



FRAUNHOFER GESELLSCHAFT

# MORGENSTADT: CITY INSIGHTS CITY LAB REPORT PRAGUE

August 2015





# CITY LAB REPORT PRAGUE

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## List of Abbreviations

BRITA in PuBs	Bringing Retrofit Innovation to Application in Public Buildings
CEMR	Council of European Municipalities and Regions
CCTV	Closed-circuit television <sup>1</sup>
CEEP	Central Europe Energy Partners
CHP	Combined heat and power <sup>2</sup>
CVUT	Czech Technical University in Prague
CWWTP	Central Wastewater Treatment Plant
DPP	Dopravní podnik hlavního města Prahy (Prague Transportation Company)
EFSI	European Fund for Strategic Investments
EMTA	European Metropolitan Transport Authorities
ICT	Information and communication technology
IPR	Institut plánování a rozvoje hl. m. Prahy (Prague Institute of Planning and Development)
NGO	Non-governmental organization
NIMBY	Not in my back yard <sup>3</sup>
PVK	Pražské vodovody a kanalizace a.s (Prague Water Mains and Sewerage Systems Co.)

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<sup>1</sup> CCTV is also known as video surveillance.

<sup>2</sup> CHP means usage of a power station for power production and heating purposes at the same time.

<sup>3</sup> NIMBY: a person who does not want something unpleasant to be built or done near where they live.

PVS	Pražská vodohospodářská společnost a.s. (Prague water supply and sewage company)
R&D	Research and Development
SMEs	Small and Medium-sized Enterprises
SWiM	Smart Water integrated Management
TAČR	Technology Agency of the Czech Republic
VZLÚ	Výzkumný a zkušební letecký ústav a.s.
UCEEB	University Centre for Energy Efficient Buildings of Technical University in Prague
UNISDR	United Nations International Strategy for Disaster Reduction
ZUR	Zasady uzemního rozvoje

# Prague City Profile



## 1.1 Demand for action in Prague

The City of Prague applied to the »Morgenstadt City Challenge« in June 2014 with an impressive show of strength. Prague has come a long way since the decline of the communist regime in 1990. Today Prague is a prosperous city in the centre of one of the largest metropolitan regions in Central Europe.

*“Nearly a quarter of the country's GDP is produced here, the unemployment rate is low, and wages are relatively high. These are features typical of developed capital cities along with orientation toward the tertiary and quaternary sectors, heterogeneity of industry and a multicultural business environment. [...] Administrative, business and banking services are concentrated in Prague. Education, consultancy, media, the film industry, real estate, transport and construction are of great significance as well. With millions of visitors enjoying the delights of the capital each year, the tourism industry is highly advanced.”<sup>4</sup>*

Despite its obvious economic strength, Prague faces many challenges in the ever more globalized environment. Just like any other European metropolis, Prague has to tackle such issues as traffic congestion, air pollution, high energy consumption, population ageing, etc. In 2014, the City of Prague applied for the »Morgenstadt City Challenge« in order to follow the European sustainable development trend and link local innovation, value creation and sustainability in a stakeholder-centred approach. The city was selected by the Morgenstadt network partners as the first city to undergo the Morgenstadt City Lab. The project management from the German side has been performed by Fraunhofer IAO. The Morgenstadt City Lab Prague was carried out by the city team between May 2015 and March 2016.

The purpose of the Morgenstadt City Lab Prague was to identify the strengths and weaknesses of the city across several sectors and action fields for a sustainable and future-oriented development. It was also intended to identify main future opportunities and current barriers that need to be overcome and to show possible trajectories for a sustainable development of Prague.

This report contains the summary of the analyses of indicators, action fields and impact factors that have been collected throughout the assessment process since April 2015. It is structured into two main parts:

**Part 1** develops and discusses the city profile of Prague.

**Part 2** shows a series of potential measures for a future development of the city and integrates them into a roadmap.

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<sup>4</sup> CzechInvest (n.d.)

## 1.2 City Lab Process

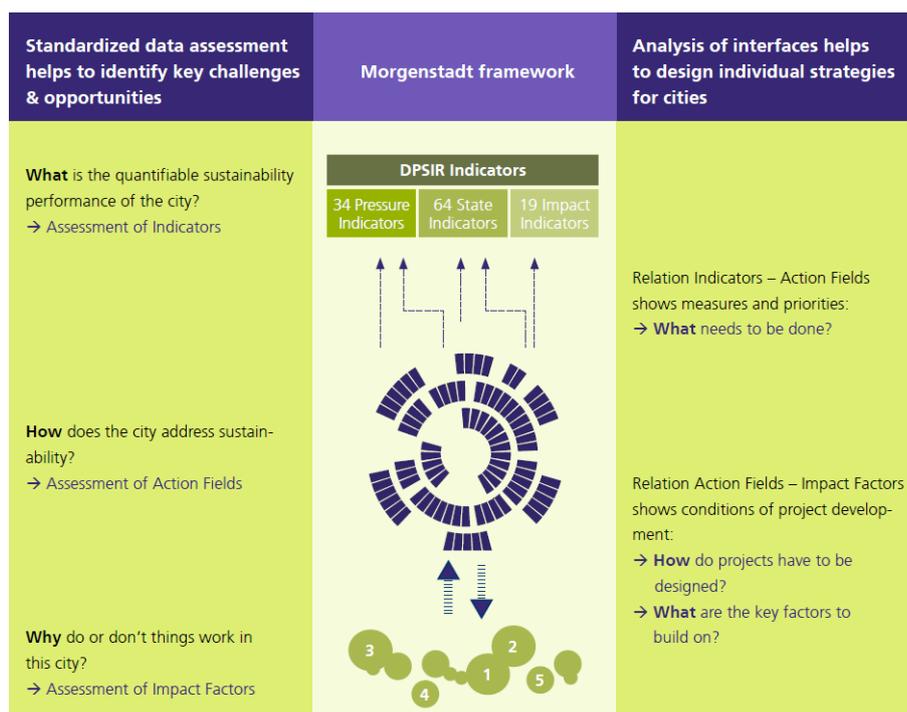
The in-depth analysis of Prague was carried out based on the Morgenstadt assessment framework for sustainable urban development, which is a multidisciplinary methodology for analyzing complex urban systems and transferring this knowledge into integrated concepts and innovative solutions for future cities (Fraunhofer IAO, 2013). The Model was developed in the course of Phase I „m:ci“ and is based on the deep-dive analyses of Freiburg, Berlin, Copenhagen, Singapore, New York City and Tokyo.

In order to achieve an in-depth understanding of the sustainability performance of cities both qualitatively and quantitatively, the Morgenstadt Model is structured into three levels of analysis:

1. performance indicators (quantitative analysis);
2. key action fields (qualitative analysis);
3. impact factors (qualitative analysis).

The first two levels of analysis, namely performance indicators and action fields are generic, meaning that they are to be applied with no variations to the sustainability performance assessment of every city partaking in the City Lab project. The third level of analysis – impact factors – is aimed at identifying drivers and barriers that are specific to each city and conditioned by its unique historic, cultural, economic, climatic, morphological, etc. characteristics. In this way, impact factors replenish the generic model and adjust it to the unique needs of each city thus providing for an objective performance profile and at the same time laying out the basis for an individual sustainability roadmap.

In this way, the combination of quantitative and qualitative means of analysis ensures the generation of an objective performance profile of Prague. At the same time, Prague's individual characteristics are essential for the design of customized development strategy.



## Indicators

In 2012, at the start of Phase I „m:ci“, over 300 indicators measuring the social, environmental and economic dimensions of the city were defined for assessing the quantifiable sustainability performance of the six selected cities. Upon the completion of the analyses, an evaluation of the relevance of indicators and of the data availability was carried and revealed the limited applicability of the majority of the 300 indicators due to the lack of statistical data. Consequently, the indicator framework was reduced to include only 123 indicators. This indicator set represents the first step of analysis and delivers a comprehensive quantified evaluation of the city's sustainability performance. Based on the modified version of the Driver-Pressures-State-Impact-Response (DPSIR) Framework<sup>5</sup>, the performance indicators were subdivided into three categories:

- 34 *pressure indicators* indicating the pressures in the city system from each of the 8 urban sectors;
- 64 *state indicators* describing the current state of the city in environmental, economical, technological and societal terms;
- 19 *impact indicators* identifying the impact that the urban activities cause on society, environment, economy and state of resilience.

The indicators were acquired from the city's statistical reports. Upon the completion of the data collection process; every indicator is compared against the corresponding indicator benchmarks. Indicator benchmarks values come

<sup>5</sup> "DPSIR Framework is a causal framework for describing the interactions between society and the environment, adopted by the EAA, where is it used as an integrated approach for reporting" ( Kristensen (2004, p. 1))

from Cercle Indicateurs, ESCI as well as being derived from the findings made in the course of mci: Phase I.

### Action Fields

On the basis of the indicators, an action-oriented second level of the Morgenstadt Model was developed.

In the course of the m:ci Phase I, the Fraunhofer expert teams identified the so-called action fields essential for the sustainable development of each of the six forerunner cities. The aim of the action fields' level is to assess how the cities act to address current sustainability challenges. By means of comparison and aggregation of the results delivered by each of the six City Teams, by best judgement of the expert team, a generic action-response framework for sustainable urban development comprising 86 action fields was designed.

The second level of the Morgenstadt Model analyzes sixteen essential aspects of urban life, each of them being operationalized by means of three to twelve action fields. The aspects are subdivided into three categories: urban leadership, levers, and points of action:

1. Urban Leadership: Strategy & Planning, Organization & Structure;
2. Levers: Regulations, Information & Education, Urban Planning, Image & Brand, Research & Development Tactics, Business Tactics, Incentives;
3. Points of Action: Energy, Transport & Mobility, Buildings, Information and Communication Technology (ICT), Urban Water Infrastructure, Urban Resilience.

The data evaluation at the action field level is guided by the following pattern. Every action field is operationalized via 3 – 5 questions, which in sum are worth 10 points when answered affirmatively. This way, depending on the number of questions within every action field and their significance for the corresponding action field, 10 points are distributed in such a way that each question is worth of 2 – 4 points in case of an affirmative answer. Therefore, with all the questions answered affirmatively, an action field receives 10 points out of 10. The result is an individual action and response profile of the city represented illustratively in the form of a rose diagram **Fehler! Verweisquelle konnte nicht gefunden werden.** The answers to the questions are to be delivered based on the analysis of the relevant documents such as city development plans, maps of the urban infrastructure, crisis management plan, flood protection plan, land use plan, nature and climate protection plans, etc. and the corresponding legal documents.

### Impact Factors

The third level of analysis within the Morgenstadt Model is represented by systemic impact factors that are conditioned by external pressures, sociocultural

dynamics, geographic and historic conditions, etc. Being unique in every city, the impact factors represent *the individual DNA of a city and they cannot be brought into a standard model that would be applicable to any city* and enhance the experts' understanding of why some cities progress on the way to sustainability whereas others do not.

In contrast to indicators and action fields, impact factors are no generic means of urban sustainability performance evaluation. For this reason, primary data collection methods such as expert interviews, expert workshops and participatory observation followed by structured self-reflection and group discussion activities are needed. Throughout the day, every research team member is expected to critically reflect upon the input they receive from the interviews and site visits, identify the impact factors relevant for their areas of research as well as the possible interconnections between them. At the end of the day, all team members present the results of their interviews and site visits during a two-hour-long structured group discussion where hypotheses about the linkages between the information generated at different levels of analysis and in different thematic sectors are made and mind maps are drawn to capture those linkages. These hypotheses are then tested in the course of two expert workshops and the ones which cannot be verified are rejected. The result is a list of impact factors containing 150-170 units out of which the so-called „super impact factors“, namely impact factors that influence the functioning of several sectors of urban life or, alternatively, have a decisive influence on the one whole sector, are extracted in the course of a group discussion. This step is essential in order to reduce the long list of impact factors to a manageable number of 30 to 45 units.

The role of the impact factors in the city development can only be derived via their cross-examination. For this purpose, the super impact factors are cross-tabulated and the effect of every one of them upon any other is evaluated by each of the Fraunhofer team members as well as by several local experts from the partaking city. In order to avoid the „group think“ effect<sup>6</sup>, each expert is expected to work independently. This examination requires that only direct impacts that are not mediated through other impact factors are taken into consideration. The mean result of all the experts' work is to be presented in the form of a cross-impact matrix. Subsequently, the passive sum and active sum of each element is aggregated, which define the role of each impact factor within the system of which there are four:

- Active factors, also known as **drivers**, exert the greatest influence on the other factors while being least influenced by them. These are the

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<sup>6</sup> „Groupthink is the process in which bad decisions are made by a group because its members do not want to express opinions, suggest new ideas, etc. that others may disagree with“ (Cambridge Dictionaries Online (n.d.))

elements with the highest active sum and the lowest passive sum. Drivers are key impact factors in driving a development or change process as they have a high influence on other elements within the system and help bring ideas and initiatives forward.

- Critical factors, also known as **levers**, exert the greatest impact on the other factors and are at the same time most greatly influenced by many other factors. These are the elements with the highest active and passive sums. Levers are essential starting points for leveraging change within a system and amplifying the impetus given by drivers.
- Passive factors also known as **indicators**, have little influence on other factors but are subject to their impact. These are the elements with the lowest active sum and the highest passive sum. They cannot be a starting point for change but can serve as indicators of change.
- Buffer factors, also known as **buffers**, have least impact on the others, and are also least influenced by them. These are the elements with the lowest active and passive sums. It is not possible to change the system by exerting influence on the buffers but they can serve as a stabilizing element within a system.

By indicating the well- and malfunctioning structures and projects within the city, impact factors indicate the demand for action and thus represent a bridging element between the sustainability performance analysis and the roadmap design.

The in-depth analysis further consisted of 57 interviews with the stakeholders from the City Hall, institutions closely related to the city (subsidiary organisations) such as TSK, PVK, PVS, universities and also local businesses. These interviews focused on identifying current strengths, challenges and development opportunities of the city. They helped to create an analysis of systemic impact factors that help understand external pressures, underlying forces, dynamics, socio-cultural and historic implications that are present within a city and impact (often unnoticed) on decisions, structures, strategies and measures taken on the city level and on the project level.

The integration of members of the City Hall and of the Prague Institute of Planning and Development (IPR) into the entire assessment and project development process was essential to ensure capacity building of the local counterpart team. As a result, knowledge and expertise with regards to the methodology, the technologies and the process were shared in order to enable a strong sense of local ownership and a strong uptake of projects after the roadmap has been delivered to the city. Moreover, the project was expected to serve as a momentum for creating partnerships and initiating individual projects.

## City Team Prague

Prague City Profile

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Alanus von Radecki – Fraunhofer IAO      Ivana Radova - IPR

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Nora Fanderl – Fraunhofer IAO      Adam Pajgrt – IPR

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Maike Buttler – Fraunhofer IBP      Klara Novakova – City Hall Prague

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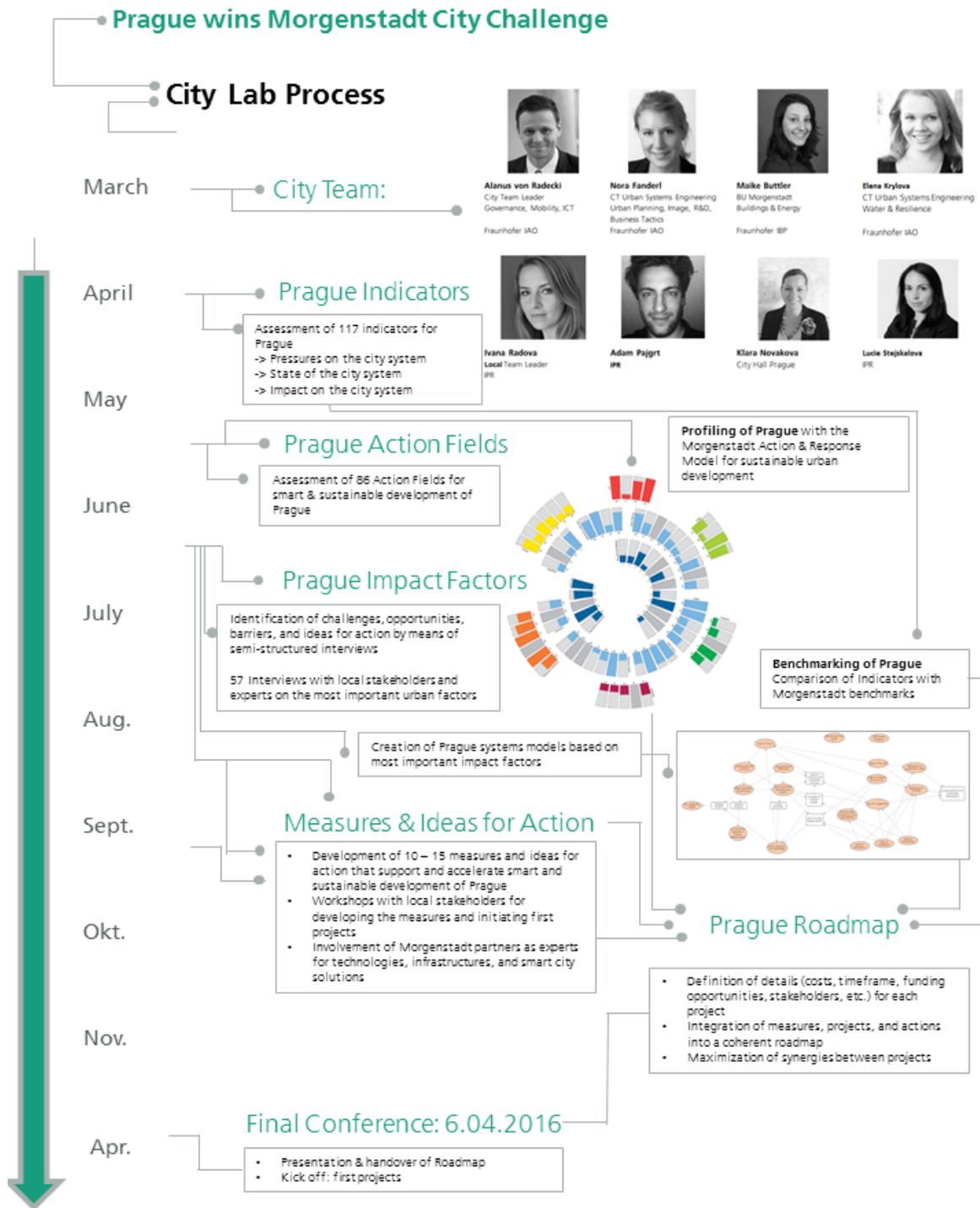
Elena Krylova – Fraunhofer IAO      Petr Suska - IPR

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## Timeline

- Kick off City Lab      March 2015
- Data assessment      April – June 2015
- On-site assessment      June 8 – 19, 2015
- Innovation Workshop      September 24, 2015
- Final Conference      April 6, 2016

Please find a full list of interviews conducted in Prague in the annex of this document.



## 1.3 Overview of current State of the City

Prague is the capital and largest city of the Czech Republic. It is a city with an over 1,100-year history, a political, cultural, and economic centre of the country with its historical Old Town making part of the UNESCO World Heritage List since 1992<sup>7</sup>.

### 1.3.1 Population Numbers and City Structure

According to the Act of the Czech National Council on the Capital City of Prague, the city is a statutory town, as well as one of 14 regions of the Czech Republic. The administration (central city level) is represented by three bodies: Prague City Assembly, Prague City Council and Prague City Hall<sup>8</sup>. The territory of Prague spans 496 km<sup>2</sup> and since 2001 it is divided into 57 municipal districts (boroughs with elected bodies, autonomous local government power and local administration). 22 of these districts have specific administrative responsibilities in delegated power of national government. Roles and competence of municipal districts are defined by municipal decree (statute). 57 autonomous municipal districts with their own elected bodies<sup>9</sup> are grouped into 22 administrative districts for the purposes of providing national administration services<sup>10</sup>. The municipal districts are very heterogeneous in terms of population numbers, density, living standards and infrastructure quality: for instance, some of the districts account for less than 2,000 inhabitants while others have over 100,000 inhabitants<sup>11</sup>.

Prague is currently home to 1.243.201 people which accounts to approximately 12 % of the total national population<sup>12</sup>. Before 1992, Prague's population was on a rise and afterwards it has been slightly fluctuating with years of population growth followed by years of population decrease. According to the data delivered by the Czech Statistical Office, Prague is the region most affected by the issue of population ageing nationwide<sup>13</sup>.

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<sup>7</sup> Prague City Development Authority (2008)

<sup>8</sup> Czech Statistical Office (2014b)

<sup>9</sup> (Act No. 131/2000, 2000)

<sup>10</sup> (Statute of the Capital City of Prague No. 55/2000, 2000)

<sup>11</sup> Czech Statistical Office (2014b)

<sup>12</sup> Czech Statistical Office (2014b)

<sup>13</sup> Czech Statistical Office (2014b)



Figure 1: Administrative Districts of Prague<sup>14</sup>

### 1.3.2 Economy, Education and Social Welfare

Prague is the political, economic, financial, cultural and educational centre of the Czech Republic, seat of the national administration, national financial institutions and most headquarters of the foreign enterprises present in the country, the nation's biggest transportation hub. Prague is the most dynamic and the best-developed region nationwide, producing over 25 % of the national GDP. In 2013, Prague's GDP per capita was € 39.113 million which is almost the double of the national GDP per capita value<sup>15</sup>. Moreover, Prague demonstrates continuously improving living standards, relatively high social stability and a strong middle class. Unemployment rate in Prague is below average in the European Union: 5.14 % in 2013.<sup>16</sup>

Since the Czech Republic committed itself to the principles of the market economy in the early 1990s, Prague went from the industry-oriented to the service-oriented economy. Currently the key branches of economy present in Prague are printing and food processing, manufacturing of transport equipment, construction incl. housing construction and electrical engineering, finance and consulting, retail and trade, information and communication services, logistics and tourism, incl. conference tourism.

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<sup>14</sup> City of Prague (2013)

<sup>15</sup> Czech Statistical Office (2014b)

<sup>16</sup> Ibid.

Prague is the region with the highest concentration of high-school and university graduates and thus the best-qualified population in the Czech Republic. It owes this fact to the highest concentration of schools and universities nationally. For instance over 1/3 of all the university students in the Czech Republic are matriculated at Prague universities. Due to the high quality of education and its commitment to the Bologna system, Prague attracts a continuously growing number of students from abroad many of which remain in Prague to work and thus allow to keep the mean population age down and the economic burden index below the nation's average: 47,5 against 47,9<sup>17</sup>. This is also a result of the internal economic migration: there is a constant inflow of people in the productive age who seek employment opportunities in Prague whereas families with young children prefer to live in the suburbs of Prague.

As mentioned above, due to lucrative job prospects for well-educated people Prague has become an attraction point for qualified specialists from abroad. Among other social problems are a large income gaps between the most and the least affluent social groups, a lack of support for specific population groups (the elderly, the disabled, young single mothers, etc.) and a persisting high level of street crime and drug abuse.

### **Characteristic Aspects**

In the past years Prague has went a long way and entered the 21st century under strikingly different conditions than just a quarter century ago. Formerly the capital of the untied Czechoslovakia, Prague is now the capital of the independent Czech Republic. However the most important transition was the one from an isolated city behind the Iron Curtain to one of the most important urban centres in the united Europe: in 2004 the Czech Republic entered the European Union and thus has subscribed to the principles of partnership, democratic management, rule of law, market economy and environmental sustainability. Now Prague is one of the most significant and well-developed metropolises in the EU and its unique position in the geographical centre of the Union creates favourable conditions for its successful development.

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<sup>17</sup> Ibid.

## 1.4 City Profile

Prague City Profile

### Space, Planning & Mobility

- Urban sprawl has resulted in road congestion and air pollution
- A reduction in car traffic has not been achieved despite significant investments
- Prague has no soft mobility systems (P&R, B&R, car-sharing, mobility hubs)
- Use of private cars is still perceived as more attractive than public transportation
- Little collaboration between City of Prague's and Prague Region's transportation systems

### Governance

- Strategic development topics not on political agenda
- New partnership with private sector necessary
- Strong need for „Smart Governance“
- Need for integrated management approach
- Lack of clear vision for future-proof urban development
- Lack of coherent development strategy with measurable goals

### Energy System

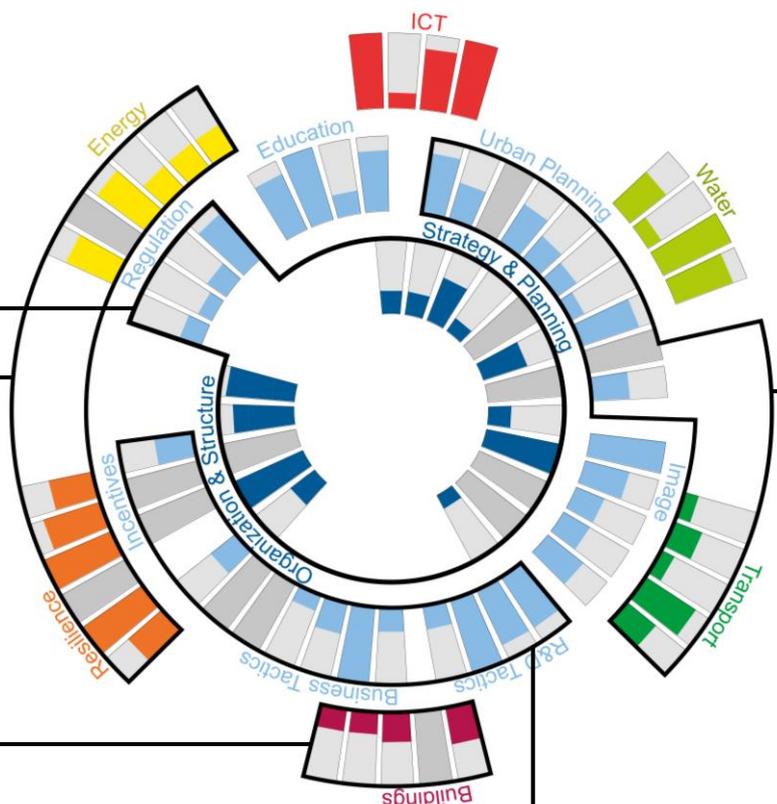
- High demand for energy and electricity
- Potential for renewable energy use is not well exploited
- Various barriers for the use of renewable energy sources
- Incentives for energy efficient industries are needed

### Buildings

- Lack of crucial information on energy performance of Prague's building stock
- Collection of data on energy performance requires political will as it is associated with high upfront and operational costs
- Modernization rate of the building stock is low
- Strong need for a new Building Code containing clear regulations

### Economy & Innovation

- Promising innovation landscape
- Entrepreneurship hindered by risk adverse conservative mentality
- Spatial distance to main technological hubs
- Lack of cooperation in R&D
- Businesses relocate away from Prague in search of tax reduction benefits and lower living costs
- Established tradition of excellent technical and mathematical education
- Potential to become an international a hub for IT, creativity and culture



## 1.4.1 Governance System & Civil Society

The current leadership and governance system of Prague is facing a range of challenges that need to be tackled in the coming years in order to transform the traditional city administration into a strategic and transparent management unit for the entire city.

**Table 1: Selected indicators of Governance Sector for Prague<sup>18</sup>**

Indicators for Prague		Benchmarks for European cities		
		Green	Yellow	Red
Debt service ratio (% of tax income spent on interest rates for public debts in the last four years)	2,62	< 10	10 - 20	> 20
City administrative expenditure (% of total expenditures)	10.17	< 10	10 - 20	> 20
City educational expenditure (%)	18	> 15	8 - 15	< 8
City social expenditure (%)	1.92	15-25	10-15 or 25-30	> 30 or < 10
Spending on public buildings (%)	0.69	< 3	3 - 6	> 6
Own-source revenue (% of total revenue)	86.73	> 95	80 - 95	< 80
Average annual unemployment rate (%)	5.14	< 7	7 - 12	> 12
Administrative structures for sustainability management of city	0	> 5	2 - 5	< 2
Degree of participation <sup>19</sup>	2	3	2 - 1	0
Existence and state of CO <sub>2</sub> -reduction goal	0	3	2-1	0
Existence and performance of sustainability management	0	3	2-1	0
Earmarked revenues for sustainability projects	0	3	2-1	0
Characteristic e-government	1	3	2-1	0

Prague has a strongly decentralized administrative system that allocates a range of important decisions to the **municipal district level**. Many decisions that are crucial for a smart and sustainable development of the city are being taken on the municipal district level: this entails also the *independent competences* of autonomous self-government (e.g. meeting the need for housing, the protection of public order, the provision of municipal services or the choice of the administrative software) and the *delegated competences* conveyed by

<sup>18</sup> The following color coding is applied: green =good, yellow=satisfactory, red=critical

<sup>19</sup> This and the following governance performance indicators refer to a scale of 0 (not-existent) to 3 (fully implemented)

sectoral legislation like register of inhabitants, social security, spatial planning etc.<sup>20</sup>

This strong exertion of the subsidiary principle bares strong potentials for a bottom-up development process together with the local civil society. It can be – and in some cases<sup>21</sup> it already is – a valuable system for a participatory approach to urban development, for strengthening the identification of Prague's inhabitants with their neighbourhoods and for enabling a variety of development trajectories with different focus and speed within one city. On the other hand, the subsidiary principle bears a set of risks and barriers for a strong and integrated development of the city, since the Prague City Hall needs to deal with 57 districts and their representatives when pushing for strategic decisions that need to be carried out by the entire city.

The Morgenstadt analysis focused only partly on this district-related decision-making system<sup>22</sup>, yet it is recommended to:

- a) Make better use of the existing local diversity for trial and error experimental development projects: progressive districts can be supported with innovation-driven projects and the introduction of smart city solutions, transforming them into inner-city frontrunners and showing the other districts the potential of innovation-based development.
- b) Seek to align the city districts behind a joint vision and joint goals that all of them will commit to.

Beyond the administrative structure of the district-related decision-making system, there are several challenges that the current governance system<sup>23</sup> faces, which can be tackled without restructuring the entire political system of Prague.

During the period 2010-2014, the city's leadership did not have enough time to develop and implement a strategic approach towards an integrated and cross-sectoral management of the city development. Since November 2014 the new Mayor, Mrs Krnacova, and the new city council have been in place. They now have the possibility to stabilize the system of leadership and to set-up a sound and modern governance approach for Prague.

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<sup>20</sup> Moreno (2012)

<sup>21</sup> A good example for a participatory engagement is the redevelopment of Vinohradská Street

<sup>22</sup> Within the Morgenstadt Analysis the City Team did not have enough time and resources to analyze the development process and smart city potential on the level of 57 districts

<sup>23</sup> By „Governance System“ we mean the political leaders of the city (Mayor, deputy Mayors and Councillors), and the administration of Prague (City Hall)

## Strong need for “Smart Governance”

With concepts like »*Smart Prague 2014 – 2020*«<sup>24</sup> or the »*Programme for the Implementation of the Prague Strategic Plan for the period 2009-2015*«<sup>25</sup> Prague demonstrates the will to take the necessary steps towards a Smart City and suggests to focus on strengthening research and innovation, promoting social inclusion and investing into sustainable mobility and energy. Yet, the Prague governance system as of today is not adequate for managing a »Smart City«. There is need for action on the organizational, strategic and structural scale in order to make the strategic management system of Prague fit for the challenges of today and the upcoming decades. While the specific fact has to be taken into consideration that governance model combines autonomous competencies as well as delegated ones from national government (combined model of public administration for all local and regional governments in the Czech Rep.). Smart City issues belong to the autonomous local government competences. Unfortunately without significant support or coordination from national government.

The management system within the city hall of Prague fulfills essential requirements of a **continuously learning organization**. Employees of the city have good perspectives for personal development and have opportunities to be rewarded with specific remunerations if they are highly engaged and effective within their workplace. Though there still exists significant difference in income between the public and private sector. The administrative leaders are highly skilled and well trained experts working within the framework of political decisions. Yet, the administration is following a traditional bureaucratic pattern of organization which manages different sectors independently from each other and relates them to political parties. In times of digitalization and a fundamental change in the economy this leads to an inefficient use of financial and human resources and to an increase in unaddressed issues, since no department feels fully responsible. Reserves are also in wider use of modern learning tools (use of ICT), knowledge sharing, use of project management methods and support for international cooperation in order to bring more innovation and inspiration from abroad.

Competing with leading cities in Europe for attracting skilled people and investments, linking mobility, energy and ICT in joint measures and projects, tackling climate change, driving the digital agenda, engaging with civil society or developing data-based decision making systems, all actions **require a cross-**

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<sup>24</sup> Hainc (2013)

<sup>25</sup> Strategic Planning Department of the City Planning Authority (2009b)

**sectoral and strategic management approach** that is able to link the existing hierarchical units of administration not only into joint projects, but also into an integrated management system based on overarching development goals and a strong coordination between all departments.

**Structural Challenges:**

In the City Hall of Prague today there is **no administrative unit dealing with cross-sectoral issues**. The organizational system of the city administration is structured hierarchically and cross-departmental decisions are based on the voluntary interaction of the heads of departments<sup>26</sup> or resolutions of the City Council. The strategic units like the »Department of Strategic Investments«<sup>27</sup> are located somewhere down the hierarchy (in this case, within the section for land use decisions), which does not allow them to exert significant influence on other sections, departments or offices. Standard methods for project management including teams of representatives of different units/companies are not implemented on regular basis. Figure 2 gives an overview over the hierarchical organization of the Prague City Hall:

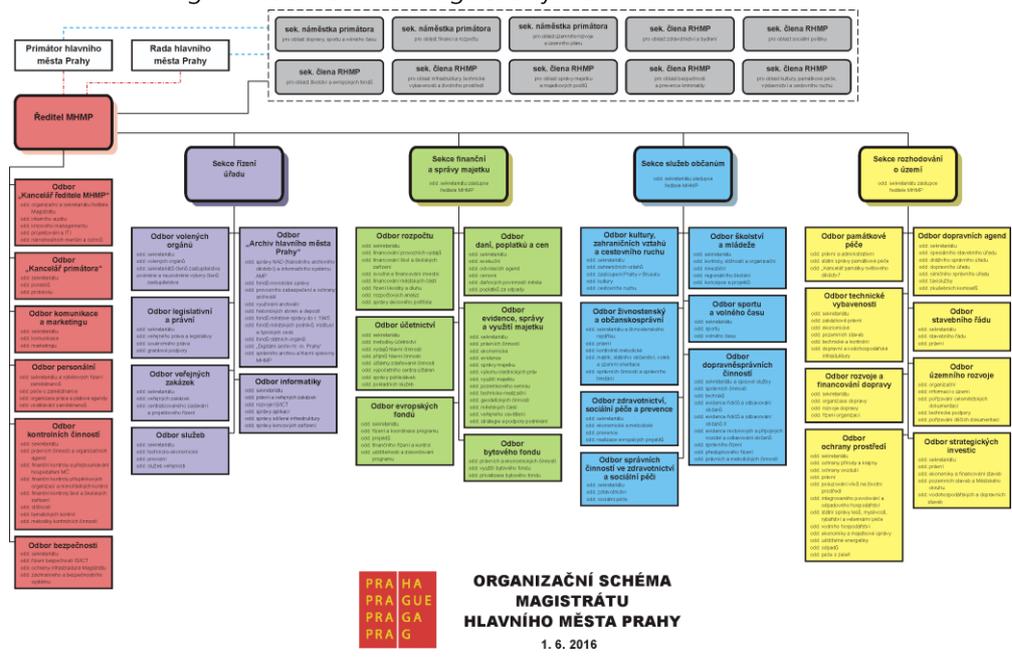


Figure 2: Organization Chart of Prague City Hall

<sup>26</sup> Every three months the heads of departments meet together with Mrs. Deverova (Chief Executive of Prague City Hall) to discuss ongoing issues within their sections and to discuss sectoral decisions. However, there is no strategic unit that would be able to steer and coordinate across the sections and departments and no joint goals that all departments have committed to adhere to.

<sup>27</sup> City of Prague (n.d.a)

The same accounts for the **management of municipal companies**, which is not coordinated in an overall strategy or in collaboration of several departments, but rather allocated with single departments that have individual budgets and follow individual goals.

Various supportive institutions like the **Prague Institute of Planning and Development (IPR)** can contribute with knowledge and experts on the planning level and would be able to provide expert advice and strategic management beyond mere urban planning. However today they are not yet developed to provide support on a larger strategic level which would encompass social and economic strategies or applied research. In addition there is no unit within the city administration that would coordinate an institution like IPR in order to maximize its value for all sections and departments.

Other supportive structures like a **Smart City Advisory Board** (of the Prague City Council) have been installed successfully in the past, but do not live up to their full potential. Sustainability Advisory Boards<sup>28</sup> help politicians take and defend strategic decisions, but also help institutionalize goals and strategies within structures that last longer than one single election period. They root the strategic development process within the most important stakeholder groups of the city. However they will only develop their full potential when coordinated through the city administration, which – in turn – needs a structural unit that can take on this role as own responsibility. In Prague the existing Smart City Advisory Board shows good potential for stabilizing and supporting a long-term development towards a thriving smart city, since it is composed of a broad range of important local stakeholders<sup>29</sup>. This potential is currently at risk to be wasted since there are no dedicated tasks to be accomplished by the advisory board, neither is there a coordinating unit that would be able to exploit the potential of the Smart City Advisory Board for the future development of Prague.

### **Strategic Challenges:**

The **lack of a clear vision** for the future development of Prague and the **lack of measurable goals** certainly represents the strongest barrier to a focused, sustainable and long-term development of Prague at the moment, since no

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<sup>28</sup> There are great examples for the value of Advisory Boards from Tokyo, Singapore and Freiburg. In all cases they played a major role in defining and implementing strategic development goals and projects for the city. All of them are rooted within Academia, the local economy, civil society and the city administration. (Fraunhofer IAO 2013)

<sup>29</sup> We suggest adding 2-3 important local companies and an institution like IPR in order to round off the composition of the advisory board. The list of institutions can include: Prague City Hall (Mayor and Deputy Mayors, Advisors to the Mayor), Prague Transportation Company DPP, TSK Praha, Czech Technical University ČVUT, Charles University Prague, University of Economics VŠE, Czech University of Agriculture, Prague University for Chemistry and Technology, Academy of Performing Arts.

security for planning and investment is given. Up until now, strategic documents of Prague only refer to vague descriptions of desired future developments<sup>30</sup>. This leaves large room for interpretation and does not help when conflicts of interest arise and investments need to be prioritized according to what is best for Prague as a whole. In absence of clear goals and measurable priorities, decisions about investments are made on an ad-hoc basis and often convey to those interest groups who exert strongest pressure or who have a strong influence on the political discussion. In sum, this **lack of a coherent development strategy** has led to a range of expensive infrastructure projects<sup>31</sup>, some delayed projects<sup>32</sup> or to completely discarded projects<sup>33</sup>. At the same time, important industrial players are hesitant to invest into innovations and R&D in Prague<sup>34</sup> since the city does not show enough commitment to work to achieve strategic sustainability goals.

Those cities that manage to increase their revenues, reduce their environmental footprints and enhance life quality for their citizens, all share one key feature, which is defining a set of strategic development goals, broken down into milestones or projects and underpinned with measurable indicators.<sup>35</sup> They have managed to agree on priorities and to communicate them in a transparent way, and they have linked their budgets to their development goals.

<sup>30</sup> In the Strategic Plan the City defines several dozens of development goals, but does not quantify them or indicate how to measure success or progress towards these goals. Example:

Goal I1.1 Preference for public transport in operation, fares and investment:

*"Optimize the Prague Integrated Transport system:*

*Ensure reliability, convenient intervals between services and attractive fares. Complete transit fare and information integration in the public transport system. Further improve the technical level of the transit fare and information system. Introduce electronic payments in the public transport system. Improve the quality of transfer connections by optimizing existing transfer terminals and building new ones. Secure appropriate park and ride facilities with room for future development and expansion. Enhance the integration of the railway into the public transport system. Improve the quality of bus services in the suburbs. Optimize investment in public transport but not at the expense of quality levels. Introduce a more effective method of transport management and ensure that all costs are justifiable."*

(Prague City Development Authority 2008)

<sup>31</sup> Large infrastructure projects like the Blanka Tunnel or the extension of the Metroline A to Motol have consumed significant parts of the city finances in the past. It is unclear, whether benefits outweigh costs and why other projects (the train to the airport or the construction of the Metroline D) were postponed instead. Conducting dedicated strategic analyses (life cycle analyses, cost-benefit, economic impact, etc. could help the city concentrate on projects with the highest benefits or added value)

<sup>32</sup> For example the electronic application system that allows for a seamless eGovernment solution in Prague.

<sup>33</sup> For example the congestion charge system that was planned under Mayor Bem and was supposed to finance the expansion of Prague's inner ring road (Eltis (2014))

<sup>34</sup> For example Skoda would be interested to set-up pilot projects on car-sharing and E-Mobility in Prague. Yet the company will not do so until the city gives security for planning and investment through clear goals.

<sup>35</sup> Examples are New York City, Sydney (City of Sydney 2014) and Vienna (Stadt Wien 2014).

With a set of municipal companies that are 100% daughter-companies of Prague<sup>36</sup>, the city has a **good control over capital assets**. This allows Prague to pass-down strategic decisions to its subsidiaries and municipal companies, once a strategy and a structure have been established. It also allows streamlining strategies and projects across a range of different institutions tied to the city. With the well-established communication system between the sections of the City Hall, the experts in the departments and the Smart City Advisory Board there are a range of important factors already in place that can be activated quickly when taking the next step and moving towards an integrated management approach for the City Administration.

There are numerous examples of impressive development projects in Prague that show good results and support a healthy and equitable development of the city. The well-developed public transportation system or the extensive flood protection system are two examples for this. Yet the Prague City Hall does not follow an **integrated management approach** towards a smart and sustainable development, which creates a vacuum of strategic management across the city administration (when it comes to strategies, projects and measures that need to be tackled in collaboration of several departments and offices) and it creates additional costs, since measures and interventions are not coordinated across the departments.

Examples:

- a) Some metro stations in Prague represent excellent locations for a transport oriented development of the city. Development of dense mixed use districts around the metro stations would spur a range of positive developments in the city (slow down suburbanization, increase the use of public transport, increase economic activities in the districts, reduce car-traffic etc.). The management of DPP is aware of this potential<sup>37</sup>, but it needs to discuss a possible strategy with several different departments without a responsible coordinator and still the District Mayors need to agree for a redevelopment of the sites.

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<sup>36</sup> The City of Prague owns 100% of shares of the following companies: Dopravní podnik hl. m. Prahy, akciová společnost; Kolektory Praha, a.s.; Operátor OPENCARD, a.s.; Pražská plynárenská Holding a.s.; Pražská vodohospodářská společnost a.s.; Rozvojové projekty Praha, a.s.; Technická správa komunikací hl.m. Prahy, a.s.; TRADE CENTRE PRAHA a.s.

And it owns at least 51% of shares of the following companies: Pražská energetika Holding a.s.; Pražská teplárenská Holding a.s.; Pražské služby, a.s.; Úpravna vody Želivka, a.s.; Zdroj pitné vody Káraný, a.s.; In addition the City of Prague has a minority share in the following companies: Bohemia Bingo, akciová společnost v likvidaci; CHEMAPOL GROUP, a.s. (konkurs); Kongresové centrum Praha, a.s.; PPF banka a.s.; PVA a.s.

<sup>37</sup> Jan Surovský: Technical Director of DPP (2015)

- b) The plans for the refurbishment of streets, water, sewage network and telecommunication are allocated in four different offices or departments, each with an own annual budget. This results in a high amount of uncoordinated refurbishment action, since the same street might be under construction several times in a few years for different purposes. Streamlining the coordination and – more importantly - the budgets for refurbishment between the responsible departments would lead to a significant reduction of infrastructure maintenance costs.

These examples show that there is large potential to increase efficiency, lower costs and address upcoming issues of smart city development through a cross-sectoral management approach that also links the budget to defined goals, measures and indicators.

### **Strategic development topics not on the political agenda**

The urban and the business world in Europe is changing quickly. Cities across Europe increasingly invest into „**Smart City**“ projects<sup>38</sup> and industrial players invest into clean technologies, ICT-based services, the Internet of Things and sustainable transportation.

At the core there are four strategic goals:

- **Sustainability** (balancing of social, environmental and economic effects of all decisions)
- **Climate Change mitigation and adaptation** (Cities reduce their emissions and enhance risk management)
- **Research, Innovation & Economic Growth** (New ideas, technologies and research as a backbone for thriving urban economies)
- **Livability & Creativity** (a healthy and prosperous life in an attractive and green environment)

These goals receive strong political support and funding throughout the EU. Prague has a large potential to play in the same league as Vienna, Berlin, Amsterdam or Barcelona. In addition it is able to attract significant amounts of EU-funding for its development and to attract further private investment into R&D. However, Prague ought to integrate these strategic development topics into its goals, strategies and future projects and it needs to set-up an organizational structure and a strategic management that is able to efficiently manage cross-sectoral collaboration of multi-stakeholder projects.

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<sup>38</sup> The 2015 EU Horizon 2020 call for Smart City Lighthouse projects SCC1 received 43 proposals with overall ca. 130 European cities applying as „Lighthouse City“ showing that they have already dedicated strategic investments into smart districts and sustainable technologies.

## Organizational Challenges

Besides the structural challenge mentioned above there is one crucial component of effective and sustainable city development that is starting to become more and more important in Prague: this is the **participation and the engagement of civil society** in urban development projects and processes. In Europe and throughout the world, city administrations are increasingly co-operating with the civil society in order to base urban renewable and urban development on the demand of local users and on good ideas from those who live, work and make business at the local scale.<sup>39</sup>

In Prague, the responsibility for directly engaging with the local communities lies with the District Governments. They are in charge of corresponding with the civil society and making sure that any development project receives their input. In the past, citizen engagement in Prague has often been characterized by a NIMBY attitude and vehement criticism of planned urban development projects<sup>40</sup>. The city administration stuck to the very basic requirements of public consultation and directly affected individuals made wide use of legal instruments to retard, change or postpone the planning and implementation process, leading to a rather confrontational character of public participation in Prague. This could be avoided, if local dwellers and affected citizens were voluntarily integrated into the planning process at a much earlier point in time, when the scope and the requirements of the project have not been fully defined. Prague is piloting with this approach in the first districts, and it is suggested to follow this process in a much more consequent way in the future. Finding the right way for Prague on how to bring in civil society into the development process of the city in a positive and effective way is a challenge that Prague needs to tackle in the coming years.

### Summary: Prague's Leadership and Governance System

There is a set of reinforcing factors that dominate the leadership and governance system of Prague at the moment and have led to underperformance of managing a sustainable development of the city in the past:

#### 1. Instable political system

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<sup>39</sup> Great examples for a successful participation of civil society in urban development are among others: Calgary ( imagineCALGARY 2014); Freiburg, or Eindhoven (Triangulum / Eckart Vaertvroeck). The German example of Stuttgart 21 showed, what may happen, if the civil society is not actively engaged in larger development projects (Railway-Technology.com 2013).

<sup>40</sup> One example for this is the new metropolitan plan, which is in the process of planning for a long time, since citizens that directly suffer from a suggested development project make use of all sorts of legal instruments to retard, change or postpone the planning and implementation process.

The current political constellation is characterized by rather instable coalitions and a high turnover of political representatives in the city council. This leads to an unusual high degree of rather unexperienced representatives, who lack political leadership and visions. It is harder to push for bold projects, when decision makers fear to make mistakes and rather stick to bureaucratic procedures than to lobby for innovation and action.

- The high turnover of political coalitions during the last years and the corresponding fluctuation of staff have led to several delayed projects and also to some dumped projects in the past.
- Due to the lack of leadership, visions and clear goals in the past, the priorities for investing public money in Prague have not been clear. This helps private interest groups to push for their own agendas and to lobby for individual projects. As a result, investments into infrastructure and urban development are rather decided upon on an ad-hoc basis.<sup>41</sup>
- All of these factors explain why developing, maintaining and operating infrastructure is abnormally expensive in Prague.<sup>42</sup>

## **2. Inadequate approach for long-term management**

Although urban development activities become increasingly interlinked, there is no cross-sectoral management unit within Prague City Hall, which would be able to coordinate and manage an overarching long-term strategy for developing Prague towards a prosperous, sustainable and innovation-driven city. It is not surprising that this kind of structure is lacking, since its establishment depends on a set of additional factors, which are closely interlinked:

- The annual budget allocations within the single departments of the City Hall are conducted without cross-linking investments or reflecting on the necessity of jointly spending money on strategic projects.
- The same accounts for the public utility companies, which operate totally independent from each other and under supervision of different councilors and departments.
- Politically agreed and quantified development goals and corresponding indicators are lacking, which hinders strategic priority setting and long-term management.

A missing cross-sectoral long-term management approach in turn also leads to a set of successive deficiencies, which hinder an efficient governance of a smart city Prague:

- There is no strategy for integrating businesses and research into a sustainable development of Prague.

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<sup>41</sup> E.g. the new metroline, or the Blanca Tunnel.

<sup>42</sup> Kortschak (2014)

- Comprehensive indicator systems and monitoring facilities are missing, which reduces transparency over costs and benefits of public investments.
- A Smart and Sustainable development of the city ranks low in the awareness of Prague's citizens.

## 1.4.2 Economy & Innovation System

The City of Prague is an economically strong region within the EU with a particularly high GDP/capita.

### Quantitative analysis: Indicators

**Table 2: Selected indicators for Economy and Innovation sector of Prague<sup>43</sup>**

Indicators for Prague		Benchmarks for European cities		
		Green	Yellow	Red
Population dynamics (% of total population)	0.464	0.5 – 2.0	0.1 – 0.5 or 2.0 – 4.0	< 0.1. or > 4
Birth rate (%)	0.14	> 5	0 - 5	< 0
Manufacturing companies in the city (per 100,000 inhabitants)	19.2	< 40	40 - 155	>155
Top-10 largest employers in the city (% of overall employed population)	3.2	< 10	10 - 20	> 20
Average annual unemployment rate (%)	5.14	< 7	7 - 12	> 12
Per capita GDP of the city (€)	30,337	> 21,000	15,000 – 21,000	< 15,000
Size primary sector (% of overall employed population)	0.2	< 5	5 - 8	> 8
Size secondary sector (% of overall employed population)	10.5	< 25	25 - 40	> 40
Size tertiary sector (% of overall employed population)	80.8	> 80	65 – 80	< 80
Average age (years)	42	< 41	41 - 50	> 50
Qualification level (%)	40.3	> 50	25 - 50	< 25
GDP growth p.a. (%, average of last 3 years)	1.2	> 2	0.5 - 2	< 0.5

Prague's economic development indicators compared to the international benchmarks deliver a quite satisfactory picture (Table 2). The city has exceptionally low unemployment, with high GDP/capita and a significant size of the tertiary sector. The accumulated data indicate that Prague is a modern city, with a solid economic base. At the same time, diversification of the city's employment portfolio would improve its economic resilience, while providing more jobs especially in the manufacturing sector.

<sup>43</sup> The following color coding is applied: green =good, yellow=satisfactory, red=critical

As mentioned previously, Prague's economy provides for 25 % of the country's national GDP. With service sector accounting for 80 % of the economic base, the structure of employment per sector is good. In the service sector most significant branches are financial and commercial services, trade, restaurants, hospitality services and public administration.

The demographic structure of Prague is currently characterized by a high share of economically active population. In 2013, the amount of labor force reached 670,400, accounting for 54 % of Prague's whole population. The unemployment rate of Prague reached 5.14 % in 2013 being remarkably low compared to the EU average of 10.9 %<sup>44</sup> (see Table 3). The share of foreigners accounted for 12 % of the city's population in 2013, which is relatively large compared to other capital cities in the Central Eastern region: in Sofia, Bratislava and Budapest the foreigners composed less than 5 % of the population in each.<sup>45</sup>

**Table 3: Economic activity of the Prague population in 2011 - 2013<sup>46</sup>**

Year	2011	2012	2013
<b>Population, total</b>	1,237.9	1,245,8	1,250.4
Economically active, aged 15+ years (labour force)	658.9	668.5	670.4
Unemployed	23.7	20.9	21.0
Economically inactive	579.0	577.3	580.0
Retired	254.0	243.8	251.7
Students	96.9	90.6	83.9
Foreigners	160.8	162.7	161.0
Children up to 14 years of age	162.0	166.6	172.5
Others	66.2	76.3	72.0

Prague is the city where approximately 20 % of all national investments take place. In 2013, the GDP per capita was € 31,427<sup>47</sup> which is well above the average among the European Union regions, even though there has been a

<sup>44</sup> Eurostat (2016)

<sup>45</sup> Eurostat (2015)

<sup>46</sup> Czech Statistical Office (2014b)

<sup>47</sup> Ibid.

slight decrease compared to 2011 (see Table 4). The higher GDP is related to better levels of income, localization of activities with a high added value and the high density of the public and private sector enterprises in the area<sup>48</sup>.

**Table 4: Gross domestic product per capita in Prague 2011 - 2013<sup>49</sup>**

GDP/capita	2011	2012	2013
CZK	809.671	803.988	816.350
EUR	32.927	31.969	31.422
PPS1)	45.599	45.518	46.025
CR average = 100	211,3	208,7	210,0
EU28 <sup>50</sup> average in PPS <sup>51</sup> = 100	175	172	173

### Qualitative Analysis: Action Fields and Impact Factors Opportunity: The Innovation System of Prague

The innovation potential in Prague is significant. Many highly innovative industries are present in Prague, such as pharmaceutical and automotive industries, ICT, financial services and consulting.

According to the Regional Innovation Scoreboard 2014, a large number of the nation's most prominent research bodies are located in Prague. Moreover, a high share of population has a university degree; and highly-qualified workforce provides a solid basis for the innovation activities. However the Scoreboard ranks Prague as a moderate innovator with an innovation performance below the EU average<sup>52</sup>. Even though Prague remains the innovation centre of the country, the growth in innovation performance has been weak in recent years. In comparison to the other EU-regions, the performance decreased. The weaknesses reported were the low number of EPO patent applications as well as low patent activity in general<sup>53</sup>.

One of the biggest challenges for entrepreneurship and innovations in the Central Eastern region is the (still) rather conservative mentality that is adverse

<sup>48</sup> European Commission (2015b)

<sup>49</sup> Czech Statistical Office (2014b)

<sup>50</sup> 28 Member States of the EU

<sup>51</sup> Purchasing power standard

<sup>52</sup> Garcia Porras and Jernyniak (2014)

<sup>53</sup> European Commission (2015b)

to risk. Another difficulty is posed by the spatial distance from main technology hubs such as London, Berlin, Hamburg, Munich etc. that offer high added value resources (investors, clients, mentors, consultants) that help start-ups develop products better and faster, at the same time increasing their market value<sup>54</sup>.

Below are several examples for the growing innovation system:

**Prague Innovation Council as an advisory board since 2014:** The Prague Innovation Council is a politically neutral body. The Chairman is the vice director of the Czech Technical University. Some members of the Council belong to the academia, others are businessmen, and three members come from Prague City Administration. The council is not yet a think tank, its role is rather that of an advisory board for the city.

**Technology agency of the Czech Republic (TACR):** Technology agency is a state-funded institution that was founded in 2009. The creation of TACR has been one of the fundamental reforms in R&D in the Czech Republic. It supports and streamlines applied research and collaboration between research and companies to foster competitiveness and economic growth. The Agency is in charge of a competence centre programme (duration 2012-2019). The main objectives of the Agency are increase the competitiveness of the Czech Republic and support the establishment and operation of centres for research, development and innovation in advanced fields with innovative potential. The overall budget is CZK 6.297 mln with 70 % as the maximum funding of the total eligible costs per project<sup>55</sup>.

**»Centre for Sustainability« as a Lighthouse project for R&D:** The Environmental Centre of the Charles University is planning to establish a research centre for sustainability. The objective of the project is to bring together those industrial, governance and research actors that are working with sustainability issues. There is also UCEEB – University Centre for Energy Efficient Buildings, which was established in 2012 within the Czech Technical University (CVUT) in Prague. UCEEB focuses primarily on Smart City topics, especially then on energy efficient buildings and high performance materials and technologies.

These examples show the existing potential for the building of an innovation system in Prague. However, there are significant challenges with regards to missing institutional structures that would enable and facilitate the R&D

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<sup>54</sup> Szabo (2013)

<sup>55</sup> TAČR (2015)

cooperation between various stakeholders in the city. missing structures and cooperation for R&D activities need to be overcome.

### **Challenge: Changes in economic pattern**

In the past decades, many international companies established and expanded their businesses in Prague because of the well-educated and relatively inexpensive workforce, and low living- and business costs. Multiple job opportunities combined with the good living standards attracted skilled workers and students from other regions of the Czech Republic and from abroad<sup>56</sup>. Additionally, the universities were completely tuition-free, which encouraged an influx of international students.

Thus, the stable economic growth together with the country's entry to the Schengen zone in 2007 enabled the city's development into a wealthy capital. The wages, but simultaneously also the prices and living costs have been continuously rising; e.g. the net disposable annual income of households per capita has increased from 196.700 CZK in 2009<sup>57</sup> to 257.700 CZK in 2013<sup>58</sup>, but then the average monthly housing costs per household have risen from 4900 CZK in 2009<sup>59</sup> to 7350 CZK in 2013<sup>60</sup>.

Currently, Prague's economic structure is facing a challenge that is waiting to be tackled: on the one hand, the processing industry is showing a gradual shift towards hi-tech production due to activities of multi-national enterprises<sup>61</sup>. On the other hand, companies are relocating their businesses into the suburbs and other Czech cities, which offer a lower cost of living as well as incentives for businesses, e.g. tax reduction.

### **Challenge: Lack of structures and cooperation for R&D activities**

**Table 5: Prague's R&D performers in various sectors 2011 - 2013<sup>62</sup>**

	2011	2012	2013
R&D performers, total	670	680	683

<sup>56</sup> European Commission (2015a)

<sup>57</sup> Czech Statistical Office (2010b)

<sup>58</sup> Czech Statistical Office (2014b)

<sup>59</sup> Czech Statistical Office (2010a)

<sup>60</sup> Czech Statistical Office (2014b)

<sup>61</sup> European Commission (2015b)

<sup>62</sup> Ibid.

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**Sector of performance:**

				Prague City Profile
Business enterprise	482	496	497	
Government	84	82	82	
Higher education	71	70	72	
Private non-profit	33	32	32	

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As mentioned earlier, Prague is the national centre for research. Over 35 % of all employees working in the research and development sector are located in Prague<sup>63</sup>. In 2013, there were 683 R&D performers/workplaces located in the city, 497 of them in private enterprises, 82 in the governmental bodies, 72 in universities and 32 at non-profit private performers<sup>64</sup> (see Table 5). Moreover, 75 % of institutes of the Academy of Sciences of the Czech Republic, 43 % of universities (public and private), 21 % of innovating firms and 30 % of other research institutes (including private companies) are based in Prague. This means Prague has almost half of all the national organizations performing R&D activities in the governmental sector and more than a 35% share in the public university sector. This setting offers a good basis for collaboration between the foreign companies and universities.

During the field research phase, a lack of or a very small and uncoordinated cooperation in R&D between the actors has been identified. It is vital to acknowledge that this can be an obstacle on the way to strengthening Prague's innovative competitiveness<sup>65</sup>. There are several possible reasons for the mentioned lack of cooperation. To begin with, foreign companies base the R&D activities in their home country, they cooperate with their suppliers<sup>66</sup> or they simply are not interested in collaboration for cultural reasons. Prague universities are not open for collaboration as they on the one hand have a mind-set of being the best universities in the Czech Republic; and on the other hand they do not consider collaborating with their European counterparts. A further reason might be the received EU-funding which works against the motivation to seek other funding options, e.g. via cooperation with businesses.

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<sup>63</sup> Ibid.

<sup>64</sup> Czech Statistical Office (2014b)

<sup>65</sup> European Commission (2015b)

<sup>66</sup> Ibid.

Furthermore, the issue of R&D is relatively new also on the political agenda of Prague. Whereas some structures for the innovation system are already in place, there is (albeit in particular areas) still a visible lack of a need for strategic planning due to the stable economic situation in the city. The Prague Regional Innovation Strategy (Prague RIS3) has been developed in the context of the European 2020 initiative on designing smart specialization strategies “RIS3” to support the city’s innovation potential, to strengthen the economic development and improve the governance. The strategy has been used as the key document for the Operational Programme Prague – Growth Pole of the Czech Republic for 2014-2020. Nevertheless, the Prague RIS3, respectively the Operational Programme Prague, has not yet been locally anchored or operatively used by the city to support the R&D activities. All in all, for a successful development of R&D, a locally anchored strategy with political commitment that has clearly set goals, defined themes and precise responsibilities and financing plans, is necessary.<sup>67</sup>

Finally, the insufficient environmental awareness of businesses, resulting in the lack of green production and services need to be taken into account. Large transnational corporations have their own sustainability policies that they implement also in the Czech Republic. However, on the national level the share of SMEs in sustainability activities is below average in the EU. There are some public measures supporting SMEs, but no significant new policy measures have been announced on this area<sup>68</sup>.

### **Opportunity: Prague’s future as an IT Hub**

The Czech Republic is nowadays with companies like Accenture Services, DHL and SAP<sup>69</sup> one of the top locations for outsourcing and offshoring IT-related services and software design<sup>70</sup>. Also, with its location in the heart of Central Europe, Prague is ideal for building trade links<sup>71</sup>. The IT field is very vibrant and students of Czech Universities are active at setting up medium and small companies and start-ups, many of which become successful. Examples of renowned software brands include AVG technologies and Alwil (AVAST), which are both specializing in online security and antivirus products<sup>72</sup>.

Unlike other sectors, in the IT sphere R&D cooperation between industries and start-ups is functioning well. IT start-up platforms are being created and

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<sup>67</sup> European Commission (2016)

<sup>68</sup> European Commission (2014a)

<sup>69</sup> Rezab (2013)

<sup>70</sup> Tagliabue (2007)

<sup>71</sup> Huth, Rajčan, and Kubica (2014)

<sup>72</sup> KPMG (2014)

mentoring programs between the start-up founders and representatives from the modern tech and IT-enterprises are being established<sup>73</sup>

This potential should be acknowledged and incentivized by creating the necessary structures and innovative climate that supports the further development of the sector. Replicating the success of cooperation in this particular sector to other areas is also something to consider.

### **Challenge: Lacking innovation space within the city**

Prague Region (Prague greater metropolitan area) already hosts several technology and innovation parks, below are several examples:

**Science and Technology Park VZLÚ Prague (about 15 km from Prague City Centre):** The Park is a part of regional innovation infrastructure and plays an active role in the development of knowledge economy and industry with main focus on aerospace, defence and security. Innovative environment is also suitable for automotive industry, railway industry, and power engineering and construction industry<sup>74</sup>.

**Science and Technology Park Rostoky (about 17 km from Prague City Centre):** At present the main part of the STP is prepared for research in the field internal combustion engines, vehicles, transmissions, electrical transfers and hybrids, fuel cells and high-speed machines<sup>75</sup>.

**InnoCrystal Science and Technology Park (about 18 km from Prague City Centre):** This international centre for development of advanced, commercially viable technologies and services has ambitions to become a recognizable brand within the EU and beyond. Focus lies primarily in the fields of biology, information technologies and electronics<sup>76</sup>.

**UCEEB - University Centre for Energy Efficient Buildings under Czech Technical University (25 km from Prague City Centre):** This university centre is focused on energy efficiency of buildings. It promotes the Smart City concept and aims at decreasing the carbon footprint of new and existing buildings. The goal of UCEEB is to design such buildings that are smart and green, as well as competitively priced.

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<sup>73</sup> StartUp Yard (n.d.)

<sup>74</sup> VZLÚ (2015)

<sup>75</sup> VTP Rostoky (2015)

<sup>76</sup> CzechInvest (2015)

One more example of a technology centre currently being built outside the city is **ELI Beamlines**<sup>77</sup> (**about 15 km from Prague City Centre**), an international laser research centre located in Dolní Břežany. The main goal of ELI is to create the latest laser equipment in the world and use it for particle acceleration. 85 % of the so-called eligible expenses are co-financed by the European regional development fund and 15 % come from the state budget of the Czech Republic.

These technology parks were built just outside of the city borders since specific funding conditions from structural funds of the European Commission did only apply to the Central Bohemian Region, surrounding Prague, and not to Prague itself. The reason for this restriction is Prague's significantly better economic standing compared to the other Czech and European regions which made Prague not eligible to receive funding from the European Commission. This development has in turn fostered urban sprawl in the area<sup>78</sup>.

Furthermore, despite Prague's universities being involved into research activities, the fact of the university buildings being spatially spread all over the city significantly hinders cooperation between them and community-building. Physical proximity and clustering facilitates more efficient transmission of ideas and knowledge-sharing.

### **Challenge: Tourism as a main economic driver**

As mentioned earlier, tourism is an important employment sector of Prague. In 2015 in total 6, 6 million people visited Prague<sup>79</sup>. However, tourism is in certain extent unsustainable. Firstly, in 2015 more than 50 % of the tourists visiting Czech Republic stayed only for one day<sup>80</sup>. Secondly, the tourism is strongly concentrated on the historic centre, leading to an insufficient use and lack of development of a greater range of tourist attractions outside the core city.

The main tourism axis is currently located on the so-called King's road (Kralovska cesta). The high concentration of tourists within this small area, with the seasonal peaks, leads to further alienation of Prague residents from the city centre, which ceased to be appealing to locals over time. Furthermore, the income from tourism in Prague adds up to about 50 % of the total income received from tourism in the Czech Republic. However, the city itself does not

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<sup>77</sup> ELI Beamlines (n.d.)

<sup>78</sup> Prague City Development Authority (2008)

<sup>79</sup> Prague City Tourism (2015)

<sup>80</sup> ČTK (2016)

directly benefit much from tourism in terms of its budget income, since a greater amount of tax revenues goes straight to the national budget<sup>81</sup>.

In order to resolve the problem mentioned above, tourism in Prague needs to be spread spatially around the city by promoting attractions outside the Old Town. The city also needs annual festivals and other events organized throughout the year to reduce the seasonal peaks and to encourage the visitors to return to Prague several times. Furthermore, congressional tourism also bears significant potential for eliminating the seasonal character of Prague tourism.

### **Challenge: Lack of qualified labour force**

Even though Prague's population is currently characterized by a significant share of economically active population, the city's demography reveals that the population is aging at an alarming pace<sup>82</sup>. The birth rate has been decreasing for a long time and now this trend has led to a negative impact on the job market. Currently, Prague faces a visible lack of economically active population in the younger age group which results in filling this gap with increasing numbers of commuters and migrant workers from the Czech Republic and abroad<sup>83</sup>.

One of the main weaknesses of Prague's education system (part of the outdated national education system) is the insufficient correlation between the specializations offered by universities and the needs of the labour market: e.g. Prague urgently needs engineers to develop the innovation sector of the city whereas the share of engineers among university graduates remains rather low. These shortcomings should be dealt with by means of projects focusing on an active employment policy (e.g. dual education), which are to be prepared with public and private sector involvement with the help of EU financial resources<sup>84</sup>.

Additionally, the emigration of qualified workforce from Prague to other countries, the so-called "brain drain", can be seen as an issue. According to a study of research institute for labour and social affairs<sup>85</sup> the phenomenon is also present in the whole of Czech Republic and the intensity of the inclination to migrate is markedly higher among the tertiary-educated than in the ordinary population. Even though, it is not yet causing a dramatic decline in the number

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<sup>81</sup> Prague City Development Authority (2008)

<sup>82</sup> Ouředníček and Temelová (2009)

<sup>83</sup> Prague City Development Authority (2008)

<sup>84</sup> Ibid.

<sup>85</sup> Vavrečková and Baštýř (2009) (The Effect of Brain Drain in the Czech Republic and Earnings Motivation for Qualified Specialists to Work Abroad)

of tertiary-education workers in the country, the danger of losing talent to other countries should be acknowledged.

Strengthening the business environment and creating leading regional technology and innovation hubs can help reduce the outflow of local talent to other countries as well as attract talented Czechs to return<sup>86</sup> and lure qualified internationals to Prague.

### **Conclusion: Need for Action**

Prague should acknowledge the challenges and create new innovative structures to become a strong competitor on the global market. The key potential lies in the innovation landscape of Prague.

Therefore the following actions should be urgently undertaken:

- create an innovation ecosystem and a high-level R&D hub to foster local innovations and attract international business / qualified workforce and keep home local qualified workforce;
- foster the potential of creative industries and improve their visibility;
- design incentives for the development of sustainable products and services;
- recognize the existing IT potential and establish an IT Hub;
- Develop Prague's image towards a diverse and smart city of the future with attractive business and research opportunities in order to draw international companies and scholars.

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<sup>86</sup> Huth et al. (2014)

### 1.4.3 Space, Planning & Mobility

With almost 30 % of the overall budget, the public transportation system represents the largest item in the overall budget of Prague<sup>87</sup>. Current figures show that this continuous investment into developing, operating and maintaining the public transportation network has made it to one of the largest success stories of Prague.

With a strong Metro Network with 58 stations, a dense Tram-line network with 268 stations above ground and a well-developed railway network with 44 stations serving over 100.000 passengers a day<sup>88</sup> Prague shows a good coverage of 29,7 stations per 100.000 inhabitants, which is better than Berlin (28), Munich (22) or Hamburg (11)<sup>89</sup>.

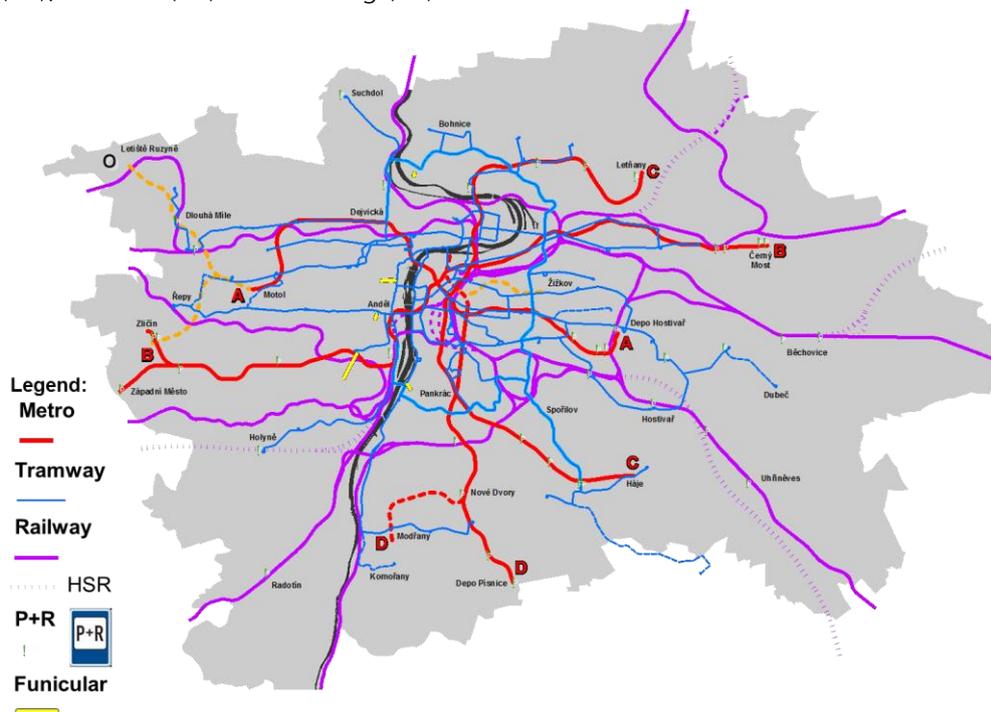


Figure 3: Prague Public Transportation Plan<sup>90</sup>

The importance and quality of the public transportation network is also reflected in the modal split: 43 % of all commuter trips are done through public transportation.

The analysis of the entire mobility system of Prague shows that based on this large success story it is now time to link the public transport system better to other modes of transportation. The remaining 57 % of commuter trips show

<sup>87</sup> City of Prague (2015a)

<sup>88</sup> ROPID (2013)

<sup>89</sup> Own assessment for Morgenstadt benchmark system

<sup>90</sup> IPR Praha, 2015

an increasing tendency towards private car usage – especially in the outer cordon. Environmentally friendly ways of commuting are rather underrepresented in Prague, as opposed to average European cities. Especially the potential for bicycling in Prague has not been exploited almost at all so far. Table 6 shows the Modal Split of Prague in relation to benchmarks from over 400 European cities.

**Table 6: Prague modal split<sup>91</sup>**

Indicators for Prague		Benchmarks for European Cities <sup>92</sup>		
		Green	Yellow	Red
Public Transport (%)	43	> 40	25 - 40	< 25
Bicycle (%)	1	> 25	5 - 25	< 5
Pedestrian (%)	23	> 40	20 - 40	< 20
Personal Vehicle (%) <sup>93</sup>	33	< 15	15 - 40	> 40

This is mirrored by the statistics which show a low development of bicycle lanes and a rather high proportion of individual cars on the roads:

**Table 7: Selected mobility indicators for Prague<sup>94</sup>**

Indicators for Prague		Benchmarks for European Cities <sup>95</sup>		
		Green	Yellow	Red
Cycling paths per 100.000 inhabitants (km)	41.7	>90	35 - 90	< 35
Average commuting distance (km/day)	20	<15	15 - 20	> 20
Average network speed (km/h)	26.2	> 30	15-30	<15
Density of EV/FC charging network (no/km <sup>2</sup> )	2.73	> 90	40 - 90	< 40
Price of public transport (€)	4	< 6.5	6.5 – 8.5	> 8.5

A key issue to be addressed in Prague today is the effects that the urban sprawl and the migration of people to the region around Prague have on the traffic system. Within the last decade the strongest increase in population has taken place in the municipalities outside of the administrative boundaries of Prague,

<sup>91</sup> The following color coding is applied: green =good, yellow=satisfactory, red=critical

<sup>92</sup> Based on Morgenstadt benchmark system for sustainable cities. The Modal Split Values are based on the analysis of >400 cities in the EPOMM Tool of the European Platform on Mobility Management: EPOMM (n.d.)

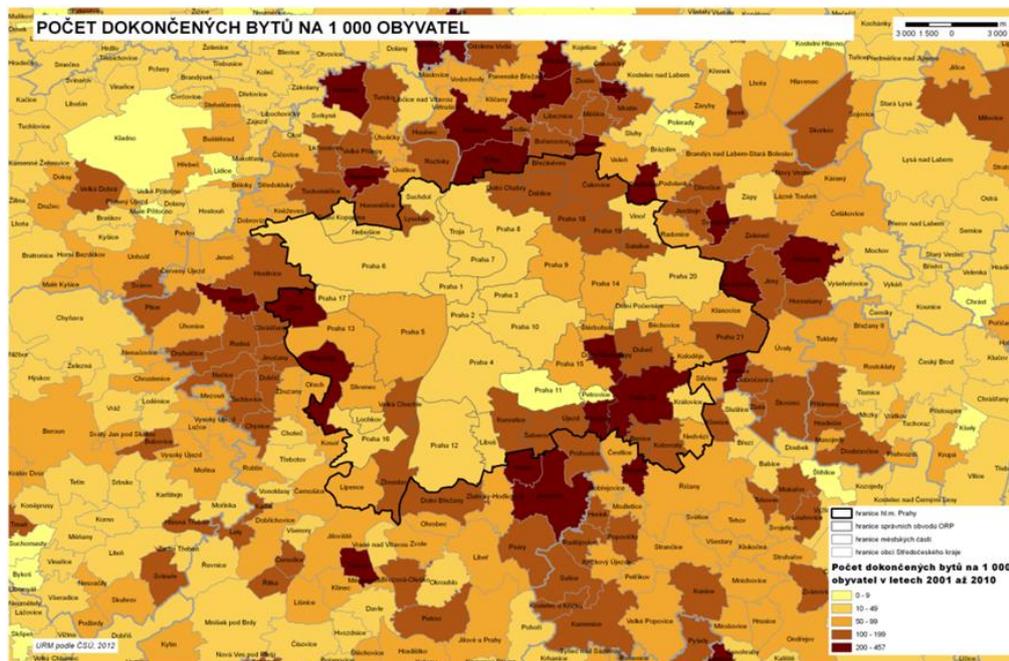
<sup>93</sup> Including private vans, excluding motorcycles and trucks

<sup>94</sup> The following color coding is applied: green =good, yellow=satisfactory, red=critical

<sup>95</sup> Based on Morgenstadt benchmark system for sustainable cities. The Modal Split Values are based on the analysis of >400 cities in the EPOMM Tool of the European Platform on Mobility Management: EPOMM (n.d.)

prompting a 44 % growth in the suburban population of Prague between 2001 and 2011.<sup>96</sup> Some of the municipalities have witnessed an extraordinary growth of up to 500 % of the original population. This process has led to significant changes in the socio-spatial pattern of Prague and the Region:

*"The suburban zones have experienced an influx of younger and better educated households with much higher incomes than the original population. [...] While suburbanization has lifted the social status of the population in the metropolitan periphery, it has contributed to a decline in social status of the population residing in the socialist housing estates. These trends have led to a reversal of the traditional sociospatial pattern of the socialist city, in which socioeconomic status decreases with distance from centre."<sup>97</sup>*



**Figure 4: Urban Sprawl in the Metropolitan Region of Prague<sup>98</sup>**

Since this urban sprawl almost solely refers to residential suburbanization, the work places of most suburban dwellers remain located within the City of Prague. As the Metro line does not serve the outer areas and the transportation concept for the Central Bohemian Region used to be badly integrated<sup>99</sup>, this requires most of the new suburban inhabitants to commute to work to Prague

<sup>96</sup> Stanilov and Sýkora (2014)

<sup>97</sup> Ibid.

<sup>98</sup> Němec (2011)

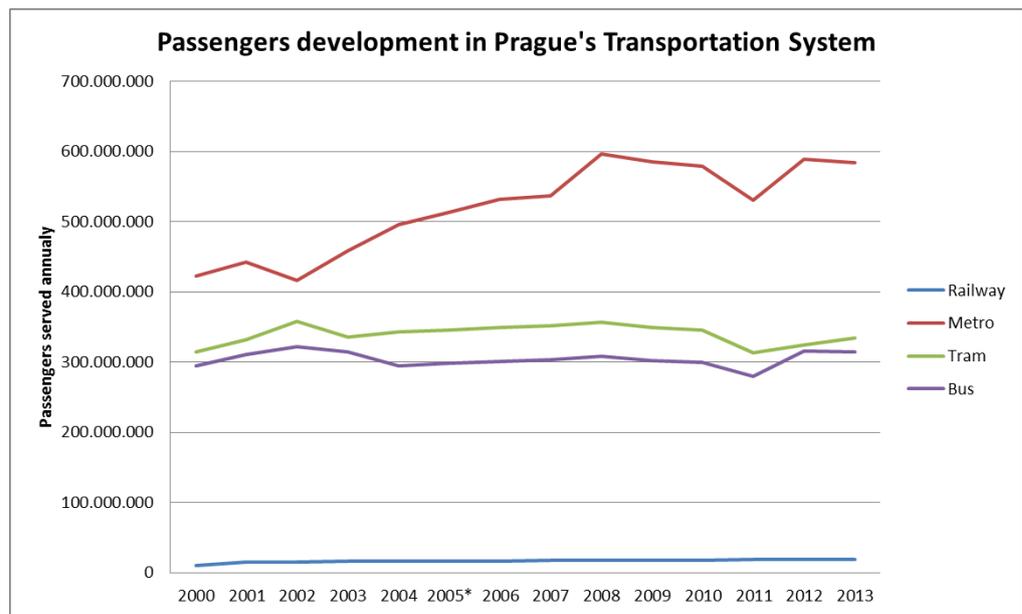
<sup>99</sup> EMTA (2016): since December 2015 a new governance structure for an integrated public transport system of Prague and the Central Bohemian Region has been successfully adopted. This is estimated to solve transport challenges in Prague and the region in a much more efficient way, then it has been possible before.

by car. As a result Prague has witnessed a dramatic shift in traffic volume and traffic structure over the course of the last 15 years, which the overall numbers do not reveal. The total increase of traffic volume in Prague has been rather modest (ca. 6 % since 2000). However, the traffic on the outer roads has increased by 53 % while the inner-road traffic has decreased by almost 18 %.

**Table 8: Shift in Prague's Road Traffic since 2000<sup>100</sup>**

	Inner cordon	Outer cordon	Total Prague
Development of car traffic since 2000	-16,39%	+59,28%	+7,29%
Development of freight traffic since 2000	-56,00%	+10,64%	-12,50%
<b>Development of traffic since 2000</b>	<b>-17,85%</b>	<b>+53,28%</b>	<b>+5,95%</b>

This development explains why the significant investments into the Transportation System of Prague have not been able to achieve an overall reduction of car traffic so far. Figure 6 shows the development of passenger figures in the Public Transport System of Prague for the time since the year 2000. While the Metro was able to buffer some of the suburbanization consequences (one can clearly note the increase 2008, when the C-Line was extended to Letňany), the Tram and the Bus network, operating mainly within the city, have maintained the passenger volume on a static level since 2000.



**Figure 5: Development of passenger volumes in Prague<sup>101</sup>**

As shown in Table 9, the largest increase on a percentage basis has been witnessed within the railway system. This, however, is of little importance since absolute numbers are very small in comparison with the other modes of

<sup>100</sup> The Technical Administration of Roads of the City of Prague (2014)

<sup>101</sup> Source: Own compilation based on statistical yearbooks Prague 2000 - 2013

transportation. Yet it reflects the existing demand for public transportation in the outer regions of Prague and demonstrates why commuting by car is the number one option for most employees in Prague.

**Table 9: Number of passengers for public transportation modes<sup>102</sup>**

	Increase in passengers	
	2000 - 2013	2006 - 2013
Railway	88,76%	14,74%
Metro	38,03%	9,91%
Tram	5,96%	-4,39%
Bus	6,79%	4,65%

The strong increase of suburban population in the northern parts (Roztoky, and Klecany among others) and the southern and eastern parts of the Prague Region (Praha 22, Jesenice, Šestajovice etc.) could not be mitigated through the Metro system.

A key reason for this is that Prague has not supported its heavy investments into the roads and the public transportation through soft mobility systems like park and ride hubs,<sup>103</sup> bike & ride or car-sharing opportunities that are linked to mobility hubs, a comprehensive bicycle lane network or incentives to make use of more environmentally friendly modes of transportation. Prague has also refrained from introducing regulatory measures that would make car-usage within the city more unattractive (reduction of parking slots, congestion charge, low emission zones, high parking fines etc.). A second reason is that in the past there has been little collaboration between Prague and the Regional Transportation system, which would coordinate an improved public transport on a regional level. By upgrading the sequence of regional trains and their transportation capacity, as well as by timing the sequence of trains, metros, trams and buses in a more precise way, Prague and the Central Bohemian Region would be able to contribute to a significant shift of traffic towards the public transportation system.

The consequences for the city today are not only an increase of traffic; it is also a heavy problem of pirate parking within districts with high job intensity (e.g. in Praha 6), leading to frustrated local dwellers and conflicts around the public space. This high density of parking cars is also strongly present in the city centre of Prague, leading to local noise and air pollution and to a waste of public space to car parking. Although NO<sub>2</sub> values are within EU limits, the

<sup>102</sup> Source: Own compilation based on statistical yearbooks Prague 2000 - 2013

<sup>103</sup> Overall there are 2739 parking stations available in Park+Ride stations in Prague. Supposing that each car serves 2 persons and DPP has counted each person that uses the Metro twice, this means that only 0,68 % of all daily Metro riders and only 0,32 % of all users of the public transportation system will find an adequate parking space for their car.

PM10 values for Prague exceed the suggested EU threshold with 33  $\mu\text{g}/\text{m}^3$  (average yearly concentration). On top of this there is a rather high amount of 29 fatal traffic accidents in 2014 that show a negative impact of the transport sector on health and life quality. The quality of public spaces in Prague (difficult to measure with quantifiable indicators) could undergo drastic improvement, if cars would be banned from some areas of the city centre.

An additional factor is the lack of an integrated e-ticketing system for the public transportation in Prague. Eight years ago Prague installed the Opencard, a universal means of payment for all modes of public transport, which was certainly a step into the right direction. Unfortunately the Opencard did not live up to its expectations and did not provide additional functions, let alone an intermodal e-ticketing option, smart-phone compatibility or additional payment functions for public or private services<sup>104</sup>. Today Prague's citizens have access to an online application ([jizdnirady.idnes.cz](http://jizdnirady.idnes.cz)) to plan multimodal routes, but it does not allow ticket purchasing and other functions. An upgrade of the Opencard or the introduction of an alternative e-ticketing system with integration into regional transportation and linked to additional intermodal mobility services could certainly improve the mobility experience of citizens and visitors in Prague. In addition it would incentivize those people to use the public transport system that today mostly rely on their car.

### **Additional Action Fields for Sustainable Mobility Systems**

A range of important action fields that aim at improving the sustainability of the mobility systems of cities have not been addressed in Prague:

#### **Electric Vehicles**

The European Automotive Market is evolving towards electric vehicles. After 2020 the tight emission targets for cars will only be achieved through plug-in hybrid or full electric (or fuel cell) vehicles. Many cities across Europe are strongly supporting the development of the EV market through installation of charging infrastructure<sup>105</sup> in collaboration with the local energy service company. In Prague, there are 54 stations provided through PRE and CEZ, but the city itself does not provide any support to electric transportation. There are no free parking slots in the public space reserved for electric vehicles, EV's are not allowed to use special lanes, e.g. the bus or taxi lanes, there is no city-wide booking system in place for the charging stations, and there are no incentives for purchasing electric vehicles. Electric car-sharing systems (station based or free-floating) are not available in the city.

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<sup>104</sup> City of Prague (2015b)

<sup>105</sup> E.g. Stuttgart has 267 public charging stations, Oslo has 720 charging stations.

The fact that the City of Prague is unaware of the potential that electric vehicles have for the reduction of noise and emissions in the city results in Prague falling behind many other European cities that strongly support electric vehicles on public roads. There is an especial opportunity to increase sustainability in the freight and logistics sector by modernizing the transport fleet of logistic companies with electric vehicles.

### **Inner City logistics**

Although heavy freight traffic in the city centre of Prague has reduced since the year 2000 due to de-industrialization, there is still a high degree of traffic in the city centre caused through delivery services and logistics. Especially in the narrow streets of the city centre and in the mixed use areas around the city centre (Smichov, Vinohradská, Praha 7, 9 and 10) the traffic due to distribution and delivery strongly impacts on the use of streets and public space. There are, however, no innovative small-scale distribution concepts in place yet. The city hall is not collaborating with logistic companies to optimize distribution and reduce traffic, there are no distribution centres in the city that focus on areas not single customers, there are no alternative distribution vehicles (E-Bikes, E-vans) on the road and the city has not enacted regulations that support sustainable logistics yet. Taken together, Prague could achieve improvements in sustainable urban transportation, when explicitly addressing the inner-city logistics sector with innovative and clean concepts.

### **Bicycle Strategy**

Today, there are 417 km of bike lanes in Prague<sup>106</sup>, which – compared to the population of Prague – puts Prague into the lower tier of European Cities which have more bike lanes. With 33.53 km bike lanes per 100 000 inhabitants, Prague is slightly better-off than Barcelona (10 km / 100 000 inhabitants), but way behind cities like Munich (86.5 km), Copenhagen (98.33 km) or Freiburg (174 km). In a city that aims at becoming smart, creative and sustainable, bike riders represent an increasingly important stakeholder group. Bicycling “represents the archetypal efficient mode for autonomous individuals to travel in ways that maximise their future-health gain, and minimise wasted time and dependence on others.”<sup>107</sup> These are features and values that are being shared through an increasing group of young, well-educated, open-minded and creative individuals, often representing the innovative core of the society.

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<sup>106</sup> The Technical Administration of Roads of the City of Prague (2014)

<sup>107</sup> Steinbach, Green, Datta, and Edwards (2011)

There is evidence for a direct correlation between the investment by the City Hall into bicycle lanes and bike-related facilities and the amount of Prague's citizens who chose to bike: the bicycle budget of Prague rose from almost nothing around the year 2000 to over 70 million CZK in 2009<sup>108</sup> and slightly above 60 million CZK in 2010 and 2011<sup>109</sup> before it was reduced to only 13 million CZK in 2013, where it stagnated<sup>110</sup>. At the same time Prague witnessed a strong increase in cyclist to a maximum of 1.541.395 trips in 2012, which since then is decreasing.<sup>111</sup>

Throughout the interviews an often-heard argument was that Prague is a hilly city and is not suitable for bikes. This argument does only hold partly, since Prague's citizens did chose to take the bike, once the city started investing into the infrastructure. At the same time the market for E-Bikes and Pedelecs has grown strongly within the EU, so that bicycles with electric support for pedaling (Pedelecs) have become affordable and a true alternative to the conventional bike in all kinds of cities.

Another argument is the lack of space for bike-lanes in the inner-city. The historic streets of Prague are indeed narrow and often only suitable for walking. At the same time many of the inner-city streets are stuffed with parking cars. Cities like Freiburg,<sup>112</sup> San Francisco or even New York City prove that there are intelligent ways on how to combine cars, public transportation and bicycles in streets with limited public space.

There is strong potential in taking up the original strategy for a bike-friendly city again: bikes require less space in the city centre than cars, they reduce emissions and noise and they increase well-being and healthiness of Prague's citizens, contributing to lower costs in the transport and health sector and making the city more attractive for young, creative and well educated workers.

### **Summary: Space, Planning and Mobility**

A key challenge for Prague is the car-dependency of commuters. This is triggered by a range of interacting factors and it causes negative effects on the spatial system and on the transportation system of Prague. Factors that contribute to an increasing preference of car usage are:

- An increase in suburbanization
- The lack of a regional approach towards public transportation

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<sup>108</sup> Filler (2012)

<sup>109</sup> Richter (2013)

<sup>110</sup> Ladislav Pivec: Managing Director TSK (2015)

<sup>111</sup> Latest official value: 1.403.102 trips in the year 2013.

<sup>112</sup> Freiburg im Breisgau (2015)

- The habits and values of citizens
- A lack of strategic investments into intermodal facilities and biking infrastructure

The consequences of this individual car usage for the city are:

- A high amount of car traffic and parking in the city center and in busy districts, in many cases it also leads to pirate parking.
- High noise and air pollution in the city center
- Shrinking attractiveness of the inner city districts for family living, which in turn increases the suburbanization.
- Shrinking rents in the city center.

An integrated approach to transport planning and to upgrading the attractiveness of (car-free) public spaces is needed in order to tackle the current mobility challenge of Prague.

#### 1.4.4 Resilience & Water Infrastructure

Urban resilience is an emerging concept that is yet to receive a universally accepted definition. As of now, the most widely used one is the UNISDR definition:

*“The capacity of a system, community or society potentially exposed to hazards to adapt, by resisting or changing in order to reach and maintain an acceptable level of functioning and structure. This is determined by the degree to which the social system is capable of organizing itself to increase this capacity for learning from past disasters for better future protection and to improve risk reduction measures”<sup>113</sup>.*

In the framework of the Morgenstadt City Lab project, urban resilience is not limited to the governance aspect of disaster risk management, rather it is perceived in broader terms and also includes societal resilience (crime prevention strategies) and technical resilience (resilience-by-design of critical infrastructures)<sup>114</sup>.

#### Quantitative analysis: Resilience Indicators

**Table 10: Indicators of Resilience Sector for Prague<sup>115</sup>**

Indicators for Prague		Benchmarks for European cities		
		Green	Yellow	Red
Number of homicides per 100,000 inhabitants	2.09	< 10	10 – 25	> 25
Number of natural disaster related deaths (average over 10 years prior) per 100,000 inhabitants	0	< 2	3 – 5	> 5
Damage from natural disasters (average over 10 years prior) % of GDP	0.5	< 2	2 – 5	> 5
Reaction time of first responders (min)	7.5	< 4	4 – 5	> 5
Number of police officers per 1,000 inhabitants	6.7	> 5	3,5 – 5	< 3,5

<sup>113</sup> UNISDR (2004)

<sup>114</sup> Fraunhofer IAO (2013)

<sup>115</sup> The following color coding is applied: green =good, yellow=satisfactory, red=critical

Number of full-time firefighters per 1,000 inhabitants	0.74	> 1,5	0,75 – 1,5	< 0,75
Number of paramedics per 1,000 inhabitants	0.24	> 1,5	0,75 – 1,5	< 0,75

Prague’s resilience indicators compared to the international benchmarks deliver an overall satisfactory picture (Table 10). Improvements are needed in the reaction time of first responders (less than 4 minutes is considered a good value) and the number of full-time firefighters and paramedics needs to be increased to reach the “green zone” (from 1.5 per 1,000 inhabitants).

## Quantitative analysis: Water Infrastructure Indicators

**Table 11: Selected indicators of Water Sector for Prague<sup>116</sup>**

Indicators for Prague		Benchmarks for European cities		
		Green	Yellow	Red
Municipal water consumption (l/ person/day)	106	70 - 150	40 – 70 or 150 - 250	< 40 or > 250
Proportion of water bodies with high water quality (%)	99.5	> 97	90 - 97	< 90
Implementation of resource efficiency measures in water sector <sup>117</sup>	3	3	2 -1	0
implementation of energy efficiency / energy recovery measures in water sector	2	3	2 -1	0
Implementation of sustainable stormwater management and/or flood protection measures	0	3	2 -1	0
Interlinkage of water sector with safety/security sector and ICT sector	2	3	2 -1	0
Percentage of wastewater that is treated according to national standards (%)	98	> 95	75 - 95	< 75
Average age of sewer systems (years)	52	< 40	40 - 80	> 80
Water supplied from stormwater harvesting/ reuse of treated wastewater (%)	0	> 15	8 - 15	< 8
Losses in drinking water distribution network (%)	17.8	< 10	10 - 25	> 25
Price of drinking water (€/m <sup>3</sup> )	1.63	> 2	1 - 2	< 1

<sup>116</sup> The following color coding is applied: green =good, yellow=satisfactory, red=critical

<sup>117</sup> This and the following three indicators refer to a scale of 0 (not-existent) to 3 (fully implemented). These four indicators are rather qualitative than quantitative and are thus analyzed in the following subchapter „Qualitative analysis: Resilience & Water Infrastructure action fields“

Table 11 delivers an overview of the quantifiable performance of Prague's water sector. Apart from two missing values, the overall picture of the Prague's water sector indicators is also fairly satisfactory; however certain major shortcomings in the water supply and sewage system need to be mentioned. First of all, the average age of sewer system is rather high: 52 years ("green zone" value: up to 40 years) which results in leakages and may lead to ground water pollution. Moreover, the leakages in the water distribution network lead to the loss of 17.8 % of water annually (should not exceed 10 %). Another alarming value is the missing reuse of treated waste - and greywater<sup>118</sup> (sustainable value is over 15 %). The price of drinking water is also rather high compared to the international benchmarks (green zone is up to € 1).

### Qualitative analysis: Resilience & Water Infrastructure action fields

#### Opportunity: Comprehensive flood protection system

As historical data on flood occurrence demonstrates, Prague has always suffered from its exposure to severe floods due to its location in the valley of the Vltava and Berounka rivers, which tend to overflow after torrential rains in its catchment area. After the devastating flood of 2002 that exceeded even the magnitude of the so-called 100-year flood<sup>119</sup> and was thus labelled a 500-year flood, Prague has invested CZK 4.2 bln into the construction of a comprehensive flood protection system. As of now, 95 % of the city's territory is secured against floods. However, there are still several areas (part of Troja in the north, Lipence, Lahovice and Lahovičský in the south) that are not protected<sup>120</sup>. The former ones are not populated densely enough so the cost-benefit analysis sees the construction of flood protection measures as non-economical, whereas the latter one stands on sand and gravel soil which makes flood protection measures with existing technical means rather impossible. Moreover, at the small local streams such as Botič and Rokytka no flood protection measures have been implemented which may result in the small-scale flash floods in the event of torrential rains.

The Prague flood protection system includes the following core elements: solid concrete walls, earth-fill dams, mobile steel-aluminium folding walls to be attached on underground wall fittings, enhanced flood protection measures in the Prague Metro aimed at improving the structural load resistance of the stations<sup>121</sup>, sewer backflow protection systems, waterproof doors and hatches,

<sup>118</sup> **Greywater** is any household wastewater with the exception of wastewater from toilets, which is known as blackwater. Usually, 50-80 % of household wastewater is **greywater** from kitchen sinks, dishwashers, bathroom sinks, tubs and showers ( LetsGoGreen n.d.)

<sup>119</sup> The probability of such a flood in any given year does not exceed 1 %.

<sup>120</sup> Prague City Hall (2012)

<sup>121</sup> Jilek, Fedorko, and Subrt (2007)

stop log covers and vent sheet covers , the early warning system, substitute energy sources, pumps as well as special anti-flood bags and ordinary sand bags, and finally the simulation software allowing for the identification of highly vulnerable areas of Prague<sup>122</sup>. The mobile flood barriers are fast and easy to install, do not require any mechanization and can even be implemented by people with no specific training. The mobile parts of flood walls are stored in storage containers distributed within the Prague's territory. In order to reduce the reaction time, the storage and transportation of the mobile flood protection barriers, each container is assigned its own precise location and includes all parts to build a particular section of a mobile flood wall. The GPS-sensor integrated into every truck carrying the containers towards the river allows to precisely locate the containers and thus improved the coordination of activities<sup>123</sup>.

The new flood protection system successfully withstood the 2013 flood, however of a lesser magnitude than the 500-year flood of 2002: 3210m<sup>3</sup>/s in 2013 against 5160m<sup>3</sup>/s in 2002.

### **Challenge: Urban water cycle management for protection against flash floods are required**

Most of the territory of Prague has a combined sewer system: except a few newly built housing estates at the Prague outskirts, road drains are connected to the sewage system<sup>124</sup>. Not only does this make the reuse of road-run off impossible, but it also has a more dire consequence: during torrential rains, the volume of incoming sewage water sometimes<sup>125</sup> exceeds the processing capacity of the water treatment plant and thus diluted sewage water drains directly into the Vltava river without any cleansing. This is a widely-used practice in Europe as increasing the capacity of the water treatment plant is usually not economical.

Nowadays, the use of innovative technologies may reduce or even exclude the necessity of streaming diluted sewage water directly into the river. To resolve this problem, **urban water cycle management methods** can be applied. To begin with, green infrastructures for sustainable storm water management such as **green streets, eco-roofs** and **urban gardens** not only improve the image and the livability of the city and its air quality but also increase the absorbing capacity of the city surface, to the most part consisting of asphalt and cobblestones with extremely low absorbing capacity. Another possible method is the **capturing of rainwater** falling on the roofs for the local use

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<sup>122</sup> EKO-SYSTEM (n.d.)

<sup>123</sup> EKO-SYSTEM (2006)

<sup>124</sup> PVK (2014)

<sup>125</sup> Several times a year at Prague's CWWTP

such as watering the gardens or flushing the toilets; this would also decrease the amount of rainwater flowing into the sewage system.

### **Challenge: Increasing water pollution**

Though the results delivered by the quantitative data analysis reassure of the high quality of water in the water bodies (99.5 %) <sup>126</sup>, the qualitative research was useful to identify the alarming trend of increasing water pollution levels. Two main causes should be named. Firstly, the increasing use of pesticides in agriculture within the catchment area of the Želivská water treatment plant requires the implementation of the at-source measures for the reduction of pollution load. Secondly, in the Czech Republic, there is no legal framework obliging the water utility companies to apply technologies for the purification of wastewater from hormones and antibiotics which leads to their accumulation in the water bodies. Taking into account the continuous progress in the medical sphere, the use of both chemical substances in medications will increase and in the long run it may have dire consequences for the health of the population.

### **Opportunity: Integrated risk management can be further enhanced by new communication concepts**

Act No. 239/2000 on Integrated Rescue System <sup>127</sup> stipulates the creation of Integrated Rescue System in every region of the Czech Republic. The City of Prague has a well-developed Rescue Safety System whose aim is to enable seamless coordination of activities of relief services (police, fire brigades, paramedics), 22 city districts, utility and services companies, telecommunication service suppliers, experts in the fields of chemistry, radioactive and explosive materials.

The communication with the population in case of emergency happens via the early warning system and the call centre for the Prague residents and visitors, which is in operation during major events and in emergency situations.

However, the current system is rather centralized as the communication happens only via the mediation of the Dispatch Centre in the Prague City Hall. Establishment of a city-wide communication concept encompassing relief services, critical infrastructures, utility companies and residents has a potential to further improve the resilience of the city against crisis situations. Such a communication concept would allow for the integration and collaborative use

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<sup>126</sup> Prague City Hall (2012)

<sup>127</sup> (Act on Integrated Rescue System N. 239/2000 Coll., 2000)

of real-time crisis management data and thus better coordination of response activities. It may also improve the trust of the population in the security services.

### **Opportunity: Safeguarding of critical infrastructures is on a good track**

Prague has been very efficient in safeguarding the functionality of its critical infrastructures. There exist building regulations with respect to critical infrastructure protection, also an integrated risk management city plan for critical infrastructure protection has been enacted. For instance, despite the lack of a city-wide back-up power supply plan, the key critical infrastructures such as water supply network, hospitals, and the headquarters of the Prague Integrated Rescue Service have already received a back-up source of power supply. Moreover, there is a back-up water supply plan in place for hospitals: in case of a disruption within a water supply network, water from tank trailers is pumped directly into hospitals' internal water network and thus their functioning remains undisrupted<sup>128</sup>.

### **Challenge: Lack of redundancy in the public alert system**

Prague has an extensive permanent early warning system: the warning signal is broadcast by over 400 stationary sirens<sup>129</sup>; this number can be increased by the deployment of mobile speaking sirens. Presently, alternative means of early warning (e.g. GPS-based SMS alerts) are not available due to the lack of agreement with one of the key three mobile service providers (O<sub>2</sub> Telefónica). In this situation, it is worth considering **using social media for early warning messages**. As a side effect of this improved communication with the residents, the trust into the public authorities of Prague among the population (especially the Generation Y) may improve.

### **Challenge: Innovative volunteer management concepts are needed**

Currently in Prague the help of volunteers and NGOs is used solely at the recovery phase<sup>130</sup>. Integrating volunteers into the crisis management system at the preparation and response phases has been declined as their participation is not guaranteed which makes this method unreliable. However, it is worth a try: today more and more cities come to realize that in order to overcome crisis situations in a most efficient and timely manner and at low costs volunteers from the general population are indispensable. By applying volunteer

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<sup>128</sup> PVK (2014)

<sup>129</sup> City of Prague (n.d.b)

<sup>130</sup> Prague Department of Crisis Management (2005)

management concepts, Prague may **reduce the maintenance costs of the flood protection system**. Moreover, a positive side-effect is possible: volunteer management concept will support the emerging culture of civil participation and teach the residents to take up responsibility for their city.

### **Challenge: Back-up plans for power and water supply need more attention**

As of now the City of Prague has no back-up power plan for an event of a power outage. The existence of small power generators in every hospital and within the facilities of the local water distribution company (PVK)<sup>131</sup> make the situation less dire, however a back-up power plant is to be set high on the city's agenda. Taking into account the high building density it should be a virtual one, using the potential of solar power, biomass and hydraulic power. Moreover, it is of utmost importance that **each of the three water treatment facilities (Želivská, Karaný and the back-up capacity Podolí) receives a back-up power plant of their own**. It is especially important for Želivská because it is the major supplier of drinking water to Prague (covers 73 % of the city's demand)<sup>132</sup>. In this case it should be a fully-functional small power plant that preferably covers part of its demand from renewable energy sources such as wind and solar energy.

Another back-up plan that is missing is a drinking water supply plan: with Želivská covering the predominant share of the drinking water demand any black-out at Želivská would pose a danger to the water security of the city. The provisional drinking water supply plan (with tank trailers and water bags) is only operational in the event of short-time water supply disruptions as the reserves of this system are limited. Nevertheless, the Full Circuit Project that is currently on the agenda is to be implemented within the shortest period of time possible to ensure Prague's water security.

### **Opportunity: Drinking water in substitute packaging**

Another aspect than needs to be mentioned with regard to back-up supply plans is the new back-up water supply scheme developed by PVK: packaged drinking water for substitute supplies. Additionally to the already existing back-up water supply scheme via tank trailers, PVK is planning to supply drinking water packaged in plastic bags. The purpose of the scheme is to improve drinking water supply to customers in the case of unexpected incidents and will come in especially handy in case of unfavourable weather conditions

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<sup>131</sup> PVK (2014)

<sup>132</sup> Ibid.

(rainstorm, frost, glaze ice, etc.) as well as in areas inaccessible for tank trailers. The target groups for this new water supply scheme are the elderly, the disabled, hospitals, and infants at schools and preschools. Czech Red Cross is going to be involved into the distribution of water bags<sup>133</sup>.

This year, PVK has launched a pilot project in Praha 6 as to test this new supply scheme in cooperation with the Czech Red Cross<sup>134</sup>. The problem that PVK has encountered being a private company is the unavailability of the data concerning the number and addresses of the target groups (the disabled, the elderly) due to privacy protection policy of the City Hall. As of now, the new scheme plan may only work if the needy, upon having been informed by the Red Cross volunteers, fill out a registration form on the PVK website and thus allow the use of their personal data. In order for this scheme to function, a comprehensive public information campaign should take place to make the residents aware of this opportunity and therefore the support of the City Hall is essential.

### **Challenge: Insufficient crisis preparedness drills for the public**

Crisis preparedness trainings are an essential component of urban sustainability as well-informed population that is aware of the right action plan in crisis situations such as fire, flood, industrial incidents, ice storm, etc. is less prone to panic and better able to cooperate with rescue services. Compared to the earlier times (before 1989) the amount of public crisis drills (at schools, universities, workplaces) has dropped significantly and now is limited to fire alarm drills for school students. The level of preparedness of the population has decreased correspondingly.

### **Challenge: Lacking Business Continuity Management**

*"Business continuity management is a holistic management process that identifies potential impacts that threaten an organisation and provides a framework for building resilience and the capability for an effective response that safeguards the interests of its key stakeholders, reputation, brand and value creating activities"*<sup>135</sup>.

In the post-9/11 world of uncertainty it is impossible to fully predict or anticipate risks. In order to become resilient, businesses are to develop an ability to survive a crisis and to enhance their adaptive capacity to be able to

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<sup>133</sup> Ibid.

<sup>134</sup> Ibid.

<sup>135</sup> BSI (2006)

continuously adapt to environmental changes. In other words, today the challenge is far beyond the previously used approaches of providing an emergency response plan or using disaster management strategies.

The worldwide standard for business continuity management is ISO 22301. In 2015, less than 20 % of all businesses in Prague implement business continuity measures based on standards<sup>136</sup>.

### **Challenge: Strong need for strategical planning for resilience**

As of now, Prague has a well-established culture of disaster management. There are two departments within the City Hall dealing with the issues of safety and crisis management: Crisis Management Department and Department of Security and Safety Systems. There is, however, neither an authority within the City Hall dealing with the issue of resilience management nor a resilience strategy. Facing the growing amount of both nature-caused and man-made challenges, the cities of tomorrow cannot continue to counter them by the reactive means of crisis management and are challenged to develop a comprehensive resilience management system. The key difference between the two is that the former one is based on the analysis of possible risks and exposures and includes measures aimed at reducing those risks and exposures spanning across the entire resilience cycle: prevention, preparation, response and recovery. Prague needs a comprehensive resilience strategy going beyond crisis management measures and routine site examination and licensing activities prior to the construction of new buildings and infrastructures.

Another aspect that the new resilience strategy should take into account is the growing spectre of natural threats Prague is exposed to. Floods still pose the biggest threat to the city, however now that the comprehensive flood protection system has been established, it is time to prepare to counter other risks as well. In the result of climate change and ever growing anthropogenic impact new challenges have arisen, namely heat waves, ice storms and smog. Though being unable to incur as high material damage as floods, heat waves can be even deadlier, especially for the elderly, the infants and people with heart and blood pressure issues. Ice storms may paralyze the city's traffic, cause the public transportation system collapse and damage telecommunication cables.

### **Challenge: Low feeling of security among the citizens**

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<sup>136</sup> Urbanec and Urbancová (2014)

It is not a coincidence that the top-10 search results delivered by Google to the 'Prague security' request address safety tips for Prague's guests. Despite the visible drop in the crime rate in the last 10 years<sup>137</sup>, further improvements are needed. Apart from organized crime, there are several areas within the city, including frequented by tourists Old Town and Malá Strana and others, e.g. Smichov, that are notorious for their high level of street crime, mainly pick-pocketing and robbery<sup>138</sup>. Most of the green areas, even those centrally located (e.g. Karlovo náměstí) are also considered unsafe and are avoided by the residents in the night-time.

Another issue contributing to the low feeling of security of the Prague residents is the continuing public distrust in the security services and little willingness to co-operate with them. This appears to be a psychological issue with its roots in the 1990s when the crime rate was skyrocketing and the police ineffective. To overcome this problem, a direct contact of the security services with the residents (e.g. via social networks, public events) is to be fostered. The recent introduction of the city-wide video-surveillance system (ca.3000 cameras) may help improve the situation, however for the video surveillance system to work to its full potential the **systematic analysis of the video data** is needed in order to identify crime spots and address them accordingly in the crime prevention strategy.

### **Opportunity: Smart water grid technologies and better customer service**

In 2014, PVK introduced Smart Water integrated Management (SWiM) system for the improved management and coordination of the city's water infrastructure. It is based on the cutting-edge technologies such as smart water metering and the use of sensors for the detection and minimization of water leaks, quality control and detection of contamination and is therefore one of the most advanced in Europe. The introduction of SWiM has allowed for higher operations efficiency, enhanced emergency management, shorter repair times, and better evaluation of services. Moreover, it has established a direct connection with the operating centre of the Prague crisis staff and thus enabled the coordination of activities with other stakeholders of the integrated relief system and the flood control system. Another important aspect of the SWiM system is improved communication with customers: Prague's residents can now receive exhaustive information about the water supply problems such as disruptions and water pollution on the PVK website and via an SMS. The

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<sup>137</sup> Czech Statistical Office (2014b)

<sup>138</sup> Prague City Development Authority (2008)

real-time map also delivers the information about the closest water tanks available<sup>139</sup>. (PVK, 2014)

### **Opportunity: Energy efficiency & energy recovery in the water sector can be further improved with innovative technologies**

PVK has already done a very good progress in terms of increasing the energy efficiency of its structures. For instance, innovative technologies for the monitoring, control and regulation of energy use in the water network are part of the newly introduced SWiM system. Moreover, water level and pressure in the water distribution system has been optimized with respect to the morphology of the city and the demand patterns of the population to allow for a more efficient energy use. Further, the CWWTP is fully self-sufficient in terms of heat generation and to 77.7 % self-sufficient in terms of power supply from biogas (2014, the best result in its history)<sup>140</sup>. Besides, in 2014, the MTC (Managed Telemetric Collection) for smart metering was introduced to allow for across-the-board data collection from the meters and real-time monitoring of consumption patterns. MTC delivers a detailed picture of consumption behaviour in real time, optimizes energy costs, monitors energy leaks, informs of emergencies, provides information for billing, etc.<sup>141</sup>

The use of renewable energy is yet another way of achieving energy efficiency. In 2013, the pumping station Cholupice received a photovoltaic power plant that was aimed at reducing the dependence of the pumping station on the external power sources and thus increase its resilience. This kind of investment has already proved to bring pay-off in the long-term perspective<sup>142</sup>. Concerning further measures, inter alia introduction of heat pumps to recover waste heat from wastewater is possible.

### **Challenge: Insufficient investment into the renovation of the water infrastructure**

The average age of Prague's water and sewage system is rather high (52 years) which inevitably leads to failures in the sewage network (3,736 in 2014) and water supply network (4,520 in 2014) resulting in 17.8 % loss in the water supply network<sup>143</sup>. Consequentially, it resulted in a considerable amount of ad-hoc repair costs.

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<sup>139</sup> PVK (2014)

<sup>140</sup> Ibid.

<sup>141</sup> Ibid.

<sup>142</sup> Ibid.

<sup>143</sup> Ibid.

Strategic investment into a gradual renovation of the old water and sewage pipes would resolve the problem of high water losses and unplanned repair costs. However, the Strategic Investment Department of the City Hall issues only one-year investment plans which does not allow for long-term planning and hinders the solution of this problem.

### **Opportunity: Cyber security is already on the City's agenda**

Following the passing of the Czech Cyber Security Act<sup>144</sup> (in force since 01.01.2015), the Prague City Hall responded with the establishment of the Department for Protection of Information Systems and Infrastructure of Prague City Hall (March 2015). The realm of this department's tasks encompasses data protection and privacy policy within the City Hall. Taking into account the importance of the ICT infrastructure for a smart city of tomorrow, this is a positive development and the basis for the smartification of Prague. However, the mentioned Department is mainly reactively and intra-organization focused which leaves room for further advancement. It is essential that cybersecurity standards are introduced and enforced on the city scale.

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<sup>144</sup> (Act on Cyber Security No. 181/2014 Coll., 2014)

### 1.4.5 Buildings in Prague

Prague's building stock is characterised by a high share of historical buildings as they survived despite the major destruction of 20th-century Europe like the Second World War. Since 1992, the whole old town and further monuments and buildings within the inner city are listed under the protection of cultural heritage. The architecture of Prague's building stock from various periods is one of the main attributes that makes the city so attractive for tourists. The whole built up area of about 5000 [hectares] is about 10% of the total area of the city territory. In 2010, there were about 88.200 houses within the City of Prague and approximately 551.243 apartments. However, there is a lack of data about the distribution of usages within the city (spatial distribution of GFA) regarding residential, commercial and industrial usages.

The average required floor space per person is about 29,3 (m<sup>2</sup>GFA/ person) and is thereby quite low in comparison to other European cities. The average price of rented apartments with 7,86 € per m<sup>2</sup> is quite low in comparison to major European Metropolis. However, the rent level has to be compared to the total expenditures and income of the local citizens, in order to evaluate its social compatibility. Assessing the relation of rental expenditures of income (29,4%) there is space for improvement. A high share of rent on income can be a problem especially for low income groups like elderly and students. High rent expenditure have had an influence on the gentrification of the old town and also on the urban sprawl at the city's outskirt. There is a **lack of regulation of the housing market** since 1990 (both, on national level and city policy). Further, the city sold a big share of their buildings and infrastructure - and thus lost lots of influence. There had been privatisation of residential building stock since 1990.

There is a **lack of information** on the energy efficiency of **Prague's building stock**, on the number of deep renovations and on the quality of building envelopes and HVAC-systems (heating, ventilating and air-conditioning). Although there is an energy assessment and audit with every major construction project in Prague and the buildings get a certificate of energy performance; there is no analytical unit in place that would analyse and evaluate all the data for the energy sustainability of Prague buildings. In sum, the data exist, but they are not analysed and interpreted and integrated into cohesive decision-making. Research on the energy consumption of the building stock in Czech Republic is done on national level. Currently it is planned to collect the data from the Energy Performance Certificates until 2016 by the Ministry of Industry and Trade. For the territory of Prague there exists some data that had been elevated within subsidy programs, but the data is not complete yet. Further research in this area is necessary. There is no data on energy consumption of interest, and also there is no data on the number of

deep renovation, percentage of buildings with insulation and percentage of HVAC systems with improvements.

However, it is assumed that about 20% of Prague’s building stock had been renovated to improve the energetic quality within the last decade. Derived from this, with an estimated average spending of 12 Mio.€ per year for the refurbishment of buildings and an estimated refurbishment rate of 2%, progress in **modernizing the building stock of Prague is rather slow** due to a fragmented ownership structure and absence of a long-term vision. At the same time there is a high amount of vacant buildings in the inner city, leaving potential for a sustainable-development of the real estate market untapped. Further, 3% of the public buildings owned or in use of central government institutions have to be energetically modernized from 2014 to 2015 Public - according to Directive 2012/27/EU.

**Table 12: Indicators for Prague Buildings System**

<b>Indicators of Building System</b>				
	P29	Required floor space	29,3	m2 GFA/ person
	P31	final energy demand-total of building stock	No Value	kWh/m2 GFA*a
	P32	primary energy demand total for building stock	No Value	co2- equiv./ m2 GFA
Pressures	P33	Rent level - Average price of rented apartments	7,86	in € per m <sup>2</sup>
	P34	Rent level - Relation between rental expenditures and income	29,40	in %
	P35	Rental increase (average of last 3 years)	-0,9	%/a
State	S49	average investment in refurbishment of residential buildings	120	Mio euro/last decade
	I8	global warming potential for building stock	No Value	Co2 equiv./ m2 GFA
Impact	I9	Rate of new construction (in percent of building stock)	0,34	% per a (2013)
	I10	Rate of refurbishment (in percent of building stock)	2	% per a
	I11	Rate of demolition (in percent of building stock)	No Value	% per a

A wave for massive insulation projects started in 2009 with the initiation of the program “green-to-savings” (“Nova Zelena Usporám”). The government wanted to support the replacement old windows, the insulation of facades, and the installation of solar collectors and the renewal of boilers especially for private home owners. The homeowners could receive up to 75% of the modernization costs paid by the state. Thus, the green investment scheme had an important impact on building renovations: The total amount of subsidies was about 20.6 billion CZK (about 755 million €) and it is assumed, that the total investment might have been even about 35 billion CZK (1,2 billion €); for Prague about 10% of the total amount had been invested into the energetic modernisation of family houses and apartment buildings. The program had been financed by the sale of CO2 certificates of the CR to Japan. However, the share of state funding within the new green-to-savings program is lower, which resulted in a strong decrease of demand by the building owners. In 2014 1.9 billion CZK (almost 70 million €) were provided as subsidies for energetic refurbishment of buildings, but not even half of this money had been applied for by October 2014.

### **Demand of a clear regulation for stricter local building standards**

There are few regulations in place that incentivize or enforce sustainable investments and behaviour. This is especially relevant in the building sector, where a clear regulation is needed in order to enforce the responsibility of investors for an integrated and sustainable development of sites in the city.

### **Demand of guidance for comprehensive modernizations**

So far, there have not been many comprehensive energetic refurbishments, and in most cases only insulation has been installed. There had been a lack of guidance for building owners and missing comprehensive planning. Thus, there appeared some moisture and ventilation problems within the renovated buildings. Further, because of many single flat owner-occupiers it is not always easy to find consensus for energetic refurbishment within multi-family-buildings.

### **Demand of information and strategy on Prague’s building stock**

There is a lack of modernisation strategy for Prague’s building stock. Though, part of the development of the “Smart Prague Concept” had been a strategy for the development of intelligent buildings - including 28 case studies for building modernisations, but the work on the building strategy had been stopped when the city’s leadership changed. Thus, the future goal should be to elevate a complete data set of the energetic quality of the Prague’s building stock and to develop a clear strategy for the development of the building stock.

In order to develop a strategy for energetic modernisation of the building stock a 3-D city model could be useful, that shows the spatial distribution of energy demands.

### **Demand of lighthouse projects for refurbishment of public buildings**

There is a current need for the energetic refurbishment of public buildings and the need to create higher environmental awareness of the citizens. Lighthouse projects of public buildings can have a high visibility (combined with right communication strategy and high visitor flow-through) and therefore function as multipliers for further replication. It is important not to look only towards the energetic quality of the buildings, but to create a more holistic understanding (e.g. by SB Tool) including the aspect of in-door environmental quality and design of public space around the building. Economic viability needs to be proven.

### **Chance for further distribution: Renovation of HVAC-systems of historical buildings using renewable energy sources**

There is a lighthouse project for energetic refurbishment of a historical building: the National Theatre. Photovoltaics have been installed on the roof and the cooling system uses the water from the river Vltava (water-water-heat pumps). It is assumed, that there might be great potential to install further water-water-heat pumps along the river Vltava. Within municipal buildings larger heat pump projects could be feasible and efficient. Another example for the renewal of HVAC-system is the Rudolfinum Concert Hall (Czech Philharmonic). The HVAC-system had been renewed using Energy Performance Contracting. There is a project called Zelene Pamatky (green monuments), which promotes sustainable refurbishment and operation of important historic buildings.

## 1.4.6 Energy System

The total energy use of Prague (17,5 MWh/a/cap), the total electricity consumption (4,8 MWh/a/cap) and the electrical energy use per household and capita (1,1 MWh/a/cap) lie above the EU average and represent a rather strong pressure for the energy system. To ensure sustainable and future-proof development, Prague needs to reduce its energy consumption. Because of the **high demand for energy and electricity** that had been identified, Prague needs to bring down its energy consumption. The energy price is remarkably low and leaves room for investments<sup>145</sup>.

The CO<sub>2</sub> emissions per capita are within the European average values (6,01 t/a/cap), but also needs attention: a) because there is **potential for reducing emissions** (e.g. via environmental education measures aimed at energy saving, via stricter Green Zone regulations in Prague and via the use of renewable energy sources) and b) because stringer emphasis will be put by the EU on reaching national and sub-national targets. In Prague the largest source of GHG emissions is the energy sector: 2,83 t/a/cap are emitted due to electricity generation) and the transportation sector (1,26 t/a/cap).

Only 3.6 % of Prague's energy demand is covered by energy produced within the city. Nearly the same value (3.5%) is the current amount of renewable energies in Prague. The potential of renewable energy use is thus under-exploited. Unfortunately, regarding the use of renewable energy sources Prague faces substantial limitations. For instance, the installation of photovoltaic panels within the historic parts of the city is impossible due to the protective regulations of UNESCO National Heritage Institution. Also there is no substantial capacity within the city area for the installation of wind turbines. Further, the use of biofuel may contribute to the air pollution within the city.

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<sup>145</sup> CEEP (2013)

**Table 13: Indicators for Prague's Energy System**

<b>Indicators of Energy System</b>				
Pressures	P4	Total energy demand per capita	17,5	MWh/a/cap
	P5	Total electricity consumption per capita	4,8	MWh/a/cap
	P6	Electrical energy use of households per capita	1,1	MWh/a/cap
State	S6	Electricity generated in the city (in percent of overall energy demand)	3,59	%
	S7	Importance of local district heating (share of heat demand)	40	%
	S8	Renewable energies in the grid (share of electricity demand)	3,5	%
	S9	Cost for electricity - average electricity price for private consumers	12,8	Euroct/kWh
	S10	Cost for heat - average price for natural gas for private consumer	5,5	Euroct/kWh
	Impact	I2	CO <sub>2</sub> emissions - overall (global protocol)	6,01
I4		Airborne pollutants (No <sub>2</sub> , average yearly concentration)	43	(NO) µg/m <sup>3</sup>
I5		Airborne pollutants (PM <sub>10</sub> , average yearly concentration)	33	(PM) µg/m <sup>3</sup>
I6		Amount of waste produced	3,81	mega tons

### Increase the use of renewable energies

The use of innovative technologies for power production and saving will help Prague increase its potential for sustainable development. Prague needs to increase the use of renewable energy sources and launch pilots on smart energy grids. Here, the existing limitation on renewable energy use need to be overcome (e.g. by locating wind turbines and photovoltaic panels in the Prague Metropolitan region).

## **Close the gap between energy strategy and its implementation**

Within the “Energy Plan of Capital City of Prague (2013-2033)” there have been developed many proposals for the implementation of energy efficiency measures within different sectors. The strategy is called “Strategy of Transition to Low-Carbon Economy in Prague”. Nevertheless, it has been discovered within the interviews, that there exists a gap between the development of a strategy and its implementation in Prague due to discontinuity within the municipality on the political level.

## **Develop a back-up power plant based on renewable energy sources**

Currently Prague has no back-up power plan to supply critical infrastructures in a case of a black-out event. There have been discussions about the installation of small local power plants distributed across the city, but it is not easy because of the city’s density and lack of space. A virtual power plant that combines multiple sources of energy, predominantly conventional (natural gas for a natural gas fired CHP) as well as renewable ones (to a lesser extent) could be a solution. However, as previously mentioned, the use of such renewable energy sources as solar, wind and biofuel is difficult due to specific local conditions. Thus it is advisable to find ways of overcoming these limitations (e.g. by locating wind turbines and photovoltaic panels) on the outskirts of the city or within the Prague Metropolitan Region.

Such a power plant is suggested as an additional measure for enhancing the energy security of Prague and creating a lighthouse project for the use of renewable energy sources. This possible stand-by facility could not only be useful for the city in case of black-outs, but also in times of peak consumption. Despite limited return on investment, a back-up power plant is essential for strengthening Prague’s energy security.

## **Initiate incentives for energy efficient industries**

The share of the industry sector in energy consumption in Prague is assumed to be only about 10%<sup>146</sup>, mostly because of decline of some energy demanding industry sectors. However, there is a **lack of incentives for energy efficient industry** within the Prague Metropolitan Region, like subsidies or tax reliefs for energy efficiency measures.

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<sup>146</sup> Czech Statistical Office (2014a)

## 1.5 Development Plans

### 1.5.1 The overview of strategies and development plans

The most important development plans for Prague are the Strategic Plan for Prague and the Metropolitan Plan, which is the new version of the Masterplan.

The IPR (Prague Institute of Planning and Development) is responsible for the strategic development, city planning and land use planning.

One of the most important and overall documents for the city is the **Strategic Plan for Prague**<sup>147</sup>. The Prague Strategic Plan is the result of the joint work of many politicians, experts, representatives of the business community and city residents. This includes several bodies of the local government like the Prague Municipal Assembly, the Prague City Council, as well as the Mayor, several Prague City Hall departments and organizations. The business sector was represented by several institutions and experts. Residents were involved in the preparation of the city's strategic Plan through a forum.

The main contributor was a specialist team from the City Development Authority of Prague led by Dr. Milan Turba. The latest update of the Strategic Plan was approved by the Prague Municipal Assembly in December 2008.

The Strategic Plan is a conceptual document that identifies main directions of city development in the medium and long term, setting goals and priorities for addressing the key issues of socio-economic development in the city. The plan is based on four principles: quality of life, sustainability, frame of reference to other European cities and feasibility.

The plan also includes the most important topics for the city: the opportunity and challenges of and for the city, Prague in a new Europe, Competitiveness, People in Prague, environment and infrastructure, safety and security, administration and management and spatial development.

The newest update of the strategic plan will be finished in September 2016. Further relevant city plans are designed to conform to the strategic plan or use it as their conceptual framework.

The accompanying document to the Strategic Plan is the **Programme for the Implementation of the Prague Strategic Plan**<sup>148</sup>. It was officially approved and published in 2009 and is valid for the period from 2009 until 2015. The Programme was prepared by the Strategic Planning Department at the City

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<sup>147</sup> Prague City Development Authority (2008)

<sup>148</sup> Strategic Planning Department of the City Planning Authority (2009a)

Development Authority Prague in co-operation with Prague City Hall departments and other partners.

In the field of innovation, the **Prague Regional Innovation Strategy (Prague RIS3)**<sup>149</sup> is an important document which aims to support the development of innovation in Prague and strengthen the economic development. This document is an update of the innovation strategy which was created in 2004 in the BRIS project, but was not systematically implemented due to a lack of political commitment. The foundation of the strategy was laid down in two workshops that were both attended by 50 representatives of 27 organizations. The strategy formation process included representatives of the Prague local government, universities, research organizations, the business sector, non-profit organizations and the relevant State organizations and agencies. As a result, an official website ([www.rishmp.cz](http://www.rishmp.cz)) was launched in March 2012, acting as the main source of information on PRIS. The website provides information and online tools for the public enabling participation. The Regional Innovation Strategy was approved by the Prague Municipal Assembly in September 2014.

Within the building sector, the **building regulations** have in the past been subject to intensive discussions. Weak building standards did not impose any responsibility on developers and held low legitimacy, putting too much emphasis on prescribing a unified standard for individual new buildings without considering the impact on the surrounding buildings and the city as a whole.

Currently the building regulations are being redesigned and amended to be in line with building regulations in developed European metropolises like Vienna or Berlin. The new regulations focus on matching building structures, integrating buildings into their environment and surroundings, improvement of public spaces and reducing parking spaces. The aim is to solve the problems of the disintegration of the city while focusing on the idea of a compact city with short distances. The new building regulations will come into force in August 2016<sup>150</sup>.

The **Metropolitan Plan** will become the new Land Use Plan for Prague and will be finished in 2020. The **Masterplan** is the current land use plan. It has been in effect since 2000. The regulations of the masterplan are binding and have to be followed during the construction of new buildings. It includes functional area use regulations and spatial regulations for development and transformation of the city. The Land Use Plan is produced by the Department of Construction and Land Use and designed by the Institute of Planning and Development.

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<sup>149</sup> IPR Praha (2014)

<sup>150</sup> IPR Praha (2016)

The goal of the new Metropolitan Plan is to **stop the uncontrolled expansion of development into fields** by defining clear borders between the city and the countryside, support the urban character of localities and prevent the development of solitary high-rises in inappropriate locations.

## Urban development and planning

The **spatial development principle** is a tool functioning on the regional level, a masterplan for the whole region. In the case of the Czech capital the ZURs' goal does not consist of coordinating, but rather of setting priorities and basic rules for city development and identifying the areas for construction of transport and technical infrastructure, which are important for the function of the city as a whole. Therefore, it is the key document for the improvement of Prague's infrastructure. It aims to make Prague a more accessible and interconnected city by cutting traveling times and distances. It addresses the issues related to the Prague Ring Road and railway traffic, especially public transportation as well as pedestrian and bike traffic.

## Prague's planning system

In the first half of the 1990s, urban planning and policies were seen as contradiction to the free market and instead of long-term plans, strategies or visions, short-term plans and ad-hoc decisions were preferred.

Since the 1989 Velvet Revolution, the city's authority has been trying hard to keep the balance between the economic growth and the preservation and development of the city while dealing with the dysfunctional planning system that was inherited from the previous communist government. Following the post-communist changes, the government agreed in the 1990s on several plans and policies; creating a new urban planning system, including the strategic plan in 1998, protection and conservation of the landmarks and housing and transport policies, which are now being revised. Due to this late development and post-communist structure, Prague's urban planning system still has some weaknesses compared to other European metropolises in terms of policies, regulations and plans, which are actively being addressed by the IPR with the citywide strategic plan, the masterplan, the new building regulations and mobility plans.

The Strategic Plan and the Masterplan are the two main citywide planning documents. The aims of these documents are to develop Prague in a sustainable and controlled way, to purposefully manage the process of urban change, to preserve and develop the values of the city and not leave it up to uncontrolled development.

"If Prague wishes to join the ranks of developed western metropolises, it requires first-rate development planning with an excellent knowledge and information base.

The capital city needs an integrated and interconnected planning system at various levels: from visions and ideas to practical regulations and ordinances. This requires institutional support. The establishment of the Prague Institute of Planning and Development was, in fact, one of the first steps in this direction.”<sup>151</sup>

A number of guidelines for the Czech Republic or plans and strategies from the EU concerning countrywide actions have been developed, including:

- Operational Programme Environment (Czech),
- Economic Development Strategy of the Czech Republic,
- Sustainable Development Strategy of the Czech Republic,
- Sustainable Development Strategy of the EU,
- Operational Programme Research and Development for Innovation (OP R&DI), financed from the European Regional Development Fund (ERDF)
- Operational Programme Enterprise and Innovation (OP EI), financed from the ERDF.<sup>152</sup>

### 1.5.2 Current and planned Projects

**The city of Prague currently carries out the following big city project:** <sup>153</sup>

- **The revitalization of Charles Square:** Charles Square (Karlovo náměstí) is a busy, thoroughfare square in Prague 2, which will be transferred into a green city boulevard with new transportation solutions until 2018.

**The districts of Prague have the following projects in progress:**<sup>154</sup>

- **Malešický Park Renewal:** The park in Prague 10 will be transformed into a senior-friendly and barrier-free green area that meets the demands of current citizens with the provisions of a new playground, benches and bins, solar lighting, bike stands and a cycle track.
- **Revitalization of Orten Square:** This largest square in Prague 7 will be renovated while decreasing the current traffic, new plants and

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<sup>151</sup> IPR Praha (2015)

<sup>152</sup> City of Prague (2007, p. 5)

<sup>153</sup> City of Prague (n.d.d)

<sup>154</sup> City of Prague (n.d.c)

flower beds, benches and bins, readjusted playgrounds, streetlights and sewerage.

**Besides, several European projects are developed within the city including:**

- **Morgenstadt: City Insights:** Prague is a member of the Innovation Network Morgenstadt: City Insights. The Fraunhofer network is a platform of high-level first movers from cities and industry run by several institutes of the German Fraunhofer-Gesellschaft.

Within the network, Fraunhofer is developing innovative strategies, products and services for sustainable urban development. The fundamental goal of the network is to accelerate development that helps to reduce energy and resource consumption, while simultaneously enhancing the resilience and livability of cities. Fraunhofer applies the full scale of cutting-edge innovation management to a high-level network of cities and companies that are already working in the field of urban sustainability in Europe and around the world. Since 2014 members of the innovation network have initiated 35 demonstrators and for first-of-its kind sustainable city development projects, which today are at various stages of implementation. Together, Morgenstadt partners leveraged public funding worth > 80 Mio. Euro in 2014 and 2015.

After Prague was elected as a Morgenstadt City Lab by the Morgenstadt Partners, the action-oriented Morgenstadt framework for urban analysis and strategic roadmap development has been applied to Prague along with a number of other promising cities like Lisbon, Chemnitz, Tbilisi and the »Urban Tech Republic« in Berlin Tegel.

- **Triangulum (Smart Cities Project)**<sup>155</sup>: The city of Prague has been chosen as one of 3 follower cities within the EU funded Smart Cities and Communities project Triangulum that follow the implementation of smart city solutions within the lighthouse Cities. Within the Lighthouse Cities Manchester, Eindhoven and Stavanger, selected districts function as living labs where smart city solutions and products are implemented. The selected Lighthouse districts for demonstration are the Corridor in Manchester, Strip-S and Eckart Vaartbroek in Eindhoven and the Centre of Stavanger including the Hillevåg district. Each of these districts demonstrates how the integration of smart city solutions in the fields of energy, mobility and ICT leads to a significant reduction of energy demand and local GHG emissions, while at the same time enhancing the quality of life and providing the basis for economic growth. The

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<sup>155</sup> Fraunhofer IAO (2016)

Follower Cities Prague, Leipzig and Sabadell test the replication potential of the Lighthouse Cities' solutions. Within the context of the Triangulum project, the Follower Cities are finalizing within a systematic approach their own Smart City Implementation Plan, which is supported by scientific evaluation and conducted in close collaboration with the Lighthouse Cities. The process will be catalyzed through the development of the Smart City Framework as a guideline and decision-making tool, which is based on the ongoing evaluation of smart City Implementations in the Lighthouse Cities. The Framework helps Follower Cities to replicate smart City Implementation Projects based upon local factors and to allocate future investments in a sustainable and efficient way. In 2018, Prague will start the implementation of its own smart city solutions according to its local factors.<sup>156</sup>

- **Invitation for Commitment<sup>157</sup>:** The city of Prague has submitted a commitment which is launched by the European Commission under the European Innovation Partnership on Smart Cities and Communities. Being part of the Partnership through making a commitment allows Prague to network with other likeminded partners in the same field, thus providing a meaningful and needed push for the smart cities strategic agenda in the EU.
- **Integrated territorial investments (ITI)<sup>158</sup>:** In the Czech Republic, 7 ITIs are identified under the ITI rules, which were created by the Common Provision Regulation (CPR). The Prague Metropolitan Area (the City of Prague and the Central Bohemia Region) is highly specific, as it comprises two "categories" of region and will support different thematic areas: transport (for integrated transport system), environment (anti-flood measures) and regional education system (capacity of schools in the circle around Prague).

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<sup>156</sup> Fraunhofer IAO (2016)

<sup>157</sup> European Commission (2014b)

<sup>158</sup> CEMR (2014)

## 1.6 Sensitivity Analysis of Prague

Based on 57 interviews with local stakeholders, the on-site assessment of Prague revealed a total amount of 174 factors that exert substantial influence upon the development of the city. Although this seems to be a high number, it is obvious, that these impact factors only represent a partial set of variables that impact upon a complex system like an entire city. Yet, for analytical reasons, following the sensitivity model of Vester, it was necessary to distil the most important factors out of this list for further processing<sup>159</sup>.

The cross-impact analysis of factors at work in Prague allows distinguishing between four different categories of factors:

1. **Drivers:** these factors have high impact on other factors and receive little influence from other factors. They have the potential to drive change and to stay stable over a long time. Often they are difficult to change.
2. **Levers:** These factors have a high impact on many other factors and they are also influenced by many other factors. These are the crucial factors that one needs to get right in order to transform the system in the desired direction. Levers need to be designed carefully, because their consequences in the system may be difficult to oversee.
3. **Indicators:** These are variables that have little influence over other factors, but are strongly influenced by other factors. They serve to show the change in the system. Therefore they can be used as indicators of a systems transition.
4. **Buffers:** These are factors that are rather inactive in any direction. They do not influence many other factors and they are not influenced by many other factors. One should not try to change the system by working with buffers.

An analysis of the “super factors” for a sustainable development of Prague through a sensitivity model<sup>160</sup> reveals a set of important insights:

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<sup>159</sup> Identification of super factors was done via multicriteria factor analysis.

<sup>160</sup> The model for sensitivity analysis as layed out by Frederic Vester was applied to analyze the significance and interrelations between the factors at work in Prague.

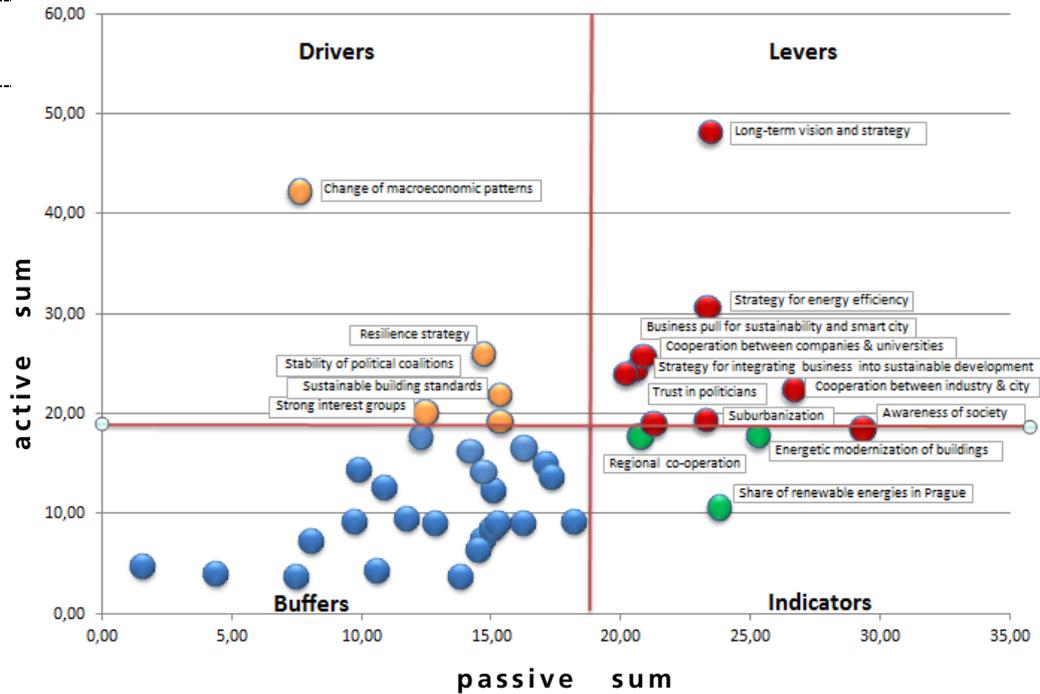


Figure 6: Cross-Impact Analysis of Prague's impact factors

For Prague, there is a set of factors that show disproportionate influence upon a sustainable development of the city. If achieved, they will be strong drivers of a positive development process and they will provide stability for a long-term development, keeping the development process on track:

- **Stable political coalitions:** only when the elected authorities have enough time and stability to develop and implement the right long-term strategies and corresponding measures, there is the chance to substantially drive the sustainable development of the city. Political stability is a complex asset, and there is no magic formula for stable political coalitions. A balance has to be found individually in each city.
- **Developing a resilience strategy for Prague:** Although well protected against floods, up until now, Prague has no overarching strategy for urban resilience in place. This would include risk management, better coordination of municipal services and the implementation of resilience by design principles.
- **Developing sustainable building regulations:** Prague is still missing a building code. A good regulation of buildings helps to drive a sustainable development of the city by reducing energy consumption, upgrading public space and infrastructure and improving the quality of life for the residents of Prague. Good building standards not only refer to the quality of the building, but also to social, environmental and financial sustainability objectives of the city development.

- **Communication & Marketing:** Active branding can help position Prague to attract industry, investment, visitors, and talent. It also increases market /sales opportunities for local businesses and helps Prague citizens identify themselves better with the city. The integrated, multi-stakeholder (cross-sectoral) development of a city brand that includes sustainability can have a binding effect on the partners involved.<sup>161</sup> A basic tenant of place branding is that brand delivery must match the brand promise, thus if there is stakeholder buy-in a good brand can act as a guiding vision for both public and private sector development. Thus, communication must be directed outwards (to visitors, partners and potential investors) and inwards (to the own citizens) (e.g. via campaigns) and be directly attached to visible lighthouse projects and strategic development issues.

The largest **lever** for the future development of Prague is the **development of a long-term vision** and a strong development strategy for the city. It is clear that this factor impacts on many other factors in the system. Once Prague has defined a clear vision for 2030 or 2050, where to drive its development, and on what to spend its investments, many other activities will follow. Deciding on the development goals for Prague in the 21<sup>st</sup> Century is therefore the number one factor that will lever a sustainable development in a long-term process.

Other levers for enabling a sustainable development of Prague are:

- **Improvement of collaboration between the public the private and the research sector.** Three impact factors prove to be levers pointing into exactly this direction: the business pull for sustainability and digitalization (many companies would like to invest into sustainable technologies in Prague), and the poorly coordinated collaboration between the private sector, Prague's Universities and the city. Taken together these factors show that once development goals are clear, the largest support for a sustainable development of the city will need to come from a new way of working together with research and the private sector to make sure the goals will be achieved jointly.
- **The development of a strategy for energy efficiency:** the energy consumption of Prague is considerably high. A strategy for energy efficiency will address a large set of activities that reduce energy consumption, but at the same time improve urban processes and infrastructure.

<sup>161</sup> A good example for this is the Brand SMARTAmsterdam or the Living Lab Malmö.

- **Regaining trust in the city representatives:** today there is continuing public distrust in the people in power (politicians, public officials, policemen, etc.), leading to instable political coalitions and to a civil society that feels unable to co-create the city. Establishing trust into the civil servants of Prague and their motivation to work for the best of all citizens, will create a strong momentum for a new form of urban development, supported by the citizens.-
- **Reversing suburbanization:** Many unsustainable developments patterns of Prague have occurred in the past due to a strong trend towards suburbanization. This means, that whoever manages to reverse this trend and to attract more people to live within the city boundaries again, will have a strong lever on sustainable transportation, land-use, economic development and urban life quality.
- **Increasing the awareness of Prague’s society:** Up until now, a sustainable development of their city is not strongly represented on the agenda of Prague’s inhabitants. However, a well-educated citizenry that is aware of the potential of a sustainable urban development for its own life quality has a strong impact on many other variables that support a long-term development of Prague. Stimulating the engagement of Prague’s society bears the possibility to creating a strong momentum for a sustainable Prague 2050.

## 1.7 Strategy development

As shown in the chapters above, the Fraunhofer Morgenstadt Framework builds on three core layers: city indicators, action fields and impact factors.

In order to take the first step from analysis to action, the Morgenstadt approach builds on an integrated reference of indicators and action fields.<sup>162</sup>

The indicator analysis has shown that 22 indicators for Prague are in a critical state, which means that they are way below the average benchmark of comparable European cities. Table 14 gives an overview over these indicators

**Table 14: Critical indicators for Prague**

			Necessary Development
<b>Transport</b>			
P23b	Bicycle share in modal split	1%	

<sup>162</sup> The basis for this is a large database of 85 x 120 datapoints, which rates the influence of each of the assessed action fields on each indicator in a generic way. The database has been produced by > 20 experts based on their judgement and estimation of systemic influences. The database that has been applied for this analytical step is generic and thus, results need to be adapted to local circumstances.

P24a	Rail share in freight transport	7,50%	
P24b	Road share in freight transport	82,30%	
P24c	Water share in freight transport	0,20%	
S23	Affordability index – Mobility	10,70%	
S17	Road share for public transport	15%	
S26	Density of EV/FC charging network	0,11	

Prague City Profile

### Energy & Buildings

P32	Primary energy demand total for building stock	298 kWh/m2	
P5	Total electrical energy use per capita (kWh/year)	17.521 kWh/a/cap	
S6	Electricity generated in the city	3,59%	
S8	Renewable energies in the grid	13,20%	

### Resilience & Resources

S30	Recycling rate	26,20%	
S11	Reaction time of first responders	7,5 min	
S13	Nr. of fulltime firefighters per 1,000 inhabitants	0,74	
S14	Medical emergency response personnel per 1,000 inhabitants	0,24	

### Society

S24	Average commuting distance	20 km	
P14c	Social expenditures in city budget	1,92%	

### Governance

S44	Administrative structures for sustainability management of the city	none	
S45	Existence and state of CO2reduction goal	none	
S46	Existence and performance of sustainability management	none	
S47	Earmarked revenues for sustainability projects	none	

In addition to this list, there are 33 indicators that show moderate reasons for concern, being in the yellow state of the benchmark system.

The combined analysis of indicators and action fields in Prague has shown that a **set of 22 action fields** can leverage the potential to drastically improve the

sustainable development of Prague in the coming years by tackling most of the issues that at current are the reason for a considerable low performance in some areas.

Table 15 shows a ranking of these 22 action fields that address many of the critical and semi-critical indicators at the same time, and which thus have been identified as key activities for a roadmap for Prague:

**Table 15: Key action fields for a development strategy for Prague**

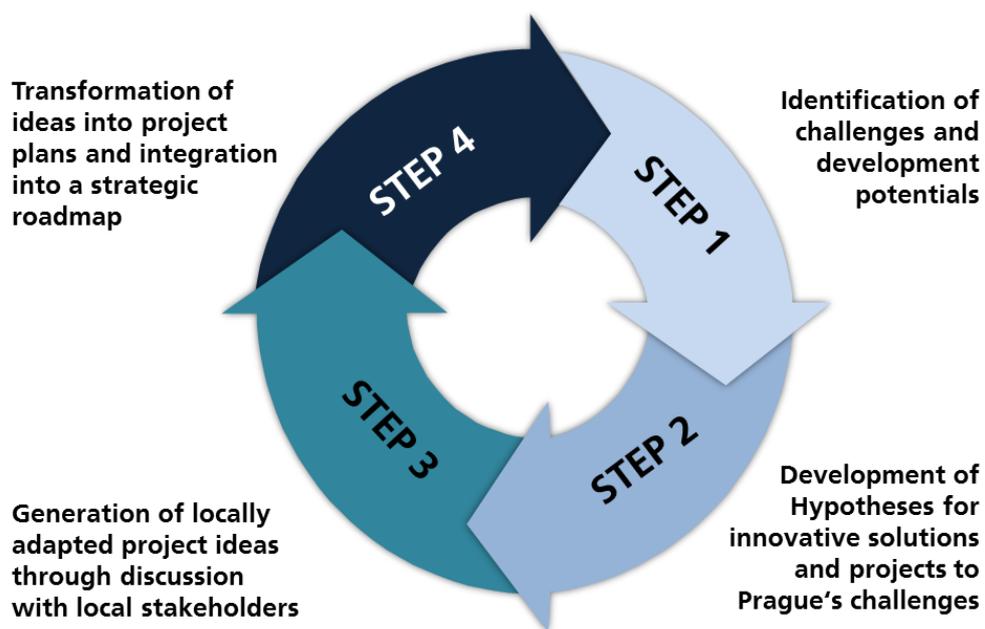
<b>Action field to be implemented</b>	<b>State of implementation today</b> <i>(on a scale from 0 – 10)</i>
1. Development of goals and guidelines for a sustainable district development.	5
2. Sponsorship / subsidies by the city for sustainable technologies & solutions	0
3. Incentives for "first movers" and "InvestCommunities"	0
4. Active partnership between city & private sector for pushing sustainability topics.	0
5. Development and implementation of services for supporting sustainability solutions.	5
6. Activation of business actors for supporting the sustainability strategy of the city.	2
7. Targeted management of climate change protection & sustainability within the administration with modern tools for management and planning	5
8. Creation of "city labs" (experimental areas) for deploying innovative technologies	5
9. Innovative financing of sustainable and connected technologies and projects	2,5
10. Alignment of budgetary policy with sustainability goals	0
11. Systematic long-term planning of the city structure	8
12. Urban development planning for a city of short distances	0
13. Collaboration between city and region for environmental protection and sustainability	0
14. Urban Innovation Management	7,5
15. Creation of administrative structures for communal sustainability management	0
16. Development of green inner city industry parks	5
17. Communal climate change management.	2,5
18. Transport Oriented Development	8
19. Provision of E-Mobility-Infrastructure	2
20. Negotiated / Voluntary agreements to higher social and environmental standards	0
21. Development and implementation of services for supporting sustainability solutions.	5
22. Development of Visions / goals together with civil society	2

Obviously not all of the action fields can be addressed at once and Prague needs to find a way on how to prioritize scarce resources on the most promising projects and measures. To this end, chapter two of this report shows how the analysis of Prague's current state can be transformed into an action

plan that boosts a strong and thriving development of the city in the 2016 and beyond.

The development of the roadmap, as lined out in chapter two, followed an iterative approach. In several steps the information obtained through the analysis was used to develop locally adapted innovation projects that would build upon the identified action fields and impact factors and tackle the deficits which were identified through the indicator assessment:

**Figure 7: Project development process**



Two workshops with local experts from Prague were held to present the project ideas, which were generated in response to the analysis, and to augment them with local knowledge and already existing project ideas within the stakeholder basis of Prague. The largest workshop was held on September 24, 2015 with more than 80 attendees from the City Hall, municipal enterprises, local companies and universities.

The project descriptions within the roadmap are not intended to be final versions of complete projects or ready to use project plans. They represent a work in progress. All projects and measures will need to undergo an individual process of definition, reformulation and implementation. It is crucial, for this roadmap to come alive, to conceive of the suggested projects as strong impulses for the sustainable development of Prague, but to keep in mind that they need to be adopted by project owners and individual frameworks for project implementation need to be found for every one of them.

# Roadmap



Source: flickr.com

## 2.1 Overview of suggested measures

A cross-integration of all levels of analysis of the Prague city lab and a set of discussions and workshops has produced a comprehensive list of 25 measures, of which 19 are introduced more in depth on the following pages.

As a matter of fact, most of the suggested projects are interconnected with the other projects. For example, it does not make sense to invest into the generation of city data, before the city has developed a data management plan or setup a data platform. There are causal interrelations between the suggested projects, but also interrelations based on time, resources, stakeholders and technologies to be deployed during implementation. The roadmap as suggested below, should therefore be closely discussed in relation to an overarching strategic management of a sustainable development of Prague.

This is the reason, why we have added the key area “Leadership System and Governance” to the four strategic areas of implementation:

1. **Space planning and mobility**
2. **Digital and creative Prague**
3. **Energy and Buildings**
4. **Leadership System and Governance**
5. **Resilience and Infrastructure**

Each of these areas contains a set of suggested measures and projects that build on each other for a successful and stable development. However, there are also a range of important interconnections between the areas that are reflected in the roadmap figures on page 89. The Development of a Smart City Think Tank, for example, will have strong positive effects in many adjacent areas and subsequent projects. A Data Analytics Centre for Prague will enable a whole range of projects in the areas of mobility, security, management, business development, energy efficiency etc. that are based on the use of urban datasets.

The main message of the suggested roadmap is therefore to put strong emphasis on an interdisciplinary, systemic and well connected development process for Prague. Prague will need to base the implementation of this roadmap within an **overarching strategic management process** that is directly attached to the decision making level of the city, integrating the right stakeholders from local companies, universities, civil society and important local associations and municipal enterprises.

The following section gives an overview over all suggested measures:

## Space, Planning & Mobility

The development of the urban space, the planning of city development projects and the transportation sector are strongly linked with each other. Therefore suggested projects and measures that relate to these areas are linked together for the Roadmap of Prague.

The core of this area focusses on the goal to upgrade and modernize the built environment of Prague and at the same time making public spaces more attractive and livable for Prague's citizens and for visitors. The largest project is the development of a new **innovation district** on one of the many existing brownfields of Prague, in order to create a lighthouse district that shows the creative, environmental, social and economic potential of Prague in one spot, relating it to modern architecture and to appealing design. An innovation district will not only re-integrate working and living, it has the potential to attract young families and reverse suburbanization, to better link industry and research and to attract creative industries and research-oriented companies to Prague. In order to make sure that this district is developed in a socially viable way, it is recommended to base parts of the development process in a participatory process of co-creation through the citizens of Prague.

A network of multimodal transportation hubs will support the city in reducing private vehicles in the city centre and shifting mobility further to public transportation and sustainable alternatives like car- and bike-sharing. One intermodal mobility hub can easily be integrated into the planning process of the innovation district, providing an innovative mobility solution for future residents and local employees. An easy use of intermodal mobility services will only be possible, if intelligent digital services are provided to plan individual trips through Prague across different modes of transport.

Finally, the city centre of Prague needs to be upgraded to become attractive and energetically appealing for Prague's citizens. This is the reason for a suggested sustainable redevelopment of Venceslav Square and the creation of a green and livable bridge across the main station, connecting Namesti Republiky and Namesti Winstona Churchilla for pedestrians and bike riders.

### Suggested measures:

1. Develop an **Innovation District** in Zizkov or Holešovice as Lighthouse project and nucleus of a smart, digital and creative Prague.
2. Design and test a **co-creation process** for the district development.
3. Develop a **Transportation Hubs Network** – Prague based on intermodal mobility hubs and the introduction of sharing and bike concepts.
4. Introduce a **Multimodal Transportation App** including Ticketing System & value added financial services.

In addition to these projects we suggest to create **lighthouses for shared and green spaces in Prague in order to upgrade the public space:**

## 5. Redevelop Venceslav Square:

- a) Take out cars
- b) Reintroduce trams
- c) Upgrade public spaces (shared & green spaces, small shops, cafés etc.)
- d) Create a sustainable inner-city distribution centre based on E-Bikes.

## 6. Develop a **green and livable connection bridge** across the Main Station between the City Centre and Praha 3.

.....  
Roadmap  
.....

## Digital & Creative Prague

Prague is in quest of a new identity. The old business model which is based on tourism and cultural heritage does not alone provide for a prosperous and sustainable development of the city in the 21<sup>st</sup> Century. Therefore the development area “Digital and Creative Prague” suggests a set of integrated measures that together have the potential to create a new identity of Prague as a creative and thriving city at the core of the European Digital Economy.

As a first tangible lighthouse project it is suggested to improve the experience of living, working and visiting the historic city centre. A set of **smart technologies** combined with smart-phone based services has the potential to better guide tourists and local citizens to existing cultural assets of Prague, but also to integrate local shops, museums, restaurants, businesses etc. in an overarching story of a smart and creative Prague. It is suggested to include the infrastructure of the city centre into this process – e.g. through smart waste bins, intelligent lighting systems, smart city logistics based on electric vehicles, etc.

As the generation and the necessity for processing data in Prague increases exponentially (e.g. from traffic monitoring, citizen-based applications, urban sensors etc.) a **data analytics centre** for Prague becomes a necessary next step. Only when bundling information flows and datasets in one place, city authorities and local companies will have the opportunity to improve the efficiency of city services, and to develop new value added services that improve the livability of the city and support the digital economy.

Many services can be built on top of an open platform and a data analytics solution: we suggest to initially focusing on an online platform for mapping and **connecting the creative industries of Prague**, on a smart digital **welcome program** for international employees and students, and an upgraded **online marketplace** for local and international companies.

A **Smart City Think Tank** is a necessary facilitator to serve as competence centre for connecting Prague’s Universities, local companies and the city administration on developing, improving and delivering some of the described measures and projects and for attracting private and external funding to realize some of the suggested measures.

### Suggested Measures:

7. **Smartify the historic city centre** for improvement of tourism through nudges and gamification
8. Develop a “**Prague Applied Innovation Think Tank**” that connects Universities, local Industry and the City Hall in Smart City Project
9. Set up a **Data Analytics Centre** for Prague to bundle data flows and real-time information from the public infrastructure and beyond.

These projects should be supported by additional measures that help leverage the potential of Prague as an international hub for digital and creative industries:

10. Develop an **Online Platform** that maps the **Creative Industries** in the city and facilitates their collaboration.
11. Set up a **welcome Program for international students** and skilled workers from abroad.
12. Upgrade the **Online Marketplace** as support tool for international companies.

## Energy and Buildings

In the light of binding EU goals on renewable energies, energy efficiency and GHG emissions, the area of energy and buildings needs urgent attention in Prague. Since it is difficult to manage what is not being measured, developing an Energy Atlas of Prague’s building stock needs to be the first step towards a city-based programme for energy efficiency and reduction of carbon emissions. In order to convince local building owners that investments into the refurbishment of buildings pay off, it is suggested that the city invests into one- or two lighthouse projects that combine energetic refurbishment of public buildings with the reduction of their maintenance and operating costs. In addition, this project could well serve as integrator for art and creative culture to be used as upgrade for public buildings.

A **virtual power** plant that combines multiple sources of (renewable) energies with many different consumers in one area (for example the innovation district), is suggested as additional measure for increasing the energy security of Prague and enhancing energy efficiency at the same time.

### Suggested Measures:

13. Create a Lighthouse project for the **energetic refurbishment of public buildings**.
14. Develop an **Energy Atlas** for the Prague Building Stock in order to

identify and map the refurbishment potential.

15. Develop and install a **Virtual Power Plant** based on multiple energy sources and consumers as Back-Up Energy System for Prague.

## Leadership System & Governance

The governance and strategic management of a long-term development of Prague has been identified as strongest lever for a sustainable and prosperous development of Prague. Governing transitions of cities is a complex task and thus needs not only a stern leadership; it also needs a set of clearly defined tools and strategic measures that support a long-term management of complex systems.

The first and foremost activity is to agree **upon clear and measurable development goals**, which serve as guideline for the subsequent strategic development process of Prague. All larger projects and investments done by the city or municipal companies should then be prioritized and rated according to their contribution for achieving the goals.

A **cross-sectoral management** unit within the administration helps bring together the multiple municipal stakeholders and break the silo-thinking within city administrations. If this unit is to function, it needs to coordinate strategic operations internally, but serve as a showcase and catalyst for all sustainability measures of the city externally. It should increase the reputation and visibility of the operational offices, not undermine them.

Management of many different sustainability projects at the same time usually results in conflicts of goals (environmental vs. social vs economic vs. long-term resilience) – especially if budgets are limited. Thus, a strategic management needs to build upon **management tools** that help take the right decisions and set the right priorities. This can be done through modern ICT-based tools, which link budgets, projects and measures to the development gals of Prague across all departments of the city administration.

As accompanying measures it is suggested, to organize a **learning journey** to Europe's most advanced cities (Stockholm, Barcelona, Amsterdam, Copenhagen, Vienna, Manchester etc.) for councilors of Prague and heads of departments, in order to compare the current state of development of Prague with other approaches towards smart cities.

A Smart City Innovation Fund helps to leverage the creative potential of Prague's students, companies and start-ups for supporting the development goals of the city. At the same time it spurs co-investments into the development of Prague by the private sector.

### Suggested Measures:

16. Develop a **vision** and define **measurable goals** for a Smart / Sustainable Prague 2050.

17. Create a **strategic management unit** within the city administration that is endowed with cross-cutting issues like „*Smart Prague 2050*“ or „*Strategic long-term planning*“.
18. Create a **Smart City Innovation Fund** linked to strategic goals of the city to spur bottom-up innovation & start-ups (*creative industries / ICT*).
19. Introduce an **ICT based Management System** for the City Hall. Link it to the strategic goals and to the budget.

These projects should be supported by additional measures that create the foundation of a modern management system for an integrated and smart development of the city:

20. Set-up a **strategic long-term management process** for the city development based on goals, indicators and annual or bi-annual success monitoring.
21. Set-up a **foresight Process** for future development of Prague (Population, Economy, Demography etc., development of future scenarios).
22. Organize for **learning journeys** to Europe’s best Smart Cities.

## Resilience and Infrastructure

Securing resilience of a city is an expensive issue. Large investments into infrastructure safety and well-designed systems are needed in order to provide the capabilities to react adequately in the case of crisis. Resilient infrastructures and well-designed risk- and crisis management systems also induce high operational costs upon city authorities. Taken together, this is the reason, why most cities only act when a concrete emergency situation has created considerable damage to infrastructure, citizens and the local economy. In Prague this was the flood in 2004, which led to the development and implementation of an expensive flood-protection system.

There are, however, smart ways to reduce investments and operating costs of resilient cities. **Working with volunteers** is one of the most recommended approaches to provide risk-mitigation and preparedness for emergencies. At the same time, investing into an **improved organization and communication** between the operators of critical infrastructures and emergency- and relief services saves a lot of money in the implementation and operation of resilience-related measures and technologies.

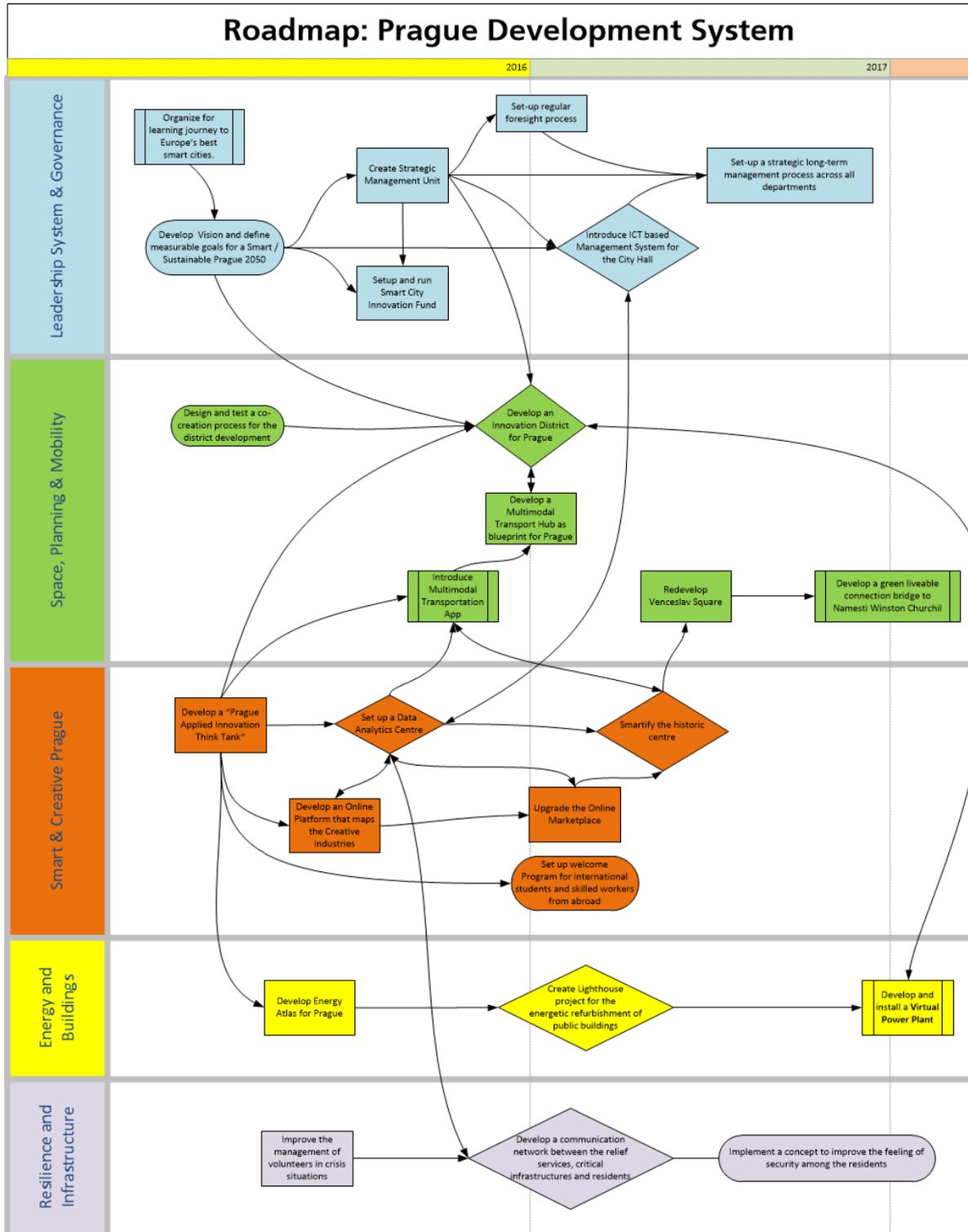
An additional strategic activity should focus on the **feeling of security** among the residents of Prague. Using approaches like the “humans as sensors” approach to decide about investment priorities into security and resilience saves costs and drastically enhances the results of the investments.

## Suggested Measures

23. Improve the **management of volunteers** in crisis situations
24. Develop a **communication network** between the relief services, critical infrastructures and residents
25. Implement a **concept to improve the feeling of security among the residents** (based on the humans as sensors approach)

As described mentioned above, there are numerous cross-links between the 25 measures and projects described above. The following section therefore displays options on how to strategically link the activities in an integrated systems roadmap for a sustainable development of Prague.

## 2.2 Strategy Map





The following section gives a detailed description of 16 of the proposed 25 projects. The Prague City Team has developed project proposals based on a joint template for these most important projects. The purpose of these project proposals is to give a good insight into the proposed activities and to deliver a preliminary project description and potential project application for the further development and latter implementation of the roadmap:

## 2.3 Design and test co-creation process for district development

Transfer     New concept / solution     Other

A bottom up visionary process for designing a concept for a development area could bring acceptable ideas / plans, trust in the city administration, environmental awareness and security of long term planning for all involved parties.

### Explanation of hypothesis:

There has been little citizen participation within the last decades in Prague. But it seems that the atmosphere is undergoing change and participatory processes are becoming important factors for successful projects. The development process for a district can be used as a lighthouse project that serves to leverage at least three benefits:

1. To test participatory development concepts and co-investment strategies
2. To develop a district vision and concept which is highly accepted by several parties and can therefore guarantee long term security of planning.
3. Use "innovation district" for development of co-creation process

It is important to base decisions about development areas on transparent criteria and to start with the identification of all relevant stakeholders (companies, municipality, citizens, research etc.) and initiate the participation process at an early stage.

A co-creation process for developing an innovation district for Prague will help to raise awareness, create acceptance and provide stability for planning and implementation on a long-term perspective. To this end it is important to collaborate closely with the civil society when developing criteria for a district showcase of Prague in the 21st Century, and when defining the vision, the goal and some key elements of the district.

### Benefit:

- Higher acceptances of processes and plans
- Demand based innovative solutions
- Urban Responsibility (higher upfront costs (planning)), but lower development costs
- Capacity Building

### References:

- Tunneldialog (Schwäbisch Gmünd)
- Competition "Zukunftsstadt"
- Freiburg Vauban
- Berlin Tempelhof (petition)

### POTENTIALS:

Potential areas

- Old heating plant area (Holesovice Bubny)
- Freight Railway Station Žižkov

**Relevant Actors:**

Owner of the development area  
 City Hall  
 IPR  
 City Council

***What current problem is the project trying to solve?***

IPR is currently in the process of improving the efficiency of communicating and informing the public about planning and development of the city. The city has to be aware of how and when they will initiate participatory processes: Formerly, only “minimal” way of citizen involvement into planning was used and many people got disappointed and lost their trust in the city leadership for many years. A good strategy has to be prepared with a strong emphasis on financing, responsibilities and coordination. There ought to be concepts for different development scales and a variety of stakeholders should be taken into consideration.

<b>Related MS Indicators</b>	<ul style="list-style-type: none"> <li>- Degree of participation</li> <li>- Decision making autonomy in the building sector</li> <li>- Rate of new construction</li> <li>- Rate of refurbishment</li> <li>- Global warming potential for building stock</li> </ul>
<b>Related Action Fields</b>	<ul style="list-style-type: none"> <li>- Development of visions / goals together with civil society</li> <li>- Creation and administration of platforms for citizen participation</li> <li>- Awareness/Education: Creating awareness of sustainability through the integration of sustainability issues in education and information</li> <li>- Creation and administration of platforms for citizen participation</li> <li>- Awareness/Education: Creating awareness of sustainability</li> </ul>
<b>Related Impact Factors</b>	<ul style="list-style-type: none"> <li>- Low awareness of sustainability in Prague Society</li> <li>- Lack of Participation</li> <li>- Readiness of Civil Society to engage and participate</li> <li>- Lack of Cooperation between Universities and City</li> <li>- Lack of Cooperation between Companies and Universities</li> <li>- Lack of Trust</li> <li>- Low awareness of sustainability in Prague Society</li> <li>- Lack of Participation</li> </ul>

# DNA of the Project

<b>Job to get done</b>	<b>What job is the project trying to get done?</b>
<b>(Goal)</b>	<ul style="list-style-type: none"> <li>- <i>Test participatory development concepts and co-investment strategie</i></li> <li>- <i>Develop a district vision and concept which is highly accepted by several parties and can therefore guarantee long term security of planning</i></li> <li>- <i>Use "innovation district" for development of co-creation process</i></li> </ul>
<b>Core Value</b>	<b>What kind of value does the project create for the city and city stakeholders?</b>
	<ul style="list-style-type: none"> <li>- <i>Higher acceptances of processes and plans</i></li> <li>- <i>Demand based innovative solutions</i></li> <li>- <i>Urban Responsibility (higher upfront costs (planning), but lower development costs)</i></li> <li>- <i>Capacity Building</i></li> </ul>
<b>Consortium</b>	<b>Who should be partner in this project and why?</b>
	<p><i>Project initiation</i></p> <ul style="list-style-type: none"> <li>- <i>Owner of the development area</i></li> <li>- <i>City Hall</i></li> <li>- <i>IPR</i></li> <li>- <i>City Council</i></li> </ul> <p><i>Participation</i></p> <ul style="list-style-type: none"> <li>- <i>Citizens</i></li> <li>- <i>Companies</i></li> <li>- <i>Researchers</i></li> <li>- <i>NGOS</i></li> </ul>

## Minimum viable project

<b>Must HAVE</b>	<ul style="list-style-type: none"> <li>- Choose the "right district" regarding the initiation of a bottom-up co-creation process</li> <li>- Base decisions about development areas on transparent criteria</li> <li>- Early identification of all relevant stakeholders (municipality, citizens, companies, researchers , NGOs)</li> <li>- Start the participation process from the very beginning of the project</li> </ul>
<b>Should HAVE</b>	-----

## Process

### Activities

Two level solution:

- Visioning process for the innovation district (Triangulum): Initiate a co-creation process by the city together with forerunners like universities, entrepreneurs and schools. Further analyse good practice e.g. “Tunneldialog” to think on methodologies for the involvement of further stakeholders (future users, neighbours) into complex innovation processes.
- Bottom up transformation process to improve an existing district; ask questions directly related to the responsibility of the involved parties (e.g. Citizens: What can I do to realize the target of “2000-watt Society”?)

Potential areas

- Old heating plant area (Holesovice Bubny)
- Freight Railway Station Žižkov

### Technologies

No specific technologies are needed.

- For facilitating a dialogue amongst citizens, digital communication technologies such as leaderboards, city apps, voting apps etc. can be used
- Planning processes that make use of virtual reality technology have shown positive effects for supporting the communication with citizens during the planning process.

## References

### Freiburg Vauban

<http://www.vauban.de/themen/buergerbeteiligung>

### Tunneldialog (Schwäbisch Gmünd)

<http://www.schwaebisch-gmuend.de/5543-Tunneldialog.html>

### Competition “Zukunftsstadt”

<https://www.wettbewerb-zukunftsstadt.de/infos/english.html>

## Financing and Investment

### Project Costs:

Project costs strongly depend on the extent and the dimension of the project.

- In a very basic format, citizen engagement can be done on a low cost basis. 5.000 – 10.000 EUR will already be enough to organize for public meetings, workshops and collaborative planning events.
- If digital technologies are used, the costs can range from ca. 2.500 EUR (costs for a small App) to 250.000 EUR (costs for a full 3D model of a future district to be displayed in Virtual Reality).

## Financing:

Participation and Citizen Engagement are usually facilitated by the municipality. However, land owners and investors share the interest of generating public support for their projects. Thus, it is encouraged to distribute the costs for a co-creation process between the municipality and the land owner / investor.

## Expected Outcomes

<b>Measuring success</b>	<ul style="list-style-type: none"><li>- Higher acceptances of processes and plans</li><li>- Demand based innovative solutions</li><li>- Urban Responsibility (higher upfront costs (planning), but lower development costs))</li><li>- Capacity Building</li></ul>
<b>City vision</b>	-----
<b>Beyond the city</b>	-----

## 2.4 Prague Applied Innovation Think Tank

 Transfer
  New concept / solution
  Other

Prague needs a high level think tank (with international reputation) that connects universities and businesses and the city on applied innovative approaches / technologies.

### Explanation of hypothesis:

The research landscape of Prague is scattered and collaboration with businesses is not managed in a proactive way. Due to large EU research funding, Universities have no strong incentive for collaboration with industry. In addition the faculties within Universities (CVTU) and the Universities among each other are not motivated to strategically improve collaboration on new and cross-cutting R&D issues.

At the same time there is a strong cluster of creative industries in Prague and the city of Prague has made a commitment to develop Prague as a Smart City in the future. Taken together, this leads to a **highly unused potential for innovation and applied research in Prague**. It is therefore suggested to setup a think tank that connects local universities, local (and non-local) companies, and the city administration, in order to transform the existing innovation potential into tangible projects that can improve the economic basis of Prague (new start-ups and joint ventures, new private investments) and support the development of Prague as a “Smart City”.

Similar institutions have successfully been developed in Vienna (Tina Vienna, ASCR), or Eindhoven (Park Strijp Beheer, iCity), Singapore or Copenhagen.

For positioning Prague as a European smart city on eye-level with cities like Amsterdam, Munich, Barcelona or Lisbon, this Think Tank will need excellence in research quality and international reputation.

**Fraunhofer IAO** is dedicated to co-develop, co-ordinate and manage a corresponding think tank in close collaboration with the local business community and the city hall. As coordinator and lead partner of the German Morgenstadt Initiative, Fraunhofer is well suited to support this important innovation project for Prague. It will therefore build on its strong collaboration with the University of Stuttgart (IAT) and the existing partnership between the University of Stuttgart and the Czech Technical University (CVUT).

With the **Prague Smart City Commission** there is already a high-ranking institution that can take on ownership of the process and support the link between Prague Universities, businesses and the city hall.

A workshop with local stakeholders on Sept. 24 on the idea of developing a Smart City Think Tank in Prague produced very promising results (for a list of participants see annex). Workshop participants agreed that there is a strong need for an institution that links research, industry and the city authorities in tangible, innovation driven projects.

Discussions focused on the best model for realizing and supporting a Smart City Think Tank in Prague. Participants argued that the City Hall needs to be an important

stakeholder and driver in this process. At the same time it was emphasized that any Innovation oriented institution to support a Smart City development of Prague must stay independent of political processes.

It was emphasized that a Smart City Think tank should focus on **tangible projects** and thus, **support and coordinate a range of smart city projects** that serve to improve the conditions of Prague in multiple ways. Besides several projects suggested under the Morgenstadt City Lab, the first and most viable project for a Think Tank is to **produce a feasibility study on the Prague Innovation District in** Holesovice or Zizkov, which was discussed in a second workshop.

### Benefit:

- Create visible growth Pole for a Smart City Prague
- connect private sector, research and City
- Improve visibility of Prague
- Support development Process of City

### References:

- Tina Vienna
- ASCR
- Copenhagen Economic development Agency
- A Star Singapore

### POTENTIALS:

- Innovation Partnership between City and Companies
- Use think Tank to solve pressing Problems of Prague

### Relevant Actors:

- CVUT
- Local companies
- IPR
- City Hall

### ***What current problem is the project trying to solve?***

The research landscape of Prague is scattered and collaboration with businesses is not managed in a proactive way. Furthermore, the Faculties within Universities (TU) and the Universities among each other are not motivated to strategically improve collaboration on new and cross-cutting R&D issues. University funding based on national and EU funds does not incentivize Universities to put emphasis on applied and impact-oriented research. Cooperation between the city and the Universities does not make use of the potential that creative heads and smart students represent for a city with a set of development challenges.

At the same time Prague needs to develop a new growth pole for attracting well-educated employees and for securing a prosperous development of the city. The focus of this could be developed around ICT, digital services, culture and the creative industries. Today the collaboration-landscape between

companies, Universities and the city is not able to support this kind of growth strategy in Prague.

**Related MS Indicators**

- Population dynamics
- Employees in innovative sector
- Qualification level

**Related Action Fields**

- Joint research institutions between industry and science for sustainability issues.
- Urban Innovation Management
- Creation of "city labs" (experimental areas) for deploying innovative technologies
- Attracting and supporting institutions of science and research as incubators for sustainable development.
- Elimination of barriers for attracting skilled personnel, investors and businesses.
- Activation of business actors for supporting the sustainability strategy of the city.
- Active partnership between city & private sector for pushing sustainability topics. (PPPs)
- Development and implementation of services for supporting sustainability solutions.
- Incentives for "first movers" and "InvestCommunities"

**Related Impact Factors**

- Lack of Cooperation between Industry and City (PPP)
- Lack of Cooperation between Companies and Universities
- Lack of Cooperation between Universities
- Lack of benchmarking system by international standards for Universities
- Lack of incentives for faculties to collaborate
- „Best thinking“ of Universities
- Centralized Research policy (state level)
- First programmes for attracting students from abroad
- Lack of Communication between Universities and Companies but initial approaches to foster R&D
- No R&D Strategy / Innovation strategy in place!
- Incentive programmes to foster R&D are not working
- Mind-set of business and research hinders R&D
- Prague as an IT Hub
- Diverse innovation landscape within the city.

***Main goals for the Applied Think Tank***

1. Facilitate joint „Smart City“ projects between companies, research institutions and municipal institutions (e.g. city hall)
2. Support the development goals of Prague by transferring them into innovative city development projects
3. Support local economic development through facilitating innovation and attracting investors
4. Attract private and public funding from national or EU level to Prague

## Additional opportunities for a Smart City Think Tank:

.....  
Roadmap  
.....

5. Raise awareness, exchange information on Smart Cities between companies, city & universities
6. Define Collaborative Business Models for smart solutions
7. Provide capacity building for Start-ups & Smart City Businesses
8. Include students into the city development of Prague
9. Serve as advisory board to Smart City Stakeholders
10. Provide a transparent and efficient decision and delivery mechanism

## DNA of the Project

<b>Job to get done</b>  <b>(Goal)</b>	<p><b>What job is the project trying to get done?</b></p> <p><i>Create joint partnerships between Universities, Companies and the City of Prague on real-world problems and with a focus on innovation.</i></p> <p><i>Coordinate the collaboration of local companies, universities and the City of Prague on smart city development issues (e.g. digital city, smart mobility, sensor networks, smart lighting etc.)</i></p> <p><i>Translate concrete development demand of Prague (e.g. brownfield development) into innovation-oriented development projects (lighthouse projects) with participation from public, private and research sector.</i></p> <p><i>Attract public and private funding for innovations and applied research in Prague.</i></p> <p><i>Attract private investments into an innovation ecosystem in Prague.</i></p>
<b>Core Value</b>	<p><b>What kind of value does the project create for the city and city stakeholders?</b></p> <p><i>Lay the foundations and support a new intelligent and creative growth model for Prague.</i></p> <p><i>The Smart City Innovation Think Tank is supposed to help the city leapfrog into the 21<sup>st</sup> Century.</i></p> <p><i>Support a sustainable transformation process of Prague.</i></p>
<b>Consortium</b>	<p><b>Who should be partner in this project and why?</b></p> <p><i>A <b>Fraunhofer</b> project team supported through a team of local experts (e.g. from the <b>Prague Institute of Planning and Development</b> - IPR Prague or the Czech technical University) would be able to take on the function of a local Smart City Think Tank.</i></p> <p><i>This constellation could be underpinned through the Czech - German Innovation Dialogue held on the level of <b>National</b></i></p>

**Governments.**

The **Prague City Hall** is an important supporter and needs to engage with the Think Tank on the level of Smart city Planning and agenda setting if the full potential shall be exploited.

**Local companies, municipal companies and international companies located in Prague (IHK)** could be addressed through bilateral or multilateral innovation projects. A structure like a local smart city innovation network would be able to support a Smart City Think Tank over the course of several years,

## Minimum viable project

**Must HAVE**

- Motivated team of minimum three experts on Smart City Projects at the interface of Universities, Companies and public institutions
- Financed over 3 years.
- Domination of Czech Language
- Office and location in Prague
- Good connection to local companies and municipal institutions

**Should HAVE**

- Enough scientific, political and industrial partners within the think tank
- Advisory board consisting of an equal share of companies, universities and municipal representatives (depending also on financial input)
- Excellent integration into the European Smart City Networks
- Embedded within the German-Czech science cooperation

**Could HAVE**

- Become a Prague Branch of Morgenstadt for branding, PR activities, communication etc.,
- In the future creation of scholarships, graduate academy (like A Star Singapore)
- Possibly take over beside coordination tasks, project management of projects
- Agency could become a branch of Czech Fraunhofer Institute which could be active out of Prague

## Process

### Activities

It is suggested to setup an interdisciplinary team of German and Czech experts, led by an experienced Fraunhofer-expert. A team of 4-5 researchers / experts will be able to create enough momentum for a strong uptake of smart city projects in Prague.

## Next Steps

### Setting up the Think Tank

Process	Timeline	Responsible
<b>1. Work out Concept / Vision</b> An initial paper about the main structure, goals and mission of the think tank shall be developed	finalized	IPR Fraunhofer IAO
2. Invite companies and other local stakeholders to sign an MoU w.r.t. the Smart City Think Tank	Summer 2016	IPR Fraunhofer IAO CVUT
<b>3. Bring City on Board</b> Share the concept and the MoU with the city hall. Discuss potential financing and support!	Summer 2016	IPR Fraunhofer IAO
4. Integrate Think Tank into Czech / German Science collaboration for additional funding opportunities!	2017	

## References

### Similar Projects

**The Aspern Smart City** Research GmbH & Co KG (ASCR) analyzes energy efficiency in the Viena's quarter Aspern. Until 2018 there will be about 40 million euro invested.  
<http://www.ascr.at/>

**Tina Vienna:** Since 2012 the Smart City Agency of the City of Vienna is located at TINA Vienna. TINA Vienna was founded by the City of Vienna in 1997 to complete the European Union's Transport Infrastructure Needs Assessment (TINA), a strategic plan for expanding transport infrastructure into the new EU member countries. The Smart City Agency supports the efforts of the city to reach its goals and to ensure a successful transformation. This includes a specific focus on research and technology policy in the city, as well as the active involvement of its residents, local industry, research and Viennese businesses in the Smart City Vienna process. Thereby TINA is smart city agency and energy centre.  
<http://www.tinavienna.at/en/smartcitywienagency>

**The Agency for Science, Technology and Research (A\*STAR)** is Singapore's lead public sector agency that spearheads economic oriented research to advance scientific discovery and develop innovative technology. Through open innovation, there is intensive collaboration between engaged partners in both the public and private sectors to benefit the greater society. As a Science and Technology Organisation, A\*STAR bridges the gap between academia and industry. Our research creates economic growth and jobs for Singapore, and enhances lives by contributing to societal benefits such as improving outcomes in healthcare, urban living, and sustainability. In 1967 the Science Council was founded and out of it the Agency was created (named in 2001). <http://www.a-star.edu.sg/About-A-STAR.aspx>

# Financing and Investment

## Project Costs:

It is estimated that basic funding will be required for a period of 3 years, until the think tank is able to fully fund itself. Funding would need to cover 100% of expenses in year 1, 75% of expenses in year 2 and 30% of expenses in year 3.

Funding the Think Tank with the above mentioned model, is expected to cost between € 1.3 Mio and 750.000€ over the course of three years, depending on the number and experience of team members and on additional costs like office rent, equipment, travel costs etc.

## Financing:

There are two models for funding:

### Model 1: Competence team as „virtual institution“

- A mixed German / Czech Team of researchers and experts is funded through a mix of national and local public funding (national research funds, local city funds). Funding period: 3 years.
- The collaboration is between Fraunhofer and a local University (e.g. CVUT) as Czech competence center „Smart Cities“. IPR represents the City of Prague.
- The goal is to attract industry funding and EU funding to perpetuate the model after 3 years!

### Model 2: Joint venture / collaborative research

- A mixed team of German / Czech experts is funded through a set of private stakeholders and the city of Prague.
- Five stakeholder invest ca. 100k€ (each per year) over the course of three years, and are therefore able to jointly decide about the goals and the projects that the Think Tank should focus on.

## Expected Outcomes

### Measuring success

Number of realized projects with universities and companies  
Project turnover  
Acceptance of stakeholder

### City vision

A Smart City Think Tank helps to bundle smart city activities. With a clear reference to the strategic plan of Prague and a Smart City Implementation Plan, a Think Tank would be able to

generate massive traction behind a set of development goals for Prague.

*Thus a Prague Smart City Think Tank could be a strong instrument to support the strategic development of the city.*

*A complementary element is a "Smart City Innovation Fund", which could either be administered by the Think Tank or which could be used by the city to spur innovative ideas within and outside of the Think Tank!*

The think tank idea was transferred from other cities and can be easily transferred to others.

## 2.5 Develop Vision & Goals for a Smart/Sustainable Prague 2050

Transfer     New concept / solution     Other

Prague needs a Vision Smart City Prague 2050.

### Explanation of hypothesis:

The lack of a clear vision for the future development of Prague and the lack of measurable goals certainly represents the strongest barrier to a focused sustainable long-term development of Prague at the moment, since no security for planning and investment is given. Up until now, strategic documents of Prague only refer to vague descriptions of desired future developments. This leaves large room for interpretation and does not help when conflicts of interest arise and investments need to be prioritized according to what is best for Prague as a whole. In absence of clear goals and measurable priorities decisions about investments are made on an ad-hoc basis and often convey to those interest groups who exert strongest pressure or who have a strong influence on the political discussion. In sum this lack of a coherent development strategy has led to a range of expensive infrastructure projects, to some delayed projects or to discarded projects. At the same time, important industrial players like Skoda are hesitant to invest into innovations and R&D in Prague since a commitment of the city for achieving strategic sustainability goals is missing<sup>163</sup>.

### Benefit:

Cities with a clear vision and measurable goals are successfully managing to increase their revenues, reduce their environmental footprints and enhance life quality for their citizens. They have managed to agree on priorities and to communicate them in a transparent way and they have linked their budget to their development goals.

### References:

- Smart City Vienna
- Tokyo 2030
- Singapore
- Freiburg 2050

### POTENTIALS:

Vision "Smart City Prague 2050"

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<sup>163</sup> Source: personal interview with Skoda

## Relevant Actors:

- City council and administration
- IFEU/C40
- Citizens

## ***What current problem is the project trying to solve?***

In absence of clear goals and measurable priorities decisions about investments are made on an ad-hoc basis and often convey to those interest groups who exert strongest pressure or who have a strong influence on the political discussion. In sum this **lack of a coherent development strategy** has led to a range of expensive infrastructure projects, to some delayed projects or to discarded projects. At the same time, important industrial players are hesitant to invest into innovations and R&D in Prague since the city does not demonstrate sufficient commitment to achieving strategic sustainability. The existing plans today only address parts of the development. There are numerous goals, but they are vague which makes progress monitoring difficult. After elections the goals are often changed or become invalid. A long-term vision broken down into clear strategic priorities and milestones is missing today, which is why many companies and international institutions are hesitant to invest into Prague.

### Related MS Indicators

- Existence and state of CO2-reduction goal
- Existence and performance of sustainability management
- Earmarked revenues for sustainability projects

### Related Action Fields

- Long-term political stability through planning and management approaches that exceed a single election period.
- Definition of indicators, creation of a performance measurement system for sustainability and climate change
- Alignment of budgetary policy with sustainability goals
- Development & implementation of a communal innovation strategy
- Systematic long-term planning of the city structure
- Development of goals and guidelines for a sustainable district development.
- Business Environment / identity management
- Professional City Marketing -> creating an international brand for the city
- Activation of business actors for supporting the sustainability strategy of the city.
- Active partnership between city & private sector for pushing sustainability topics. (PPPs)

**Related Impact Factors**

- continuing public distrust in the people in power (politicians, public officials, policemen, etc.)
- Instable political coalitions. Lack of continuity!
- Lack of political leadership and visions
- Lack of Strategic Thinking
- Lack of a strong long-term vision and strategy
- Lack of incentives/ strategies to motivate companies to develop sustainable products
- No incentives/ tax reduction for (foreign) companies to invest in the city
- Lack of incentives/ strategies to motivate companies to produce in a sustainable way
- Difficulties to attract and keep qualified personnel.

## DNA of the Project

**Job to get done**

**(Goal)**

**What job is the project trying to get done?**

- Create a vision of how Prague should position itself as a city in Europe in the 21st Century
- Make sure the vision is being shared by civil society, local opinion leaders, city administration and local companies.
- Define strategic goals for the development of Prague in the 21st Century. Make them measurable and trackable.
- Communicate the vision and invite stakeholders across Europe to support Prague in achieving the vision.

**Core Value**

**What kind of value does the project create for the city and city stakeholders?**

The long-term goals of urban development guarantee economic, social and environmental benefits in the long term; they are also a first step towards a holistic urban development concept.

**Impacts:**

- Strategy or plans that will be/are implemented independently of political decision-makers or elections
- Planning reliability for companies and investors
- Image of the city as a city that takes sustainability seriously

- Safeguarding the quality of life of the cities for their residents.

**Consortium Who should be partner in this project and why?**

Mayor: needs to initiate and support vision

City council: has to be integral part of the development process. Needs to adopt the Vision and co-ordinate operationalization through the city hall.

City administration: should design draft of goals and measures for their departments. Should organize an engagement process with local stakeholders.

Citizens: in order to achieve the greatest acceptance possible, the citizens should be integrated in the design process of the vision.

A moderator is needed to co-ordinate the development process. Malik Institute has strong experience with the development of shared visions.

## Minimum viable project

**Must HAVE**

- Clear goals which can be checked e.g. eco balance
- Vision should include citizens' participation, in order to create more acceptance
- Has to be adopted by city council

**Should HAVE**

- Monitoring tool in order to check the different (annual ) goals
- Milestones
- PR concept

**Could HAVE**

- Could include not only the core city, but region
- Visualization of measures
- Link to the budget

## Process

## References

### Similar Projects

Smart City Vienna is a long-term initiative by the city of Vienna to improve the design, development and perception of the federal capital. Smart City Vienna

looks at a cross-section of the city, covering all areas of life, work and leisure activities in equal measure, and includes everything from infrastructure, energy and mobility to all aspects of urban development.

The smart city Vienna project is based on the core themes of the European SET Plan Initiative.

- Its target systems and tasks are the following:
- Holistic view and management of urban energy systems
- Highly efficient production and supply technologies
- Intelligent networks and thermal energy supply
- “Active” buildings with very low energy demands
- Development of environmentally-friendly, highly energy-efficient and low CO2 mobility systems

Main Outputs are:

- Overview on the current status and the potential impact of Smart City relevant implemented and available infrastructure
- “Smart Energy Vision 2050” (long-term)
- Strategic “Roadmap 2020 and beyond” (medium-term)
- Action Plan for 2012-2015 (short-term)

<https://eu-smartcities.eu/blog/project-smart-city-wien>

In Singapore, a strong degree of stability dominates urban policy objectives and yet a high level of flexibility is preserved. The Urban Redevelopment Authority (URA) is Singapore’s national urban development planning department, which designs long-term strategies and then implements the specific plans (Urban Redevelopment Authority 2013 # {119}).

## Products & Tools

- MCI sector analysis and key action fields
- Morgenstadt model to see where changes are needed
- Workshops in order to design vision and goals

## Financing and Investment

### Project Costs:

The costs for the development of a Prague vision 2050 depend upon the size of the public engagement process and the input from the moderator.

It is estimated that Prague will be able to design a shared Vision with ca. 500 000€.

- Organizing 12 – 20 workshops and public engagement processes with different kinds of audiences
- Organizing an online participation process for Prague Citizens
- Contracting a moderator for designing and supporting the process

- Writing, proofreading, layout, printing of the Vision

## Financing:

The Vision itself should be financed by the City Hall. For parts of the implementation there are EU programmes available:

Via LIFE+ funding

<http://ec.europa.eu/environment/life/funding/life2015/#integrated>

LIFE Environment & Resource Efficiency (sub-programme for Environment) is similar to the former LIFE+ Environment Policy & Governance strand (but no longer covers climate change related projects). It will co-finance action grants for pilot and demonstration projects to develop, test and demonstrate policy or management approaches, best practices and solutions, including development and demonstration of innovative technologies, suitable for being replicated, transferred or mainstreamed; and to improve the knowledge base for the development, implementation, assessment, monitoring and evaluation of EU environmental policy and legislation, and for the assessment and monitoring of the factors, pressures and responses that impact on the environment within and outside the Union.

Or possibly LIFE Environmental Governance & Information (sub-programme for Environment) incorporates elements of the former LIFE+ Information & Communication strand. It will co-finance action grants for information, awareness and dissemination projects to promote awareness raising on environmental matters, including generating public and stakeholder support of Union policy-making in the field of the environment.

## Expected Outcomes

### Measuring success

- Is there a long-term plan for the built city structure? (y/n)
- Does city planning follow principles that support sustainability (e.g. the compact city, the walkable city, the green city etc.)? (y/n)
- Are there regular updated prognoses on inhabitants, demography, traffic, development, housing demand etc.? (y/n)
- Are there regular data assessments with respect to the city structure? (y/n)
- Does the long-term planning correspond to and link with regional or federal planning? (y/n)

### City vision

Long-term sustainable concepts mean that urban development objectives can be pursued, negative developments countered and holistic approaches

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Roadmap  
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**Beyond the  
city**

designed.

## 2.6 Multimodal Transportation App

Transfer     New concept / solution     Other

Prague needs to offer a multimodal transportation app in order to enable a more sustainable mobility behavior and to reduce congestion and traffic within the city through connecting public transport, bike- and car-sharing facilities, e-ticketing, intelligent parking, and charging hubs for e-mobility.

### Explanation of hypothesis:

The multimodal transportation application helps reducing congestion and traffic within the city and incentivizes the public to use alternative transportation modes instead of motorized private transportation. The app simplifies the use of public transport and promotes more sustainable mobility behaviour through an e-pricing system with nudging and gamification elements.

The app connects the advanced public transport system in the city of Prague with further transportation modes and allows user profile tailored trip planning with maximised sustainable value. An advanced e-ticket system as the backbone for the app's business model simplifies pricing for all public transportation facilities but also for other modes of transportation, like bicycle- and car-sharing, charging and parking payments. Additionally, the integrated payment system can be widened as a payment system for local offers and services like restaurants, public lockers, cultural offers (see proposed project on smartification of the city centre) and combines them with sustainable mobility through an incentive system e.g. bonus collection.

Further developments include installation of a mobility hub network within the city of Prague and Wi-Fi Hotspots at important mobility nodes (airport/train stations). For purposes of further optimization and improvements within the transport system, the user data will be collected and analysed.

### Benefit:

- Increase the number of public transport users
- Reduction of emissions and traffic within the city
- Reduction of parking problems
- Simplify the ticketing system for inhabitants but also for international guests
- Support local economy

### References:

- Tokyo Suica & Pasma system
- Hong Kong Octopus Card
- SmartCity Budapest Transport
- San Francisco – SFPark

### POTENTIALS:

- Enhance quality of live within the city
- Embed into the smart city strategy
- Create environmental awareness

### Relevant Actors:

- Department of Environment
- Mobility Department

- DPP
- ROPID
- IPR
- Smart City Agency (new) Transportation companies
- Local suppliers

***What current problem is the project trying to solve?***

Even though Prague has an advanced public transport system, the city is struggling with the high amount of car traffic and parking in the city centre. As lined out in chapter 1.4.3 a combination of interacting factors are at play that lead Prague’s inhabitants to favour the car for their daily commute. The heavy investments into the public transportation system and into the construction and maintenance of roads has not been sufficiently supported by projects that push for intermodality and easy-to-use information- and billing systems in the public transport sector. The current unintelligible system is difficult to understand, both for guests and locals, which further promotes the use of private cars.

**Related MS Indicators**

- Modal split
- Existence and performance of sustainability management
- Internet connectivity
- CO2 transport emissions
- Airborne pollutants

**Related Action Fields**

- Provision of E-Mobility-Infrastructure
- Innovative financing of innovative/sustainable technologies and projects
- Development and implementation of services for supporting sustainability solutions
- Targeted combination of different modes of transport
- Interoperable electronic ticketing systems in public transport
- Intelligent traffic management based on real-time information.
- Targeted combination of different modes of transport

**Related Impact Factors**

- High amount of car traffic and parking in the city centre
- Well established and functioning Public Transportation network
- Lack of intermodal concepts and facilities
- Missing link between cycle path network and public transport
- Unintelligible ticket system
- Lack of park and ride facilities
- High degree of individual car possession
- Low emission zones in Prague until 2016

## Job to get done

### (Goal)

#### What job is the project trying to get done?

*The main purpose of the project is to develop an application that connects the advanced public transport system in the City of Prague with further transportation modes and allows user profile tailored trip planning with maximised sustainable value. An advanced e-ticket system as the backbone for the app's business model simplifies pricing for all public transportation facilities but also for other modes of transportation, like bicycle- and car-sharing, charging and parking payments. Additionally, the integrated payment system can be widened as a payment system for local offers and services like restaurants, public lockers, cultural offers and combine them with sustainable mobility through an incentive system e.g. bonus collection.*

*Further developments include installation of a mobility hub network within the city of Prague and Wi-Fi Hotspots at important mobility nodes (airport/train stations). For purposes of further optimization and improvements within the transport system, the user data will be collected and analysed.*

## Core Value

#### What kind of value does the project create for the city and city stakeholders?

- *Reduction of emissions and traffic within the city*
- *Simplify the ticketing system for inhabitants but also for international guests*
- *Support local economy*
- *Enhance quality of live within the city*
- *Embed into the smart city strategy*
- *Create environmental awareness*

## Consortium

#### Who should be partner in this project and why?

- *Smart City Agency (new)*
- *The City of Prague (transport department)*
- *Public transportation company*
- *Software developers*
- *Local businesses willing to provide bonuses including entertainment facilities (museums, cinemas, theaters, aquariums, etc.) and restaurants/cafés*
- *the operators of the ticketing service are the public transport providers;*
- *universities/research institutions (to conduct relevant project-related studies)*
- *private companies and consultants (to support the project management and the technical development of the system)*

## Minimum viable project

### Must HAVE

- **Build up a consortium** with a heterogeneous group of partners (transport companies, local suppliers, universities/ research institutions, ICT provider)
- **Multimodal Transportation Application** to connect the advanced public transport within the city of Prague with e-car- and bicycles sharing offers, intelligent parking, bike lanes and footpaths
- **Analysis** of collected data to improve traffic in the city
- **Incentive System** for sustainable mobility and to use public transportation through gamification or reward system

### Should HAVE

- **App development:** Add further businesses as partners that are interesting for the residents (supermarkets, drugstores, etc.)
- **Interactive use** of app for passengers by reporting open parking spots, prices etc.
- **Smart card** for easy payment and tickets. Moneyless tickets and payment method for many stores, parking meters etc. all around town
- **Wi-Fi Hotspots** at important mobility nodes (airport/ train station) or ability to use app offline

### Could HAVE

- Development of **intermodal mobility hubs** (different transportation modes, information system)
- **Smart sensor and metering system** that helps drivers to find open parking spots. Will reduce traffic and emission

## Process

### Activities

1. Market analysis
2. Definition of the business model and financing scheme
3. Identification of the core consortium
4. Call for applications for local suppliers for additional app services
5. Design of the App
6. Testing of the App
7. Designation of Free Wi-Fi spots in the city
8. Promote the app via social networks, travel blogs, TV, hotels, travel agencies, tourist information offices, etc.
9. Extend the app's functions/ the app pricing system to other services (e.g. access to cultural and leisure activities, up-to-date information on discounts and events-> smart City App)

## Technologies

- Smartphone Application
- Gamification Concept
- E-pricing system
- Seamless routing algorithms (user centric)
- Parking information system

Add-ons:

- Mobility Hubs
- Wi-Fi Hotspots

## References

### Similar Projects

#### Tokyo Suica & Pismo

With the Suica/Pismo System implemented in Tokyo, one card can be used for all public transportation means and companies as well as a vast number of shops and vending machines (including those outside stations). JR East, the world's largest passenger railway company, was the first company in Japan to introduce a large-scale IC card automatic fare collecting system. In November 2001, it launched the Suica (Super Urban Intelligent Card) in the Tokyo metropolitan area at 424 stations, replacing the magnetic cards that were formerly used. Pismo card (a development of the Passnet system, which offers interoperability with the JR East Suica system and integrates private bus companies into the former Passnet network) was originally introduced by 22 members of the Passnet Association in the Kantō region of Japan.

Website: <http://www.pasmo.co.jp/en/> .

#### Hong Kong Octopus Card

Hong Kongs Octopus Card is a rechargeable, smart chip card that is the most used electronic payment method in Hong Kong. Its main purpose was the collection of fares for the mass transit system when it was introduced in 1997. Today the card is used as payment method in restaurants, supermarkets, parking meters, car parks and service stations and vending machines. The octopus card also provides a rewards programme and it was the model for many similar smart cards for example the oyster card in London.

Website: <http://www.octopus.com.hk/home/en/index.html>

#### SmartCity Budapest Transport

The SmartCity app is a public transport information application for Budapest. SmartCity contains a vector based map with address search, a public transport route planner and the full timetable of all the public transport lines of Budapest. All functions of SmartCity can be used offline, without data traffic.

Website: <http://en.smartcity.hu/>

#### San Francisco – SFPark

SFPark is an app that uses new technologies and sensors to improve the parking in San Francisco and reducing traffic. The app lets drivers know where they can find free parking spots and charges the lowest possible rate. The

pricing is adapted to the demand to control the parking in several areas. The app can also be used to pay the meters rate by phone.

Website: <http://sfpark.org/>

## Expected Outcomes

### Measuring success

- Improve modal split
- Existence and performance of sustainability management
- Improve CO2 transport emissions

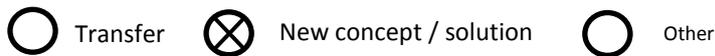
### City vision

Sustainable transport and reduce of cars for a more livable environment

### Beyond the city

There is a potential to transfer the project to other cities with a lack in modal split beyond Prague.

## 2.7 Energy Atlas



To date, already more than 50 % of the Earth's populations live in urban areas. And cities are known to be the key consumers of resources and the key producers of global emissions. Therefore it is essential to optimize urban energy consumption to ensure sustainable urban development using innovative technologies. The first step should be the collection and structuring of data on the energy performance of the building stock.

### Explanation of hypothesis:

It is assumed that about 20% of Prague's building stock had been renovated<sup>164</sup> to improve the energetic quality within the last decade however there is no credible source providing the exact number. In the Czech Republic, research on the energy consumption of the building stock is carried out on national level. For the territory of Prague there exists some data that had been elevated within subsidy programs, but the data is not complete yet which makes further research in this area necessary. Not only data on energy consumption is of interest, but also data on the number of deep renovations, percentage of buildings with insulation and percentage of HVAC systems with improvements. Thus, the goal should be to gather a comprehensive data set of the energetic quality of the Prague's building stock and to develop a clear strategy for the energetic refurbishment of the building stock.

### Benefit:

Database to develop refurbishment strategies  
Database to develop new energy supply strategies based on renewables

### POTENTIAL:

- Use of existing energy performance certificates
- City cooperation with energy providers
- Use of open maps

### Relevant Actors:

- City of Prague
- Researchers
- Energy providers
- Citizens

### *What current problem is the project trying to solve?*

To date, Prague has no comprehensive database reflecting the city's energy supply, consumption, demands, efficiency and saving potential. The Energy Atlas will

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<sup>164</sup> Interview with an official of the Prague City Hall

comprehensively map Prague’s energy supply, consumption, demands, efficiency and saving potential in order to allow the relevant stakeholders to explore where improvements are needed.

**Related MS Indicators**

- Total energy demand per capita
- Total electricity consumption per capita
- Electrical energy use per household
- Primary energy demand total for building stock
- Share of electricity demand of private households
- Electricity generated in the city
- Importance of local district heating
- Renewable energies in the grid

**Related Action Fields**

- High-efficient centralized energy supply (District Heating / District Cooling)
- Communal energy management
- Use of Smart Grid Technologies
- Promotion of renewable energies

**Related Impact Factors**

- Weak approach to energetic modernisation of buildings
- Lack of information on Prague’s building stock
- Lack of strategy for energy efficiency
- Increasing consumption of electricity
- Low share of renewable energies in Prague

## DNA of the Project

**Job to get done**

**(Goal)**

- The goal of the project is to design a detailed map illustrating the energy performance of Prague’s building stock, a so-called „Energy Atlas“ of the city. Energy Atlas will comprehensively map Prague’s energy supply, consumption, demands, efficiency and saving potential in order to allow the relevant stakeholders to explore where improvements are needed. The Energy Atlas will particularly focus on the use of renewable energy sources.

### Core Value

- Energy Atlas is a tool that can be used by housing societies, utility companies, the city's administration (for their asset management and public relations), and energy consultants and for political decision makers. The long-term benefits of this project include energy saving and reduced CO<sub>2</sub> emissions. The Atlas can be also of use to property owners in order to coordinate investments with neighboring buildings, for instance a new heating system.

### Consortium

- Pražská teplotárenská a.s.
- Prague City Hall Department of technical facilities
- Prague City Hall Department of strategic investments
- Prague City Hall Department of Environmental Protection
- Prague City Hall IT Department

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Roadmap  
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## Minimum viable project

### Must HAVE

- 3D city model
- Energy footprint of buildings

### Should HAVE

- Solar potential analysis
- Heat demand estimation
- Geothermal analysis
- Grid implementation
- Hydropower potential analysis etc.

### Could HAVE

- Further analytical tools tailored to Prague's particular needs

## Process

### Activities

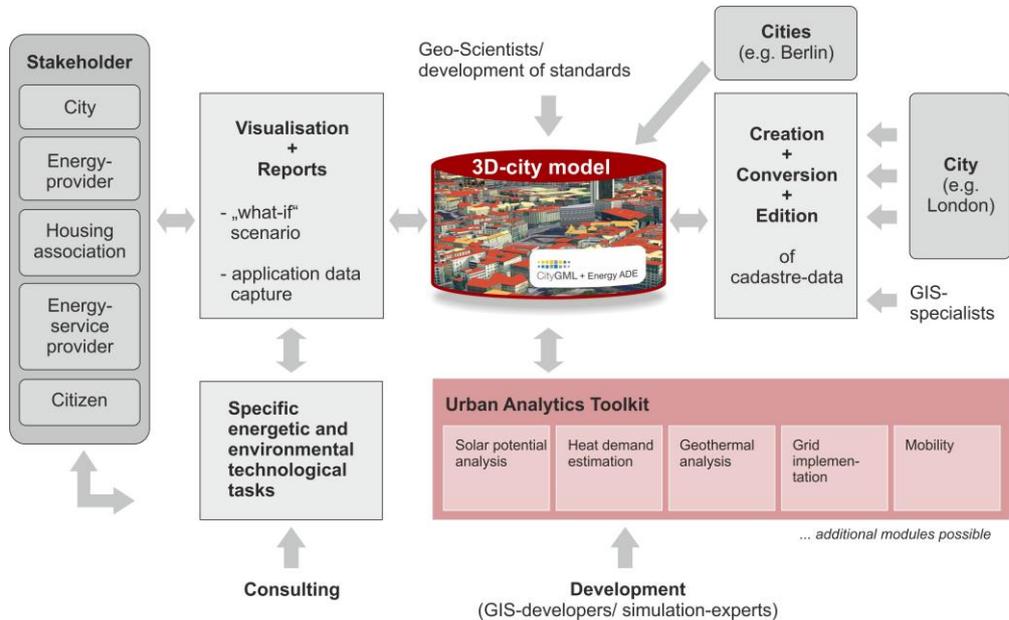
- Setting up of a consortium
- Data collection
- Data analysis
- Aerial laser scanning
- Implementation of a 3D city model of Prague
- Analysis of renewable energy sources potential in Prague
- Regular data updating

### Technologies

CityGML  
Aerial laser scanning  
Open Maps

## References

### *Energy Atlas Berlin*



Project duration: June 2011 – May 2013

Budget: 500.000 €

Appropriation:

European Institute of Innovation and Technology (EIT)

Project executing organisation:

Knowledge & Innovation Center for Climate Change and Mitigation (Climate KIC)

Partner:

TU Berlin, Innovationszentrum Energie, TU München (Lehrstuhl für Geoinformatik), Deutsches GeoForschungszentrum Potsdam (GFZ), GASAG AG, Bezirksamt Charlottenburg-Wilmersdorf, Berlin Partner GmbH, Berliner Senat für Wirtschaft, Technologie und Frauen

With the right input data the Energy Atlas maps the status quo in Berlin, as for the energetic condition of the buildings, existing power stations and network conditions (electricity, gas, heat).

<http://energyatlas.energie.tu-berlin.de/en/fakten>

## Financing and Investment

### Project Costs:

Approximately € 250,000 – 300,000

### Financing:

e.g. via EU Horizon 2020 calls such as:

- LCE 5 – 2017: Tools for integration and coordination of the energy system
- SCC 1 – 2016/2017: Smart Cities and Communities solutions integrating energy, transport, ICT sectors through lighthouse (large scale demonstration - first of the kind) project

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Roadmap  
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## Expected Outcomes

### Measuring success

- Full implementation and regular updating of an Energy Atlas, increased use of renewable energy sources

### City vision

- The creation of an energy atlas will improve the energetic performance of buildings, save money and reduce CO<sub>2</sub> emissions.

### Beyond the city

- This project can be transferred upon other cities in the Czech republic and internationally to improve the energy performance of buildings and reduce the environmental impact of energy production.

## 2.8 Improvement of the management of volunteers in crisis situations

Transfer   
  New concept / solution   
  Other

The cities of today are growing increasingly vulnerable to various crisis situations and Prague with its susceptibility to floods is no exception. Incorporating volunteers' help at all stages of crisis management can make the city more resilient and allow to cut expenses

### Explanation of hypothesis:

In order to support emerging civil participation, as well as to improve its general resilience situation, the City of Prague needs to incorporate volunteers into its crisis management plans. Prague needs to establish a volunteers management concept that will allow to include volunteers at all 4 stages of crisis management:

1. Prevention
2. Preparation
3. Response
4. Recovery.

This system is to include NGOs, volunteers' associations as well as independent volunteers. The City of Prague is to play the coordinating role.

### Benefit:

- Improved resilience
- Improved crisis management
- Development of participation culture
- Cost-saving

### References:

- University Stuttgart IAT KOKOS
- University Stuttgart IAT INKA

### POTENTIALS:

Employ the unused potential of volunteer helpers  
 Save costs on the maintenance of the flood protection system  
 Support the emerging culture of participation in the Prague society

### Relevant Actors:

- City Hall
- Fire Rescue Service
- Paramedics
- Police
- Civil society
- NGOs

## What current problem is the project trying to solve?

To overcome crisis situations in a most efficient and timely manner and at a low cost volunteers from the general population are indispensable. According to the Act No. 239/2000 on the Integrated Rescue System, NGOs and volunteer fire brigades are part of the Integrated Rescue System and thus part of the regional crisis plans. However, independent volunteers are not included into the crisis management plans. The aim of the current project is to provide an IT-based integration of all the volunteers' structures such as associations, companies and citizens' initiatives as well as independent volunteers. An interactive volunteering system where volunteers can register and provide data about their relevant skills and competences (logistical knowledge, medical or engineering skills, etc.) is to be established. This system is to be accessed via an Internet webpage as well as via a smartphone app.

### Related MS Indicators

- Damage from natural disasters
- Number of natural disaster related deaths
- Degree of participation

### Related Action Fields

- Innovative financing of innovative/sustainable technologies and projects
- Establishment of semi-formal and informal networks
- Creation and administration of platforms for citizen participation
- Integrated risk management
- Flood protection strategies

### Related Impact Factors

- No city-wide resilience strategy in place
- Cost-intensive maintenance of flood protection system
- Insufficient inclusion of the residents into crisis management system
- Lack of participation

## DNA of the Project

### Job to get done (Goal)

The aim of the proposed project is to provide new insights into the linking of good structures of crisis management with self-organization capacity of the company on a reliable basis. On this basis, optimized solutions for the professional integration of

	volunteering are developed in crisis management and civil protection.
<b>Core Value</b>	Organizational, institutional and socio-cultural development of the integration of voluntary helpers in the crisis management and civil protection.  The benefits of this project for society as a whole is to compensate for the declining willingness to get involved permanent and binding as volunteer, through a professional integration of diversified volunteer. The increasing attractiveness volunteering through the link with the world of the profession through instruments of human resources management and a fully customized design in the organizations opened the necessary opportunities.
<b>Consortium</b>	<ul style="list-style-type: none"> <li>• Crisis management department of the City Hall (coordinating role)</li> <li>• Department of rescue and safety systems of the City Hall (coordinating role)</li> <li>• Information technology department of the City Hall</li> <li>• Civil society</li> <li>• NGOs (Czech Red Cross, ADRA, Hand for Help, People in Need, etc.)</li> </ul>

## Minimum viable project

<b>Must HAVE</b>	Analysis of motivational and cultural aspects volunteering at current and potential volunteers. Consequential and compared with previous framework another possible incentive structures for promoting volunteer work in the field of crisis management and civil protection be worked out and put into the form of a measure catalog.
<b>Should HAVE</b>	Integration of tools (e.g. Apps) and social media applications for the registration and coordination of volunteers
<b>Could HAVE</b>	Automated analysis of social media information to enhance crowd sourcing.

## Process

### Activities

1. Information gathering with regard to volunteer management, volunteer types and inter-organizational cooperation between crisis management organizations, governmental authorities and the private sector by means of interviews and participatory workshops (e.g. Design Thinking) (Month 1-5)

2. Detailed analysis of information gathered in the previous tasks focusing on
  - the motivation of volunteers,
  - the organizational structures of crisis management institutions
  - the private sector, especially companies
  - concepts and tools for volunteer management (Month 4-7)
3. Synthesizing of information to create an integrated volunteer management concept adapting to existing concepts and integrating existing volunteer management tools and social media applications (Month 5-9) .
4. Definition of application cases and application scenarios for the above mentioned concepts (Month 5-9).
5. Validation of the integrated concept with support of relevant stakeholders to show its functionality in a real environment (Month 9-12).

## Technologies

Smartphone app

## References

### **KOKOS – Kooperation mit freiwilligen Helfern in komplexen Schadenslagen**

The aim of the project " Support of cooperation with volunteers in complex damage situations", funded by the Federal Ministry of Education and Research, is to develop methods, technical concepts and IT tools to the public (population, society, associations, companies) as an active partner in the crisis management and to strive for a cooperation.

The scientists involved examining from May 2015 to April 2018, as existing social, economic and civil structures can be included in overcoming major crisis situations. In the initial treatment of the population could, for example, employees of the panels that distribute food to the needy in almost all major cities, help with their logistical experience in primary care. It is also conceivable that football or handball teams that work and performed well as a team have to be consulted to assist in cleanup or reconstruction work and also act there hand in hand. In addition, companies could join forces in industrial areas, to accompany improve their own recovery prior ability, but also to support agencies or the population in disaster situations.

[\(http://kokos.wineme.fb5.uni-siegen.de/projekt/\)](http://kokos.wineme.fb5.uni-siegen.de/projekt/)

### **INKA - Professionelle Integration von freiwilligen Helfern in Krisenmanagement und Katastrophenschutz**

The aim of this project is to provide new insights into the linkage of good crisis management structures with self-assembly capacity of society on a reliable basis. In this way optimized solutions for the professional integration of volunteering are developed in crisis management and civil protection. This is done in close co-operation between all major organizations with voluntary protection and rescue forces, experts in the field of civic engagement, the personnel management of enterprises and labor and social science university facilities.

[http://www.swm.iao.fraunhofer.de/de/Projekte/Oeffentliche\\_Projekte/INKA.html](http://www.swm.iao.fraunhofer.de/de/Projekte/Oeffentliche_Projekte/INKA.html)

## Expected Outcomes

### Measuring success

- Was an improvement of the management of volunteers in crisis situations achieved?
- Is there a successful integration of tools (e.g. Apps) and social media applications for the registration and coordination of volunteers?

### City vision

In a larger scale city vision for sustainable urban development the improvement of the management of volunteers in crisis situations can reduce the damage and cost in case of a hazard or other event of crisis.

### Beyond the city

This project can be transferred upon other cities in the Czech republic and internationally to improve the management of volunteers in crisis situations.

## 2.9 Create Cross-Sectoral Strategy Unit in City Administration

Transfer     New concept / solution     Other

Prague needs a cross-sectoral strategy unit in city administration to improve cooperation.

### Explanation of hypothesis:

The city administration is the heart of the city and thereby it is essential that the key actors are always up to date concerning new technologies and sustainable development. But in a lot of cities, the departments do not work together, there exist parallel structures and as a result the performance of the urban sustainable governance of a city is not as good as it could be. As the sustainable transformation of a city is a cross-departmental task, solutions for a better and more innovative cooperation should be developed. Therefore a cross-sectoral strategy unit is needed.

### Benefit:

If the city administration is well-informed and is aware of the possibilities of a sustainable city development, the sustainable development process will be fastened and an important lever will be activated. Together with a motivated city council, companies and civil society, innovative ideas can be implemented.

### References:

Gdansk  
Freiburg

### POTENTIALS:

Improvement of cooperation of city administration  
Acceleration of processes within city administration

### Relevant Actors:

City Hall  
City administrative departments

### ***What current problem is the project trying to solve?***

Regarding the sustainable transformation process of a city, there are a lot of departments involved and there is no clear contact person for companies etc. Consequently, there are redundant structures which could be improved by creating a cross-sectoral strategy unit. This unit can implement and/or monitor the city's sustainable development programme, can raise awareness about the sustainable projects, be active in networking and build up partnerships and can be consultant for sectoral implementation. Changes of city administrative questions last usually long and are difficult to implement if there is no sufficient political support. Decisions about localization of unit (e.g. connected to Mayor's office) have influence to importance of unit, dependence, consistency.

<b>Related MS Indicators</b>	-----
<b>Related Action Fields</b>	-----
<b>Related Impact Factors</b>	-----

## DNA of the Project

<b>Job to get done</b> <b>(Goal)</b>	<p><b>What job is the project trying to get done?</b></p> <p>In order to create cross-sectoral unit within city administration , first there should be a plan set up which structure should this unit have (organigram)</p> <p>Training of members of unit</p> <p>Design of communication plans/tools for unit and management tools</p>
<b>Core Value</b>	<p><b>What kind of value does the project create for the city and city stakeholders?</b></p> <p>Coordinating various sectors' work and their cooperation can be an effective way to manage a city's sustainable development. It requires strong communication with the top level administration, different departments, citizens, private sector stakeholders, etc. Gaining credibility within the various sectors requires a politically supported central position in the city administration.</p>
<b>Consortium</b>	<p><b>Who should be partner in this project and why?</b></p> <p><i>Mayor</i> <i>Involved members of city administration (city planning, energy department, mobility department etc.)</i> <i>External experts with experience of personal management e.g. consultants,</i> <i>Possibly citizens (e.g. Ludwigsburg)</i> <i>Opinion of companies: which contact persons they wish</i> <i>Possibly Fraunhofer IAO and IFEU as support</i></p>

## Minimum viable project

### Must HAVE

- At least three persons
- Own office or usage of existing office
- Funding of unit (calculated personal costs in city's budget)
- Secure funding for five years, independence from mayor/city council elections
- Political support for unit

### Should HAVE

- Own budget
- different tasks and competences, not only communication about sustainable topics
- ongoing specified training to staff members in all sectors.
- Regular exchange of information/meetings of different departments

### Could HAVE

- specified training to other stakeholders (industry etc.)
- Exchange with other similar units in other cities
- Introduction or support of E-government and usage of ICT for communication between stakeholders.

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Roadmap  
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## Process

### Activities

- Create plan about cross-sectoral unit, get political support (city council decision). It is important that the sustainability management unit makes sustainable development a high priority on the city administration's agenda.
- Structural organization (number of persons, where it is located in organigram. within or outside administration, definition of tasks etc.)
- Develop concept management and communication plan in order to engage experts and initiate cross sectoral cooperation within the administration. Initiation of communication activities by focusing on releasing the potential already present within the administration.
- Continuous monitoring and adaptation of training : In order to continuously push forward the process there should be ongoing specified training to staff members in all sectors. Ensuring sectoral implementation is aligned with overall sustainable development strategies might require monitoring and target setting for indicators which are not currently part of collected statistics.
- Integrate other persons as input in training e.g. industry etc.

## References

### Similar Projects

In Freiburg, there is a Sustainable Advisory Board which helps the city administration with their sustainable measures. In Ludwigsburg a new department "sustainable development" was created as a consequence of a round table with the civil society and city administration and there are consolidated the tasks energy, business development and climate protection.

[http://www.ludwigsburg.de/site/Ludwigsburg-Internet/get/1110806/2011\\_wichtige\\_Folien\\_Referat.pdf](http://www.ludwigsburg.de/site/Ludwigsburg-Internet/get/1110806/2011_wichtige_Folien_Referat.pdf)

The sustainable development process of the City of Gdansk is managed as a part of the City Development Strategy and its 22 operational programmes. It is named Local Agenda 21. The Local Agenda 21 Forum formed by the representatives of administration, business, NGOs, industry, researchers, and citizens is considered to be a consulting group evaluating the policy and presenting its conclusions to the city board. Gdansk's sustainability management unit is planned to cooperate closely with all of the departments and the coordinators of the 22 operational strategy programmes. They will facilitate the exchange ideas and information, report on activities and provide guidance. In the future, the unit would have a central role in policy formulation and evaluation, analyzing the implementation of the strategy and sectoral programmes, and defining the implementation activities. To carry out such cross-sectoral coordination, the unit needs a position close to or within the Mayor's Office. <http://www.urbanworks-toolkit.eu/en/function4.html>

Riga's Local Agenda 21 office, currently the Sustainability Management Centre Agenda 21, is responsible for the implementation of the Aalborg Commitments. Since Riga's Aalborg Commitments Baseline Review identified some shortcomings in terms of sustainable development and generated recommendations, the LA 21 office is working to develop an implementation strategy and action plan to stimulate dialogue between the decision-makers, administrators, experts, NGOs and interested citizens. With an existing and proactive LA 21 office, the city of Riga has a good foundation from which to work. The office has built strong partnerships at local, national, as well as international level. Within the city administration, the unit cooperates with the City Development Department to ensure coherence between the city's development goals and the current indicators. <http://www.urbanworks-toolkit.eu/en/foundation4.html>

Örebro's Planning Department is closely connected to the Mayor's office, as well as the different sectors of municipal administration. It is one of the four departments in the Municipal Administrative Office. Currently, the Planning Department is responsible for the planning and implementation of the strategies for sustainable development. However, the unit sees the need to develop to the point where sustainable development will be incorporated into the city's general policy model and handled cyclically - much like municipal finances.

Therefore, for the future, they envision a cross-sectoral coordinating unit still belonging to the Municipal Administrative Office and being guided by the Municipal Executive Committee. This facilitates contact with political management, creates support for the unit and enables dissemination. Their unit will be responsible for coordination, increasing awareness, monitoring and reporting, leading and developing, and interacting. While it will have close connections to the different sectors, the unit will not be responsible for implementing activities of the sectors. Instead, the unit will work with the departments to support and create the conditions for their implementation of integrated and cross-sectoral work on sustainability. <http://www.urbanworks-toolkit.eu/en/layout4.html>

The City of Turku has an Agenda21 office shared with 28 municipalities in the Southwest Finland. The office gets financial resources from the municipalities, project funding, consultancy, and event participation fees of companies. Municipal funding is approved every programme period, but the additional project funding is short-term, and consultancy and company fees come in irregularly. Thus, as the office has long-

term responsibilities, the balance between financial and human resources and the assigned responsibilities of the office is not optimal.

However, multiplicity of municipalities and sources of funding help the office to meet management challenges. Individual municipalities provide both human and financial resources. This stabilizes the effects of political waving in the funding and provides the broad range of knowledge and skills for strategy and programme development. Another aspect is the high number of short-term projects that overlap in time. Thus, there are periods of intense activity with insufficient of human resources. These challenges are being addressed in the further development of the office's management and structure. <http://www.urbanworks-toolkit.eu/en/construct4.html>

The City of Novgorod has managed to move forward on issues related to sustainability due to a network of top managers in the city administration who find such issues important. Currently, this network is the main human resource for the efforts. However, it is only the first step towards a more concrete coordinating unit.

A sustainability management unit will be established in the framework of the Dialog Centre – an existing organisation located outside of the city administration structure. The Dialog Centre has knowledge and expertise in public administration, social issues and business. The resources provided by the Dialog Centre will enable the new unit's work, which will focus on consultancy and advising the city administration and keep close ties with city officials. <http://www.urbanworks-toolkit.eu/en/construct4.html>

## Products & Tools

- Communication models/methods
- Training for staff in order to be up-to-date
- Tools in order to work with the departments that are implementing projects to organise the information and knowledge created in a systematic Indicators to evaluate progress, e.g. Local Authorities Self-Assessment of Local Agenda 21 (LASALA).
- A free, online self-assessment tool developed by ICLEI Europe to help local governments evaluate processes and progress towards sustainable development.
- Sustainability Cycle  
 A cyclical, integrated sustainability management tool developed by ICLEI Europe to lead local governments advance their sustainability level and implement the Aalborg Commitments.

## Financing and Investment

### Project Costs:

Depends on existing personal costs (possibly staff members can be used in a different position)

### Financing:

Mixture of municipal grants, federal funding and EU funding?

No perfect suitable fund, possibly ERA-NET on Smart Urban Futures EURO-5-2015

Former suitable project: SUSTAINABLE NOW

<http://www.sustainable-now.eu/>

## Expected Outcomes

### Measuring success

- Existing cross-sectoral unit
- Acceptance of other departments
- Possibly acquired projects and funds

### City vision

Since the administration decides on the city's sustainability goals, staff must be well informed about the technologies, processes and concepts and be able to apply the newly acquired knowledge directly. A cross-sectoral unit bundles the knowledge of the involved departments, can communicate with the citizens and make the Vision of a smart city of Prague more transparent.

### Beyond the city

Definitely, as the idea has been transferred and can be adapted in other cities

## 2.10 Transportation Hubs Network - Prague

Transfer     New concept / solution     Other

Intermodal transportation hubs that combines park and Ride with car- and bike sharing and provides hybrid space concepts for multifunctional use can serve to mitigate car traffic in the city, to improve use of public transportation and to increase bottom up economic activity in the districts.

### Explanation of hypothesis:

Create Lighthouse Transportation Hubs with hybrid parking system (e.g.in Praha 6), offering intermodal connections, flexible structures (after-use-concepts) and student accommodations etc.

Make best use of synergies in district around. Combine with intelligent park & ride app. Solar panels and e-bike sharing could serve to solve bike riding aversion (hills). Needs to be integrated into bike lane concepts.

Start with one lighthouse hub and replicate later.

### Benefit:

Improve traffic situation in Prague

Make use of bikes and intermodal transportation more attractive

Spur development in districts

### References:

- Miami park-houses
- Geneva Bike parking

### POTENTIALS:

Incubator for district centered transport development

Link to local stakeholder group that would be able to replicate similar solution in other parts of the city

Create brand: Prague Hub

### Relevant Actors:

Developers / Investors

Municipalities

Public Transport Companies

Dep. of transportation in city hall.

IPR

**What current problem is the project trying to solve?**

- High degree of car-based commuting into Prague due to suburbanization
  - High degree of pirate parking in streets within some of Prague’s districts (e.g. Praha 6)
  - Car traffic and parking cars consuming public spaces in the city centre & neighbourhoods
  - High Air Pollution level (PM10)
  - Lack of bike lanes and alternative transportation modes
  - Poor intermodal mobility options that connect public transportation in Prague with individual mobility
  - Brown Field Development
- 
- Park and ride stations are important for bringing people from the outer regions of Prague into the public transport system. They need to be improved and expanded. The connection to the airport provides potential for additional park and ride schemes.
  - The public transportation system – especially the trains – needs to increase the frequency of rides in order to become a more attractive option for commuters from the outskirts
  - The attractiveness of the inner-city mobility of Prague needs to be increased as a third step by providing local e-bike sharing schemes, free floating e-car sharing and intelligent and sustainable inner city logistics through electric cargo bikes. Soft factors like opening the one-way streets for bikes in both directions or connecting e-bike sharing schemes with easy-to-use smartphone applications and e-tickets need to go along with this, but also investments into public transportation (e.g. Tram and Metro).
  - The public should be incentivized to use the public transport system and discouraged from driving to the city centre. Therefore payed park zones need to be installed in all areas that are prone to “pirate parking” from suburb-commuters and some central streets and public places need to be closed completely for regular car-traffic.

**Related MS Indicators**

- P23 Modal Split
- S23 Share of individual budget spent on transport
- S24 Average commuting distance
- S25 Average network speed
- S26 Density of EV/FC charging network
- S27 Price of public transport
- S28 Public budget for greening the mobility sector

**Related Action Fields**

- 32 District Management - small-scale use-mix in local districts
- 33 Transport Oriented Development
- 34 Urban development planning for a city of short distances
  
- 44 Innovative financing of innovative/sustainable technologies and projects
- 47 Activation of business actors for supporting the sustainability strategy of the city.
- 49 Active partnership between city & private sector for pushing sustainability topics. (PPPs)
  
- 68 Innovative, sustainable distribution concepts for city centers
- 69 Intermodal urban freight traffic
- 70 Provision of E-Mobility-Infrastructure
- 72 Targeted combination of different modes of transport

**Related Impact Factors**

- 8 Suburbanization & urban sprawl
- 9 High noise and air pollution in the city
- 11 Several postindustrial sites ready for redevelopment within the city
- 15 High degree of individual car possession
- 16 Weak support for bike infrastructure from the city & transport companies
- 17 High amount of car traffic and parking in the city centre
- 18 Low emission zones in Prague until 2016
- 20 Well established and functioning Public Transportation network
- 21 Lack of intermodal concepts and facilities
- 22 Missing link between cycle path network and public transport
- 23 Unintelligible ticket system
- 25 Lack of park and ride facilities
- 26 Barriers in public space through traffic and parking

## DNA of the Project

<b>Job to get done (Goal)</b>	<p><b>What job is the project trying to get done?</b>  <i>The main 'job' is to reduce the car-traffic on inner city roads in Prague.</i></p> <p>Secondary jobs are</p> <ul style="list-style-type: none"> <li>- <i>to increase the share of Public transport</i></li> <li>- <i>To provide alternative mobility modes by providing inter modality options to the Inhabitant.</i></li> <li>- <i>To introduce systems of park + ride, Car sharing, E-Cars &amp; Bikes.</i></li> <li>- <i>Intermodal transport hubs give opportunity to Brown field development and some other Urban Developments for Commercial activities.</i></li> </ul>
<b>Core Value</b>	<p><b>What kind of value does the project create for the city and city stakeholders?</b>  <i>It enhances the overall traffic situation of the city, better mobility will shorten the trip time for inhabitants who study, work, or live in Prague City Centre and Prague 6.</i>  <i>More people will find parking slots in P+R facilities and be able to seamlessly connect to public transport and other modes of transportation</i>  <i>Transport hubs will increase the business opportunity. Nearby areas of the transportation hub can be developed as business centres, shopping malls and other commercial activities.</i>  <i>It will also give the city an overall upliftment for using sustainable modes of transport.</i></p>
<b>Consortium</b>	<p><b>Who should be partner in this project and why?</b></p> <ul style="list-style-type: none"> <li>- <i>The land owners</i></li> <li>- <i>The City of Prague</i></li> <li>- <i>Planner: (SBA?)</i></li> <li>- <i>Infrastructure developer: (Pöyry?)</i></li> <li>- <i>Local Transport company DPP</i></li> <li>- <i>Road transport company TSK for park management</i></li> <li>- <i>Smart Parking solutions provider (Bosch / OSRAM?)</i></li> </ul>

## Minimum viable project

<b>Must HAVE</b>	<p>Pilot project: 1 Intermodal Park &amp; Ride Hub connected to a junction of public transport.</p> <p>sufficient number of cost effective Park &amp; Ride slots</p> <p>Connection to the Metro, to Buses, to Tram and / or to Railway</p> <p>Integration into the district with bike lanes and bicycle storage facilities</p> <p>Ticketing and Billing system adapted to different user types (daily user, frequent user, casual user etc.)</p> <p>Ticketing and Billing system linked to the public transport and related to</p>
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parking costs in the city centre (overall costs for parking and using public transportation must be cheaper than just parking in the city centre).

Security concept for surveillance of public space and protection of cars

**Should  
 HAVE**

Park & Ride hubs with small commercial activities; providing small shopping centre, cash machines, nearby Fuel station, waiting area, meeting area, travel info point, other public facilities etc.

Bike & E-Bike sharing stations

Cars or E-car sharing stations

Small scale district logistics – distribution centre

Communication strategy for attracting users

**Could  
 HAVE**

Intermodal Transport Hub as nucleus for a transport oriented district development

Flexible space concepts, co-working spaces, meeting and conference rooms

Event location

Apartments, shopping facilities etc.

Leisure activities: Fitness studio, Cinema, Tennis court etc.

Hotel, Flex-Offices etc.

Full integration into sustainable district transport development (certain roads leading to city centre to be converted in Eco-Boulevard, consisting of Bicycle lanes, Pedestrian lanes & restricted private transport use).

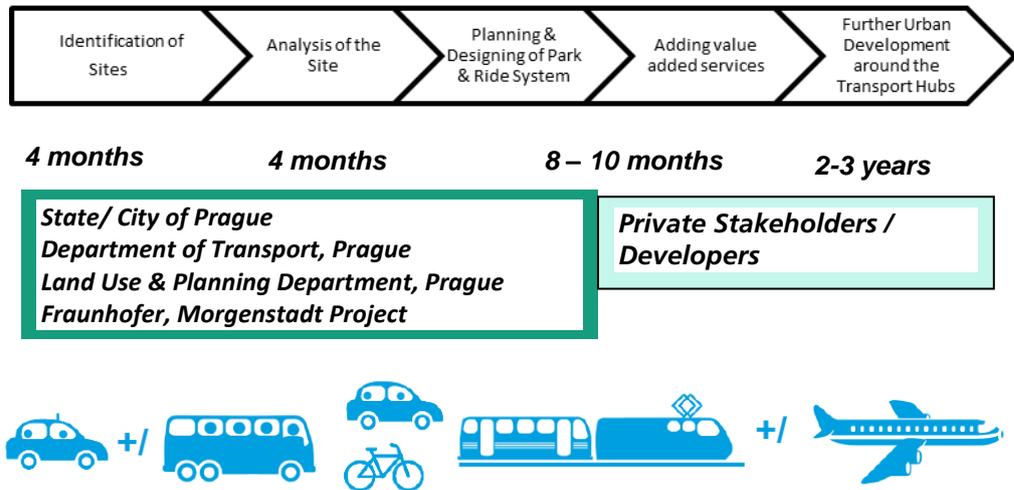
## Process

### Activities

*In an initial screening four sites next to major transport connections in Praha 6 have been identified as potential sites for a transportation hub: these are Praha- Podbaba, Borislavka, Na Petince, Praha-Holešovice.*

*These sites can potentially be developed as Intermodal Mobility Hubs starting with intelligent Park & Ride concepts. Available parking lots in Neighborhood commercial centres can be converted as Car Sharing, E-Car & Bike Stations.*

However, a decision needs to be based on a deep analysis of road connectivity and concepts (e.g. Tunnel Blanka). It is also necessary to take into consideration the finalization of the outer ring and the mobility effects of this on the area.



Besides the ideas named on the page before, three concrete projects were discussed:

- The central place Vaclavske Namesti is being redeveloped in the coming years. It is being discussed to re-introduce trams to the square and close car-traffic. This process should be used to set-up a pilot project on sustainable inner-city logistics including a distribution centre, electric cargo-bikes and a distribution concept for the historic city centre of Prague.
- The Smart Urban Logistics Conept (in German), can serve as guideline<sup>165</sup>.
- The Cargo Bike city logistic concept of the Manchester Corridor, which is to be implemented throughout TRIANGULUM can serve as blueprint for replication in Vaclavske Namesti.
- Three large shopping malls in the city centre of Prague have potential for setting-up a collaboration project on E-Bike sharing: Andel, Palladium and Quadrium. By investing into a bike-sharing scheme these operators could offer e-bike stations in 3 different places in the city and increase their sustainability credentials for attracting customers. A joint approach with the city will be needed.
- A medium sized shopping centre at Cerny Most Metro station has already signaled to engage in a sustainable development process of the city. IKEA is located at the same location and might be interested in engaging too. The goal is to increase sustainable transportation (Car-sharing, bike-sharing and the use of public transport) through a joint strategy development with the shopping centre.

## Technologies

- **Which Technologies are to be implemented in the project?**

<sup>165</sup> <http://www.smartcities.at/assets/01-Foerderungen/SmartUrbanLogistics-Gesamtkonzept-v1-0-Web.pdf>

- Smart Parking sensors
- Intelligent Apps for Booking / Ticketing / Billing
- Intelligent & efficient lighting systems
- Electric Bikes
- Electric Vehicles
- Charging stations for Ebikes
- Charging stations for Evs

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Roadmap  
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## References



### **Frankfurt Airport, Germany**

[http://www.frankfurt-airport.de/content/frankfurt\\_airport/de.html](http://www.frankfurt-airport.de/content/frankfurt_airport/de.html)  
<http://www.thesquaire.com/en/>



### **Arctic, Anaheim California, USA**

<http://www.articinfo.com/>  
[http://www.metrolinktrains.com/stations/detail/station\\_id/81.html](http://www.metrolinktrains.com/stations/detail/station_id/81.html)  
<http://www.hok.com/design/type/aviation-transportation/anaheim-regional-transit-center-artic/>



### **Plaza Elíptica, Madrid**

[https://www.metromadrid.es/es/viaja\\_en\\_metro/red\\_de\\_metro/estaciones/PlazaEliptica.html](https://www.metromadrid.es/es/viaja_en_metro/red_de_metro/estaciones/PlazaEliptica.html)  
<http://subway.umka.org/map-madrid/line-6/plaza-eliptica.html>

## Financing and Investment

### **Project Costs:**

Concept development, feasibility, plans: 100.000€

Construction costs for basic park & ride facility: ca. 500.000€ - 1,5 Mio €  
(300 parking slots)

Costs for purchasing the land: N/A

Costs for Intelligent lighting: ca. 50.000€ - 75.000€

Costs for Intelligent parking system: ca. 75.000€

Costs for booking system, ticketing etc.: ca. 50.000€

Costs for security system and operation room: ca 75.000€  
Operating costs including maintenance, surveillance etc.:  
>120.000€ annually.

The Sqaire, Frankfurt ,2011  
Project Cost: 1 billion€ (Euros)  
<http://www.archdaily.com/342579/the-sqaire-isk>

Arctic, Anaheim, California, 2014  
Project Cost: 185 million\$ (USD)  
<http://www.ocregister.com/articles/artic-643100-city-meeks.html>

Plaza Eliptica, Madrid, 2004  
Project Cost: 43 million€ (Euros)  
<http://tpf.eu/projects/intermodal-station-in-plaza-eliptica-madrid/>

## Financing:

This project can potentially be financed through a Design- Build- Finance – Operate (DBFO) approach. Especially when providing value added services an investor will be able to regain its investment through renting out parking slots, selling tickets, operating car- and bike sharing systems and renting out office and vendor spaces to all kinds of companies, retailers and service provider.

Some added funding may be achieved via EU funding: Especially under the Work Programe Transport and mobility in H2020 2016 / 2017:  
[http://octopux.octopuxconsultin.netdna-cdn.com/wp-content/uploads/2015/05/draft\\_wp-sc4\\_transport\\_2016-2017.pdf](http://octopux.octopuxconsultin.netdna-cdn.com/wp-content/uploads/2015/05/draft_wp-sc4_transport_2016-2017.pdf)

Especially when using innovative technologies an option for generating EU financing (credits) could be to use EFSI funding: <http://www.eib.org/about/invest-eu/?lang=de>

## Expected Outcomes

### Measuring success

- Levels of noise and air pollution in the city
- Amount of car traffic and parking in the city centre
- Amount of park and ride stations
- Use of park and ride stations
- Passengers in public transport system
- Modal Split
- Increase in PuTr Revenue
- Less congestion in traffic
- Air Quality

- Increased Urban Development

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Roadmap  
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**City vision**

A set of intermodal mobility hubs in Prague would be able to push urban development in the districts and to set the stage for bike lanes, e-mobility lanes and eco-boulevards in Prague

*At the same time intermodal hubs are able to increase the use of public transportation (especially metro, tram and railway).*

*Less congested traffic will increase city value.*

*Investment in PuTr will strengthen the city resilience , and increase Transport indicator value.*

*More open public spaces & Eco-boulevards will enhance the city image and the environment.*

*Transport hubs will provide opportunity for more new economic activities and further expansion of existing economics.*

*Transport hub can help developing Brown fields, as an economic centres.*

**Beyond the city**

A "Prague Mobility Hub" could find replicators across Europe.

*Same model can be applied to other cities in Czech Republic, which are facing traffic congestion, and low value of PuTr uses.*

*It also enhances the city value in terms of Sustainable approach towards transport and increase the sustainable indicator.*

## 2.11 Data Analytics Centre for Prague



Transfer



New concept / solution



Other

An increasing diversity and amount of data require a high level data analytics centre for Prague

### Explanation of hypothesis:

Prague needs a data platform for aggregating city data from a variety of different sources and a data analytics system, allowing the City to aggregate and analyze this data, to increase the efficiency of city services and to effectively address crime, public safety, and quality of life issues. The Data Centre should function as a data hub, integrating different kinds of urban data sets (real-time data, static data, point data etc.) in a comprehensive IOCT architecture. It should make use of advanced data analytic tools to identify risk more strategically, deliver services more efficiently, enforce laws more effectively and increase transparency. With this data, suitable climate effective and sustainable development plans can be created and more easily be checked.

### Benefit:

Data for better implementation of measures and simulation for future measures  
 Evaluation of undertaken measures  
 Better Reaction concerning challenges possible

### References:

Mayor's Office of Data Analytics (MODA) of New York City  
 Analytics Centre of Excellence in Edmonton  
 Rio de Janeiro Intelligent Operations Centre

### POTENTIALS:

Streamline city processes  
 Improve city services  
 Reduce administration and management costs  
 Reduce maintenance and operational costs for infrastructure and services

### Relevant Actors:

IPR  
 City Hall  
 Municipal districts, municipal companies  
 Institutions and companies – data sources  
 IT companies – infrastructure and tools  
 Universities, research – data analyses

### ***What current problem is the project trying to solve?***

The City of Prague and its municipal companies produce an increasing amount of data stemming from urban processes in different areas (traffic data from the roads, real-time surveillance data of public spaces, energy related data,

environmental data, security related data, risk-related data on stormwater and floods, data on travelers, tourists, crimes, streetlights etc.)

Although the Prague City Hall has a Department for ICT, these data are not collected systematically and not linked with each other. The ICT management is divided into a purely technical part and a content-based and analytical part. The Department of Computer Science PCH may be beneficial in terms of ensuring the technical infrastructure and identifying some source systems. It does not provide for data collection and management, and (content).

The organisational structure covering all relevant issues is not available (infrastructure for data storage, data management / provision, content management, analyses, open data management etc.). There is no data hub or city operations centre that would make use of the data for optimizing urban processes such as traffic management, lighting, energy management, waste management, civil protection etc.

**Related MS Indicators**

**Related Action Fields**

**Related Impact Factors**

- Industrial Water Consumption
  - Total energy demand per capita
  - Total electricity consumption per capita (MWh/year)
  - City administrative expenditure
  - Own-source revenue as a percentage of total revenue
- 
- Communal energy management.
  - Use of Smart Grid Technologies
  - Innovative, sustainable distribution concepts for city centres
  - Interoperable electronic ticketing systems in public transport
  - Open Data System for / by city
  - Urban Big Data Systems
  - Intelligent traffic management based on real-time information.
  - Networked Security Solutions
  - Integrated Risk Management
  - Resilience-by-design approaches in critical infrastructure protection
  - Alignment of budgetary policy with sustainability goals
  - Joint research institutions between industry and science for sustainability issues.
  - Urban Innovation Management
- 
- Lack of cooperation between city public utility companies
  - Lack of data
  - Continuing public distrust in the people in power (politicians, public officials, policemen, etc.)
  - Lack of Strategic Thinking
  - Difficulties to attract and keep qualified personnel
  - Lack of Participation
  - No city-wide resilience strategy in place
  - Continuing public distrust in the security services
  - Maintenance of flood protection measures is very cost-intensive
  - Problematic areas within the city with a high level of street crime
  - Low feeling of security among the residents

## DNA of the Project

### Job to get done

#### (Goal)

#### What job is the project trying to get done?

*Take political decisions based on city data and evidence.  
Improve functioning of Prague's infrastructure (transport, telecommunications, water etc.) based on real-time data.  
Improve effectiveness of public services based on city service data.  
Improve cost-efficiency of the city administration and municipal enterprises  
Increase service level for different kinds of city "users" (citizens, local companies, tourists, students etc.)*

### Core Value

#### What kind of value does the project create for the city and city stakeholders?

*Enable for evidence based decision making.*

*The central aspects of evidence-based city planning and management include the linking of all sorts of different available data sets in order to improve the functioning of the city processed and the service level towards the citizens.*

*The aggregated and analyzed data allows the city administration to effectively address crime, public safety, and quality of life issues and to simulate scenarios e.g. for certain sustainable climate protection measures.*

*This will ultimately lead to a higher satisfaction of Prague's citizens and to the attraction of companies that want to do business in Prague. At the same time it will lower costs for the administration.*

### Consortium

#### Who should be partner in this project and why?

*Prague City Hall  
(Department of ICT)  
Czech Technical University  
SAP Czech  
Robert Bosch GmbH  
Prague Municipal Companies (Pražská energetika, Pražská*

*plynárenská, Pražská Teplarenska, DPP, TPK)  
Cadferm / Virtualcitysystems for visual representation of data.  
Fraunhofer IAO  
Fraunhofer FOKUS*

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Roadmap  
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## Minimum viable project

### Must HAVE

- Server Park
- Powerful Database with in-memory calculation
- Real-time access to data sources from various city sectors
- Powerful analytics solution

### Should HAVE

- Oversight of Citywide Data Projects
- Visualization of data in the city
- User-friendly design (so also non-IT professionals can work with it)
- Link to all relevant departments within the city hall
- Protection against cybercrime
- Data privacy standards

### Could HAVE

- Include data from the region

## Process

### Activities

#### 1.) Define Reference Architecture

Data categories (Real time data, Static Data)  
Data Formats (.csv, .txt, .json, .xml, .sql, .rdf)  
Data interfaces & protocols  
Open data vs. closed data  
Data securing & privacy measures

#### 2.) Identify and verify existing sources and datasets throughout the city

Analyzing the wealth of available City data - data that is created every day as the City operates. The goal was to create a comprehensive picture of City operations and to ensure the most pertinent data was available to conduct meaningful analyses.

#### 3.) Where possible optimize datasets according to architecture and secure data collection method,

#### 4.) Build the infrastructure

Establish an end-to-end infrastructure - including data, data management, methods and consumption - that lays the foundation for a powerful analytical capability.

## 5.) Create a model for Prague City Analytics

Define desired outcomes

Develop data mining algorithms

Operate the Data analytics centre in close collaboration with the City Hall

## References

### Similar Projects

The Mayor's Office of Data Analytics (MODA) is New York City's civic intelligence centre, allowing the City to aggregate and analyze data from across City agencies, to more effectively address crime, public safety, and quality of life issues. The office uses analytics tools to prioritize risk more strategically, deliver services more efficiently, enforce laws more effectively and increase transparency. The office's core functions include:

- Collaboration with City agencies to implement data-driven solutions to City service delivery issues.
- Building a Citywide data platform to facilitate data sharing
- Oversight of Citywide Data Projects
- Implementation the City's Open Data Law

<http://www.nyc.gov/html/analytics/html/home/home.shtml>

A good example is the increase in efficiency of NYC's tax controllers. The city has a several million businesses but only a few tax controllers. If these few controllers engage only in random checks to ensure businesses are paying the correct amount of tax, their efficiency is not very high. It would be better to send them to only the most likely perpetrators; but the question was how to find them. The Flowers' data task force set out to develop a system for identifying tax evaders. What they came up with is very simple but effective. They developed an indicator of business activity and concluded that wherever a business is, there is waste (garbage, wastewater, etc.). This data is available per BIN and can be matched with tax data. If there is a lot of waste but no tax income, this represents an anomaly. Although it alone is not proof that someone is engaged in tax fraud, it is more likely that this person or business is attempting tax fraud than someone whose tax and waste values match. This indicator can be used to select which businesses the controllers should be sent to check on. With this basic system the controllers' success rate was improved from about 10% to almost 90%. One of the central points

is that this does not have much influence on the controller. They do the same work, but are provided with a weighted list instead of a random list. This also makes the approach more successful because, as Flowers claims, the controllers were not forced to change their work habits.

### Products & Tools

- Data collection tools, e.g. platforms, programs
- Possibly open-source tools, exchange platform in order that several persons can collect data
- E.g. MODA uses a variety of other tools, ranging from basic analysis in Microsoft Excel, Microsoft SQL Server for data access, Oracle business

intelligence tools to perform data look-up and Palantir for relationships and network mapping

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Roadmap  
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## Financing and Investment

### Project Costs:

1 million dollars for initial infrastructure (source: <http://gcn.com/articles/2013/10/04/gcn-award-nyc-databridge.aspx>)

### Financing:

A city operation centre has the potential to save money for the city on a large scale. Investing into a city operation centre can thus be refunded through the city's own funds.

Example: Birmingham was able to save 1.8 Billion € in three years through switching to an intelligent city management based on data-analytics: <http://sap-espresso.com/viewStory/111>

### Additional funding sources can be found through EU projects e.g. via EU Horizon 2020 calls like

INFRASUPP-7-2014 – e-Infrastructure policy development and international cooperation  
ICT 10 – 2015: Collective Awareness Platforms for Sustainability and Social Innovation  
FoF 8 – 2015: ICT-enabled modelling, simulation, analytics and forecasting technologies  
LCE 5 – 2017: Tools for integration and coordination of the energy system  
SCC 1 – 2016/2017: Smart Cities and Communities solutions integrating energy, transport, ICT sectors through lighthouse (large scale demonstration - first of the kind) project  
CO-CREATION-2017-8: Policy-making in the age of big data: evidence-informed policymaking and policy-modelling  
ICT3.5 – 2017: Collective Awareness Platforms for Sustainability and Social Innovation  
EINFRA-21-2017: Platform-driven e-infrastructure innovation

## Expected Outcomes

### Measuring success

The success will be measures in the reduction of costs for the city and the increase of satisfaction for citizens.  
At the same time cost-effectiveness of municipal companies and rising corporate taxes are a good indicator for a functioning data analytics centre.  
Further indicators are:

**City vision**

- Increased effectiveness of public transport
- Increase in safety and security
- Reduction of energy use and emissions

A Prague Data Analytics Centre will ultimately be linked to the strategic goals and the budget of the city. By Creating impact assessment and monitoring approaches across causal chains and distributed benefit calculations the analytics centre will help increase the transparency about the effectiveness of measures taken in Prague.

This – in turn – helps the city take better decisions and helps Prague become a European leader in showing other cities the way towards a truly smart and sustainable city.

**Beyond the city** -----

## 2.12 Smart City Innovation Fund Prague

Transfer     New concept / solution     Other

An innovation fund helps the city activate the creative potential of local universities, start-ups, companies and research institutions for supporting the development goals of the city.

### Explanation of hypothesis:

There are several bottom up initiatives, smaller start-ups and research-oriented institutions in Prague that bare a large potential for supporting the strategic development of the city of Prague with innovative ideas, products, services and solutions.

Yet, today there are no incentives that would gear the attention of the digital industries, the creative and cultural industries or the local companies and startups toward a more sustainable and intelligent development of the city.

A Smart City Fund that provides grants and financing for innovative ideas tied to the strategic development goals of the city, could spur creativity and make best use of the potential within civil society, research and industry to support a prosperous and sustainable development of Prague

### Benefit:

- Spur innovations in Prague
- Support creative and cultural capital of Prague
- Contribute to sustainable development of Prague
- Attract foreign investment

### References:

- Badenova Innovation Fund
- Revolving Smart City Fund Eindhoven
- FairClimateFund Amsterdam
- Council Innovation Fund Calgary

### POTENTIALS:

- Incubator for new ideas and startups in the city
- Impulse for growth and an innovation-based economy
- Business support for the development goals of the city

### Relevant Actors:

- City Hall
- Municipal Enterprises
- Local companies

## ***What current problem is the project trying to solve?***

A positive long-term development lies at the moment solely in the hands of the city administration of Prague. There is no real sense of co-ownership for the city in civil society, research and the corporate world. This leads to a situation where huge potentials for a stronger development of the digital, creative and cultural sector in Prague lie unused.

At the same time the city is about to publish a strategic plan for the future development of Prague and will need support from different kinds of local stakeholders to pursue long-term goals and to create a "smart city".

### **Related MS Indicators**

- Degree of participation
- Administrative structures for sustainability management of city
- Existence and state of CO2-reduction goal
- Existence and performance of sustainability management
- Earmarked revenues for sustainability projects
- GDP of city
- Size tertiary sector
- Employees in innovative sector
- Qualification level

### **Related Action Fields**

- Definition of indicators, creation of a performance measurement system for sustainability and climate change.
- Alignment of budgetary policy with sustainability goals
- Alignment of budgetary policy with sustainability goals
- Cluster Management (Support of specialized and small businesses through networking, promotion and marketing, communication, and enabling market access)
- Business Environment / identity management
- Urban Innovation Management
- Creation of "city labs" (experimental areas) for deploying innovative technologies)
- Attracting and supporting institutions of science and research as incubators for sustainable development.
- Innovative financing of innovative/sustainable technologies and projects
- Activation of business actors for supporting the sustainability strategy of the city.
- Incentives for "first movers" and "InvestCommunities"

### **Related Impact Factors**

- Lack of Cooperation between Universities and City
- Lack of Cooperation between Industry and City (PPP)
- Lack of Cooperation between Companies and Universities
- Lack of Cooperation between Universities
- Lack of incentives for faculties to collaborate
- Centralized Research policy (state level)
- No R&D Strategy / Innovation strategy in place!
- Incentive programmes to foster R&D are not working

## DNA of the Project

<b>Job to get done</b>	<b>What job is the project trying to get done?</b>
<b>(Goal)</b>	<p>Activate local companies, universities, start-ups, NGOs and research institutes to support the sustainable development of Prague through creative ideas and applicable innovations.</p> <p>Support local institutions with strong potential to develop new products, services and solutions that could be tested in Prague and marketed across Europe.</p>
<b>Core Value</b>	<b>What kind of value does the project create for the city and city stakeholders?</b>
	<p>It integrates the public and the private sector across a range of innovative projects.</p> <p>It creates economic development in the right sectors and therefore actively impulses a strategic development of the city.</p> <p>It contributes to secure a future-oriented development of Prague based on the collaboration between the public, private and research sector.</p>
<b>Consortium</b>	<b>Who should be partner in this project and why?</b>
	<ul style="list-style-type: none"> <li>- <i>The City Hall</i></li> <li>- <i>Municipal company / companies</i></li> <li>- <i>Smart City Advisory Board</i></li> <li>- <i>Smart City Think Tank (Project suggestion Nr. 8)</i></li> </ul>

## Minimum viable project

<b>Must HAVE</b>	<ul style="list-style-type: none"> <li>- A revolving source of money that is renewed every year and can be spend on supporting innovative projects</li> <li>- A decision making structure and a sounding board that makes sure that funding is spent according to the development goals of Prague</li> <li>- A Project Manager that manages the applications and broadcasts the fund</li> </ul>
<b>Should HAVE</b>	<ul style="list-style-type: none"> <li>- Engagement of one or multiple municipal companies as contributors to the revolving fund</li> <li>- Direct link to the city hall – e.g. through an own budget</li> <li>- Sound communication strategy (website, presentations etc.) that shows successes and invites for applications</li> </ul>
<b>Could HAVE</b>	<ul style="list-style-type: none"> <li>- Local cluster management for the creative &amp; digital community through events and networking</li> <li>- Crowd-Investment approach through local companies that would like to support the innovation landscape in Prague</li> <li>- Local, national or international sponsors</li> <li>- Regional integration into the Central Bohemian Region</li> </ul>

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## Process

### Activities

Setting up the innovation fund:

#### 1. Identification of Invest-community

Stakeholders that are interested in supporting a smart and innovative development of the city of Prague and institutions that are owned by the city.

#### 2. Definition of Goals, statutes and conditions for funding

#### 3. Setting up the organization and decision making structure

Project Manager

Supervisory committee

Expert advisory committee

Application procedures etc.

#### 4. Launch call for applications

#### 5. Fund the winners

#### 6. Track your success by monitoring the innovation

## References

### Similar Projects

The **badenova Innovation Fund** for Climate and Water Protection is an innovative instrument for increasing local sustainability and for generating regional investments in climate and water protection projects. Each year, the regional energy provider badenova sets aside 3% of the company's profits (an average of about 1.3 million €) for investing in exemplary regional projects addressing climate and water protection issues. In total, the Innovation Fund has funded 195 innovative projects with a total volume of slightly over 20 million € since 2001. It has generated over 100 Mio.€ of co-investment into local innovations and has supported the development of >10 marketable products.

[https://www.badenova.de/web/de/umweltundregion/innovationsfonds\\_1/innovationsfonds.jsp](https://www.badenova.de/web/de/umweltundregion/innovationsfonds_1/innovationsfonds.jsp)

#### Council Innovation Fund Calgary

<http://www.calgary.ca/Mayor/Pages/Council-Innovation-Fund.aspx>

#### Innovation Fund City of Joondalup

<http://www.joondalup.wa.gov.au/Govern/GrantsandFunding/InnovationFund.aspx>

#### New York City Cultural Innovation Fund

<https://www.rockefellerfoundation.org/our-work/initiatives/nyc-cultural-innovation-fund/>

### Products & Tools

## Financing and Investment

### Project Costs:

The Smart City Innovation Fund will need at least one full-time project manager to administer all application processes, to coordinate the selection process and to carry out impact monitoring.

Together with further organizational and administrative costs, the annual costs for the Innovation Fund will amount to ca. 150.000€.

The Smart City Fund needs a significant budget (of at least 2 mln € / year) to fund local innovations and innovative project

### Financing:

Each year 3% of the profits of Prague’s Municipal Companies could be channeled into the innovation fund in order to support local smart city projects.

For the municipal companies, the regular investment of own profits pays off in several ways:

- a) Support own innovations

By being able to apply for funding themselves they can thereby experiment with technologies and solutions which have not been tested or are not yet economical under market conditions.

- b) Incentivize co-investments

Through only financing 50% of the project costs for companies, the innovation fund will unlock additional investments into local innovations and into the development of the city.

Additional funding could come from the City Hall or local companies that are interested in investing into a Smart Future of themselves in Prague.

## Expected Outcomes

### Measuring success

- Amount of applications received per year
- Amount of projects funded per year
- Annual project funding volume
- Incentivized co-investments
- Marketable products & services that have been created

### City vision

The Smart City Innovation Fund will be able to help Prague grow through research, innovation and the creative and cultural industries.

Through a growing pool of innovative and solutions the fund has the potential to make a real difference for the future development of Prague

In addition it can create and foster a network of local innovators and creative minds that are hold together by a

### Beyond the city

future vision for their city

Inviting the Central Bohemian Region to take part at the fund could be a step for regional integration.

Inviting companies, startups and research institutions from across Europe to make use of the fund, if there proposed projects support the development goals of Prague, will allow for an even larger amount of high-quality projects.

## Notes from the Analysis of Freiburg

The **Badenova Innovation Fund** dates back to the establishment of the company in the year 2001. From the beginning, it was a firm part of the company's constitution – all shareholders (municipal and private) agreed to make the Innovation Fund an „important guiding principle of the ecological business profile“(Held 2012) of the company. The city of Freiburg has proved to be an important driver in the development of the Innovation Fund. In the year 2000 the municipal energy provider (FEW) fused with five other regional energy companies to form the regional energy provider Badenova (Stadt Freiburg 2013b). Until this point the city had been a 75% shareholder in the FEW and now it held just under 33% of the Badenova shares – thereby losing some autonomy. To compensate for this loss of influence, Freiburg placed much importance on ensuring that the company had a strong emphasis on ecological goals right from the start.

The Innovation Fund was created to be the most effective instrument for working towards these goals and was integrated as such in the constitution of the Badenova from the very beginning. The overarching goal of the Innovation Fund is to help develop, in the broadest sense, the environmental protection efforts in the region surrounding Freiburg. Thematically, the fund is aimed towards climate and water protection. Therefore, all funded projects are relevant to environmental protection. The second large goal is to strengthen the local innovation potential in the field of environmental protection. Technological innovation and municipal progress in climate protection, but also projects relating to environmental education, are thus important priorities. The third main goal lies in the area of public relations. Using the Innovation Fund, the shareholders of Badenova would like to make innovative and effective solutions in the field of climate and water protection accessible to the general public in order to ensure the multiplication of the funded measures.

A three-step application process, in which projects are evaluated and assessed several times, was developed as a central success factor for the funding of high quality innovation projects. Private individuals, municipalities, associations,

societies, businesses and other organizations are eligible to apply. Before funding is allocated, the projects are evaluated by an independent expert advisory committee and by a committee of municipal representatives. Final project approval is granted by the Badenova supervisory board. Once this stage is achieved, the organizational and administrative effort required by the projects is kept to a minimum and is extremely flexible. So far, many innovative technologies in the area of climate and water protection have been funded, for example (Badenova AG & Co. KG 2013b):

- a hydroelectric turbine screw in Freiburg
- the energetic utilization of waste materials
- a flywheel energy storage for the Freiburg city rail transit system (tram)
- the utilization of sewage sludge
- a FLACTON PV concentrator
- the intelligent combination of wood and water heating
- the production of biogas from whey
- a wood gasifier

## 2.13 Prague Innovation District

 Transfer
  New concept / solution
  Other

The joint development of the Prague Innovation District will lever the innovation potential of the City of Prague, accelerate the development from idea to roll-out stage and create international competitive advantage as a high-level R&D Hub.

### Explanation of hypothesis:

The city of Prague needs to create an innovation ecosystem to foster local innovations and to attract international business and skilled workforce. The concept of the innovation district intends to bring business and research together in a specially designed space to accelerate the development of new and innovative products and services from an idea stage to a market roll-out.

With the development of a high-level R&D hub, the co-operation of research & development will be facilitated and an urban lab for testing innovative solutions and technologies will be provided. Therefore the innovation district will offer infrastructures for co-operation (conference centre, co-working spaces, shared labs for prototyping and testing) within a livable mixed-use environment. Integrating advanced technologies and process design, the innovation district will function as a Living Lab for the smart and sustainable “City of the future”.

The development process could be moderated by the Smart City Think Tank. It can integrate the creative industry potential of the City of Prague in the co-innovation process and build up a joint venture with the site owners, citizens, relevant companies, universities and the city for co-investment into a participatory process. In this way, a district vision and concept can be developed which will be highly accepted by several parties and can therefore guarantee long-term security of planning.

### Benefit:

- Advanced research and development district for industry and research to collaborate and to develop innovative products and services
- Transfer of existing innovation potential to achieve tangible development (economic development concept)
- Living lab for testing new urban solutions in a real city

### References:

Triangulum: Strijp S and Corridor Manchester  
 Barcelona @ 22  
 Vienna Neumarx  
 Berlin TXL  
 Cleantech Cluster Copenhagen

### POTENTIALS:

Attract EFSI / and foreign investment  
 Attract international academic & businesses  
 Accelerate the development from idea to roll out  
 Creation of new knowledge-intensive jobs  
 Lighthouse district for sustainable urban development, enhance visibility of the Prague R&D landscape  
 Competitive advantage international

## Relevant Actors:

Universities & companies  
Creative industries  
City Hall & IPR  
Fraunhofer  
Site Owner & Citizens

.....  
Roadmap  
.....

### ***What current problem is the project trying to solve?***

Prague's economy is currently facing competitors like Warsaw or Budapest, with the effect that companies are leaving the city because of bigger market potentials and cheaper production facilities (e.g. due to tax incentives). Prague needs to create a competitive advantage by setting up a high-level R&D Hub to foster local innovations and to attract international businesses and skilled workforce. The Prague innovation district is designed to become a testbed for new and innovative technologies and development processes and will help to shift Prague's image towards a modern and innovative city and to communicate the diverse innovation potential of the city. Furthermore, designing a space for co-operation between companies and universities will help solve the issue of insufficient cooperation between industry and research and bridge this gap by means of advanced co-creation infrastructure, offering facilities for communication in idea development, testing and roll-out.

The innovation district should be used to test participatory development concepts involving all the above-mentioned parties. Currently, the city shows a high interest in designing participatory concepts to develop demand-oriented solutions and increase the acceptance of processes and plans.

#### **Related MS Indicators**

- Growth rate
- GDP of the city
- Business volume – amount of exported goods per year
- Employees in innovative sector
- Qualification level
- Systemic dependence on industrial players
- CO2 emissions
- Rate of refurbishment/ new construction
- Electricity generated in the city
- Renewable energies in the grid
- Modal split
- Average commuting distance
- Degree of participation

**Related Action Fields**

- Creation of "city labs" (experimental areas) for deploying innovative technology)
- Joint research institutions between industry a. science for sustainability issues
- Alternative criteria and procurement procedures for real-estate-property.
- Urban development planning for a city of short distances
- Develop green inner city industry parks.
- Cluster Management
- Development of visions / goals together with civil society
- Creation and administration of platforms for citizen participation
- Awareness/Education: Creating awareness of sustainability

**Related Impact Factors**

- Lack of Cooperation/ Communication between Companies and Universities
- Change of economic pattern and direct competition with Warsaw and Budapest
- Spread of University Buildings all over the city
- Prague as an IT Hub
- Lack of strategy to motivate business actors and citizens to act sustainable
- Difficulties to attract and keep qualified personnel
- Subsidiaries of foreign companies in Prague have their R&D department in their home country
- Lack of Participation and trust

**Prague Innovation District – potential development areas****Žižkov Freight Railway Station (Czech: Nákladové nádraží Žižkov)**

**Size: 33ha, Distance to train station with public transport: 3.6 km**

**Owner:**

Žižkov former freight railway station (closed in 2002), previously used for rail freight transport (mainly food, coal), is located in the Žižkov district of Prague (Praha 3). The station building from the 1930s was declared as national cultural heritage in March 2013 due to its historical, technical and architectonic values. Since its closure, the station has hosted several events like the Prague Biennale art exhibition, the 15th edition of the annual Designblok festival and the landscape festival which was meant to revitalize the premises of the Žižkov freight railway station.

Žižkov is in private possession. Therefore a strategy for coordinating a potential development of the area with the developers and property owners is needed as a first step.



**Praha-Bubny railway station (Nádraží Praha-Bubny)**

**Size: 27 ha, Distance to train station with public transport: 2.7 km**

**Owner: French development group ORCO**

The area of Praha-Bubny railway station is located in Prague 7 in the Holešovice cadastral area. Although today it is only served by local trains and features limited passenger facilities, it is one of the largest stations in Prague by area, with 20 tracks and 6 platforms. The land was bought by the French development group ORCO from the Czech Railways for CZK 1,1 bn in 2006, since 2012 transformation of the building into a centre for contemporary history through art, first art projects has been realized.

The development project designed by ORCO aims at developing a 'city within a city', transformation into an urban/residential ecosystem with offices, apartments, malls, hotels, hospital and university. The construction of the first buildings is due to start in 2016. Some plots on the edge of the area have been sold to finance the core development.

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Roadmap  
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**The brownfield in Holesovice district (the old heating plant within the area),**

**Size: 9 ha, Distance to train station with public transport: 3.4 km**

**Owner: Prazska Teplarenska**

This area hosts the old heating plants built by PRAŽSKÁ TEPLÁRENSKÁ a.s., the most important thermal energy supplier in Prague. It supplies heat for 265,000 households and a number of industrial enterprises, schools, institutions and many business entities in Prague. There is a brownfield where the sub-railway track was built for industrial transportation. In the Holesovice district, there has been a lot of innovative redevelopment going on such as the revitalization of the old brewery, Prague Marina and the Lighthouse. The industrial buildings are slowly transformed into offices, galleries and apartments which promote the image of Praha 7.

## DNA of the Project

**Job to get done**

**(Goal)**

**What job is the project trying to get done?**

*The goal of the project is to develop an inner-city innovation district as an advanced research and development space for Industry and Research and thus create a high-level R&D hub with international visibility. Therefore, the district will bring together research and development (universities and companies) and create an urban lab to test innovative solutions / technologies in the urban context, offer infrastructure for co-operation like a conference centre, co-working spaces / shared labs for prototyping and testing) within a livable environment. Therefore the creative industry potential in Prague needs to be integrated in the co-innovation process, which is designed in a joint successive*

**Core Value**

**What kind of value does the project create for the city and city stakeholders?**

*approach, leaving space for innovative development. The development process could be moderated by the Smart City Think Tank as a facilitator building up a joint venture with the site owner, relevant companies, universities and the city for co-investment strategies.*

*The innovation district is designed to accelerate the development of ideas from conception to the roll-out stage, and function as a business incubator for start-ups and companies. The high-level R&D hub will attract companies and international academics and create new knowledge-intensive jobs. The district will be the showcase for the „city of the future“ (mixed use, sustainable environment, smart city, advanced mobility etc.) and offer a blueprint for sustainable urban development to be replicated within the city of Prague and beyond. The high-level innovation district is designed to attract EFSI and foreign investment. The participatory development process should lead to a higher acceptance of processes and plan, demand based innovative solutions, urban responsibility and capacity building.*

**Consortium**

**Who should be partner in this project and why?**

- Smart City Think Tank as facilitator
- Co-investment through joint venture between companies / universities and the City of Prague
- Universities and Companies as key actors in the consortium, identification of relevant departments and specific companies
- Co-innovation process based on the creative industry potential
- City of Prague
- IPR and Fraunhofer IAO as moderators of the joint development process and as potential users of the new co-creation space
- Owner of site
- Potential investors
- Prague’s citizens in general (open to public) and specifically citizens of the neighborhood and future inhabitants

## Minimum viable project

**Must HAVE**

- An integrative planning process involving key stakeholders from politics, local business, universities, creative industry and citizens working on a successive development process that starts at the very beginning of the process and is based on stakeholder analysis and transparent decision criteria.
- Advanced co-creation facilities: Co-Working spaces/

Should HAVE

- Innovation Labs with advanced production equipment, prototyping labs, shared spaces for conferences/ fairs/ events
- Mixed-use for living, working and leisure with offers for a heterogeneous target group (student accommodation, guest hotels, micro housing, social infrastructures like cafes and restaurants, working spaces, laboratories)
- Sustainable architecture and retrofitting, architectural visibility
- Efficient and innovative energy system with renewable energy sources, indirect heating system, innovative programs and products
- User-oriented solutions: Smart offices and homes versus intelligent low tech solutions
- Decentralized water management for resource efficiency, utilizing rainwater and recycling wastewater into energy (biogas/ mineral fertilizer)
- Car and bike sharing facilities with e-vehicles
- Open data platform for entrepreneurs to develop services and application for the specific urban context
- Public Wi-Fi/ Wi-Fi spots (e.g. in combination with smart street lighting)
- Space for co-innovation: conceptualization of testbed function (real life conditions with specific laws and regulations to test and pilot)

Could HAVE

- Smart sensor infrastructure with integrated sensors for traffic, parking and waste management
- Testbed for autonomous systems (e.g. Prague Innovation District as a showcase for driverless transport systems like autonomous shuttle bus, cleaning robots)
- Pneumatic waste collection systems with biogas-production from organic waste
- Smart street lighting (with LED lighting system, motion and light sensors) Leisure activities: Fitness studio, Cinema, Tennis court etc.

## Process

### Activities

A development of an innovation district in Prague needs to deal with a series of legal questions, which are currently under development. This refers for example to the new Masterplan of Prague and to a new building regulation.

If these issues are dealt with, it is recommended to take the following steps:

#### Month 1 – 12: Concept development

- Identification of the relevant stakeholders (Think Tank, site owner, industry, creative industry, citizen) and transparent participatory design
- Setup of entity (NGO) integrating key stakeholders within the innovation network
- Identification of suitable development sites

#### Joint scenario process (what does the ideal Prague innovation district look like?)

- Development of a Vision for the Prague Innovation district in collaboration with key stakeholders and further relevant stakeholders through workshops and interviews
- Identification of relevant topics co-innovation should focus on
- Choosing a suitable development site
- Breakdown of the vision for the Innovation District into concrete missions for different stakeholders through workshops with key stakeholders
- Launch a feasibility study on joint business plan
- Definition of overall financial strategy for project portfolio (commitment of investors such as companies, investors, crowd funding, citizens..)
- Development of business models
- Establish project portfolio

#### **Month 12-22: Planning**

- Alternative 1: Setup an innovation partnership with developers, planners and engineers for design definition
- Alternative 2: Setup of architectural design competition and specification of criteria for design tenders

#### **Technologies**

- Smart and sustainable buildings
- Efficient retrofitting
- Smart Energy System with renewable energy source, indirect heating system, micro smart grid, smart meters)
- Natural based and advanced materials, passive energy standard, optimized energy demand, assessed complex quality of buildings (SBToolCZ)
- BIM (Building information model) based project design and facility management recommended.
- Public space renewal
- Decentralized water management for resource efficiency, utilizing rainwater and recycling wastewater into energy (biogas/ mineral fertilizer)
- Pneumatic waste collection system
- Biogas production from organic waste and biomass production
- Smart street lighting
- ICT for public Wi-Fi hotspots, sensor infrastructure and open data platform
- E-mobility and car- and bike sharing
- Smart home technologies (automatic windows, sensor infrastructure, smart meters, connected devices)
- Autonomous systems (driverless transport system for example shuttle bus on dedicated test-street, cleaning robots, drones for logistics)

## References

**Triangulum: Strijp S and Manchester Corridor**

The two lighthouse districts Strijp S in Eindhoven (NED) and Manchester (UK) will be redeveloped in the context of the Smart Cities and Communities Project 2014 funded by the European Commission towards smart and sustainable districts. The city of Prague is a follower city within the Triangulum project and will replicate the best-practice solutions first implements in the lighthouse cities.

Website: [www.trinagulum-project.eu](http://www.trinagulum-project.eu)

- Project coordinator (Fraunhofer IAO): Damian Wagner

[damian.wagner@iao.fraunhofer.de](mailto:damian.wagner@iao.fraunhofer.de)

- Prague Project coordinator (IPR): Adam Pajgrt [pajgrt@ipr.praha.eu](mailto:pajgrt@ipr.praha.eu)

**Lighthouse district Manchester Corridor:** Transformation of an inner-city student quarter for ca. 72,000 students into a smart city district. This will entail renovating historical buildings and building up an autonomous energy grid to supply the entire district with heat and electricity. The grid will combine geothermal and district heating with two independently operating electricity grids and a fuel cell that can store excess energy.

Website: <http://www.corridormanchester.com/welcome>

Contact person: Steve Turner: [s.turner2@manchester.gov.uk](mailto:s.turner2@manchester.gov.uk)

**The lighthouse district Stijp S** in Eindhoven (formerly a Philips industrial complex) will become a creative smart district. With the SANERGY concept, Philips has identified a technology that allows it to clean up the contaminated soil in the district and at the same time generate heat-energy. A district-wide ICT solution will allow residents to access different kinds of infrastructure, such as booking electric vehicles from a district car sharing scheme or using smart parking concepts. In this way, the IT-based tool will help residents to develop sustainable patterns of energy and mobility behavior. In addition, electric buses will make city traffic more eco-friendly.

Website: <http://www.driehoekstrijps.nl/>

Contact person: [h.kok@eindhoven.nl](mailto:h.kok@eindhoven.nl)

**Berlin TXL- the Urban Tech Republic**

Collaborative development process of the innovation district Berlin TXL- the Urban Tech Republic was initiated in 2008 on a site of 500 ha situated at a 14 minutes distance from Berlin city centre. Berlin TXL is a testbed for industrial production in the manufacturing and industrial production area, designed to foster innovative mobility solutions for the city of the future (intelligent parking system, autonomous driving, e-mobility), which will also involve smart housing and living. The district will have the capacity to host 800 companies and research facilities.

Website: <http://www.berlintxl.de/>

Contact Person: Philip Bouteiller (TXL GmbH, Partner in the Morgenstadt Network)

### **22@ Barcelona**

The innovation district 22@Barcelona is located in the city's previously industrial area on the waterfront close to the city centre. The district offers a 200 ha area of high-quality environment for working, living and learning and has been created around the five knowledge-intensive clusters in the spheres of media, energy, medical technologies, ICT and design. Moreover, the district hosts several support, welcome and networking programs. Key stakeholders are the city, 10 universities, 12 R&D centres and more than 7000 companies.

Website: <http://www.22barcelona.com/>

### **Neu Marx Knowledge Centre, Vienna**

The innovation district Neu Marx has been developed on a 37ha sized area of the former slaughterhouse in the core zone of the district St. Marx in Vienna. The intention is to create a livable working and living environment as a modern hotspot for media, life science and technology. Currently 6,800 employees and 15,000 people are expected to work and live there.

Website: [www.neumarx.at](http://www.neumarx.at)

### **Freiburg Vauban**

<http://www.vauban.de/themen/buergerbeteiligung>

### **Tunneldialog (Schwäbisch Gmünd)**

<http://www.schwaebisch-gmuend.de/5543-Tunneldialog.html>

### **Competition "Zukunftsstadt"**

<https://www.wettbewerb-zukunftsstadt.de/infos/english.html>

## **Financing and Investment**

### **Project Costs:**

The Prague Innovation District represents a long-term development project, which might create costs to up to € 1 Billion or more.

### **Financing:**

Depending on the ownership structure of the district, the largest part of the costs will need to be born by a developer who is willing to invest into the innovation district.

Companies, universities and research institutions to be allocated in the district will need to be asked to express interest and to contribute financially.

The City of Prague might want to make sure that cultural aspects and creative industries are strongly reflected within the district and might thus invest into the provision of open spaces and flexible building concepts that offer cheap rent.

Public funding could be secured for truly innovative aspects and for making sure that crucial sustainability criteria are met.

# Expected Outcomes

## Measuring success

- Lowering insolvency rate of companies
- Number of business start-up for development
- Proportion of companies with R&D facilities
- Number of start-ups
- Number of company headquarters
- New patent registration (from big companies/ from middle-sized companies which have no its own R&D departments)
- Total funding for innovative projects
- Company's investment costs
- Investment costs for researches
- Proportional share of municipal budget in R&D/ innovation
- Population development – inflow/ outflow of graduates
- Number of graduates/ foreign graduates
- Share of R&D employment
- Livability
- Employment dynamics in growth sectors
- Number of foreign students
- Outflow of students to foreign countries
- Higher acceptances of processes and plans
- Demand based innovative solutions
- Urban Responsibility (higher upfront costs (planning), but lower development costs))
- Capacity Building

## City vision

The Innovation District will serve as a blueprint for the City of Prague in terms of sustainable district development

- replication of the concept to further development sites within the city to create an innovation cluster landscape
- vision to develop Prague towards a unique Research, Design and Innovation Hub with international visibility, functioning as an economic driver for the future
- Lighthouse for sustainable district transformation will emphasize the relevance of sustainability and motivate further developers to replicate efficient and smart solutions.

## 2.14 Communication network for the relief services, critical infrastructures, utility companies and residents

○ Transfer    ○ New concept / solution    ⊗ Other

Establishment of a city-wide communication concept encompassing relief services, critical infrastructures, utility companies and residents is to improve the resilience of the city against crisis situation by allowing for better coordination of activities and reduces reaction time.

### Explanation of hypothesis:

Act No. 239/2000 of the Czech Republic on Integrated Rescue System stipulates the creation of integrated Rescue System. City of Prague has its Rescue Safety System that coordinates the rescue units and services in time of extraordinary situations. Its aim is to enable seamless coordination of activities of relief services (police, fire brigades, paramedics), 22 city districts, utility and services companies, telecommunication service suppliers, experts in the fields of chemistry, radioactive and explosive materials. However, this system is very centralized as the communication happens only via the mediation of the Dispatch Center in the Prague City Hall. The aim of the project in question is to offer a communication network concept based on flat hierarchies.

### Benefit:

- Improved resilience of the city
- Improved coordination of activities of rescue services
- Improved feeling of security of the population

### References:

- DRIVER
- SECTOR
- Morgenstadt

### POTENTIALS:

- Allows for direct communication among the network members
- Inclusion of the residents
- Building of trust into security services

### Relevant Actors:

- City Hall
- Fire Rescue Service
- Paramedics
- Police
- Civil society

## What current problem is the project trying to solve

Expansion of the existing “Rescue Safety System City of Prague” (RSS CofP) in order to establish a comprehensive communication concept for sustainable and conflict-free communication and coordination with flat hierarchy between essential stakeholders (civil society, emergency services, volunteers, NGOs, critical infrastructure , utilities, operators, public administration - list extensible) supported by ICT

### Related MS Indicators

- City administrative expenditure
- Damage from natural disasters
- Number of natural disaster related deaths
- Reaction time of first responders

### Related Action Fields

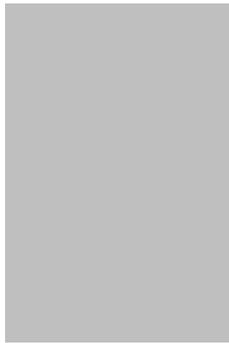
- Establishment of semi-formal and informal networks  
Urban Big Data Systems
- Networked Security Solutions
- Integrated Risk Management

### Related Impact Factors

- Continuing public distrust in the security services
- No city-wide resilience strategy in place
- Insufficient inclusion of the residents into crisis management system

## DNA of the Project

<b>Job to get done (Goal)</b>	Expansion of the existing “Rescue Safety System City of Prague” (RSS CofP) in order to establish a comprehensive communication concept for sustainable and conflict-free communication and coordination with flat hierarchy between essential stakeholders (civil society, emergency services, volunteers, NGOs, critical infrastructure , utilities, operators, public administration - list extensible) supported by ICT.
<b>Core Value</b>	Support of sustainable development concepts enhancing effective and efficient communication between different stakeholders.
<b>Consortium</b>	<ul style="list-style-type: none"> <li>• Department of rescue and safety systems of the City Hall</li> </ul>

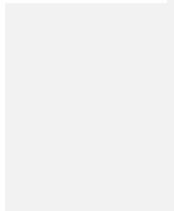


(coordinating role)

- Information technology department of the City Hall
- Utility companies (power, water, gas suppliers)
- Critical infrastructures
- Civil society

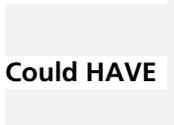
## Minimum viable project

### Must HAVE



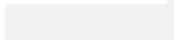
- Integrated process model , taking into account legal and regulatory frameworks, essential actors and their collaboration supported by ICT
- Possible alignment with a particular emphasis (e.g. flood protection)

### Should HAVE



- Comprehensive integration of ICT ( in particular a 3D -based communications network)

### Could HAVE



- Inclusion of social networks as a communication tool

## Process

### Activities

1. This task aims at providing a (set of )scenario(s) for the project. Each scenario will be uniquely named and characterized by listing the actors involved, the activities performed, and the resources used. (Month 1- 4)
2. Collection of information on currently used communication concepts including information sharing procedures and practices as well as tools within the organizations. The research activity conducted in this task will consist of collecting information by interviews and workshops with relevant stakeholders. (Month 2- 5)
3. Synthesizing and creating a new piece of information on the basis of information gathered from different sources, done through four thought patterns: Cause-effect, Comparison-contrast (finding commonalities and differences), Problem-solution (finding solutions to a defined problem) and Classification . (Month 4- 7)
4. Based on the analyses conducted in the previous tasks collaborative processes will be defined and designed. The proposed collaborative processes will not aim at replacing the already active processes within the organizations; on the contrary, the aim is to complement and supplement the organizational processes, if this is needed and wanted . (Month 7-9)
5. The final scenario and process will be tested and validated with support of relevant stakeholders to show the functionality of the system in a real environment. (Month 8-12)

## Technologies

- 3D City Model
- Social Media

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Roadmap  
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## References

### **SECTOR – Secure European Common Information Space for the Interoperability of First Responders and Police Authorities.**

SECTOR is an innovative research project aimed at improving the crisis management schemes in multi-actor emergency responses. SECTOR is focused on establishing the foundations of future Common CCM Information Spaces by expanding the European scientific knowledge base on (cross-border) multi-agency CCM processes and the complications these imply when aiming at setting-up and designing cross-border supporting information Systems.

SECTOR is positioned to focus on the cooperation between organisations for the provision of better information exchange and therefore – more efficient actions, better management during crisis situations or disasters.

The SECTOR Common Information Space concept is aimed at supporting collaborative crisis management processes, helping different first responder organisations (incl. Fire brigades, ambulance, civil protection agencies etc.) and police authorities to share information and resources, while respecting both the autonomy of these agencies, local predefined procedures and the local legal requirements.

(<http://www.fp7-sector.eu/>)

### **DRIVER - Driving Innovation in Crisis Management for European Resilience**

The DRIVER project implements the Aftermath Crisis Management System-of-Systems Demonstration.

Programme funded under the 7th Framework Programme by the European Commission.

The DRIVER project aims at two main dimensions:

- firstly, the development of a pan-European test-bed enabling the testing and iterative refinement of new crisis management (CM) solutions and thereby facilitating capability development through the provision of respective methodologies and infrastructure;
- secondly, at the actual development of a DRIVER Portfolio of Tools that improves crisis management at Member State and EU level.

Crisis Management (CM) is an ever evolving challenge. This does not necessarily mean that the frequency of crises increases, but unless innovation is up to the challenge of producing solutions, which fully exploit modularity, flexibility and adaptivity, then either the cost of capability development or the costs due to inadequate management of ever more complex crises will grow.

Components of the DRIVER portfolio of tools (example):

- Civil resilience solutions: individual and community resilience; volunteer crisis preparedness; resilience of local governments; crisis communication with the general public; organisation and mobilization of individuals and communities

## ESRI Morgenstadt

The joint research project “Morgenstadt – City Insights” is designed as enabler for new collaborations of industry and research in the task of transforming our cities into smart and sustainable environments.

As part of this project and currently in development applications for the 3D City Engine are being built in the cooperation between the Fraunhofer IAO and ESRI.

These include applications for crisis management, such as 3D-flood simulation.

## Financing and Investment

### Financing:

#### Horizon 2020

14. Secure societies – Protecting freedom and security of Europe and its citizens

- Call Security
- Sub Call – Disaster resilience: safeguarding and securing society, including adapting to climate change
- SEC - DRS 1 - 2016: Integrated tools for response planning and scenario building

## Expected Outcomes

### Measuring success

- Was an adaptive communication system to support and expand existing communication paths established?
- Could all relevant stakeholders be incorporated into the system?
- Was a comprehensive integration of the system in a 3D-based communication network achieved?

### City vision

Implementation of an adaptive communication system to support and expand existing communication paths for sustained, rapid and efficient crisis intervention with flat hierarchies.

## 2.15 Lighthouse refurbishment of public buildings and capacity building of facility management and occupants

Transfer     New concept / solution     Other

Develop lighthouse projects for refurbishment of public buildings and capacity building of facility management and occupants of buildings in use.

### Explanation of hypothesis:

(1) Prague's market is moving towards more energy efficient buildings. There are e.g. projects done by private sector like EPC (Energy performance contracting). Thus the public sector should follow this trend. There is a current need for the energetic refurbishment of public buildings and the need to create higher environmental awareness of the citizens. Lighthouse projects of public buildings can have a high visibility (combined with right communication strategy and high visitor flow-through) and therefore function as multipliers for further replication.

(2) Further, as previously mentioned in Chapter 1.4.5, Prague's public buildings lack appropriate facility and energy management. Building design can be done well, but occupants do not use the buildings in an adequate manor. To solve this issues, existing buildings need to be optimized by improving facility management and understanding and educating building users.

### Benefit:

Raise awareness on energy efficiency and sustainability  
Save energy and emissions  
Show compatibility of innovation and economy  
Increase life-quality of employees etc.

### References:

Office in Remscheid  
Plus Energy School in Stuttgart  
Monastery Benediktbeuren  
Deutsche Bank Tower in Frankfurt

### POTENTIALS:

A good typology for lighthouse refurbishment might be schools or hospitals.  
A good typology to improve facility management and occupants' behaviour might be the buildings of the City Hall.

### Relevant Actors:

City Hall, Local Boroughs  
Dep. of Environment (City)  
UCEEB  
Fraunhofer IBP

## **What current problem is the project trying to solve?**

At present, there had been done few deep analysis of existing buildings and few comprehensive energetic refurbishments within the city of Prague. In most of the refurbished buildings only insulation had been installed. In some of the renovated buildings moisture and ventilation problems occurred. Further, experts identified a lack of guidance for building owners and missing comprehensive planning including indoor environmental quality. There is a current need for the energetic refurbishment of public buildings and the need to create higher environmental awareness of the citizens. By the creation of lighthouse projects for energetic refurbishment including a broad communication strategy both challenges can be faced.

### **Related MS Indicators**

- it is assumed that about 80 % of Prague’s building stock still remains without any improvements of energetic quality as well as the HVAC-systems of buildings built before 1990

### **Related Action Fields**

- 3 % of the public buildings owned or in use of central government institution have to be energetically modernized annually from 2014 - according to Directive 2012/27/EU.

### **Related Impact Factors**

- low awareness of sustainability in Prague’s society
- few guidance for energetic modernization for building owners
- HVAC systems before 1990 without improvements
- Lack of strategy for upcoming projects of public buildings
- Lack of information on Prague’s building stock

## **DNA of the Project**

### **Job to get done**

#### **(Goal)**

### **What job is the project trying to get done?**

There is a current need for the energetic refurbishment of public buildings and the need to create higher environmental awareness of the citizens.

Lighthouse projects of public buildings can have a high visibility (combined with right communication strategy and high visitor flow-through) and therefore function as multipliers for further replication.

It is important to provide convincing arguments to prove the payback of the investments for the projects, in order to convince the politicians of the city for the

implementation of the refurbishment projects and create multiplier effects for further refurbishment projects.

**Core Value**

**What kind of value does the project create for the city and city stakeholders?**

- Raise awareness on energy efficiency and sustainability
- Save energy and emissions
- Show compatibility of innovation and economy
- Increase life-quality of employees etc.

**Consortium**

**Who should be partner in this project and why?**

The workshop experts recommended to initiate an advisory board to accompany the development of the refurbishment strategy for public buildings and the future implementation.

Such board could be led by IPR (as part of Triangulum "Implementation Plan"). The members should include

- Stakeholders of the City Hall (political legitimacy)
- Office for Property Management (data and overview)
- Consultants on Energy Efficiency (technical expertise)
- Researchers / University (technical expertise)
- Buildings User Representatives (experts on workflows and user requirements)

## Minimum viable project

**Must HAVE**

- Find adequate buildings for both project approaches (1: refurbishment and 2: FM and user training). Lighthouse buildings should be chosen as replicable (e.g. more ordinary buildings) to settle on an appropriate process that could be later used as a template. A good typology for lighthouse refurbishment might be schools or hospitals.
- An adequate economic model: To convince decision-makers, it is further important to present precise numbers, how much they can save.
- Commitment of city hall and / or local borough to support such projects

**Should HAVE**

- Establish an advisory board on city level or municipal level to moderate the discussion between experts, project teams and government on energetic refurbishment. The board should

### Could HAVE

- contain university representatives, experts, politicians-  
decision makers, heritage protection and IPR.
- Development of a communication strategy
- Complete data on public building stock: Information about energy consumption of buildings owned by municipality is going to be collected. Every building over 250 people/users must have an energy audit according to EU regulations, common on commercial market. Thus, the City Hall will have soon energy certificates for all big buildings, later also for smaller ones, but there can be a gap between the estimated energy uses due to the certificates and the energy consumption in practice. Thus, gathering adequate energy efficiency information about the whole public building stock is difficult in the near future.

## Process

### Search for possible cases

- Lighthouse buildings should be chosen as replicable (e.g. more ordinary buildings) to settle on an appropriate process that could be later used as a template.
- A good typology for lighthouse refurbishment might be schools or hospitals.

### Collect examples with good economic models

- Prove economic viability: Provide convincing arguments (basically economic ones) to prove the payback of the investments for the projects. To convince decision-makers it is important to present precise numbers, how much they can save.

### Convince a patron (e.g. local mayor) to support such a project

- Do interviews with decision makers on the level of local municipalities and discuss the project ideas with them.

## References

### Similar Projects

“Old buildings also have a future, because the greatest potential for energy savings is in the building’s fabric. The implementation of new concepts, materials and technologies in refurbishment is demonstrated in a whole range of exemplary refurbishment projects. Data acquired from scientific evaluation makes these pilot applications into models for consistent building refurbishment.” <http://www.enob.info/en/refurbishment/>

“The learning and living environment provided by schools should offer optimum learning conditions. EnOB research initiative is therefore placing a

particular focus on “Energy-efficient schools”. This is intended to develop principles for future-oriented school building concepts based on model projects. For example, solutions that could lead to significantly improved energy efficiency combined with increased comfort will be tried out in test projects. So-called energy-plus schools will be implemented as flagship projects.”  
<http://www.enob.info/en/research-areas/enob-key-research-areas/energy-efficient-schools/>

“The BRITA in PuBs proposal on Eco-buildings aims to increase the market penetration of innovative and effective retrofit solutions to improve energy efficiency and implement renewables, with moderate additional costs.”  
<http://www.brita-in-pubs.eu/>

## Products & Tools



1. Office Building

### Refurbishment of an Office Building-1968 (Remscheid)

- Changed use of the building from only administration to administration and disposal
- Reduction of the overall energy requirement by around 75 per cent (primary energy)
- A look at the lifecycle costs for a period of 80 years showed that the amount of construction costs is only about 20% of the total cost.
- Costs for maintenance and cleaning constitute 80 % of the lifecycle costs.

<http://www.enob.info/en/refurbishment/projects/details/waste-disposal-given-a-new-facelift/>



**Plus-Energy School (Stuttgart)**

- Goal: The school will produce more energy and it's users consume
- Analysis of the existing structure and energy consumption
- Development of a holistic concept for energetic modernisation
- Calculation of payback period
- Supervision of heat losses during construction activities
- Monitoring after commissioning

**Further Information:** Hans Erhorn [hans.erhorn@ibp.fraunhofer.de](mailto:hans.erhorn@ibp.fraunhofer.de)

## Financing and Investment

### Project Costs:

#### Consider Life-Cycle-Costs of projects

The refurbishment strategies should not be based on the lowest price invested, but the lowest price invested and spent during the whole buildings life-cycle. The lighthouse projects must show its advantages in savings.

#### Project Example: City of Remscheid

Implementation costs: Construction Costs (KG 300): 480 €/m<sup>2</sup>, Technical System Costs (KG 400): 201 €/m<sup>2</sup>

At the beginning, the option of refurbishment and rebuilding had to be weighed up against the alternative of constructing an entirely new building (including demolishing the old building). A feasibility study showed, however, that a new building with the same standard of execution would have cost around 40 per cent more. A look at the life cycle costs for a period of 80 years showed that the amount of construction costs is only about 20% of the total cost whereas maintenance and cleaning add up to 80 % of the costs. The overall energy consumption could be reduced by around 75 per cent (primary energy).

### Financing:

#### "Green Savings"

Funding from "Green Savings" program might be used.

#### EU Project "Triangulum"

Some lighthouse projects - possibly located within the area of the future innovation district - might be funded via the EU project Triangulum.

#### EU Project "OP Prague – Growth Pole"

Funding from "OP Prague – Growth Pole" might be used. According to the EU program the municipality has to spend the budget until 2018, so the potential projects are under a time pressure.

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Roadmap  
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### Involve private companies

- Energy Performance Contracting / Success Contracting Model
- Sponsors, who could test new technologies within the projects (e.g. producing building materials and technologies)

## Expected Outcomes

### Measuring success

- Energy consumption per year and square meter of refurbished buildings
- Yearly costs for energy consumption of refurbished buildings
- Costs (CZK) for refurbishment of building envelope and HVAC-Systems
- User satisfaction within refurbished buildings
- Refurbishment rate of public buildings
- Refurbishment rate of Prague's building stock

### City vision

Within the city lab had been revealed that a "larger scale city vision" is missing. However, lighthouse projects for energetic refurbishment of public buildings could become part of the development of such strategy.

### Beyond the city

Yes, in those cities that were not realizing such projects yet / have a high energy consumption of building stock and low refurbishment rate.

## 2.16 Integrated ICT based Management System for the City Administration

Transfer   
  New concept / solution   
  Other

Develop an integrated municipal governance and management tool that links all activities across all departments of the city hall to the strategic goals of the city and to the budget.

### Explanation of hypothesis:

A municipal management tool will help visualize urban master plans and indicators; it will relate strategic urban development goals to measures, projects and single tasks of the city administration and provide for a direct link to the budgetary system of the cities. In sum the idea is to implement a modern IT-based management and decision making system in Prague, which in addition works as internal communication and project management tool for the employees of the city administration and at the same time serves as eGovernment a tool that provides open data to the public and includes citizens into decision making processes in a transparent way.

Reorganising and integrating existing practices, plans and strategies under one steering wheel – the Integrated Management System (IMS) - will systemize the work, boost the efficiency and provide a multitude of positive outcomes. It will direct all available resources towards the goals defined and secure the transparency and democratic principles of decision-making. In the IMS, the effort lost in running several parallel management systems can be turned into effectivity and sustainability.

### Benefit:

Besides the already stated impact on effective and sustainable urban development, increased transparency of urban and business processes and improved participation of the citizenry, an integrated ICT-based management system can force the city-wide development goals.

### References:

New York  
Copenhagen  
KSIS 2.0 -> Ludwigsburg

### POTENTIALS:

Innovative tool to facilitate administrative tasks  
Possibly integrate citizens

### Relevant Actors:

- City Hall/mayor and other City Council members
- Municipal districts bodies (local politicians)
- City and municipal districts administration
- City planners, IPR
- Data Analytic Centre
- Fraunhofer FOKUS
- SAP, Cadfer, ESRI

## What current problem is the project trying to solve?

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Roadmap  
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When delivering municipal services, the Prague City Hall is faced with an increasing degree of complexity and a range of new cross-sectoral challenges. Demographic shifts, new technological developments, as well as overlapping societal, economic and environmental crises, are completely transforming the dynamics of the Prague systems. This increased degree of complexity demands efficient and effective management approaches: sustainable urban development, integrated mobility systems, climate change mitigation and adaptation, energy efficiency, smart districts, cluster management, sustainable economic development, risk management, resilience engineering, CO2 neutrality, citizen participation, integrated urban planning etc. all these issues demand involvement of multiple stakeholders and several departments of the city administration. Yet the traditional urban governance and administration structure is hierarchical, sectoral and bureaucratic and appears insufficient to address today's challenges. Information are not shared across departments. The budget is sectoral and impact monitoring does not take place.

<b>Related MS Indicators</b>	-----
<b>Related Action Fields</b>	-----
<b>Related Impact Factors</b>	-----

## DNA of the Project

<b>Job to get done</b>	<b>What job is the project trying to get done?</b>
<b>(Goal)</b>	<p>Visualize urban master plans and indicators;</p> <p>Relate strategic urban development goals to measures, projects and single tasks of the city administration</p> <p>Provide for a direct link between measures, projects and the budgetary system of Prague across all departments of the city hall.</p> <p>Create near to real-time (previous day) transparency over projects, progress and use of resources for the city administrations, the city councils and the public as a basis for decision-making and as governance and control assistance for interventions in a self-organizing system.</p> <p>Create a user-oriented communication system for the implementation and operation of an effective municipal</p>

sustainability management.

**Core Value**

**What kind of value does the project create for the city and city stakeholders?**

Through directly linking indicators with city development objectives and budgetary systems, while integrating this information into all levels and departments of the city's administration, the management system will help to fundamentally transform the way Prague is administered.

The second avenue of improvement will be through the facilitation and promotion of civic participation. This platform will not only be utilized within the administration, but will provide a medium for citizens to inform themselves about city objectives and monitor the city's progress in meeting these objectives.

**Consortium**

**Who should be partner in this project and why?**

- City Hall
- Fraunhofer IAO
- SAP
- IPR

## Minimum viable project

**Must HAVE**

- Defined development goals for Prague broken down into measures and projects
- Office
- Three employees, better more
- Clear goal: for what, which data, for whom

**Should HAVE**

- Security options
- Discussion possibilities about future projects

**Could HAVE**

- Crowdsourcing aspects
- Connection with cloudforEurope:  
<http://www.cloudforeurope.eu/objectives>
- Combine with an App like in Barcelona:  
[http://www.opencities.net/app\\_challenge](http://www.opencities.net/app_challenge)

## Process

### Activities

The process of digitizing public administration has resulted in many isolated technical solutions, singular administrative processes and heterogeneous structures. These have to be consolidated for e-government to function securely and smoothly. This is a complex task because it affects infrastructures and technologies as well as IT processes and governance – on all levels and across all departments and regional authorities.

What kind of IT should be procured? Which standards are needed? What can be stored in the cloud? Source: <https://www.fokus.fraunhofer.de/en/fokus/e-government>

- 1) Map the technological procedures that support the different departments of the administration of Prague
- 2) Integrate the status quo assessment to an ICT based solution for a prototype deployment
- 3) Test and optimize prototype in “life” environment
- 4) Collaborate with department of finance to inquire the process of the budget consultation as well as the requirements on the management software
- 5) Link other system like a council information system or the staff requirements and planning into the management tool
- 6) Definition of generally applicable indicators of sustainability / sustainable urban development including key performance indicators that need to become part of an integrated impact monitoring of the management system

## Technologies

There are management tools for city administrations available e.g. from SAP, SAS, IBM, Cisco and others.

## References

### Similar Projects

Stockholm Municipality - integrated Management System

KSIS 2.0 – Integrated Management System for the City of Ludwigsburg

### MUE – Monitoring Urban Europe

After an intensive phase of implementing activities and with the monitoring data output at hand, it is time to step back and evaluate what has been achieved. The data collected through monitoring are used for evaluating both the results obtained through implementation and the way the management cycle is working.

Evaluation and reporting is the last step of the cycle, but provides the basis for starting a new year with a new cycle. It analyzes what has happened during the year in order to understand why things happened or failed to succeed. It provides the politicians with a basis for taking further decisions on the targets and actions for the next year. It provides the stakeholders, including the public, with a report on what the city has done during the year and how they have succeeded in fulfilling their targets. The importance of this step is the actual city council decision on how to act on the results of the evaluation process. How will the knowledge gained be used to adapt or set the short-term targets for the next year? What actions should be implemented next year? Is there a need to revise the baseline review because of major changes in the city or its surroundings? In any case, a decision should be taken and a new annual cycle should begin.

[http://www.localmanagement.eu/index.php/mue25:mue\\_evaluation](http://www.localmanagement.eu/index.php/mue25:mue_evaluation)

### **Products & Tools**

Suitable online tools , e.g. platform, data sets, 3D models..

## **Financing and Investment**

### **Project Costs:**

In Berlin setting up an ICT based managements scheme produced costs of 238.604 Euro. Of this 120.000 Euro were financed by EU<sup>166</sup>

### **Financing:**

e.g. via EU Horizon 2020 calls like

ICT 10 – 2015: Collective Awareness Platforms for Sustainability and Social Innovation

FoF 8 – 2015: ICT-enabled modelling, simulation, analytics and forecasting technologies

LCE 5 – 2017: Tools for integration and coordination of the energy system

SCC 1 – 2016/2017: Smart Cities and Communities solutions integrating energy, transport, ICT sectors through lighthouse (large scale demonstration - first of the kind) project

CO-CREATION-2017-8: Policy-making in the age of big data: evidence-informed policymaking and policy-modelling

### **EINFRA-21-2017: Platform-driven e-infrastructure innovation**

Another example is:

Open Cities is a project co-founded by the European Union that aims to validate how to approach Open & User Driven Innovation methodologies to the Public Sector in a scenario of Future Internet Services for Smart Cities. It will do so, by leveraging existing tools, trials and platforms in Crowdsourcing, Open Data, Fiber to the Home and Open Sensor Networks in seven major European cities: Helsinki, Berlin, Amsterdam, Paris, Rome, Barcelona and Bologna.

<http://www.opencities.net/content/project>

## **Expected Outcomes**

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<sup>166</sup> <http://www.berlin.de/projektzukunft/networking-events/internationale-kooperationen/open-cities/>

**Measuring success**

- Potential for new niches of innovation for growth
- Businesses are more able to respond to demands of the city
- Employment
- More efficient use of resources
- Creation of new markets through city procurement and targeted policies
- Time savings for citizens with associated socio-economic benefits
- Increase in the responsiveness of the citizenry

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Roadmap  
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**City vision**

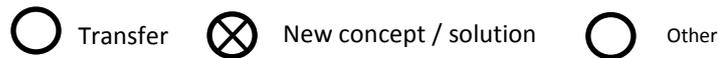
Besides the already stated impact on sustainable urban development, the following positive effects can accordingly be expected:

- Continuity and long-term alignment of activities
- Evidence-based planning and management of the city
- Increased transparency of urban and business processes
- Improved participation of the citizenry
- Strong alignment between activities, development goals and budget.

**Beyond the city**

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## 2.17 Smartification of the historic city centre of Prague



Prague needs to smartify its historical centre in order to increase the quality of stay for locals, business guests and tourists, to incentivize sustainable behavior patterns and communicate the image of a modern and diverse city.

### Explanation of hypothesis:

Future Prague is a sustainable and smart city with a maximized quality of life for its inhabitants and visitors. The smartification of the city centre is the first step towards the smartification of the whole city of Prague.

The project aims to effectively integrate “hardware” and “software” elements to develop smart solutions for specific demands of certain districts within the context of the overall urban vision. Accordingly, in case of the historic city centre of Prague, the project intends to bring together the diverse offers and services of local supply (including business, culture, leisure, retail, transport aso.) and make these available for inhabitants and visitors via specific tailored application profiles. Thus, smartification will improve the quality of stay for different user groups (e.g. locals, business guests, tourists, students) and motivate sustainable behaviour through higher transparency, incentives or gamification (e.g. using environmental friendly transport, supporting local economy). The project also aims to improve the management of overloaded infrastructures through e.g. real-time parking, traffic and waste management and crime control. Core function of the project will be an ICT architecture based on a data hub (in compliance with the Triangulum architecture) connecting the implemented hardware like smart street lighting, sensor infrastructure, communication touch screens, ibeacons and connected mobility devices in an intelligent way and providing data for further development.

### Benefit:

- Enhances the quality of stay of different user groups in the city centre
- Supports the local economy of the city centre
- Creates environmental awareness and motivates more sustainable behaviour
- Increases the distribution of tourists around the city (and the surrounding region)

### References:

- Smart city App Monaco
- Lepší místo
- Triangulum lighthouse districts Manchester, Stavanger, Eindhoven
- Smart Santander
- Behavioral psychology and economics (Nudges / Thaler & Sunstein)
- Gamification in Tourism

### POTENTIALS:

- Creation of a lighthouse district for advanced smart city development
- City Image shift communicating the diverse and innovative character of the city of Prague
- Strengthen the cultural sector and local economy
- Attraction of international guests and business

## Relevant Actors:

Prague City Hall  
 Municipal districts authorities  
 Prague City Tourism  
 IPR  
 Department of Environment  
 Department of Economics  
 Cultural institutions  
 Local suppliers  
 Companies (e.g. Transport, ICT, Energy, Light)

## What current problem is the project trying to solve?

The main tourism axis is currently located between the Prague castle and the inner-city main shopping area around Staroměstské náměstí. The high concentration of tourism on this area, with the seasonal peaks, is leading to alienation of inhabitants from their city centre. The space is highly commercialized for touristic purposes and is therefore not attractive to locals. The current city image of Prague is not sustainable and highly underestimates what the real city of Prague has to offer. Many tourists visit the city only once and stay for only one night. The tourism needs to be spread spatially around the city by promotion of attractions outside the direct centre. Furthermore, the infrastructure of the city centre is not sufficient for the current tourism flows. Smartifying the city center also helps to tackle low awareness and ignorance of sustainability issues. By creating an advanced incentive system, inhabitants and visitors will be motivated to behave in a more sustainable way, e.g. to use bike sharing or support the local economy through purchasing in small and specialized shops.

### Related MS Indicators

- Modal split for deploying innovative technologies
- Internet connectivity
- CO2 transport emissions
- Degree of participation
- E-government
- Sustainability management
- GDP of city
- Size tertiary sector
- Mobile connectivity

### Related Action Fields

- Professional City Marketing: creating an international brand for the city
- Financing of innovative/sustainable technologies and projects
- Development and implementation of services for supporting sustainability solutions
- Targeted combination of different modes of transport
- Interoperable electronic ticketing systems in public transport
- Creation of "city labs" (experimental areas)
- Creation of Open Data System for / by city
- Creation of Urban Big Data Systems

**Related Impact Factors**

- Prague as an IT Hub
- Low awareness of sustainability in Prague society
- Spatial and seasonal concentration of tourism on main axes
- Unsustainable 1 day tourism
- Tourism as the main economic driver without economic benefit for the city
- Infrastructures not ready for tourism
- Missing link between cycle path network and public transport

## Minimum viable project

**Must HAVE**

- Development of a **Smart city application**, bringing together all city services and organizing these in specific tailored application profiles. City Council, Cultural institutions, shops and business will offer their products and services in the fields of transport, culture and local supply.
- A **gamification/ therefor designed bonus system** as the key element of the Smart City App will be developed in collaboration with local suppliers and helps to spread out tourism from the overcrowded tourism hotspots to the wide range of leisure and cultural facilities, but also motivate sustainable behavior (f.e. by using public transport instead of the taxi)
- Backbone: development of **an integrating ICT architecture with open data hub**
- Free **Wi-Fi Spots** at transport and cultural nodes (f.e. airport, train station, Václavské náměstí), therefore design space.

**Should HAVE**

- **Smart lighting** with LEDs and sensors for energy savings and crime prevention (also via. webcams)
- Implementation of a **Sensor Network** for optimizing the management of traffic, parking and waste
- Implementation of Touchscreens providing information at relevant transportation nodes and relevant sights
- Implementation of a **sharing system with e-vehicles and bikes**, loan system via Smart City App
- **High power communication infrastructure** for residential areas, commercial areas and public space
- **City Website** with open data, e-government and improvement of security of digital data

**Could HAVE**

- Smart City App: **Augmented Reality function** providing App user with AR information on local supply/ cultural landmarks/ bus arrival times/ bus routes/ events/ planned projects aso.



- Implementation of **ibeacons** to strengthen retail and cultural sector
- Use of **power networks as intelligent data networks** to provide energy and usage information

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Roadmap  
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## Process

### Activities

1. Set-up interdisciplinary working group
2. Define main beneficiaries to be addressed
3. Talk to the main beneficiaries in the city center and ask what they would like to have (!)
4. Define use cases and aspired benefits
5. Develop a concept to address and include the main beneficiaries in a digital and sensor- based process that creates added value for them in the city center.

### Technologies

- ICT Architecture and data hub
- Smart CityApp with Gamification system
- Augmented reality
- Smart street lighting
- Sharing System for e-vehicles and bicycles
- Sensor Network
- Ibeacons and / or Google's Eddystone
- Advanced Wi-fi spots

## References

### Similar Projects

#### **Triangulum: Strijp S and Manchester Corridor**

The lighthouse districts Strijp S in Eindhoven (NED), Stavanger (NOR) and Manchester (UK) will be redeveloped in the context of the Smart cities and Communities Project 2014 funded by the European Commission towards smart and sustainable districts. The city of Prague is a follower city within the consortium of 22 international partners and will participate in the development process to replicate smart solutions to the cities context after year 3.

website: [www.trinagulum-project.eu](http://www.trinagulum-project.eu)

- Project coordinator (Fraunhofer IAO): Damian Wagner

[damian.wagner@iao.fraunhofer.de](mailto:damian.wagner@iao.fraunhofer.de)

- Prague Project coordinator (IPR): Adam Pajgrt [pajgrt@ipr.praha.eu](mailto:pajgrt@ipr.praha.eu)

**Lighthouse district Manchester Corridor:** Transformation of an inner-city student quarter for ca. 72,000 students into a smart city district. This will entail renovating historical buildings and building up an autonomous energy grid to supply the entire district with heat and electricity. The grid will combine geothermal and district heating with two independently operating electricity

grids and a fuel cell that can store excess energy.

Website: <http://www.corridormanchester.com/welcome>

Contact person: Steve Turner: [s.turner2@manchester.gov.uk](mailto:s.turner2@manchester.gov.uk)

**the lighthouse district Stijp S** in Eindhoven has been the former Philips industrial complex, will become a creative smart district. A district-wide ICT solution will allow residents to access different kinds of infrastructure, such as booking electric vehicles from a district car sharing scheme or using smart parking concepts. In this way, the IT-based tool will help residents to develop sustainable patterns of energy and mobility behavior. In addition, electric buses will make city traffic more eco-friendly.

Website: <http://www.driehoekstrijps.nl/>

Contact person: [h.kok@eindhoven.nl](mailto:h.kok@eindhoven.nl)

### **Intelligent Street Lighting - Osram**

Osram Street Light Control (SLC) is an innovative comprehensive concept for outdoor lightning. The central element is a software that manages the outdoor lighting system. The control helps to reduce CO2 emission, power consumption and light pollution by dimming specific areas or single lights as well as adapting the light level dynamically to the age of the light source. Through the monitoring and analysis of the system, the software also helps to facilitate maintenance planning and reduces maintenance costs.

The street light control brings more security to the city by being reliable and adaptive. The powerline technology extends power networks into data networks and helps to secure the communication so it's not interrupted by weather conditions or voltage peaks and ensures light anytime.

The system is very flexible and extendable and can therefore adapt easily and fast to the needs of a city.

Website: <http://www.osram.com/osram.com/news-and-knowledge/light-management-systems/product-knowledge/street-light-control/index.jsp>

### **Smart mobility – Ecoguru Fraunhofer Institute Stuttgart**

Ecoguru is a smart mobility solution of the Fraunhofer Institute in Stuttgart. The intelligent software Ecoguru is the heart of the booking and charging system for the electric fleet of cars of the Institute. The software collects and analyzes all data from the cars and charging stations and delivers information on the battery charge, the driving range and rewards smart and sustainable driving decisions. A micro smart grid produces and saves renewable energy that is used by the charging ports to charge the e-fleet. Therefore it also demonstrates the conception and composition of a locally integrated energy system.

Website: <http://www.ecoguru.de/>

### **Smart city app - Bosch Smart City App- Monaco 3.0**

Monaco 3.0 is a smartphone app from Bosch that connects technology with public services. This includes bus networks, parking lot management, waste collection, and information on road works. This helps to better control traffic flow in the city and to reduce CO2 emissions and improve processes like the management of the waste collection or the information flow between city departments. As best communication works both ways, the app has a crowd sourcing function that illustrates how people can actively participate in and improve city life by reporting status information of public services, like for example broken elevators.

Website: <http://blog.bosch-si.com/categories/smart-city/2013/12/smart-city-monaco-3-0-bosch-technology/>

### **Gamification in tourism – Adventures in the US and Europe**

The tourism industry is experiencing a lot of attention for the gamification of tourism lately. Two good examples for location-based games, guides, storytelling and edutainment are stray boots and tripventure. Strayboots is based in the US and available for many US cities as well as for the UK. With the app, travelers and locals can go on urban adventures, solve clues, discover cool spots and learn more about the destination or particular places. For solved riddles or answered questions points can be earned.

Tripventure is a similar app for European cities. The app is location-based which means that games, stories and guides only work when the visitor is on site. The location-based guide “Inspector Triton” is available for Berlin, Hamburg, Cologne, Munich, Paris, London, Stockholm, Rome, Barcelona. Solving a virtual crime, the visitor is being guided through the city to solve riddles and questions on different spots for 3 hours of gaming.

Websites: <https://www.strayboots.com/>, <http://sprylab.com/de/location-based-games-und-stories>

### **Sensor infrastructure for smart management - Smart Santander**

Smart Santander is a smart city experiment in Santander, Spain. Around 2000 sensors are installed mainly in the city centre and transmit data through the city network in real-time. The Open-Data-Website provides access to generated information.

The sensors collect data on different topics. Usage sensors help determine the level of energy and water consumption in the city (smart meters). Environment sensors collect weather data, water temperature, noise and pollution level. Sensors powered by GPS register mobile processes (vehicles, waste components, products for consumption, public buses, etc.). Other sensors also monitor the traffic intensity or deliver information on free parking lots.

Around 2000 RFID tag/QR code labels have been deployed, offering the possibility of “tagging” points of interest in the city, for instance a touristic point of interest, shops and public places such as parks, squares, etc. The “pulse of the city” app gives residents the possibility to report damages or problems directly to the city hall through the app.

The goal of the project is to make more effective use of public services and increase the quality of life for the residents.

Website: <http://www.smartsantander.eu/>

## **Financing and Investment**

### **Project Costs:**

A similar project to smartify the city centers of the German cities Reutlingen and Chemnitz produced costs of ca. 2.5 Mio EUR.

Modules to be considered for investment:

1. Concept development
2. Sensor network
3. ICT Platform (Backend)
4. Frontend and Usability
5. Operation and Maintenance of Services

## Financing:

An initial concept will need to be funded either by a public authority (e.g. the City Hall) or collectively.

It is recommended to combine the use cases with a clear business model (e.g. participating local shops pay for the “smartification” service based on the amount of additional customers they receive). In this case operation and maintenance of the system can be handed over to a private (or semi-private) company.

## Expected Outcomes

<b>Measuring success</b>	Increased attractiveness of the city center for tourists and local citizens Higher turnover of shops and institutions that are not directly located at the main tourist route. Higher liveability
<b>City vision</b>	-----
<b>Beyond the city</b>	-----

## 2.18 Virtual Power Plant as Energy back-Up System

Transfer     New concept / solution     Other

### Virtual Power Plant as Energy Back-Up System

#### Explanation of hypothesis:

The city of Prague is not resilient regarding energy blackouts (electricity and heat). There have been discussions about the installation of local power plants (in order to minimize the risk of blackouts), but it is difficult because of the city's density / lack of space. There is also no substantial capacity within the city area for the installation of wind turbines. Thus, there is no potential for a "large solution", but it could be worth to discuss the combination of several small power sources (like PV, biomass, small hydraulic power plants ...) and storages within a virtual power plant.

#### Benefit:

Increase the use of renewable energy sources  
Create back-up capacities for the case of a blackout

#### References:

Virtual Power Plant implemented in Manchester Corridor by Siemens within Triangulum:

[http://www.siemens.co.uk/pool/news\\_press/news\\_archive/2015/triangulum\\_infographic\\_10feb2015.pdf](http://www.siemens.co.uk/pool/news_press/news_archive/2015/triangulum_infographic_10feb2015.pdf)

<http://www.newpower.info/2015/11/new-power-interview-turning-manchester-into-a-smart-energy-city/>

#### POTENTIALS:

Further installation and combination of lots of small power sources (like PV, biomass, small hydraulic power plants ...) and storages within a virtual power plant.

#### Relevant Actors:

- IPR
- Researchers
- Energy providers

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Roadmap

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## 2.19 Concept for the improvement of security feeling among the residents

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Transfer     New concept / solution     Other

The low feeling of security among Prague's residents is a persisting issue. Some areas in the city are considered unsafe for the incidents of pickpocketing and robbery and green areas are avoided during nighttime.

### Explanation of hypothesis:

The onsite-research and the analysis of Prague's statistics and program development documents have revealed that Prague is not considered safe by its residents. There are areas in the city that are known to have a high level of street crime. However, no studies have been carried out so far to analyze the connection between the crime rates in certain areas and the feeling of security of people there. Therefore it is not clear whether the feeling of insecurity is justified or not.

The proposed project aims at providing this missing link between the crime statistics and the people's feeling of security. The feeling of security will be measured by deploying the "humans as sensors approach" –people wearing sensors measuring pulse, blood pressure, heartbeat etc. while walking through the areas known as unsafe.

### Benefit:

Solution of a long-term societal problem  
Improved feeling of security among the residents  
Basis for an improved crime prevention strategy

### References:

- Urban Emotions  
[http://www.corp.at/archive/CORP2015\\_50.pdf](http://www.corp.at/archive/CORP2015_50.pdf)

### POTENTIALS:

Link to the long-term development strategy  
Improve the image of the city nationally and internationally  
Develop a more effective crime prevention concept

### Relevant Actors:

City Hall  
Prague Police  
Prague Residents

### ***What current problem is the project trying to solve?***

- The feeling of security among the general population is low.<sup>167</sup>

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<sup>167</sup> Prague City Development Authority (2008), private conversations with Prague inhabitants

- Centrally located parks are considered unsafe (e.g. Karlovo namesti)
- Continuing public distrust in the security services and little willingness to cooperate with them.

<b>Related MS Indicators</b>	Number of homicides
<b>Related Action Fields</b>	Crime Prevention Concepts
<b>Related Impact Factors</b>	<ul style="list-style-type: none"> <li>• Low feeling of security among residents</li> <li>• Problematic areas within the city with a high level of street crime</li> </ul>

## DNA of the Project

<b>Job to get done (Goal)</b>	Improve the security feeling among Prague residents
<b>Core Value</b>	<p>Results can be used:</p> <p>to transport a realistic, non-subjective picture of the security in the urban area in Prague</p> <p>in urban planning for decision support and the evaluation of ongoing planning processes</p>
<b>Consortium</b>	<p>Prague City Hall (coordinating role)</p> <p>Prague Police (coordinating role)</p> <p>Research Team (implementation and evaluation of the results)</p>

## Minimum viable project

<b>Must HAVE</b>	Human-centred approach to extract contextual emotion information from technical sensor data (measurements from calibrated bio-sensors) and human sensor data (subjective observations by citizens).
<b>Should HAVE</b>	Extracting emotion information from crowdsourced data like Twitter (detecting the type of emotion), and correlating the measured and extracted emotions.
<b>Could HAVE</b>	Enhancements of emotional mapping to traffic public spaces (public transport, individual traffic, pedestrians and cyclists)

## Process

### Activities

1. Detecting emotions using wearables, (Month 1- 6)
2. "ground-truthing" these measurements using a smartphone-based App in near real time, (Month 1- 6)
3. Extracting emotion information from crowdsourced data like Twitter (detecting the type of emotion), (Month 1- 6)
4. Correlating the measured and extracted emotions. (Month 4 - 8)
5. Map the gathered information for further use (Month 4 - 8)
6. Preparation of information to raise awareness of the public in the field of safety for the construction of a better relationship of trust in the security agencies (Month 7- 12)
7. Using Municipal Police (Městská Policie) for positive presentation and image.

### Technologies

- Human as sensors
- Wearable sensors
- Mobile devices

### References

*There are no clear references, since this is a transfer of interdisciplinary research, with focus on urban planning. This can be adapted for the field of civil security and crime prevention.*

## Financing and Investment

### Financing:

#### Horizon 2020

14. Secure societies – Protecting freedom and security of Europe and its citizens

- Call Security
- Sub Call – Fight against crime and Terrorism
- SEC - FCT 2 - 2017: Human Factor for Prevention, Investigation, and Mitigation of criminal and terrorist acts

## Expected Outcomes

### Measuring success

- Were emotional feelings of security recognized using wearables?

- Were subjective emotional data collected from individuals?
- Can Emotions be extracted from crowdsourcing data and be compared?
- Is there a correlation between the collected data?
- Could this information be used for the sustainable urban development, in particular for the feeling of security of the population?

**City vision** *In a larger scale city vision for sustainable urban development the gathered data can be used in urban planning for decision support and the evaluation of ongoing planning processes.*

**Beyond the city** This project can be transferred upon other cities in the Czech republic and internationally that face the issue of low security feeling among the residents.

# Annex

## List of interviews

	<b>Surname</b>	<b>Name</b>	<b>Institution</b>
1	Houdová	Eva	Prague City Hall - Dep. Of Education
2	Petrů	Václav	Prague City Hall - Dep. Of Education
3	Šurovský	Jan	DPP
4	Pivec	Ladislav	TSK
5	Holý	Miroslav	TUV
6	Macháček	Josef	Prague City Hall, Director of Safety Department
7	Moldan	Bedřich	Environmental Centre, Charles University
8	Lupíšek	Antonín	UCEEB
9	Šubrt	Tomáš	Czech University of Life Sciences
10	Pasková	Anna	Ministry of Environment
11	Kašpar	Daniel	Prague City Hall
12	Elfmarková	Darja	Inovacentre
13	Cipro	František	Prague City Hall, Director of Culture and Foreign Relations Dep.
14	Kubeš	František	Ministry of Local Development
15	Ginzl	František	Prague City Hall - Director of Crisis Management Dpt
16	Luciak	Ivan	DOW Chemicals Czech Republic
17	Mareš	Jakub	ImpactHub
18	Kasl	Jan	Ex Mayor of Prague
19	Dobrovský	Jan	Prague City Hall, Head of strategy and business support
20	Karásek	Jan	SEVEN
21	Plamínková	Jana	Councillor Environment and Infrastructure
22	Hainc	Jaromír	IPR
23	Mach	Jaroslav	Prague City Hall - Dep. of Transport
24	Šolc	Jaroslav	Prague City Hall - Dep. of ICT
25	Skalický	Jiří	Acting Director of the Use of Space Decision-making
26	Hnilica	Jiří	VŠE
27	Merta	Jiří	Prague City Hall - Dep. of Spacial Development
28	Kučera	Karel	CzechInvest
29	Moravec	Ladislav	Pražská Teplárenská, Director General
30	Šíma	Libor	Prague City Hall - Dep. of Transport
31	Vacek	Lukáš	Prague City Hall - Dep. of Urban Planning
32	Zderadička	Marek	IPR
33	Skalský	Martin	Arnika
34	Barry	Martin	reSITE
35	Děvěrová	Martina	Prague City Hall - Director
36	Stropnický	Matěj	Deputy Mayor of Prague
37	Novák	Michal	??
38	Pazour	Michal	Technological Centre
39	Taraba	Milan	Association of Tenants CZ
40	Mánek	Pavel	Prague City Hall – Director of ICT Dep.
41	Elis	Pavel	PRE, Director
42	Mrkos	Petr	PVK, Director
43	Domagalsky	Petr	Robert Bosch GmbH
44	Žejdlík	Petr	PVS
45	Hladík	Petr	Technological Centre

46	Štěpánek	Petr	
47	Hlaváček	Petr	Director IPR
48	Klauda	Petr	Siemens
49	Škalická	Petra	People in Need
50	Špicar	Radek	Aspen institute
51	Bízková	Rut	TAČR
52	Kaas	Tomáš	Prague City Hall – Director of Transport Dep.
53	Černý	Vladislav	Želivská provozní a.s.
54	Filler	Vratislav	Automat
55	Škořochová	Olga	Kvas o.s
56	Čaněk	Marek	Praguewatch
57	Stacey	Weston	AmCham, Director
58	Excursion:		Monitoring centre TSK
59	Excursion:		Operations Centre of Prague Crisis Team
60	Excursion:		Water Treatment Plant

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