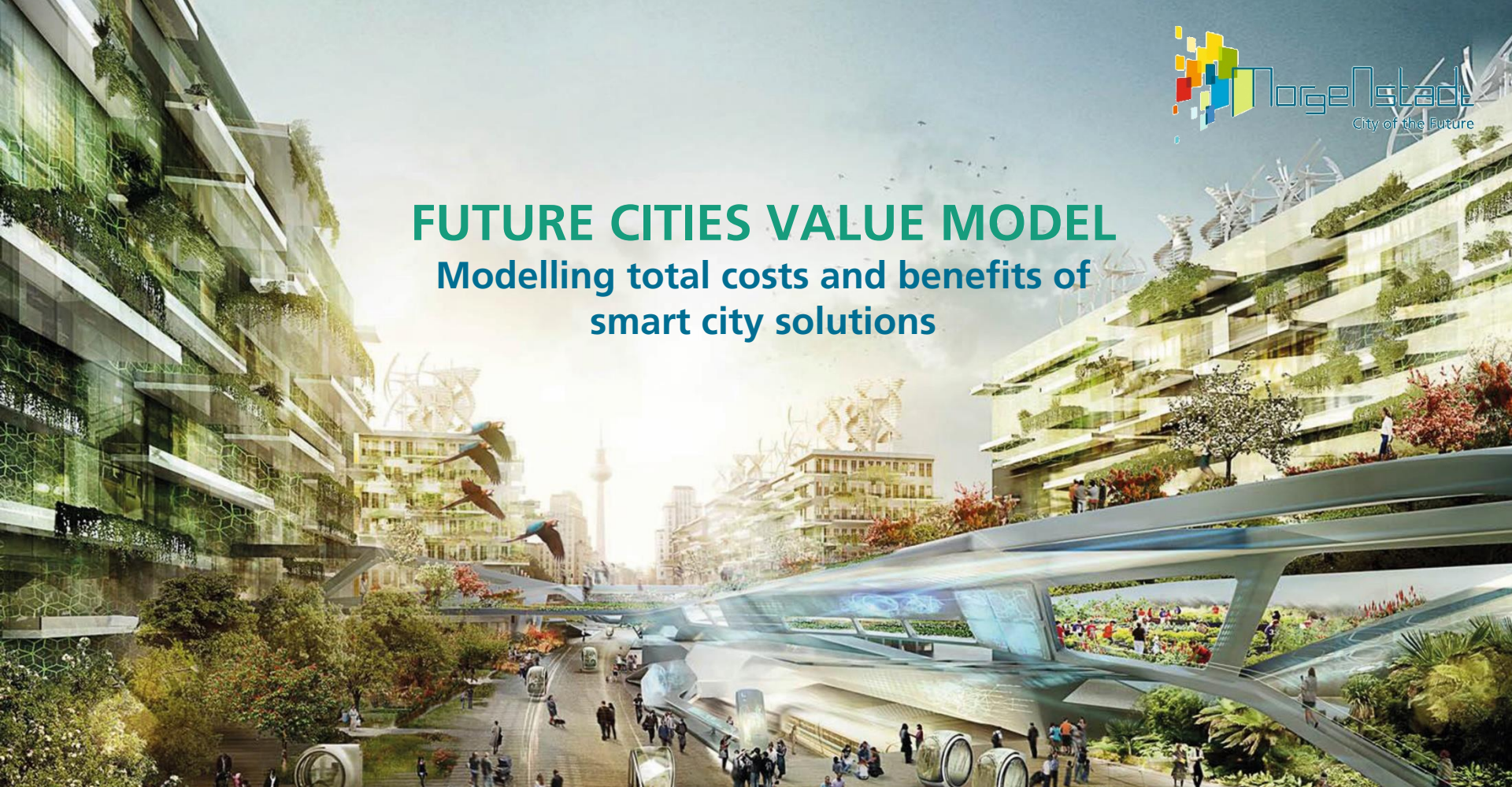# FUTURE CITIES VALUE MODEL
Modelling total costs and benefits of smart city solutions

DEALING WITH URBAN COMPLEXITY

THE SMART CITY MARKET – A BEAST TO TAME!

An increasing amount of clean and connected solutions are available to shape the **smart city market** – a market that is targeted at making cities more efficient, sustainable and livable.

Yet, companies struggle to put **sound business models and financing schemes** behind these solutions. This is one of the main factors, why the smart city market remains in limbo.

The reason for this lies within the complexity of cities. Smart solutions create both, **public value and private returns on invest**. The specific distribution of these depends on a variety of context-specific factors:

- e.g. How many people stop using their car in Munich as opposed to Milan when introducing a bike sharing scheme?

- How much solar potential is there in London as opposed to Zagreb – and how do energy consumption rates relate to this?

- How much people benefit from a better distribution of water in the city, and would they pay for it, or would return of investment be intangible? etc.

In light of an unclear return on invest, investments usually do not happen – and the smart city market remains where it is.

McKinsey&Company   **Source:** McKinsey Global Institute analysis

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IN FOCUS: THE WIDER IMPACT OF SMART SOLUTIONS

UNDERSTANDING THE IMPACT OF URBAN SOLUTIONS

By failing to **understand the larger urban value** that can be created through technologies, datasets and urban solutions, companies lack crucial information to design adequate pricing and marketing models for their offers.

As a consequence, these companies cannot develop fully informed new business models that ought to reflect the full potential of urban data for optimal exploitation.

THE GOAL: COST BENEFIT MODELS FOR URBAN SOLUTIONS

The Fraunhofer Morgenstadt research aims to solve this problem!

Together with industry partners we strive to measure the social, economic and environmental value of a defined set of smart city solutions within it's urban context.

Through applying systems dynamics modelling to smart city solutions we aim to create **cost-benefit analysis instruments for urban solutions,** enabling companies and cities to calculate the greater RoI from Smart Solutions in any given city.

Urban Data Platform

Bike sharing

Energy Planning

Air quality

Mobility as a Service

Citizen Safety

Citizen feedback

Digital planning

PRODUCTS & DATA AS PART OF AN URBAN ECOSYSTEM

UNDERSTANDING HOW OWN PRODUCTS RELATE TO CITY NEEDS

In a city, sustainable and connected products & services create value on two levels:

a) **Direct returns on invest** through the impact they generate for a customer

b) **Indirect returns on invest** through the impact they generate in connection with other products, services, infrastructure and data.
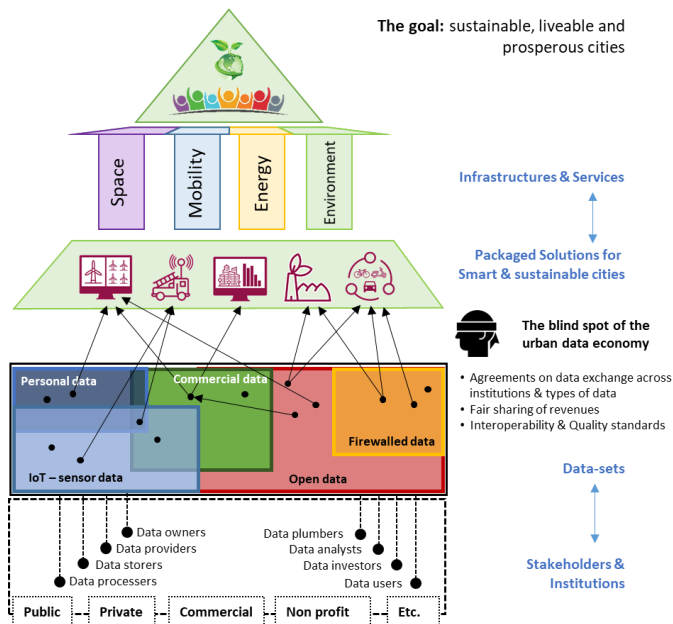
A shared e-scooter – for instance – creates direct revenue for the sharing-service provider, but it also frees up space in the city, helps maintain clean air, reduces congestion and saves time.

Quantifying these indirect returns helps not only make a strong argument for the solution, it also helps to **turn beneficiaries into investors**.

PACKAGING OF SOLUTIONS TO MEET CITY'S DEMANDS

To quantify direct and indirect benefits of urban solutions, packaging is needed. Through "packaging", individual products and services are contextualized as part of an urban solution referring to (i) societal needs they meet(ii) technical solutions (iii) business model and financing options – and (iv) the structured context for a city

A growing compilation of "packaged solutions" for smart cities can be found here.

The goal: sustainable, liveable and prosperous cities

Space | Mobility | Energy | Environment

Infrastructures & Services

Packaged Solutions for Smart & sustainable cities

The blind spot of the urban data economy
- Agreements on data exchange across institutions & types of data
- Fair sharing of revenues
- Interoperability & Quality standards

Personal data | Commercial data | Firewalled data
IoT – sensor data | Open data

Data-sets

Data owners | Data plumbers
Data providers | Data analysts
Data storers | Data investors
Data processers | Data users

Stakeholders & Institutions

Public | Private | Commercial | Non profit | Etc.

THE GOAL: Value-Cases for urban solutions

Urban Data Platform

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From Value Case to CBA

1 Definition of Solutions under joint scope of analysis

2 Functions, technologies and requirements for local roll-out.

3 Systems dynamics model for each solution incl. factor matrix.

4 Reality check through data-analysis of selected corresponding use-cases.

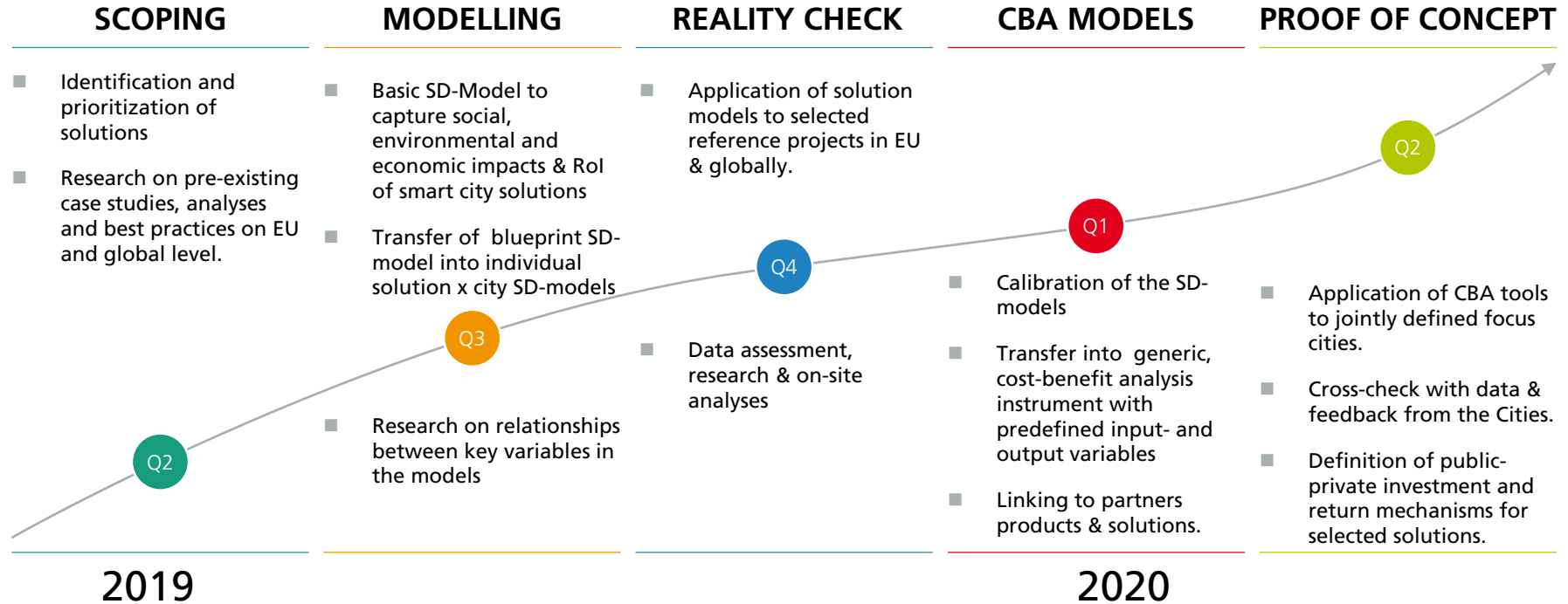5 Revenue sharing models between public and private stakeholders

THE FRAME – Innovation Network Morgenstadt

THE INNOVATION PARTNERSHIP

- The „Future Cities Value Model" becomes a dedicated research cluster within the existing Fraunhofer Innovation Network „Morgenstadt"

- A separate research programme, separate meetings and in-person workshops & roundtables link the „Value Model" members.

- The network is managed by Fraunhofer. The content of the analysis (definition of solutions under scope) etc. is jointly defined.

- Research and development of Smart City CBAs is done by Fraunhofer experts and provided exclusively to cluster members.

- Costs: 50.000 EUR per company & year

ACTIVITIES

SCOPING	MODELLING	REALITY CHECK	CBA MODELS	PROOF OF CONCEPT

SCOPING

- Identification and prioritization of solutions
- Research on pre-existing case studies, analyses and best practices on EU and global level.

MODELLING

- Basic SD-Model to capture social, environmental and economic impacts & RoI of smart city solutions
- Transfer of blueprint SD-model into individual solution x city SD-models
- Research on relationships between key variables in the models

REALITY CHECK

- Application of solution models to selected reference projects in EU & globally.
- Data assessment, research & on-site analyses

CBA MODELS

- Calibration of the SD-models
- Transfer into generic, cost-benefit analysis instrument with predefined input- and output variables
- Linking to partners products & solutions.

PROOF OF CONCEPT

- Application of CBA tools to jointly defined focus cities.
- Cross-check with data & feedback from the Cities.
- Definition of public-private investment and return mechanisms for selected solutions.

Q2   Q3   Q4   Q1   Q2

2019   **2020**

EXPECTED RESULTS

- Context-responsive cost-benefit analysis instruments for Smart City solutions: tools that help asses under which circumstances an investment into a smart city solution will generate which amount of social, environmental and economic return on invest in a given city.

- Public-private investment and revenue-sharing models linked to smart city solutions under scope.

- Blueprints and contract models for financing and delivering a smart city solution to a given city.
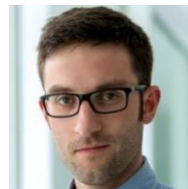
Be ahead of the market!

http://www.morgenstadt.de

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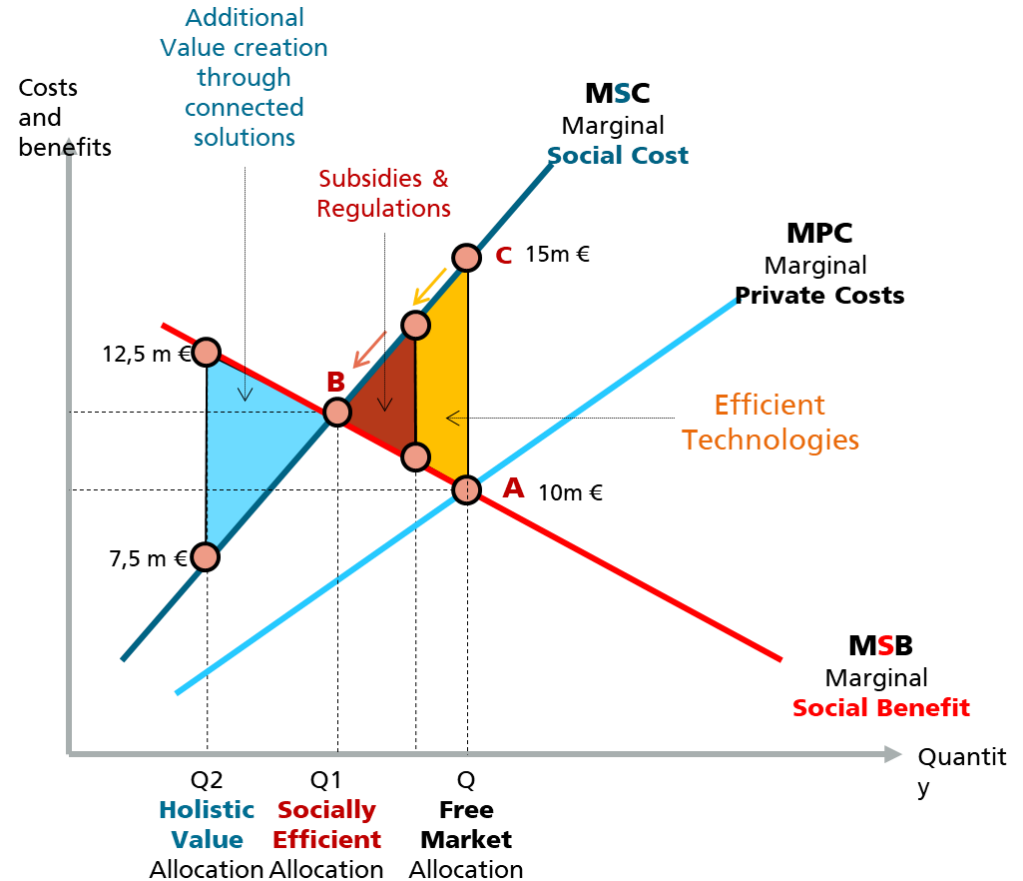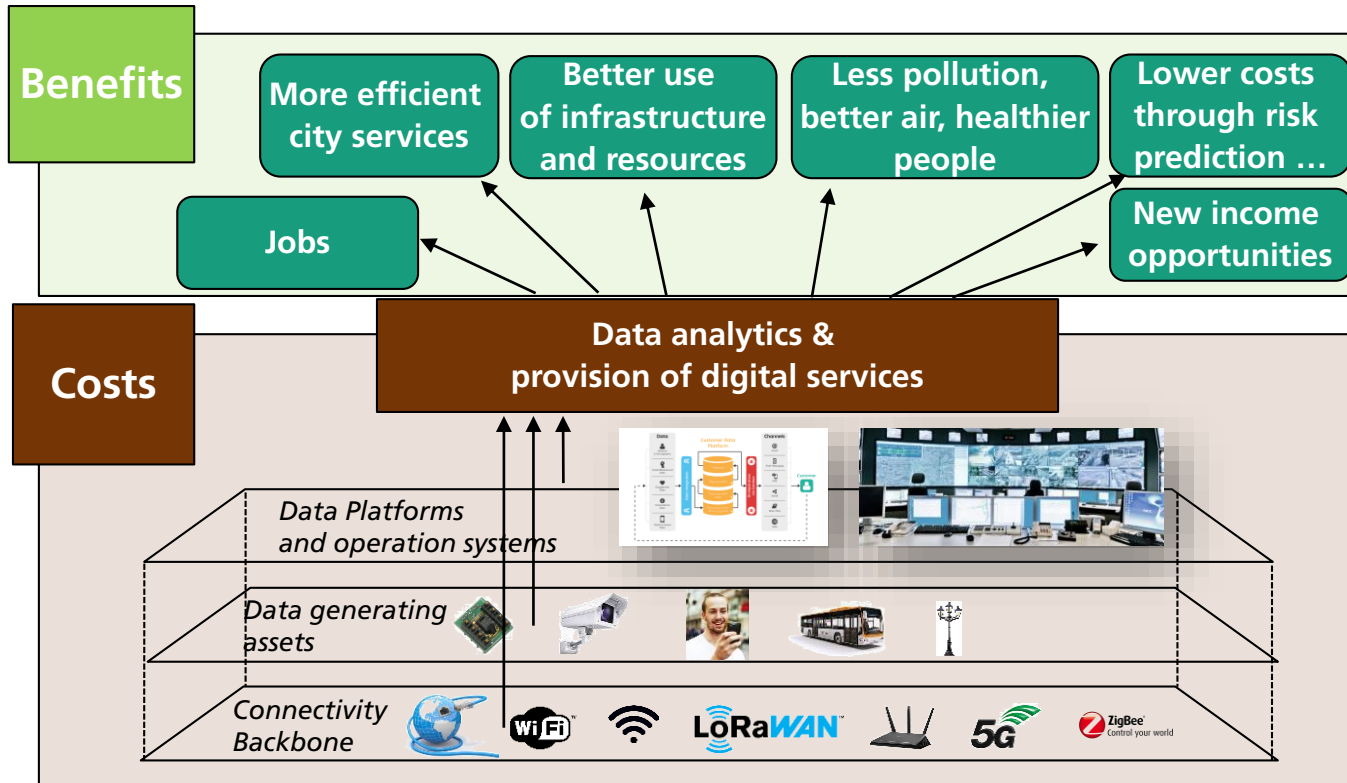Petr.suska@iao.fraunhofer.de

BACKGROUND

Radecki, Alanus von (2017)
„Holistic value model for smart cities"

Smart Economy in Smart Cities:
Springer, 2017
ISBN: 978-981-10-1608-0

https://www.researchgate.net/publication/306925478_Holistic_Value_Model_for_Smart_Cities

CUMULATIVE DATA VALUE FRAMEWORK

Benefits

- More efficient city services
- Better use of infrastructure and resources
- Less pollution, better air, healthier people
- Lower costs through risk prediction …
- Jobs
- New income opportunities

Costs

Data analytics & provision of digital services

Data Platforms and operation systems

Data generating assets

Connectivity Backbone

Social, environmental and economic returns on investment over time.

Zero marginal costs for automated digital services.

Medium to low fixed and variable costs for operation & maintenance

High costs for upfront investments in infrastructure.

Value model for data-driven use cases

Smart city infrastructure & governance

Data -sets

Smart City use case

Primary Costs

Generation & provision of data (e.g. through sensors)

Hidden costs

Connectivity, broadband, data platforms, data policies, municipal data team, server parks, research & development.

Secondary Costs

Refinement, aggregation, protection, management & analysis of data

Added value for city

Social impacts

Economic impacts

Environ mental impacts

Benefits

Value expressed in monetary units derived through all types of impacts from a single use case. Impacts can be positive or negative.

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