>, where gas emission from automotive vehicles is minimised. Neckermann describes the goal as 'zero emissions, zero accidents and zero ownership.'<sup>11</sup>

Smart mobility solutions enable cities to give space back to the citizens as lesser space is required for roads and parking space as automated vehicles working together can help maintain and improve traffic flow by at least 35 percent<sup>12</sup>, the government will then be able to develop and build infrastructures that improve the overall quality of life of the citizens. With zero emission produced from autonomous vehicles, technology can be seen as an opportunity to deal with air pollution in cities<sup>13</sup> and improving the quality of air over time.



<sup>10</sup> [https://www.hitachi.com/rev/pdf/2012/r2012\\_03\\_105.pdf](https://www.hitachi.com/rev/pdf/2012/r2012_03_105.pdf)  
<sup>11</sup> <https://www.neckermann.net/thought-leadership/mobility-revolution/>  
<sup>12</sup> <https://www.sciencedaily.com/releases/2019/05/190519191641.htm>  
<sup>13</sup> <https://www.sciencedirect.com/science/article/abs/pii/S0048969>



## Examples in autonomous mobility development

NuTonomy (now belonging to Aptiv PLC) a MIT spin-off technology startup company with the support from Ford has first started their public road testing of their autonomous vehicles in Singapore as of April 2016, hoping to introduce on-demand autonomous vehicles in the years to come.

VBZ, to further develop the future of public transport in Zurich, has launched their first test drive with

autonomous shuttle in Switzerland. The vehicle will be fully automated and will be run by electricity.

Sensible 4 has commenced their autonomous test drive for three self-driving vehicles controlled by on-demand mobile app and a Remote-Control Centre in April 2020 and aims to achieve Level 4 autonomy in the near future.

## Fields of use for electric vehicles



Carsharing<sup>14</sup>



On Demand<sup>15</sup>



Private Ownership<sup>16</sup>

## Levels of Automated Driving

Level of Automation	Description
Level 0	<b>No automation</b> – Driver is in full control of all driving tasks
Level 1	<b>Driver assistance</b> – Driver is responsible for most of the steering with a few added automations Adaptive Cruise Control Brake assist features
Level 2	<b>Partial automation</b> – Vehicle can control speed, centering of vehicle and steering while maintaining distance between vehicles Audi Traffic jam pilot system Tesla autopilot
Level 3	<b>Conditional automation</b> – one when certain conditions are met, vehicles are capable of self-driving but require take over should the road conditions not be ideal for automated driving
Level 4	<b>High automation</b> – self-drive under specific circumstances without human interactions
Level 5	<b>Fully automation</b> – able to monitor and manoeuvre through all road conditions and requires no human intervention. Capable of performing all driving tasks identical to a human, eliminating the need for steering wheel and gas pedals

<sup>14</sup> <https://www.todayonline.com/singapore/car-sharing-sees-spike-users-experts-question-how-sustainable>? <https://www.neckermann.net/thought-leadership/mobility-revolution/>

<sup>15</sup> <https://www.uber.com/us/en/safety>

<sup>16</sup> <https://www.guideautoweb.com/en/articles/55126/2020-honda-civic-vs-2020-toyota-corolla-the-numbers/>



## Challenges in achieving automation for vehicles

Legislation rights for autonomous driving is one of the biggest concerns with achieving level 5 automation as currently, only 50+ countries including Singapore, Japan and South Korea have agreed common regulations for automated driving. Under the UNECE (United Nations Economic Commission for Europe), there is currently no worldwide regulation for autonomous driving and no uniform regulation in the European Union either. Only with uniformed legislation can there be progression towards a fully autonomous vehicle.

Renata Jungo Brungger says that 'Progress must not stop at national borders. Legislation must keep up with technical progress otherwise paramount innovations for automated and autonomous driving cannot be brought to the road.'<sup>17</sup> Finland for example has targeted political legislation to be carbon neutral by year 2035, which requires them to have a more efficient transport infrastructure and lower emissions. Further investment and legisla-

tion rights need to be approved for Finland to achieve their carbon emission goals in 2035.

Society's perceived knowledge of autonomous vehicles carry an important role with achieving level 5 automation as well. Currently the trust in autonomous vehicle is low with around 71 percent of the Americans still unable to trust autonomous cars due accidents caused by automation malfunctions. 15 Accidents caused by autonomous vehicle tend to be the leading headliner for news articles and such headlines create a significant impact on how people look at the development of autonomous vehicles.

Dissonance between the driver and the vehicle impacts the development of autonomous vehicles as well, with autonomous driving drivers heavily relying on the vehicle' automation system, which may lead to unforeseen accidents should the system malfunctions.

<sup>17</sup> <https://www.daimler.com/innovation/case/autonomous/legal-framework.html>

## Autonomous development within OEMs



### Audi

In 2018, Audi developed its first automotive with level 3 autonomous driving technology in the Audi A8. However, it requires certain conditions to be met before the hands-free experience commences. The AI traffic jam pilot system integrated within the vehicle controls from stop, accelerating, steering, and braking during the driving experience. During piloted driving, the sensors [Radar, Lidar and Ultrasonic] detect surrounding objects and road attributes and classifies the information, accordingly, localising a 'Big Picture' image within the system which is then processed within the decision algorithm to predict and decide the path the vehicle will take.



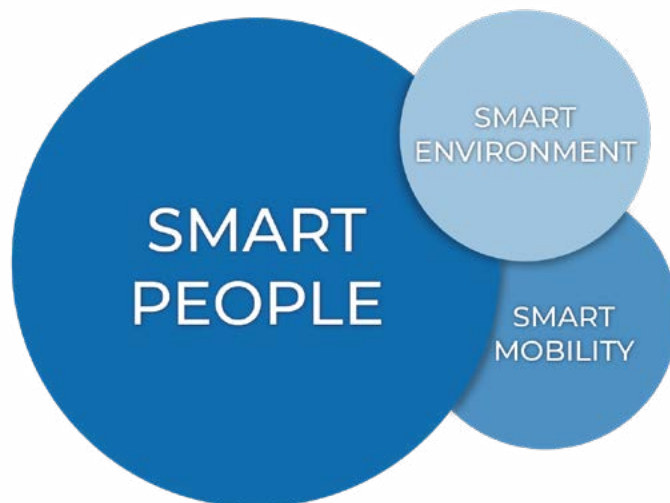
### Volkswagen

Volkswagen together with Argo AI, a Pittsburgh-based autonomous vehicle start-up company backed up by Ford Motor is developing a new vehicle, a retro-styled electric van with the ability to self-drive under certain circumstances, such as under defined routes or geofenced areas which is categorised under Level 4 autonomy. The vehicle is planned to be market ready by 2025. Outlooks and Predictions.

An expert of EVs, Peter Fintl, Director, Technology & Innovation of Capgemini Engineering, predicts that majority of the countries will establish legislation for autonomous driving in the years to come. Furthermore, Highway Pilot Level 3 will be achieved by the end of 2021. Autonomous vehicles will achieve Euro NCAP (European New Car Assessment Programme) approval on AEB (Autonomous Emergency Braking) and cornering by 2022. This development is followed by collision avoidance in 2025. Autonomous driving of level 5 may likely be seen achievable by 2030 if progress were to go smoothly, according to the roadmaps planned by companies.

More safety and comfort for drivers, faster availability of automated driving functions for all vehicle classes:

Bosch and Cariad, the software subsidiary of the Volkswagen Group, are now working together towards this goal and have agreed on a comprehensive partnership. The companies want to make partially and highly automated driving suitable for the masses and available to everyone. The aim is to make functions available for vehicles of the Volkswagen Group's brand groups that allow drivers to explicitly take their hands off the steering wheel at times. These are so-called Level 2 "hands-free" systems, for city, country and motorway, as well as a system in which the vehicle takes over the complete driving task on the motorway (SAE Level 3). The first functions are to be implemented in 2023.



## The world's cities are growing at an unprecedented rate

According to the United Nations<sup>18</sup>, 6.33 billion people will live in cities by 2050, which accounts for 66.4 percent of the world population. A historic milestone was reached in 2008 when the number of people living in cities exceeded the rural population of

the world for the first time in world history, signalling the beginning of an unstoppable trend of migrating to cities from the rural areas. This trend necessitates the growth of many cities into megacities with more than ten million concurrent residents, with forecasts predict-

ing that around 630 million people will live in megacities by 2025. This continued trend of growth brings with it many challenges to the cities, with a central concern of environmental sustainability.

<sup>18</sup> <https://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html>



## Most cities are not sustainable and have profound negative impacts on the environment

Cities account for 70 percent of greenhouse gas emission while only taking up 2 percent of the Earth's landmass. According to the United Nations Environment Program (UNEP)<sup>19</sup>, construction and operation of buildings “account for 36 percent of global energy use and 39 percent of energy and process-related carbon dioxide emissions.”

In addition, according to the World Bank, beyond the depletion of the ozone and use of non-renewable energy, cities generate more than two billion metric tons of municipal solid waste every year. Annual waste generation is estimated to increase by 70 percent to 3.4 billion metric tons by 2050. This means that with a lack of effective methods of dealing with

waste in large volumes, pollution of our environment is unavoidable, leaving underlying risks for future generations.

## Sustainability goals and initiatives exist but are often not met or ineffective

The goals laid out in the Paris Climate Agreement require all buildings in the world to be net-zero carbon by 2050 but according to a WRI report, only less than 1 percent of today's buildings are net zero carbon, with only 2,500 net-zero energy buildings worldwide in 2017.

In 2018, the EU has identified 14 member states as at risk of missing the 2020 target of 50 percent recycling (Bulgaria, Croatia,

Cyprus, Estonia, Finland, Greece, Hungary, Latvia, Malta, Poland, Portugal, Romania, Slovakia, and Spain).

Additionally, recycling and waste management solutions are often inefficient and inconvenient for citizens. Meanwhile, incentives and penalties cannot be put in place in huge cities due to the lack of ways of obtaining accurate data.

**Hence, technological innovations in smart cities can not only streamline processes but also ensure that sustainability initiatives are cost-effective.**

<sup>19</sup> <https://www.un.org/en/climatechange/climate-solutions/cities-pollution>

# Smart Environmental Solutions

## Smart energy solutions

Smart energy technologies mainly deal with reducing energy consumption by encouraging a decreased and measured energy consumption pattern among city residents. Automated systems that restrict energy consumption based on different scenarios are also deployed by city governments.

For example, smart meters record consumption of energy in one-hour intervals or less and convey this data to the utility company which allows utility companies to craft different price points based on seasons or days of the week. This enables residents to have more tailor-made energy consumption costs and encourage reduced energy consumption that can now be matched with reduced energy costs.

In addition, the data generated will provide detailed insights into energy consumption patterns, which can then be used to increase consumers' awareness of their energy usage and influence them towards reducing their energy consumption through concepts like gamification.

There are also automated solutions such as making household appliances responsive, ensuring that they will temporarily stop consuming energy when demand for energy (and prices) increases, which lowers the peak levels in electricity demand and decreases the need for expensive standby capacity that is only needed in case of peak usage.



**Göran Näslund**

Telenor Connexion

*People need to have the right tools to be 'smart, good or sustainable citizens'.*

## Smart water solutions

With the lack of sanitary water being one of the biggest challenges of modern and future cities, smart water solutions aim to minimise waste and ensure good sanitation. As such, the solutions are geared towards the detection of pollution, leakages and their respective solutions.

Smart sensors can be strategically placed within the water distribution network to provide real-time insight into pressure, flows and quality, which allows for detection of leakages especially

when analysing the flows during the night when normal consumption is minimal. Also, these sensors can measure the quality of surface water in real-time, bypassing the tedious processes of sampling and analysing which usually cause a lag between the emergence of pollution and the detection of it.

Furthermore, with maintenance on water infrastructure being expensive and highly disruptive for residents, such maintenance has to be planned and the data

from the sensors above can then enable Predictive maintenance planning. Sensors in the pipes measure flow, pressure, and acoustic signals, which can then be combined with other data like insurance claims caused by flooding, data from Geographical Information Systems and even complaints of leakages and poor water quality, all of which can be collated from the Internet of Things and synthesised to enable the prediction of leakages and issues before they occur.

## Smart trash solutions

Even the most mundane and simple trash bin can be fitted with sensors to provide data that becomes the foundation of smart solutions. Waste containers can be equipped with sensors that detect the volume and weight of waste in a container.

With this data, the system is able to inform waste management company, enabling them to optimise the number and routes of garbage trucks that are sent out. Truck drivers is able to operate in a smarter way by skipping areas with containers that are not yet full, and making an early stop at containers that are close to reaching their limits.

This not only makes it more efficient and thus cheaper in the

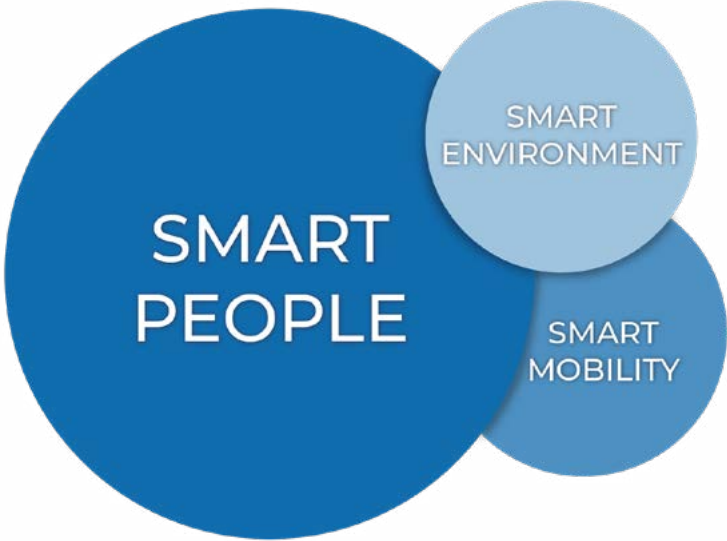
long run but also reduces pollution that occurs due to full waste containers when people simply dump their waste on the street beside the container.

Besides, sensors can also enable the tracking of the recycling activities of individuals through the weighing of recycling containers outside a residence or the identification of individuals who use central recycling centres and containers frequently and correctly. This data of recycling behaviour can then allow governments to accurately reward or penalize residents based on their recycling behaviour which will encourage recycling and work towards environmental sustainability.





# Ready to get smart?



In this white paper, we explored smart mobility, smart environment and smart people separately, but they are all interconnected.

Smart people are the core of building a smart future. The various technologies mentioned under smart mobility and smart

environment are only deployable when paired with smart people. These technologies will further reinforce their smart lifestyles and thus pave the way for a smart future.

At Mercuri Urval, we not only understand the demands, challeng-

es, resources and opportunities present in smart cities, but we also work with smart city experts. This puts us in a strong position to help our clients find leaders well-suited for the smart city landscape and allows us to help our clients in their efforts to thrive in a smart future.



**Ricky Foo**  
Partner,  
Singapore



**Daniel Müller**  
Partner,  
Zürich



**Niklas Sutela**  
Partner,  
Helsinki



**Joel Lim**  
Management Consultant,  
Singapore



**Lydia Chen**  
Digital Transformation Coordinator,  
Singapore



**Merrick Choo**  
Researcher,  
Singapore

If you have questions pertaining to the white paper or the topic of smart cities as whole, feel free to reach out to the members of the Smart Cities team.





A blue-tinted photograph of a city street. On the left, a large, ornate building with a prominent dome and arched windows is visible. The street is lined with trees and has a streetcar in the distance. The overall scene is a typical urban street view.

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**Mercuri Urval**

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