



A platform for the
livable city of the future:
Intelligent City Performance

Introduction

This white paper shows how a digital ecosystem can pave the way for the smart city of the future: an ecosystem that connects the city to regional and global companies and adds value for its citizens. This platform integrates an array of unconnected insular solutions. In so doing, it creates a holistic understanding for the city's decision-makers and facilitates seamless city services for residents.

Smart cities are currently the subject of much discussion, but the term is not used uniformly. It refers to concepts that aim to shape cities using the opportunities offered by new technical developments and information and communication technologies with respect to the environment, social cohesion, political participation, etc.¹ There is substantial motivation for coming to grips with the topic of smart cities because cities are facing huge challenges – which are becoming more pressing.

Persistent trends such as strong population growth, worsening traffic and inefficient city logistics, along with the combination of high emissions levels and the simultaneous increase in the regulation of WHO limits, are increasing the pressure on cities to act.

The importance of urgent problems in an urban context has led to wide-ranging research in many areas and numerous niche products. The past decade has been shaped by smart city pioneers, who have created highly specialized technologies – some of which are used around the world, and others that appear to be, as yet, undiscovered.²

The findings generated by these pioneers help cities gain insights into every single area within their field of activity. But that's precisely the problem: into every – single – area.

Specialist digital tools for various expert disciplines have reached a high level of maturity. However, these tools are missing a unifying gaze that brings together all these findings to create a holistic perspective for a city administration. As a result, cities are facing an all-new challenge: combining all these new solutions with each other, or even being aware of them at all. And why do they need to do this? So they can implement them in a targeted way and make informed decisions.

The recently proposed European Data Act will make it easier for data to be exchanged between compa-

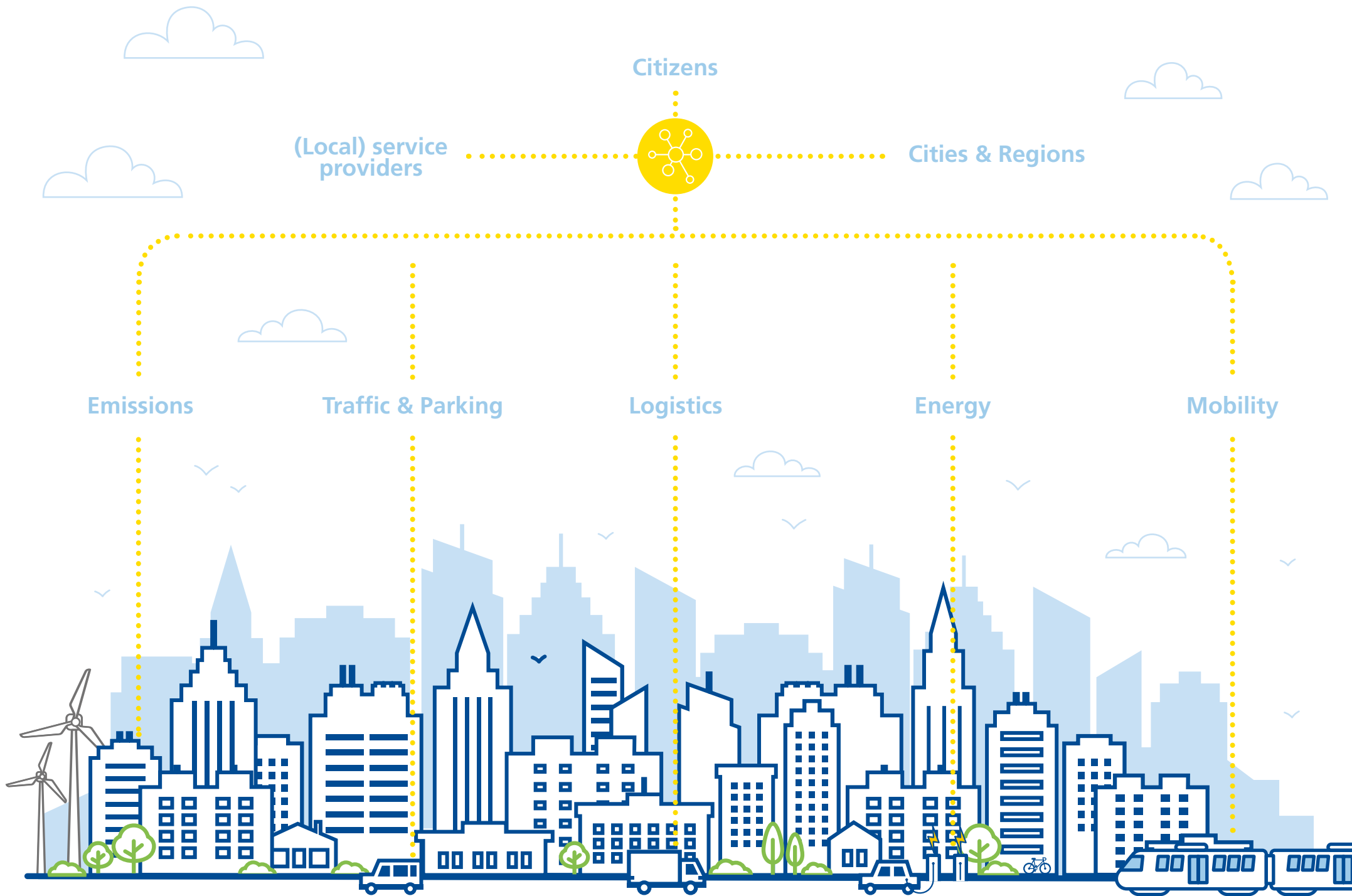
nies and public institutions. This goes hand-in-hand with various benefits for users and public institutions, including rights to access and utilize user-generated data.

To put these solutions into practice, though, cities need reliable technology that generates trust. Based on this, cities can undertake dynamic planning and are given the necessary ability to respond and act so they can deal with new challenges.

This is the vision of the Intelligent City Performance platform (ICP). The ICP platform represents a digital ecosystem between the city, municipal, regional and global companies and institutions, as well as citizens. In turn, the platform allows urban society to act as a whole to a greater extent and bring together its resources for the shared goal that unites all its stakeholders: sustainable, mutual growth.

¹ <https://wirtschaftslexikon.gabler.de/definition/smart-city-54505>

² <https://link.springer.com/article/10.1007/s11192-019-03134-8>



Networking and AI for added-value services

The plethora of IT systems used within the city provides experts with key insights to manage their respective specialist divisions. But what about the other decision-makers within the city? How do they learn about this information? Today, micro-level decisions are based much more on data than decisions on the strategic macro-level.

Urban data platforms face the problem of centrally collecting data from specialist areas and sensor data from the local area and making this accessible. This is a first key step on the journey towards a digital city twin – but merely collecting data on its own does not generate added value. Rather, it's about generating knowledge from this data and using it to create services that can be used directly.

Companies are not generally taken into account in these efforts, even though their data and their behavior in the urban space have a substantial impact on the big picture for a city. Think about how much they impact the mobility of people in a region. For instance, if the shift times of a major factory are not compatible with the local public transport network, the city's efforts to promote sustainable mobility will be all for naught.

With ICP as an open, neutral (i.e. provider-agnostic) platform, we link cities to regional and global companies in the city space. This enables them to create innovative, needs-based and sustainable services for citizens and improve them on an ongoing basis. The platform functionalities provided by the ICP enable city employees to use the connected data to make

dynamic plans and derive actions directly. As part of this process, open-source data and data drawn from companies are combined with each other to add value, depending on the use case. The ICP approach has been selected so a wide array of service providers can be connected with the minimal effort. It also enables a continued high level of integrity to be created with pre-existing, more complex smart city solutions. Data and IoT platforms are a prominent example of this. From ICP's perspective, they represent a key form of data input, enabling adjustments to be undertaken at different digitalization levels from city to city and even from division (domain) to division: there are often major differences in this respect.

The platform is also equipped with a function enabling precise analysis of the effectiveness of city measures. Based on strategic climate action, quantitative sustainability targets are defined in the ICP together with city officials. These are set out in a roadmap and a milestone plan. Routine-based measures then contribute to achieving KPI targets. Its efficacy assessment is based on the delta comparison and low-threshold visualization of KPIs. An aggregated all-round solution that allows all these areas to interact does not yet exist. Eighty percent of cities surveyed state that a smart city platform could help them achieve their climate action and sustainability goals.³

As the below graphic illustrates, ICP consists of a modular system of platform components, with services building on this. These services can be added or deactivated in a flexible, needs-based way. As part of this approach, the technologies used draw on established open-source components and standards.

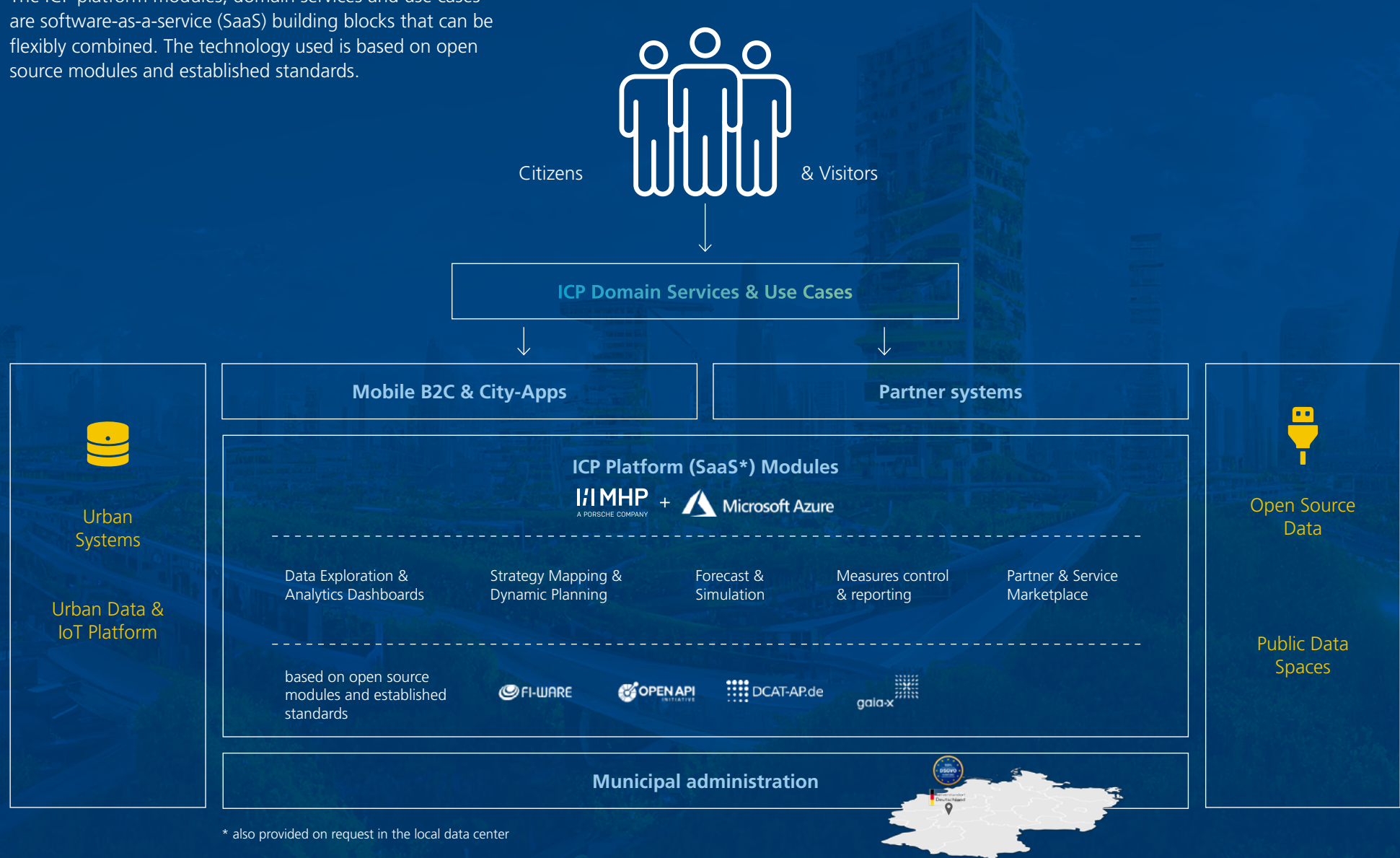
The ICP software-as-a-service modules are constantly being enhanced with our project partners and adapted to the premises of a livable city and the individual requirements of the stakeholder groups.

While the development of the platform revolves around a centralized SaaS model, the solution is designed with an eye to modularity and portability. This means that the bulk of the modules can be operated from a regional, city-based computer center (on-premises), which enables individual customer requests to be supported. This in-house computer center can either be fully managed by the city or with the help of MHP's developer team.

³ Source: Motorpresse Stuttgart & MHP (2021), n= 30, worldwide

ICP connects urban stakeholders

The ICP platform modules, domain services and use cases are software-as-a-service (SaaS) building blocks that can be flexibly combined. The technology used is based on open source modules and established standards.



Platform modules: a business intelligence framework for cities

Research was carried out into the anatomy of cities' core tasks and use cases to enable a platform to be provided for a large number of cities. The outcome? Software modules that a city administration can flexibly combine to enable low-threshold access to city-wide data. Based on this, intuitive plans can be made and partially or fully automated actions derived. In turn, these platform modules can be used to create new services and integrate existing solutions.

The ICP platform tackles the core tasks of an intelligent city. These tasks can be divided into three underlying fields of action, within which the ICP provides the city with digital support:

Discover and understand

Digital services, new sensors, and the people and the city themselves produce huge volumes of information each day – and this information needs to be processed. That said, private companies within the city space produce the bulk of this data. Certain questions

arise at this point: on the one hand, how can all these various sources of data be intuitively combined with each other to gain new findings? On the other, within what context are the numerous individual goals to be seen within a city?

The functionalities provided to the city in this area encompass the following:

- Intuitive visualization of all connected data sources and intelligent filters
- Creation of in-house analyses and monitoring dashboards by city employees
- Simple comparison and combination of data sets
- Ability to connect strategic goals to operative KPIs, and to existing and future city initiatives
- Relevant platform content and news specific to a particular area

Plan and design

Once the connections have been understood, plans need to be made. Data needs to be intelligently networked so users can easily recognize when trends within the city are becoming problematic. In our current, fast-paced times, this begs the question: how do updated, or even new, data sets impact existing plans and concepts for the future?

ICP functions:

- Strategic KPI monitoring
- Dynamic planning of city initiatives
- Forecasting and simulation – scenario testing

Execute and manage

Once plans have been made, they need to be put into practice. The challenges are complex and the tasks to be fulfilled are diverse. These tasks fall under a wide range of competence areas for city bodies, units and departments. The complexity means that all the users in the city space need to be involved: municipal companies and private providers alike. By extension, this raises the following question: how can various stakeholders work together holistically to meet the city's smart city objectives?

ICP functions:

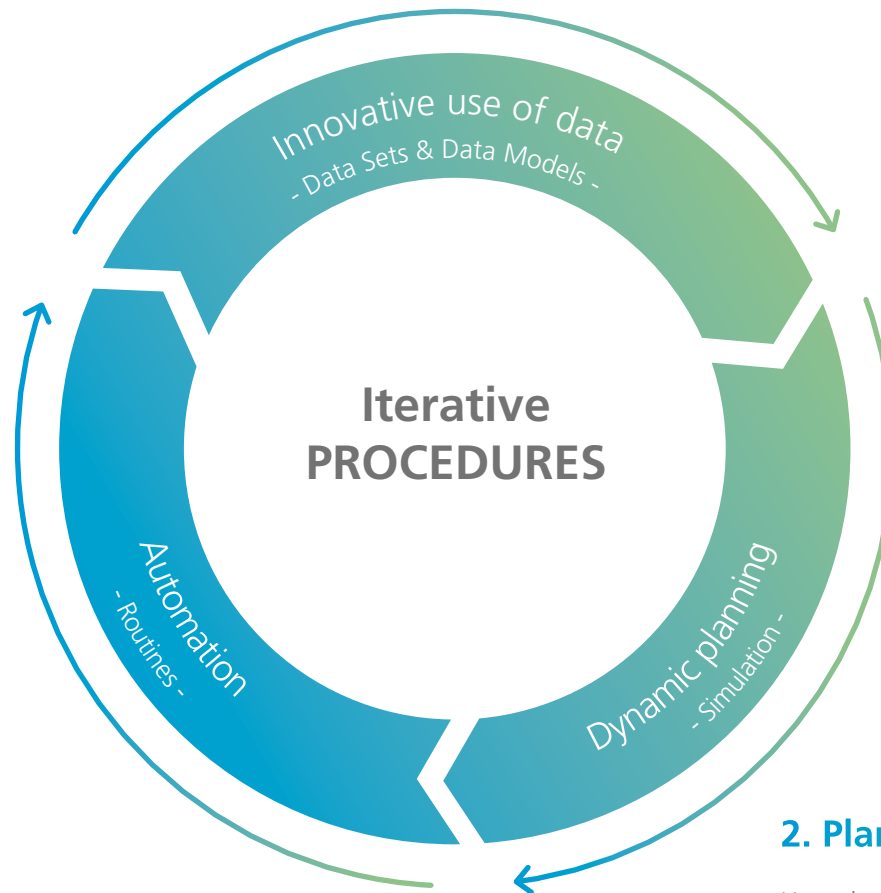
- Measures (routines, actions and triggers), incl. recommendations for action and reporting on these measures
- Catalog of services/measures, and a marketplace for partners and services

3. Execute & Control

How can different stakeholders work together holistically to meet the city's smart city goals?

1. Analyze & Understand

How can different data sources be combined intuitively to gain new insights from them?



2. Plan & Design

How does updated or new data influence existing concepts and planning?

Artificial Intelligence (AI) for efficient city administration

AI components represent the core foundation of the platform's functions. Local administrations can work more efficiently, thanks to AI. One major benefit of AI is that it puts organizations in a position to shape their key operational tasks in a more efficient way.

AI can help decision-makers keep an overview of policies. It also enables them to identify the initiatives that have the most importance for citizens while also representing the biggest levers for sustainability goals. In turn, this lets decision-makers plan and measure the potential impact that every initiative has on society as a whole.

AI plays a major role in the provision of personalized user experiences, creating a more personal connection between a municipal administration and its citizens by adapting to their specific needs. The use of AI to analyze citizens' feedback, for instance, makes it easier to design strategies and initiatives addressing key issues.

AI is an opportunistic tool for organizations in every sector and of every size. It enables them to analyze data more quickly, make better decisions and act more swiftly. Nobody knows the challenge arising from under-resourcing and under-staffing better than municipal administrations and town halls. AI helps organizations do things that they wouldn't otherwise have the staffing resources for.



ICP services

Modular services can be constructed on the basis of the platform modules. In so doing, ICP provides cities with flexibility in terms of timescale and functions: cities can draw on best practices in the form of established services (from partners, MHP or cities) from the areas of mobility, climate action and sustainability. Alternatively, they can have tailored software components developed via ICP incubator consulting, with these components adapted precisely to their individual service needs and relevant KPIs. They become part of a network with many cities and partners, enabling them to learn from others' experiences. Ideally, this would lead to municipalities undergoing continuous digital development, using innovative technologies to respond to citizens' changed needs on an ongoing basis and offer optimized services.

In the understanding of the platform, a distinction is made between domain and cross-domain services:

A domain is a topic-based (vertical) slice through the ICP platform, e.g. in the mobility, energy or transport sector. Various domain services and the relevant ICP platform modules are provided within each of these domains. This could encompass, for instance, the digitalization of the process for applying for charging infrastructure within the "energy" domain.

But why introduce domains if the aim is to break down data silos? On the one hand, these domains are based on city departments, or, in other words, the fundamental tasks that a city needs to undertake and that gener-

ally form the basis of its organization. In turn, this enables targeted work to be carried out on initiatives and projects so they can be connected to each other.

On the other hand, domains correspond to the areas on which national and international data spaces already focus and will focus in the future (e.g. Mobility Data Space, Fraunhofer Medical Data Space). Individual data spaces are intended to facilitate the effortless exchange of data within specialist areas and the suitable cataloging of this data. This is necessary for subsequent machine learning and therefore enhances and supports the digitization of the domain in question.

ICP domain services include the following, for instance:

- The charging and emissions dashboard provides a visualization and improves the transparency of charging infrastructure and air quality values. This encompasses various activities, such as the analysis of the capacity of charging infrastructure across the city, on a district level and for each individual charging point. Furthermore, trends regarding the usage behavior of the charging infrastructure are derived and presented in visual form.
- The needs forecast for charging infrastructure empowers cities to independently forecast the need for charging infrastructure and therefore promote the consistent expansion of electromobility. To this end, weaknesses in the public charging infrastructure on offer are depicted transparently.

Cross-domain services, conversely, are a horizontal connection between domain services from at least two different domains.

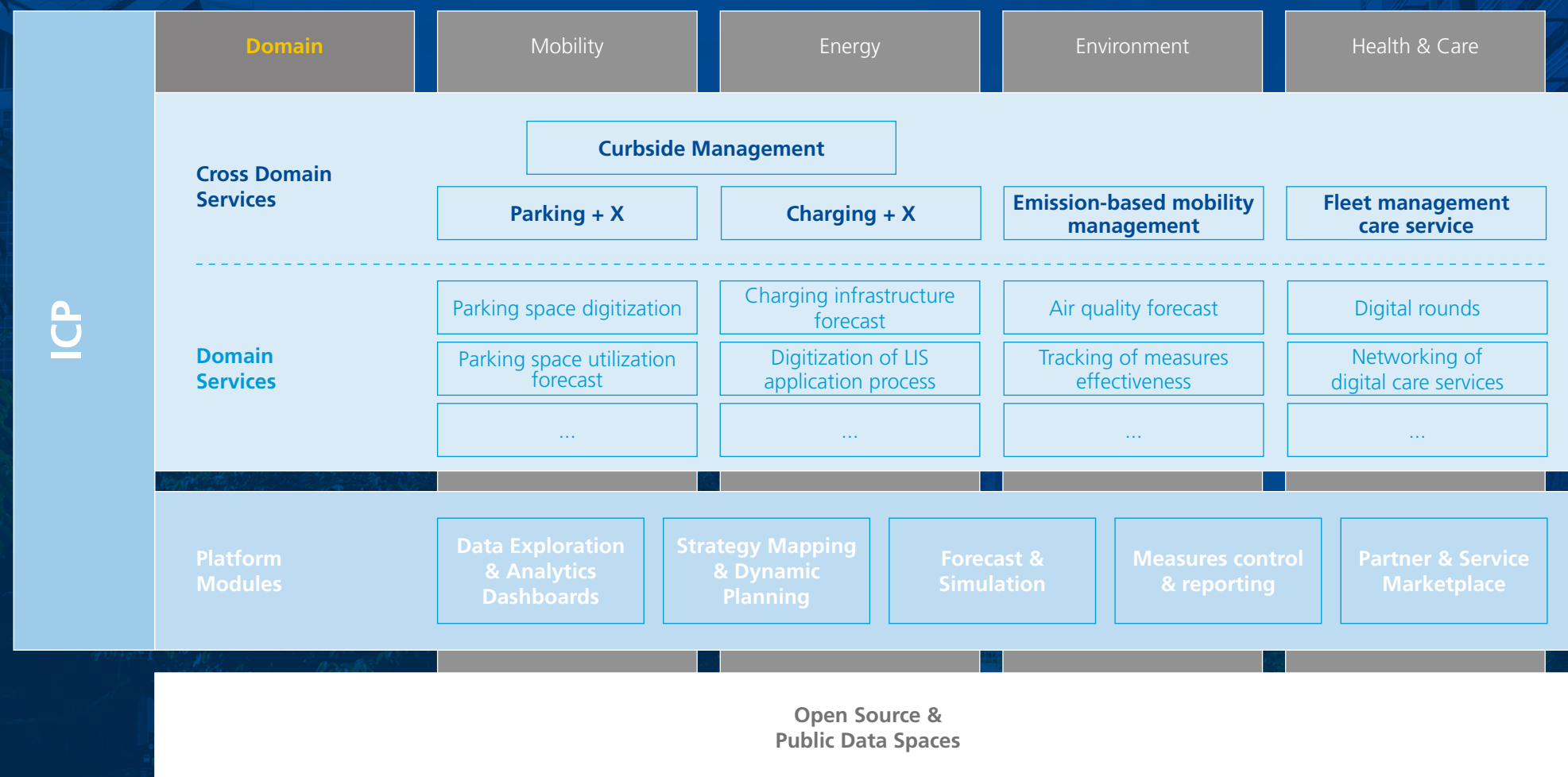
ICP cross-domain services include the following, for instance:

- Emissions-based mobility control (EMO) enables inner-city mobility to be managed using set air quality parameters. This involves deriving environmentally sensitive measures that lead to a reduction in traffic-related emissions (e.g. directing traffic to P+R with sustainable mobility services).
- Charging + X sees e-mobility be encouraged through the optimized use and needs-based design of charging infrastructure. Formerly unused charging time can be converted to add value, thanks to services at the charging point (e.g. parcel locker, last-mile mobility).
- Parking + X involves the parking available in a city being shaped to meet users' needs using services and mobility offerings (e.g. reserved parking spaces, parcel lockers, last-mile mobility). In so doing, intermodal mobility chains are reinforced and traffic levels within the city reduced.

The graphic illustrates how the modular ICP system is constructed. The services make use of the underlying platform modules as required for the service in question.

ICP platform modules, domain services & use cases

The diagram schematically shows the modular relationship between platform functions and the domain services and use cases that build on them.



ICP as a marketplace of partners and services



Smart city solutions are highly complex. To make this complexity manageable, ICP links the city to strong partners via a shared ecosystem: the marketplace of partners and services.

In this marketplace, regional and global companies offer smart city technologies that can be applied directly. These technologies can support cities with managing the challenges facing them and assist companies with identifying business opportunities for new solutions and putting them into practice on the basis of sustainable business models.

Subsequently, the marketplace of partners and services supports cities in attaining their strategic objectives and accelerates the time to market.

As a result, the smart city services described in the previous section could be provided by MHP or by partners; the city is free to select whichever partners it desires.

Added value for cities:

- ICP uses a horizontal approach to connect vertical isolated solutions and form seamless city services.
- ICP offers access to a partner and service marketplace where directly applicable smart city technologies and services are made available by regional and global companies.
- To augment the cloud-based city services, ICP provides a platform with tools and services for further independent, supplementary development.

Alongside this, ICP offers:

- An open, neutral, cloud-based platform
- Monitoring and reporting in real time
- The ability to measure the impact of sustainability measures
- Access to the ICP network and best-practice measures

Added value for companies as an ICP B2B partner:

- Access to the city's service ecosystem so it can build on this foundation to create new, scalable business models
- The opportunity to use real-time data from ICP and connect it intelligently
- The acquisition of new customers by participating in the ICP marketplace
- Additional potential by scaling the ICP platform internationally
- Increased reach for addressing customers via the ICP platform

ICP services – general approach to developing use cases

ICP pursues a top-down approach when developing use cases. Initially, the main questions are which climate and sustainability goals are being pursued regionally in a city and which provisions city actors are bound by on the federal, state and EU level. Based on these local city goals and requirements, a data and service audit is used to determine which services and data sources are already available to support these plans and which are still required. From this audit, ICP ultimately draws up use cases and identifies partners necessary for contributing to regional climate action and sustainability goals.

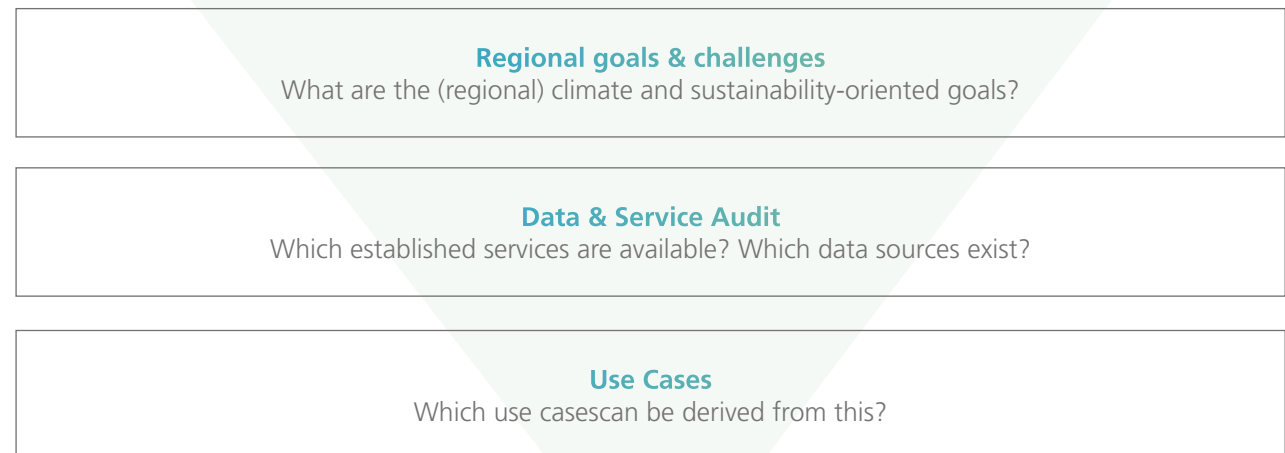
For an initial stocktake of “smart city readiness”, MHP also offers the four-stage “smart city check” (SCC). This consists of four phases:

- 1. Initial conversation and survey**
- 2. Establishing the status quo**
- 3. SCC day workshop kick-off**
- 4. Digital city roadmap/milestone planning**

The SCC survey serves to generate a data-based diagnosis of a city’s digital preparedness and obtain insights into existing smart city services, measures and initiatives for the introduction of innovative digital services. The focus is on four question blocks on city ini-

tiatives and goals, organization and collaboration in a city, data collection and processing and existing smart city solutions. The SCC can therefore be understood as the initial kick-off to prepare cities for the introduction of digital smart services, such as ICP.

Our framework is based on a top-down approach



Summary/ conclusion



ICP not only provides an open, neutral, cloud-based platform and data. It also supplies tools and services that help the stakeholders involved activate and draw on a city's potential. All with one aim: achieving climate action and sustainability targets and making the city livable in a sustainable way for generations to come.

Accordingly, ICP not only constitutes the foundation for the collaborative development of services between cities and businesses, but also provides a tool for city employees that allows them to play out specific measures in their city and assess their efficacy directly.

With the ICP platform, we are pursuing a vision: we want to make our living spaces future-proof by offering added social, economic and environmental value for all stakeholders within a city society. To do this, we offer an open and neutral platform that allows cities and companies to enter into partnerships to provide innovative, sustainable and attractive services for citizens.

The ICP platform

- Creates, as an #incubator, the digital framework conditions for scalable further development of business cases between the city and its B2B partners.
- Connects data silos within the city and beyond.
- Offers access to a marketplace where directly applicable smart city technologies are offered by regional and global companies in order to support cities with combatting the challenges facing them.
- Uses agnostic architecture to enable neutral, low-threshold #multistakeholder cooperation.
- Is characterized by outstanding #neutrality and #openness in data connectivity.
- Clears the way for #cross-sectoral, scalable business models.
- Contributes to regional climate action and sustainability goals #SDGs with its KPI-based measures.

MHP can draw on extensive experience from comparable projects in the municipal realm – from designing innovative digital business models to implementing suitable digital services.

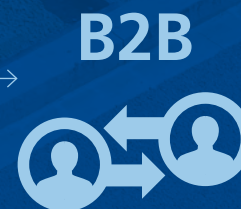
An interdisciplinary team of urban planners, platform specialists and mobility and IT experts assists our customers, providing specialist and methodological support so they can successfully design the city of the future. In so doing, we use tried-and-trusted methods that align with the challenges at hand, such as technology roadmapping or design thinking. In turn, this enables us to develop seamless, user-centered city services with real added value – for the city, for citizens and to boost the regional economy.

Value proposition MHP



- Value added services
- Easy accessible & usable service
- Data protection & privacy
- Benefit for sustainable behavior

- Profitable & scalable services
- Smooth city operations
- Management of public space
- Laws & Regulations
- Precise innovation management
- Data ownership & sharing



B2A



- Budgetary constraints
- Sustainability & Climate protection
- Regulations & Laws
- Data governance
- Artificial Intelligence & Data Management

Contact

Publisher

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Our consulting approach is unique, combining holistic IT and tech knowledge with deep expertise in management. This makes MHP the ideal partner for a successful digital transformation. As digitalization experts, we deliver innovative strategies on the basis of strong analysis. These turn your change processes into sustained success.

Over 3,000 employees are driving digital progress in 19 locations worldwide, for over 300 clients. We display excellence at every level.

ENABLING YOU TO SHAPE A BETTER TOMORROW

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An aerial photograph of a dark asphalt road that winds through a lush, dense green forest. The road has white dashed lines and curves in an S-shape. Two cars are visible: a dark-colored car in the upper curve and a red car in the lower curve. A semi-transparent teal banner with a white diagonal stripe is positioned in the center of the image, containing the main text.

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