



EUROPEAN COMMISSION  
Horizon 2020  
H2020-SCC-2016  
GA No. 731198



<b>Deliverable No.</b>	RUGGEDISED D7.3	
<b>Deliverable Title</b>	Intermediate Replication Assessment	
<b>Dissemination level</b>	Public	
<b>Lead participant</b>	ISINNOVA	
<b>Written By</b>	Loriana Paolucci (ISINNOVA) Daniel Cassolà (ISINNOVA) Lukáš Grůza (BRNO) Yuliya Ostrenko (BRNO) Joanna Tobolewicz (GDAŃSK) Mateusz Bonecki (GDAŃSK) Joanna Zbierska (GDAŃSK) Krzysztof Garski (GDAŃSK) Marco Mordacci (PARMA) Cristina Pellegrini (PARMA) Enzo Bertolotti (PARMA)	2020-05-15
<b>Checked by</b>	Mario Gualdi (ISINNOVA)	2020-05-18
<b>Reviewed by</b>	Stefano Faberi (ISINNOVA) Alis Daniela Torres (ICLEI)	2020-06-15
<b>Approved by</b>	Gudrun Haendlmaier (AIT) Albert Engels (ROT)	2020-07-08
<b>Status</b>	Final	2020-07-08





H2020-SCC-2016 – Grant Agreement number 731198 - RUGGEDISED

#### **Acknowledgement:**

The author(s) would like to thank the partners in the project for their valuable comments on previous drafts and for performing the review.

#### **Project partners:**

- 01 – GEMEENTE ROTTERDAM (ROT) - NL
- 02 – UMEA KOMMUN (UME) - SE
- 03 – GLASGOW CITY COUNCIL (GCC) - UK
- 04 – RISE RESEARCH INSTITUTES OF SWEDEN AB (RRI) - SE
- 05 – ISTITUTO DI STUDI PER L'INTEGRAZIONE DEI SISTEMI SC (ISINNOVA) - IT
- 06 – AUSTRIAN INSTITUTE OF TECHNOLOGY GMBH (AIT) - AT
- 07 – NEDERLANDSE ORGANISATIE VOOR TOEGEPAST NATUURWETENSCHAPPELIJK ONDERZOEK TNO (TNO) - NL
- 08 – ICLEI EUROPEAN SECRETARIAT GMBH (ICLEI) - DE
- 09 – ERASMUS UNIVERSITEIT ROTTERDAM (EUR) - NL
- 10 – UMEA UNIVERSITET (UU) - SE
- 11 – UNIVERSITY OF STRATHCLYDE (US) - UK
- 12 – VYSOKE UCENI TECHNICKE V BRNE (UB) - CZ
- 13 – STATUTARNI MESTO BRNO (Brno) - CZ
- 14 – COMUNE DI PARMA (Parma) - IT
- 15 – URZAD MIEJSKI W GDANSKU (Gdańsk) - PL
- 16 – Ballast Nedam Bouw & Ontwikkeling Holding B.V. (BN) - NL
- 17 – ROTTERDAMSE ELEKTRISCHE TRAM NV (RET) - NL
- 18 – ENECO ZAKELIJK BV (ENE) - NL
- 19 – Koninklijke KPN NV (KPN) - NL
- 20 – AKADEMISKA HUS AKTIEBOLAG (AHAB) - SE
- 21 – VASTERBOTTENS LANS LANDSTING (VCC) - SE
- 22 – UMEÅ ENERGI AB (UEAB) - SE
- 23 – UMEA PARKERINGS AKTIEBOLAG (UPAB) - SE
- 24 – SCOTTISH GOVERNMENT (TS) - UK
- 25 – SP POWER SYSTEMS LIMITED (SPPS) - UK
- 26 – TENNENT CALEDONIAN BREWERIES UK LIMITED (TCB) - UK
- 27 – SIEMENS PUBLIC LIMITED COMPANY (SIE) - UK
- 28 – PICTEC (PIC) - PL
- 29 – UNIRESEARCH BV (UNR) BV - NL
- 30 – INFOMOBILITY SPA (INF) - IT
- 31 – FUTURE INSIGHT GROUP BV (FI) - NL
- 32 – THE GLASGOW HOUSING ASSOCIATION LIMITED IPS (WG) - UK
- 33 – GDANSKA INFRASTRUKTURA WODOCIAGOWO-KANALIZACYJNA SP ZOO (GIWK) - PL
- 34 – RISE ACREO AB (RA) - SE

#### **Disclaimer:**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 731198. The sole responsibility for the content of this document lies with the Ruggedised project and does not necessarily reflect the opinion of the European Union.





## Executive summary

The Replication process of RUGGEDISED has been designed with the aim to guide and support Brno, Gdańsk and Parma in getting ready for the replication of smart solutions inspired by those already implemented in the three Lighthouse Cities: Rotterdam, Glasgow and Umeå. To this end, the three Fellow Cities are assisted in the development of their Replication and Investment plans for the deployment of the local smart city projects, with the ambition of becoming Lighthouse Cities themselves and start deploying the smart solutions identified in the plans immediately after the closure of RUGGEDISED project.

To reach this challenging objective, an intensive process of capacity building and knowledge transfer has been set up and structured in four main blocks of activities unfolding both at European and local levels:

- Empower the cities through knowledge share and training;
- Assess the state of play, establish and run the smart city governing groups;
- Deliver a vision and an implementation roadmap with participatory foresight;
- Deliver the replication and investment plans.

This report is intended to give an intermediate update on the replication process carried out by Fellow Cities in the RUGGEDISED project and to provide additional information on smart solutions, that were earlier defined in deliverable D7.1 “Initial Replication Assessment” (M19) , to be implemented in the identified replication areas.

Moreover, the results of the first evaluation assessment on the level of cooperation and capacity on Smart City topics perceived at the beginning of the project by the members of the FC governance groups are reported. In order to show the evolution of the studied levels, a second assessment will be done at the end of the replication process, when great progress is expected thanks to project activities.



## Contents

1.	Introduction.....	6
2.	RUGGEDISED Replication process in a nutshell .....	7
3.	Intermediate Replication Assessment in BRNO.....	9
3.1	Update of Brno Smart City context .....	9
	Brno Smart City Developments .....	9
	Brno City Ecosystem .....	10
	URBIS Smart City Fair.....	10
	Smart City Guidance Package .....	11
	New Open Data Platform in Brno .....	11
3.2	Brno Replication Area.....	11
	International Open Urban Design Idea Competition for Špitálka.....	12
	Zoning Study .....	13
	Master Plan for Smart District Špitálka.....	14
	Other Relevant Side Events and Activities.....	15
3.3	Lighthouse solutions to be replicated in Brno.....	18
	Expert Round Tables.....	18
3.4	Other relevant smart solutions, not included in the Replication Plan .....	26
3.5	Integration and Long-Term Sustainability of the Smart Solutions .....	27
4.	Intermediate Replication Assessment in GDAŃSK.....	28
4.1	Update of Gdańsk Smart City context .....	28
4.2	Gdańsk Replication Area .....	28
4.3	Lighthouse solutions to be replicated in Gdańsk .....	31
4.4	Other relevant smart solutions, not included in the Replication Plan .....	38
4.5	Integration and Long-Term Sustainability of the Smart Solutions .....	38
5.	Intermediate Replication Assessment in PARMA .....	41
5.1	Update of Parma Smart City context.....	41
5.2	Parma Replication Area .....	42
5.3	Lighthouse solutions to be replicated in Parma .....	42
5.4	Other relevant smart solutions, not included in the Replication Plan .....	51
5.5	Integration and Long-Term Sustainability of the Smart Solutions .....	51
6.	Evaluation assessment of the Replication process in Fellow Cities .....	52
6.1	Assessment of activities in the Fellow Cities .....	52
6.2	Overall Satisfaction with the level of Cooperation: methodology and ex-ante assessment.....	55
6.2.1	Questionnaire on Cooperation: baseline and expectations.....	55
6.2.2	Results: Baseline and expectations .....	57
6.3	Improved Smart City capacity .....	60
6.3.1	Smart City capacity level at the beginning of the project .....	61





6.4	Next steps.....	66
7.	Conclusions and next steps .....	67

## Figures

Figure 1:	Replication process in RUGGEDISED (WP7) .....	7
Figure 2:	Špitálka district – location in the city .....	12
Figure 3:	Replication area in the Špitálka district.....	12
Figure 4:	Winning proposal visualizations.....	13
Figure 5:	Zoning study area.....	14
Figure 6:	Master plan visualizations.....	15
Figure 7:	Meeting with local stakeholders in Brno .....	16
Figure 8:	International student competition MUNISS.....	16
Figure 9:	Špitálka exhibition “Transformation of the future smart district” .....	17
Figure 10:	Study visit to Rotterdam from Brno .....	17
Figure 11:	Gdańsk Śródmieście and other city districts (left). Location of Gdańsk Śródmieście district (right). .....	29
Figure 12:	Lastadia building before the refurbishment .....	30
Figure 13:	Visualisation – spatial development concept .....	30
Figure 14:	Lastadia – current status.....	31
Figure 15:	Parma University Campus .....	42
Figure 16:	Smart Mini Eco Stations (rendering) .....	45
Figure 17:	3D RTE Parma Information Management (screenshots) .....	45
Figure 18:	Brno- perception of local cooperation level (baseline and expectation).....	58
Figure 19:	Gdańsk - perception of local cooperation level (baseline and expectation).....	59
Figure 20:	Parma- perception of local cooperation level (baseline and expectation) .....	60
Figure 21:	Brno- perception of Smart City Capacity level – Baseline .....	62
Figure 22:	Brno - Answers distribution – Baseline .....	62
Figure 23:	Brno - Capacity level per sector - Baseline.....	63
Figure 24:	Gdańsk - perception of Smart City Capacity level – Baseline .....	63
Figure 25:	Gdańsk - Answers distribution – Baseline .....	64
Figure 26:	Gdańsk - Capacity level per sector - Baseline.....	64
Figure 27:	Parma- perception of Smart City Capacity level – Baseline .....	65
Figure 28:	Parma - Answers distribution – Baseline .....	65
Figure 29:	Parma - Capacity level per sector - Baseline .....	66

## Tables

Table 1:	Strategic plans and their main targets .....	10
Table 2:	Brno Smart Solutions to be replicated .....	18
Table 3:	Business model canvas for the Smart solutions included in the Replication Plan - Brno.....	22
Table 4:	Investment plan - Brno.....	24
Table 5:	Replication Roadmap – Brno.....	25
Table 6:	Gdańsk Smart Solutions to be replicated .....	31
Table 7:	Business model canvas for the Smart solutions included in the Replication Plan – Gdańsk.....	34
Table 8:	Investment plan – Gdańsk.....	36
Table 9:	Replication Roadmap – Gdańsk.....	37
Table 10:	Gdańsk innovation missions mapped onto priorities of CMCE initiative .....	40
Table 11:	Parma Smart Solutions to be replicated.....	43
Table 12:	Business model canvas for the Smart solutions included in the Replication Plan - Parma .....	47
Table 13:	Investment plan - Parma .....	49
Table 14:	Replication Roadmap – Parma .....	50
Table 15:	Evaluation framework for the Fellow Cities .....	53



## 1. Introduction

This report is intended to monitor the replication process carried out by Fellow Cities in the RUGGEDISED project and to provide additional information on smart solutions that were earlier defined in deliverable D7.1 “Initial Replication Assessment” to be implemented in the identified replication areas.

With the structure of a short report, this document updates the progress done by the RUGGEDISED Fellow Cities during the past two years and a half of the project. Finally, an assessment of activities in the Fellow Cities is provided, which comprises a monitorization of the effects of the local processes as well as the impacts that the knowledge transfer and capacity building process will have on the three cities.

In essence, the main purpose of this deliverable is to increase the effectiveness of the replication activities by means of assessments and evaluations. In doing so, knowledge can be systematised and the experience gained in the path of becoming a Smart City can be used elsewhere in order to reduce future efforts and costs.

The structure of the document is as follows:

- Chapter 2 provides a general overview of the replication process carried out in WP7 during this period, describing its main blocks of activities;
- Chapter 3, 4 and 5 report the detailed Intermediate Replication Assessments of Brno, Gdańsk and Parma respectively in terms of the current smart city context and updated information on replication activities and other relevant smart solutions;
- Chapter 6 gives an evaluation assessment of the cooperation and capacity level of the Fellow Cities’ governance bodies, both in terms of situation before RUGGEDISED (baseline) and expectations at the end of the overall replication process (ex-ante assessment);
- Finally, Chapter 7 outlines the main findings and conclusions drawn from the assessments provided by the cities and advances the next steps to be taken in the near future.



## 2. RUGGEDISED Replication process in a nutshell

The Replication process of RUGGEDISED has been designed with the aim to guide and support Brno, Gdańsk and Parma in getting ready for the replication of smart solutions inspired by those implemented in the three Lighthouse Cities: Rotterdam, Glasgow and Umeå.

Concretely, the three Fellow Cities are assisted in the development of their Replication and Investment plans for the deployment of the local smart city projects. Each Fellow City will determine the formal binding level of these plans (e.g. should they be officially approved by the local authorities or not), with the ambition of becoming Lighthouse Cities and start deploying the smart solutions identified in the plans immediately after the closure of RUGGEDISED project.

To reach this challenging objective, an intensive process of capacity building and knowledge transfer has been set up and structured in four main blocks of activities unfolding both at European and local levels (**Fout! Verwijzingsbron niet gevonden.**).

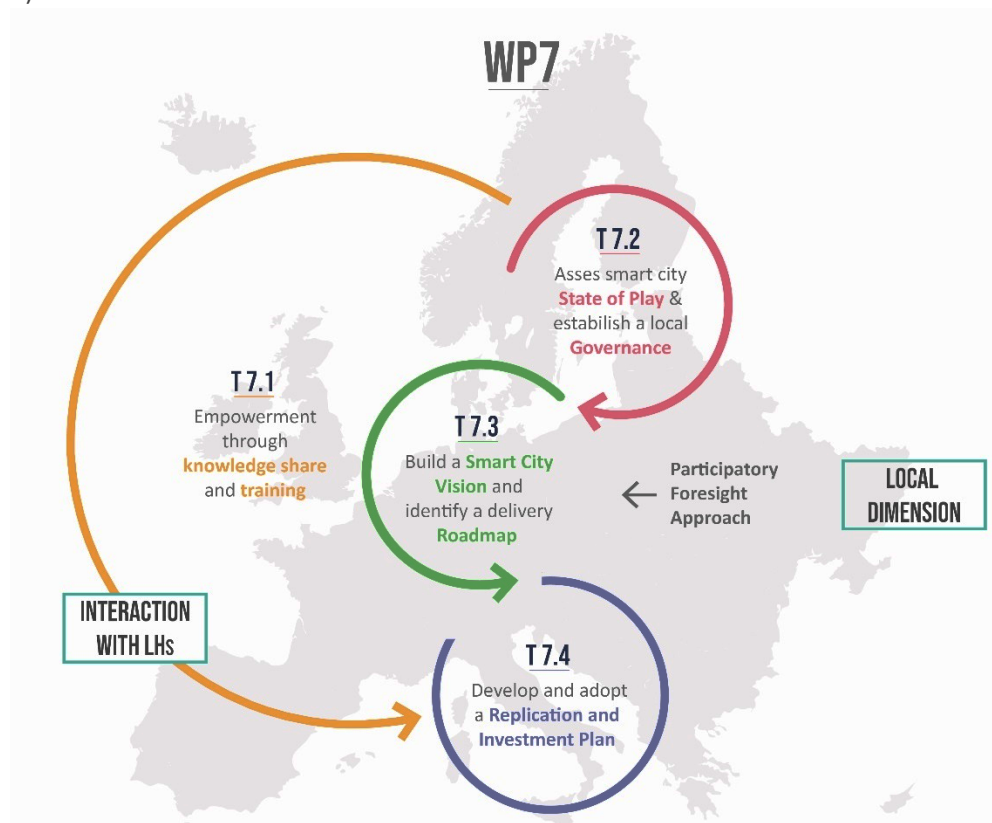


Figure 1: Replication process in RUGGEDISED (WP7)

### ❖ *Empower the cities through knowledge share and training* (T7.1)

Knowledge transfer is a term used to encompass a broad range of activities envisaged to support mutually beneficial collaborations between the societal players taking part in the smart city activities of the RUGGEDISED cities: authorities, universities, industries and businesses and the civil society.

Within RUGGEDISED, the concept of knowledge transfer has been applied making use of different modalities and means of implementation. Fellow Cities, indeed, are involved in an intensive process of capacity building and knowledge transfer aimed at supplying the competencies for an informed and reliable replication of the smart solutions. Learning from other experience is a key step for strengthening know-how and boosting expertise on both technical and non-technical themes and, thereby, allowing Fellow Cities to consciously deal with eventual barriers that might be encountered, to anticipate potential failures and to be able to identify the best way to avoid them.



To this purpose, several opportunities of knowledge transfer between Lighthouse and Fellow Cities are foreseen in the replication process in RUGGEDISED: Replication Workshops; Study Tours and ad hoc webinars, web meeting and conference calls<sup>1</sup>.

The following three blocks of activities shall be understood as consecutive steps that are due to take place on a local scale in each of the Fellow Cities.

❖ ***Assess the state of play, establish and run the smart city governing groups (T7.2)***

The Replication and Investment Plans are to be considered as the reference documents that the Fellow Cities are committed to and will not substantially modify. In order to reach this final milestone, an initial phase where actors review the state of play and prepare the work is required.

Moreover, to ensure that the Fellow Cities start off on the right foot the long way towards becoming a Smart City, proper forms of Smart City Governance have been established in compliance with the local needs, requirements and traditions<sup>2</sup>.

This is an ongoing activity and significant results have been already achieved. Each Fellow City, indeed, established an effective local governance group with a strong commitment in carrying on and steering smart city's activities and initiatives. In all cases, efforts were focused on ensuring solid group structures able to persist after the end of the project, being able also to "survive" the numerous political elections and successions of several local governments. This is fundamental to guarantee that Fellow Cities can continue steering and supporting the local Smart Cities activities over time.

In this regard, **an update on the current progress of Brno, Gdańsk and Parma is provided in this report.**

❖ ***Deliver a vision and an implementation roadmap with participatory foresight (T7.3)***

Another key step leading up to the development of the replication and investment plan is the definition of the strategic city vision and the roadmap of upcoming actions and investments in energy, mobility and ICT sectors. To this purpose a participatory foresight approach has been adopted in RUGGEDISED with the aim to facilitate the strategic planning and the effective establishment of a collaborative platform able to collect and catalyse all the interests of the community. This process has been implemented in each Fellow City and steered by the respective Governing Groups that provided for the involvement of a wider group made up of all the local stakeholders relevant for the development of the Smart City.

All Fellow Cities have almost finalised their participatory foresight process<sup>3</sup> and are up to define their medium-long term city visions and roadmaps. The results of this work are reported in D7.2 "Visions and Roadmaps".

❖ ***Deliver the replication and investment plans (T7.4)***

As mentioned, this is the final goal of the entire replication itinerary and, once drafted their Replication and Investments Plans, Brno, Gdańsk and Parma will become in turn Lighthouses and will concretely start on their path towards becoming Smart Cities.

---

<sup>1</sup> Details and outcomes of this activity are reported in D7.6 "Reports on technical workshops"

<sup>2</sup> An initial assessment was conducted at the beginning of the project and evidence of the different actions is reported in the "Initial Replication Assessment" (D7.1).

<sup>3</sup> Reports of the local workshops are reported in D7.5 "Reports from the Governing Groups meetings"



### 3. Intermediate Replication Assessment in BRNO

#### 3.1 Update of Brno Smart City context

##### Brno Smart City Developments

Smart City concept is firmly established in Brno. After the last municipal elections in autumn 2018, when the new government of the city was re-established, there were only a few changes to the Smart City agenda thereafter. Changes in the city council thus had no greater negative influence on the set course of building a Smart City of Brno.

Brno city council already has its smart city advisory board - Commission for smart and participatory city. One of the five deputy mayors is committed to a smart city agenda and the Department of Strategic Development and Cooperation is responsible for implementation of Smart City approach.

Recently, the City of Brno approved several important **STRATEGIC DOCUMENTS** which set main targets for future city development:

- The main strategic document of the City of Brno - #Brno2050<sup>4</sup>  
The aim of #Brno2050 is to create a strategy of the city, to empower and engage citizens and other stakeholders. To tackle this great challenge, the development of the strategy has been divided into three areas of interest (resource management, quality of life, good governance) and into three interconnected process steps:
  1. Long-term: Vision 2050.
  2. Mid-term: three 10 years plans (2028, 2038 and 2048) with specific priorities and topics.
  3. Short-term: several 2-3 years Action Plans (first one till 2020), where we include individual activities and projects.
- The Sustainable Energy and Climate Action Plan of the City of Brno (SECAP)  
Based on the city's participation in the Covenant of Mayors for Climate and Energy initiative and approved in September 2019, the Sustainable Energy and Climate Action Plan of the City of Brno sets out ambitious targets reducing CO2 emissions. It involves concrete reduction measures, together with a timeframe and allocated responsibilities that translate the long-term strategy into practice.  
A memorandum of reducing emissions in the City of Brno was signed recently (February 2020). 28 companies and universities have confirmed their promise to help the city to achieve 40% CO2 reduction till 2030. More companies and stakeholders are expected to join soon.
- The Sustainable Urban Mobility Plan of the City of Brno<sup>5</sup>  
The Sustainable Urban Mobility Plan is a strategic document, whose objective is to create conditions for satisfying the mobility needs of people and businesses in the City of Brno and its surroundings and contribute to an improvement in the quality of life. The objective of this document is to seek and find the possibilities of sustainable transport services for the territory; this should be done with the help of citizens and municipal, regional and state authorities.

Table 1 below shows the main targets established in the strategic plans above mentioned.

<sup>4</sup> For more information about the strategy #Brno2050 see deliverable D7.2 "Visions and Roadmaps"

<sup>5</sup> More information on the Sustainable Urban Mobility Plan can be found here:

[http://www.mobilitabrno.cz/data\\_files/ostatni/brno-mobility-plan-eng.pdf](http://www.mobilitabrno.cz/data_files/ostatni/brno-mobility-plan-eng.pdf)



Table 1: Strategic plans and their main targets

Name	Time of origin	Sector	Main set targets
The main strategic document of the City of Brno - #Brno2050	2017 - in progress	All	Increase the share of local renewable energy supply (50–70% of the city's final energy consumption in 2050) CO2 neutral city till 2050
Brno Sustainable Urban Mobility Plan	2014-2018	Mobility	Modal split: <ul style="list-style-type: none"> <li>- 56% for public transport</li> <li>- 12% walking</li> <li>- 12% cycling</li> <li>- 20% cars</li> </ul> A fourfold reduction in greenhouse gas emissions by 2050 compared to 2010 or 1 tonne eq. CO2 per person per year by 2050); decrease in total energy consumption in passenger transport by 20% by 2050)
Brno Sustainable Energy and Climate Action Plan	2017-2019	Energy	40% CO2 reduction till 2030

## Brno City Ecosystem

The need for networking across different groups has developed within the last few years. In reaction to that, the Brno City Ecosystem was launched in 2017 – a platform gathering Brno science partners, business alliance partners, NGOs, the active city community and local governments, all working together on solutions for the city and its citizens.

In 2018, the Ecosystem was actively involved in the preparation and approval of the main strategic document of the City of Brno - #Brno2050. The scope of the Ecosystem members' participation in the strategy creation was a brand-new experiment for Brno, and it has highly contributed to the impact of the strategy.

Several workshops of the city ecosystem members were organized with the support of the RUGGEDISED project. Mainly for the purposes of creating a new city strategy (see deliverable D7.2).

## URBIS Smart City Fair

URBIS Smart City Fair was launched in 2018 with the aim to introduce the concept of smart cities to municipalities and active citizens through a two-day international conference.

Every year, URBIS brings a smart combination of a trade fair and an exclusive conference programme, where leaders in the field of Smart City are introduced. Over two days dozens of representatives of Central European cities and municipalities and leaders in innovations meet with one goal – to share experience, ideas and examples of specific solutions, how to correctly develop a Smart City concept in cities. City of Brno is one of the main co-organizers of the fair.

At the Urbis fair 2019 the focus was on the following topics: Science meets Parliaments, Science meets Regions and RUGGEDISED. The second day of the General Assembly of the RUGGEDISED project took place during the fair and opened some of the internal meetings to the fair's visitors. On this occasion, the Fourth Replication Workshop was opened to other cities outside RUGGEDISED. The aim of this workshop was to help the city representatives (whether from RUGGEDISED Fellow Cities or other European cities) to learn as much as possible about the most innovative city projects throughout Europe<sup>6</sup>.

Wolf D. Prix, internationally acclaimed architect and a member of RUGGEDISED Advisory Board, also gave a keynote speech highlighting the essentials when planning for sustainable development in complex city systems.

<sup>6</sup> Report of this WS can be found in D7.6





The RUGGEDISED project has been an important part of the event from the very beginning. Albert Engels, the RUGGEDISED main coordinator, took part of the programme as a keynote speaker and introduced the project to the experts and general public.

### Smart City Guidance Package

In January 2019, the City of Brno served as a testbed for the [Smart City Guidance Package](#), which was developed by the Action Cluster for Integrated Planning, Policy and Regulations in the European Innovation Partnership on Smart Cities and Communities<sup>7</sup>.

The Smart City Guidance Package seeks to provide the necessary support for planning and managing smart city projects by providing examples of good solutions and best practices, pitfalls that can be expected and how to overcome these, e.g. where to find information about financial possibilities and how to engage stakeholders.

The methodology of the Smart City Guidance Package worked well to connect the objectives of Brno Sustainable Energy Action Plan, Sustainable Urban Mobility Plan, #Brno2050 and RUGGEDISED project.

### New Open Data Platform in Brno

Brno launched an online platform for open data at [data.brno.cz](http://data.brno.cz), one of the first cities in the Czech Republic to do so. This platform is designed to be used by the public and will also help students and professionals. Besides data-sets, people can find useful apps as well as articles about data, the platform and other helpful tips. The interactive apps that exploits data from the city are the most popular tools on the website. People can see for example a map of car accidents in the city or they can compare orthophotos of the city taken at different points in time.

Data published at [data.brno.cz](http://data.brno.cz) are collected from the city itself, city organizations and other providers. The development of the website is an ongoing process and it will continually change depending on new data-sets and technologies. The platform is particularly useful for the academic sphere who can use the data for analysis, thesis or other academic research work.

The Open Data website is a first step to replicate the Open-data decision platforms created by Glasgow and Umeå in RUGGEDISED. At the beginning of 2019, colleagues from the Data, analysis and evaluation department of Brno City Municipality travelled to the City of Glasgow on a study visit. Focusing on GIS applications and data-based decision platforms, the delegation from Brno gained valuable insights from their counterparts working in the city council of Glasgow.

## 3.2 Brno Replication Area

In November 2017, Brno City Council approved Špitálka heating plant locality as a replication area for the RUGGEDISED project with the purpose to develop a modern smart city neighbourhood. It is a 2.4-hectare area, owned by the city company Teplárny Brno a.s. (heating company).

The replication area is part of the broader Špitálka district which is directly linked to the historical centre of the city and at the same time it is part of the protection zone of the city's heritage conservation area. It is an area with a high density of development and a closed block structure. Nowadays, these dilapidated buildings form a large part of local brownfield sites. Whole Špitálka district is 27 hectares large, has 1,400 inhabitants with density of 6,359 inhabitants per km<sup>2</sup>.

---

<sup>7</sup> More information about the Action Cluster for Integrated Planning, Policy and Regulations in the European Innovation Partnership on Smart Cities and Communities can be found here: <https://eu-smartcities.eu/clusters/8/description>



Figure 2: Špitálka district – location in the city

The red line in Figure 3 shows the size of the replication area.



Figure 3: Replication area in the Špitálka district

At the end of year 2018, Brno City Council declared RUGGEDISED project to be one of the city's strategic projects and, in this context, Špitálka locality became a strategic development area.

Below are described several important activities which helped to push development of the replication area to the next stage.

### International Open Urban Design Idea Competition for Špitálka

During the year 2018 Brno City Municipality together with the Brno's Chief Architect office prepared an International urban design idea competition for the Špitálka replication area. The objective of the competition was to obtain quality urban design ideas and find a solution that will achieve further steps leading to a change in the city's planning documentation, regulation plan for the location and future development of the Brno district heating plant and the surrounding area into a smart city district.

The competition jury was composed of two parts: four independent jury members and three involved jury members. The chairwoman and also an independent member of jury was Barbara van den Broek, a main city urban planner of the City of Rotterdam. In addition to the new urban artery, competitors had to take into account defined principles





of Smart Cities, making the new neighbourhood environmentally friendly and self-sufficient as regards energy consumption. The Špitálka district could thus serve as a testbed for further city development.

#### Basic information about the competition

**Type of competition:** international, urban, open, single-phase, ideological

**Date of announcement:** 10/30/2018

**Submit of proposals:** 01/21/2019

**Jury evaluation meeting:** 03/07/2019- 03/08/2019

**Exhibition of competition designs:** 06/20/2019 – 07/31/2019

**Winning proposals and prize money:**

- *1st place:* Aulík Fišer architects – 500,000 CZK
- *2nd place:* Pelčák and partner architects – 400,000 CZK
- *3rd place:* Veronika Kubalcová, Jana Liptáková, Eva Kovářová – 300,000 CZK
- *Rewards:* OMGEVING cvba, A8000, DKLN, gogolák+grasse, ra15

The press release of the competition is available [here](#).



Figure 4: Winning proposal visualizations

### Zoning Study

The next step of locality transformation was to assign a zoning study “Transformation area - Špitálka and surroundings” in June 2019. The winning and highest-appraised proposals from the International urban idea competition served as one of main resource materials for this study.

The aim of the zoning study is to propose the functional and spatial arrangement in the purpose of complex integration not only of replication locality Špitálka but also for surrounding brownfields into the transformation area. There are former manufacturing factories, which previously formed the industrial centre of the city. The redevelopment of the whole area will not only be associated with new areas for housing, work or leisure time, but



also new transport links will be added in the zone. The most important of these is the so-called New City Avenue, which is supposed to ensure transport service in the newly emerging part of the city. The zoning study will then be used for an amendment to the Master Zoning Plan of the City of Brno and for the very construction and revival of this part of the city. Deadline for submission of the final version is the end of April 2020.



Figure 5: Zoning study area

### Master Plan for Smart District Špitálka

The third step forward to smart district transformation started to run in parallel with the second step. The Prague-based architect studio A8000 architects began working on the 'Master Plan' in November 2019 and should submit the final proposal by the end of June 2020. Unlike the zoning study, the master plan focuses only on the 2.5 ha of the western part of the compound area occupied by the district heating company Teplárny Brno. The goal is to create a detailed proposition of a modern neighbourhood where people can comfortably live, work and spend their leisure time. The proposal should deal with complicated critical infrastructure and come up with solutions about current constructions located at the site. Again, the author of the master plan has to take the results of Urban Idea competition into consideration. **The final version of this plan will be included in the zoning study and used in Replication and Investment plan for the RUGGEDISED project.**

Recently presented draft version focuses on the concept of "supercluster" for the cultural creative industry and is based on five pillars: *creativity, cooperation, connection, development and community*. It is planning to model housing capacity for 500 up to 900 citizens.

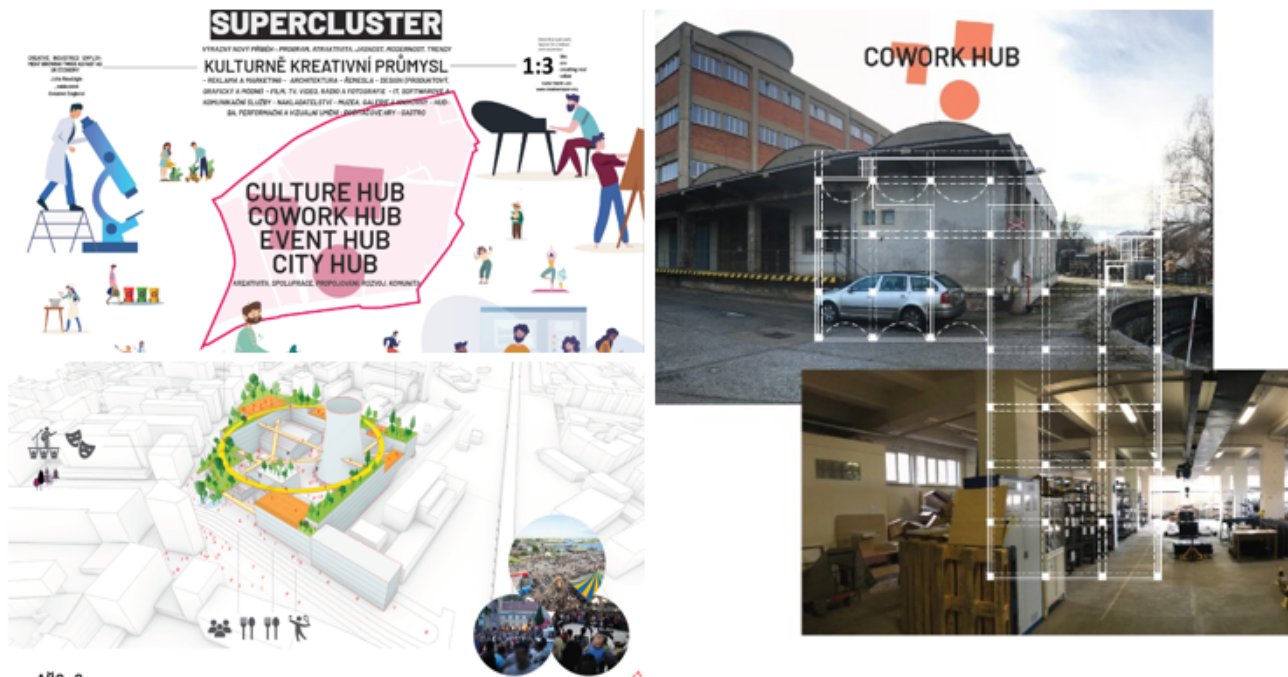


Figure 6: Master plan visualizations

## Other Relevant Side Events and Activities

### Meetings with local stakeholders

Another activity which is crucial for future locality transformation is involving major stakeholders of the site and surrounding areas. During the last two years three large group joint meetings and dozens of individual meetings have been organized. First two joint meetings (in June and August 2018) between city representatives and landowners took place at the heating plant venue as part of the preparation of the announcement of an urban planning competition for the Špitálka area, with subsequent discussion of the terms of reference of the competition. The third joint meeting took place in the City Hall in November 2019. The initiative took place in the presence of landowners and representatives of major industrial companies and had the form of a presentation where the city administration and representatives of the Chief architect's office, authors of zoning study and architects from A8000 architects gave an update on the latest development.

After every event, all participants received an online questionnaire in order to collect feedback on possible cooperation with the city and plans of developing their own sites. From the beginning of year 2020 (and ongoing) individual meetings are organized with different stakeholders which are aimed to synchronize their needs within area transformation.





Figure 7: Meeting with local stakeholders in Brno

### International Student Competition MUNISS

The City of Brno engages with students on the future of its smart city district.

In 2018 the MUNISS competition focused on the Špitálka locality, with the central theme of time planning and description of a locality manager. The aim of the project was to create a basis for announcing a competition for urban design of a heating plant location. Students had to define the use of the territory in the horizon of 5, 10 and 15 years.



**CHYTRÁ ŘEŠENÍ  
V AREÁLU  
ŠPITÁLKA**  
POKROK NEZASTAVÍŠ

Figure 8: International student competition MUNISS

In 2019, the MUNISS team of students from the Faculty of Economics again focused on the analysis of smart solutions and their impact on the quality of life in the area and proposed and assessed ten specific smart solutions, technologies and practices, which could affect the model of the future smart district.

Final projects of both years are available [here](#).

### Website RE:Špitálka

In November 2019 the new web for the future district Špitálka was launched. Web pages serve as an info point, where all visitors can learn more about the current and future development of the locality, how this new neighbourhood differs from the others and also how they can get involved. For instance, the Innovation section has a list of selected solutions and additional more detailed information on the direction in which the smart district of





Špitálka will be heading. The users of the website can vote for the solutions they like or submit their idea for the smart district by means of the ready-made form.

Websites are available [here](#).

#### Špitálka exhibition “Transformation of the future smart district”

The exhibition was organized as a part of the International urban design idea competition for presenting results of the contest to the general public. All twenty-seven designs could be seen at an exhibition in Brno Urban Centre at the Old Town Hall from June 20 to July 31, 2019.



Figure 9: Špitálka exhibition “Transformation of the future smart district”

#### Study visit to Rotterdam

In September 2019 Rotterdam welcomed Brno’s city councilor for urban development Filip Chvátal as well as RUGGEDISED project manager Lukáš Grůza. The main interest of the visit was to get a closer look to early steps of redevelopment of the ‘Heart of South’ project. Special focus was put on public-private partnership and financing models, methods of engaging different stakeholders and ownership structure.



Figure 10: Study visit to Rotterdam from Brno

#### Memorandum of Cooperation between Brno City Municipality and the company Teplárny Brno (heating plant)

Purpose of this Memorandum of Cooperation is to adjust the further cooperation in planning of future smart district Špitálka. Teplárny Brno (heating plant) is the owner of the site where a replication area is located. This memorandum is a first step for an upcoming legal contract assigning roles for both sides in redevelopment of the site.

#### Špitálka in the first long-term National investment plan of Czech Republic 2020-2050

The future smart district Špitálka project was selected and included in the first long-term National investment plan of Czech Republic 2020-2050 “Country of the future for 11 million people”. [Here](#) you can find the full document (in Czech language only).



### 3.3 Lighthouse solutions to be replicated in Brno

The brand-new smart city district Špitálka will provide a wide field of opportunities to implement various smart solutions realized within the project RUGGEDISED and even to get inspired by other smart city lighthouse projects. Work is under way on the definition of innovative technologies and approaches, which will be used in the future smart neighbourhood and, as a first step, an **INITIAL EXPERT ANALYSIS** has been prepared by the Brno research and university departments.

As part of the project, the SIX Research Centre coordinated the process of selection of the solutions that could be applied in the local environment, thus creating six expert researches on individual topics of the Smart Cities concept:

- Electrical Grid and E-Mobility
- ICT and Security
- Mobility
- Sharing Economy
- Smart Thermal Grid
- Smart waste management

All six expert studies can be found [here](#).

The analyses assess the possibilities of replication of individual innovative projects and measures implemented in Lighthouse Cities of the RUGGEDISED project and mention alternative options implemented in other European and non-European cities. These researches serve as a basis for the future definition of innovative aspects of the smart neighbourhood.

#### Expert Round Tables

Building on initial expert analysis, during the second half of 2020, expert roundtables will be organized. Each aforementioned topic will be covered with one expert table half-day discussion whose formed outputs will lead to a closer specification of technologies and approaches applicable in future construction. SIX Research Centre will be involved in coordination and organisation of these expert roundtable discussions.

During the roundtable, the following attributes of each smart solutions will be considered:

- Investment costs with comparison of investment return
- Efficiency
- Impact on the achievement of the objectives
- Operating and maintenance costs
- Simplicity of implementation (possibility of incorporating measures into existing conditions)
- Presence of positive externalities

The results from these discussions will help the city administration to select the smart solutions to be integrated in the future site development.

Below you will find a list of smart solutions with which are considered to be replicated in the smart district Špitálka. The main goal for Špitálka is to achieve positive energy district status.

**Table 2: Brno Smart Solutions to be replicated**

Smart Solutions	LHs Smart Solutions
<b>BN1:</b> Smart Thermal Grid (Geothermal heat-cold storage and heat pumps)	<b>R1:</b> Geothermal heat-cold storage and heat pumps <b>U3:</b> Geothermal heating/cooling storage
<b>BN2:</b> Smart district Špitálka connection to 100% renewable energy	<b>U1:</b> Smart City connection to 100% renewable energy



<b>BN3: EV-charging hub and infrastructure</b>	<b>U6:</b> EV-charging infrastructure hub <b>G2:</b> EV-charging hub battery storage in car parks
<b>BN4: Intelligent building control and end user involvement</b>	<b>U4:</b> Intelligent building control and end user involvement
<b>BN5: Intelligent LED streetlights</b>	<b>G6:</b> Intelligent LED streetlights with integrated EV charging functionality <b>G8:</b> Implementation of demand-side management technology in street lighting <b>R11:</b> Efficient and intelligent street lighting
<b>BN6: Flexible Green Parking</b>	<b>U7:</b> Energy-efficient land use through flexible green parking pay off
<b>BN7: Integration of near-site RES</b>	<b>G4:</b> Optimisation of integration of near-site RES
<b>BN8: OpenData platform</b>	<b>U8:</b> Smart open-data city platform <b>R9:</b> 3D city operations model <b>G7:</b> Smart open-data decision platform
<b>BN9: Energy management system</b>	<b>R8:</b> Energy management system <b>G10:</b> Implementation of demand-side management technology in non-domestic properties <b>U2:</b> Peak load variation management and peak power Control

#### **BN1: Smart Thermal Grid**

An intelligent system of connecting buildings with heat and cold supply. This system will be based on the use of geothermal heat and its underground storage, residual heat of buildings and from nearby heating company, use of renewable energy sources for additional heating or cooling of water, etc. This will ensure the lowest possible dependence on fossil resources.

#### **BN2: Smart district Špitálka connection to 100% renewable electricity energy**

Construction itself will be optimized for maximisation of renewable energy sources use. Additional energy supplied from outside of the district will be 100% green - selected provider will have to ensure that provided energy comes entirely from renewable resources.

#### **BN3: EV-charging hub and infrastructure**

Parking spaces for residents in the area located in the underground floors of residential buildings will be equipped with chargers for electric vehicles supplied by energy mainly from near-site RES.

#### **BN4: Intelligent building control and end user involvement**

An energy management system for incorporated buildings that enables continuous monitoring and analysis of the indoor environment and thus an efficient setting of energy flows. Depending on parameters such as the presence of people (and their number) in a room, sunshine, outer temperature, room utilisation prediction and others, the system can set optimum regulation of the temperature and inner climate in buildings.

The needed energy for heating/cooling and ventilation of the rooms will be supplied based on measuring relevant parameters affecting the temperature in the building (and in the rooms themselves). In the case there is enough sunlight, it will be possible to reduce the energy needed to heat the rooms that are directly affected by it. As the outer temperature gradually increases, heating can also be reduced in the rooms on the northern side of the building, etc. By measuring the carbon dioxide content in the rooms, it is possible to calculate how many people are present in the building and in each room. This provides valuable information on how well we are doing in using these premises. If a longer absence of people in a room is detected, the lights will be turned off and other devices will also be switched into the power saving mode.



By measuring the energy consumption for heating, cooling and ventilation in the building and in the individual rooms, it is possible to trace whether there are any major differences between the rooms and subsequently figure out their reasons.

#### **BN5: Intelligent LED streetlights**

Lighting is specific in that it creates feelings of safety, overview of the location, a certain orientation. Therefore, sufficient light should always be provided. There are projects where, for example, public lighting is only illuminated by sensors when a person comes near to it, but this can also have a negative effect on the perception of people's safety. These factors will be considered when specifying the lighting system for the future smart neighbourhood.

Energy-efficient LED illumination that will adjust its brightness based on the momentary need and intensity of natural light according to the data obtained from sensors. Where appropriate, lamps can be fitted with chargers for electric vehicles or with Wi-Fi transmitters.

#### **BN6: Flexible Green Parking**

A smart parking system that offers users parking options in the area, makes the booking of the parking place and makes it possible to use a mobile app to pay directly for the parking. Occupancy will be monitored in real time using a camera system.

If you choose a car to travel to the smart neighbourhood, the application will offer you where you can park in the area and at what price. The price will depend on the time of day (increasing or decreasing demand for parking) and on the specific location. The application will offer you more possible parking options in your destination and at the same time it will offer you alternative options of how you can get to your destination (bike, public transport, etc.). It will book a place chosen by you and you will be able to pay the parking fee directly through the application. The occupancy of the parking spaces will be monitored by means of a camera system, which will also ensure that it is up to date in real time.

Parking spaces for residents in the area will be located in the underground floors of residential buildings. This will reduce the obstruction of public spaces that can subsequently be used for more meaningful purposes.

#### **BN7: Integration of near-site RES**

Connection of renewable energy sources and onsite battery storages which can support demand from buildings and demand from electric vehicles. The inclusion of battery storage ensures that the maximum onsite usage of the renewable energy can be achieved, minimising any export to the national grid. This will result in raising the value of the power generated by avoiding purchasing from the grid and exporting at a significantly lower value.

The development of control software and hardware will evaluate electricity market conditions and grid demand requirements, as well as potential oversupply from other renewables on the grid, and decide on how the battery is charged and discharged. Weather data will be used to monitor the probable level of generation coming from the renewables and thus affect the discharge rates to ensure that the required capacity is available for the following day.

#### **BN8: OpenData platform**

One of the smart solutions already under implementation in Brno. OpenData platform is accessible [here](#).

At the beginning of 2019 colleagues from the Data, analysis and evaluation department of Brno City Municipality travelled to the City of Glasgow on a study visit. Focusing on GIS applications and data-based decision platforms, the delegation from Brno gained valuable insights from their counterparts working in the city council of Glasgow.

#### **BN9: Energy management system**

Smart meters monitor energy supply and demand in public areas and all buildings in the area. These data are interconnected in a single energy management system that uses them to optimise energy flows between buildings and efficient use of energy resources (minimisation of load in peak periods, maximisation of renewable energy sources utilisation and reduction of energy losses). Energy management of buildings will be set up in such a way as to promote energy-responsible behaviour of their users.

The buildings will be interconnected by energy flows, and energies between them will be directed based on momentary and predicted consumption data. This means that during the day these flows will be directed primarily to office buildings and operations, while in the afternoon and during the night to residential buildings. This measure





will make it possible to evenly distribute the network load and, reducing thus the overall energy consumption. Optimisation of energy flows and their use will lead to cost savings both for building owners and for users alike.

To be able to prepare a detailed business model canvas for each solution together with a Replication Roadmap and Investment plan we need to build it on specific conditions and district design which will be delivered by Master plan for Špitálka described above. Then together with outputs from Expert roundtable discussions we will be able to elaborate closely about future replication activities. **Below stated Business model canvas for the Smart solutions included in the Replication plan, Investment plan and Replication roadmap tables will be thus more particularized in the final Replication and Investment plan.**



Table 3: Business model canvas for the Smart solutions included in the Replication Plan - Brno

Smart Solution	Key Partnership	Key Activities	Key Resources	Value Proposition	User Relationships	Key End Users
<b>BN1: Smart Thermal Grid (Geothermal heat-cold storage and heat pumps)</b>	Brno heating company, Brno university of technology (BUT), Technical Networks Brno, plc	Technical specification; creating a new business model for Brno heating company; implementation	Presence of heating company in the locality and their expertise	New technologies and business model, CO2 reduction, energy independency	Co-creation of business model, energy-data exchange	Inhabitants, property owners
<b>BN2: Smart district Špitálka connection to 100% renewable energy</b>	Energy provider, Brno heating company	Creating business model, renewable energy supplier procurement, employment of RES, energy-storage, electricity-grid integration	RE sources, low energy costs	100% renewable energy, climate neutral district, RES integration	Information, procurement involvement	Property owners. inhabitants
<b>BN3: EV-charging hub and infrastructure</b>	Brno heating company, BUT	Creating business model, Implementation of distribution system	Renewable and low-cost energy, Solar panels and battery storage integration	CO2 reduction, simplicity of service, user friendly application	Information, wider uptake of EV mobility	Inhabitants, EV users
<b>BN4: Intelligent building control and end user involvement</b>	Property developer, IOT companies and start-ups	Implementation of a monitoring system, integration with data portal	IOT sensors and network, software infrastructure,	Comfortable living environment and conditions, data protection	Involvement, information, education, gamification	Inhabitants
<b>BN5: Intelligent LED streetlights</b>	Technical Networks Brno	Technical specification, behaviour analysis, procurement, implementation	IOT sensors, Near RES integration	Energy efficiency, decrease of light pollution, safe and comfortable light conditions	Information, education	Citizens
<b>BN6: Flexible Green Parking</b>	Brno road network company, Technical Networks Brno Application developer	Business model, application specification and realization, sensors implementation	Underground garage, flexible parking, user involvement	Friendly user interface, improved city services, anonymous data	Information, education, user involvement	Citizens, inhabitants



				collection and prediction, CO2 reduction		
<b>BN7: Integration of near-site RES</b>	Technical Networks Brno	Business model, development of control software, PV panels and battery storage integration	Renewable and low-cost energy, Solar panels and battery storage integration	CO2 reduction, climate neutrality, positive energy district, local production, minimalization of export to the national grid	Information, education	Inhabitants, property owners, developers
<b>BN8: OpenData platform</b>	ICT companies a SMEs, Brno data portal department, Brno GIS department	Smart district data collection, integration with existing data portal, data protection protocols, creation of analytical tools, evaluation reports	Already existing data system, existing urban GIS system, ICT department	Various types of datasets, open data standardization, analysis	Information, user involvement,	ICT companies, developers, cities, citizens, inhabitants
<b>BN9: Energy management system</b>	Brno heating company, BUT, system supplier	Implementation of a monitoring system, electricity-grid integration	Sensors, smart meters, dedicated system	CO2 reduction, minimisation of load in peak periods, maximisation of renewable energy sources utilisation and reduction of energy losses	Information, education, user involvement	Inhabitants



Table 4: Investment plan - Brno

Smart Solution	Estimated Cost	Funding Source and Scheme	Funding Timeline	Link with other existing initiatives
<b>BN1: Smart Thermal Grid (Geothermal heat-cold storage and heat pumps)</b>	5-10 million EUR	PPP - City of Brno, Brno heating company, Technical Networks Brno, EU-funds	2022	
<b>BN2: Smart district Špitálka connection to 100% renewable energy</b>	0.5 million EUR	City of Brno in cooperation with Brno heating company	2022	
<b>BN3: EV-charging hub and infrastructure</b>	2-3 million EUR	City of Brno and Brno heating company, EU-funds	2022	
<b>BN4: Intelligent building control and end user involvement</b>	500k EUR	Procured to private developer	2022	
<b>BN5: Intelligent LED streetlights</b>	5-10 million EUR	City of Brno and Brno road network company	2023	
<b>BN6: Flexible Green Parking</b>	200k EUR	City of Brno and Brno road network company	2023	
<b>BN7: Integration of near-site RES</b>	2-3 million EUR	City of Brno and Brno heating company, EU-funds	2022	
<b>BN8: OpenData platform</b>	200k EUR	City of Brno	ongoing	data.brno.cz
<b>BN9: Energy management system</b>	300k EUR	City of Brno and Brno heating company, EU-funds	2022	



Table 5: Replication Roadmap – Brno

Smart Solution	Design	Procurement	Deployment	Other Phases
<b>BN1: Smart Thermal Grid (Geothermal heat-cold storage and heat pumps)</b>	2020-2021	2021-2022	2022+	N/A
<b>BN2: Smart district Špitálka connection to 100% renewable energy</b>	2020-2021	2021-2022	2022+	N/A
<b>BN3: EV-charging hub and infrastructure</b>	2020-2021	2021-2022	2022+	N/A
<b>BN4: Intelligent building control and end user involvement</b>	2020-2021	2021-2022	2023+	N/A
<b>BN5: Intelligent LED streetlights</b>	2020-2021	2021-2022	2023+	N/A
<b>BN6: Flexible Green Parking</b>	2020-2021	2021-2022	2023+	N/A
<b>BN7: Integration of near-site RES</b>	2020-2021	2021-2022	2022+	N/A
<b>BN8: OpenData platform</b>	2018	2019	2019	N/A
<b>BN9: Energy management system</b>	2020-2021	2021-2022	2022+	N/A



### 3.4 Other relevant smart solutions, not included in the Replication Plan

#### **Traffic intensity data**

Installation of cameras and sensors to detect the movement of persons, cars, bicycles and other objects in public space. Automatic counting of traffic intensities in various transport modes is no longer a problem for camera systems.

These data can be subsequently used to identify and eliminate troublesome spots, adapt public space or navigate drivers to vacant parking spaces. In the future, they can be linked to the city data portal. When this data are collected, the data will be automatically anonymised and aggregated, making it impossible to distinguish the movement of people at the level of individuals. This will ensure the right to privacy protection.

#### **Energy standard for new buildings**

The construction of the RE: Špitálka smart district is expected to be conducted in a passive standard. Possibilities of construction of energy positive houses will also be verified.

#### **Efficient use of rainwater**

Rainwater will be collected in tanks and subsequently reused for washing and flushing, the water collected in excess will then be soaked in at the site. In addition, it is possible to make the excess water create natural ponds in the locality, which will refresh their surroundings during hot months.

#### **Green roofs**

Roofs with classic coverings (asphalt, plastic, sheet metal, ceramic or concrete tiles) have the disadvantage that all the water that falls on them is usually drained directly into the sewer. Moreover, on hot summer days, these roofs become hot and raise the ambient temperature. A green roof, also called vegetation roof, on the other hand, is able to retain much water and cool down the surroundings by evaporating it. In addition, a green roof consumes CO<sub>2</sub>, filters out harmful substances from the air and provides living space for plants and animals. A vertical garden may work the same way.

#### **BRNOiD – a city that is increasingly online**

The objective of the project is to provide services to citizens in an electronic way and to communicate with them. The project started with the implementation of electronic season tickets for public transport and the creation of an e-shop of city services.

Over 125,000 Brno residents have their electronic account in the BrnoiD e-shop, of which more than 60% are in the verified “full” version. Through BrnoiD, the following 7 areas can be handled: Public transport, Waste, Brnopass tourist card, Library, Brno Zoo, Sports, Participatory City Budget ‘Dáme na vás’.

#### **Brno urban grid**

Brno Urban Grid is an analytical web app allowing quick visualisations of spatial data for the Brno metropolitan area and Brno city. The App uses a square grid with size of 250 m x 250 m per cell which allows it to present data in fixed and comparable units. Different types of data such as points, lines, rasters or other spatial phenomena can be visualised in the grid.

General public as well as urban planners, traffic planners, data analysts and journalists have access to spatial data without having to work with complex geographic information systems.

#### **Participatory city budget ‘Dáme na vás’**

A project of the City of Brno, where citizens can decide on a part of the municipal budget. For 2019, the city allocated an amount of CZK 35 million for it. The involvement of citizens increases every year; in 2018, 14.5 thousand citizens voted. Brno is the first statutory city in the Czech Republic to introduce a participatory budget on a citywide level, thus inspiring other cities not only in the Czech Republic, but also abroad.

‘Dáme na vás’ runs in three main stages:

- Submission of projects – Brno residents come up with ideas to revitalise and improve their city;



- Gathering support – anyone who convinces others of their ideas and gets at least 300 “likes” progresses to the third stage;
- Autumn voting – where residents of the city decide on which projects are to be implemented by the city.

Involvement in participative budget: 26,147 people (in 3 years)

#### **Eco grants – Greenery to the Roofs! and Catch Rainwater!**

Year 2020 will be a second year of two new subsidy programmes announced by City of Brno – Zeleň střechám! [Greenery to the Roofs!] and Nachytej dešťovku! [Catch Rainwater!]. Their common denominator is mainly water saving and management, which is in general a widely discussed topic.

The subsidy programme Greenery to the Roofs! is intended for all those who want to improve the thermal stability of their dwelling and live in a permanently sustainable property. The aim of the subsidy programme is to get an effective solution to the management of rainwater in buildings in the territory of the City of Brno.

The aim of the subsidy programme Catch Rainwater! is to motivate the owners and builders of apartment buildings located in the City of Brno to a sustainable and efficient water management and thus reduce the amount of drinking water taken from surface and underground sources.

### **3.5 Integration and Long-Term Sustainability of the Smart Solutions**

Smart district Špitálka is from the beginning designed as a testbed for innovative technologies and approaches. The intention is to test various smart technologies within the individual technological, environmental and community-based fields, such as smart thermal grid, mobility, sharing economy etc., so that these technologies can be compared, evaluated and then possibly upscaled within the whole city. Data collection and analysis will thus play a crucial role in further deployment. One of the main goals of the smart district will be also education itself and knowledge transfer. The impact of the realization can thus be much greater and can far exceed the Brno region.

A construction of the smart district will be complex and therefore the list of smart solutions and technologies will probably be much larger than stated above containing smart solutions from RUGGEDISED Lighthouse Cities. The final list of smart solutions and approaches planned for the future smart district Špitálka will be part of the final Replication and Investment plan.



## 4. Intermediate Replication Assessment in GDAŃSK

### 4.1 Update of Gdańsk Smart City context

The general aim of introducing foresight into RUGGEDISED project was to prepare Gdańsk for possible futures. To that end, Gdańsk developed scenarios, visions and roadmaps for technology development. The adopted foresight methodology included participatory inclusion and networking of all stakeholders (academia, businesses, industry, NGOs, and public administration representatives) who were invited to participate in the process.

The foresight process consisted of four meetings which were conducted in Gdańsk and coordinated by PICTEC, an independent research and technology organization based in Gdańsk, with support from AIT. The 1st Foresight Forum focused on the identification of STEEP<sup>8</sup> factors seen as the determinants of Gdańsk development in the future. The 2nd Foresight Forum was dedicated to the creation of future scenarios. The 3rd Foresight Forum addressed the creation of a holistic vision which will influence Gdańsk development in the future. Finally, the general objective of the 4th Foresight Forum was to develop a roadmap which organizes innovation priorities to be achieved by the city in a long-term perspective.<sup>9</sup>

The outcomes of all the aforementioned meetings will be taken into account in the preparation of official Gdańsk Operational Programmes beyond 2023. The programmes cover all main domains of the city governance: education, public health and sport, social integration and civic activity, culture and free time, innovation and entrepreneurship, investment attractiveness, infrastructure, mobility and transport, public space. Gdańsk 2030+ development strategy is planned for evaluation. Issues related to climate change will possibly become an important part of operational programmes being part of the strategy.

Gdańsk made also steps towards creating the new vision of Gdańsk as an open, smart city. Experience gathered during the cooperation in RUGGEDISED will help the city to shape the new smart city strategy. Issues like smart grid, e-mobility and new technologies for cities will be addressed in a separated document.

Current changes in the city management structure (2019) have shown that issues covered by the RUGGEDISED project will be gaining importance in Gdańsk. The new deputy mayor's responsibilities include overseeing adaptation of the city to climate change, public transport and ICT. This area of responsibility is quite similar to the scope of the RUGGEDISED project, which makes our cooperation even more important.

Gdańsk is also working on unlocking further potential on open data, since releasing new real-time datasets on public transport was a step forward making public transit more accessible and easier to use. About 20 million HTTP requests are sent monthly to the city open data server, providing external partners with data for applications and websites.

### 4.2 Gdańsk Replication Area

The projects included in the replication plan will be implemented in **Gdańsk Śródmieście ("Downtown")** district, which is the traditional area of Gdańsk where the old town is located. The quarter covers 5.65 km<sup>2</sup> and is populated by 29,630 inhabitants with a population density of approximately 5,244 persons per square kilometre.

<sup>8</sup> Sociological, Technological, Economical, Environmental and Political

<sup>9</sup> Results of this process are reported in D7.2 "Visions and Roadmaps"





**Figure 11: Gdańsk Śródmieście and other city districts (left). Location of Gdańsk Śródmieście district (right).**

Within this district there was a market called “Lastadia”. The name “Lastadia” comes from the Flemish language and means a place for unloading goods. There was a buttery market there as a place for wholesale butter trade, which was mainly delivered by water through the Motława river. In the mid-nineteenth century, the city authorities liquidated the commercial function of the place, in favour of the construction of the Municipal Junior High School. The facade of the building was redesigned by the outstanding Berlin architect Friedrich Schinkel. The whole was built in the neo-Gothic style. After war damage and reconstruction, the building housed a boarding school.

Revitalization works covered two buildings: the former Junior High School and the former dormitory. As part of the investment, the historic buildings have been rebuilt, and the area around them was developed, including pavements, access roads and a car park. Elevators were installed in both buildings; window frames were replaced and foundations were insulated. All load-bearing walls, external and internal, were reinforced with micropiles. The objects have also been insulated from the inside, and their brick facade restored. A historic flat roof has been restored in the building of the former junior high school, and an additional floor was created in the attic. The original cradle ceilings have been preserved, and those located above the hallway and in the corridors have been additionally strengthened. The investment cost is PLN 39 million (ca. 8.6 million EURO), of which PLN 7.8 million is EU funding. After completion of the works, the buildings will be designated for office functions.

An important element of the Lastadia revitalization process was the construction of the “Nowa Lastadi” apartment complex. This complex was founded on the Motława River, at Lastadia Street.

In the area of the Buttery Market, also the concept of traffic calming has been implemented, which has a significant impact on shaping spatial structures and transport systems of urbanized areas. Overground passages are being built, which will significantly contribute to the synergy effect that traffic calming can generate, as well as contribute to reducing the nuisance of urban traffic. A ground pass is being built at Podwale Street, which will connect the quarter of the Buttery Market with the Lower Town and Main Town, forming all together the historic core of Gdańsk.



Figure 12: Lastadia building before the refurbishment



Figure 13: Visualisation – spatial development concept





Figure 14: Lastadia – current status

### 4.3 Lighthouse solutions to be replicated in Gdańsk

In the result of the four foresight fora held in Gdańsk, involved stakeholders have outlined several innovation priorities which have been in detail presented in RUGGEDISED report D7.2. All the priorities are also addressed in section 4.5 of this report given their relevance to the long-term sustainable planning and development of the city.

In relation to the main pillars of the RUGGEDISED project, i.e. energy-efficient construction, e-mobility and ICT solutions for energy management and systems integration, Gdańsk has proposed 7 replication projects. According to both the project schedule and Gdańsk internal investment plan, the projects will be carried out after the preparatory phase executed within RUGGEDISED.

Table 6 introduces Gdańsk replication projects and links them with relevant lighthouse solutions. During workshop sessions organized by RUGGEDISED consortium as well as during the study visits to Umeå, Glasgow and Rotterdam, Gdańsk has already acquired the relevant knowledge and discussed implementation and deployment constraints with partnering Lighthouse Cities.

Replication projects will be eventually included in the “Urban Innovation Agenda” (see section 4.5 below) which is meant as a report summarizing all the conclusions of the foresight process, translating them into a time-framed technology development roadmap and linking them with overall priorities set out by the stakeholders.

Table 6: Gdańsk Smart Solutions to be replicated

Smart Solutions	LHs Smart Solutions
<b>GDA1:</b> RES-ready urban energy management system	<b>R5+R6:</b> DC grid, PV and storage for mobility and smart-charging parking spaces
<b>GDA2:</b> Advanced energy management and integration system for public school building	<b>U1+U3:</b> Smart City connection to 100% renewable energy and geothermal heating/cooling storage and exchange
<b>GDA3:</b> Refurbishment, modernization, and ICT for buildings in Lastadia street	<b>R1:</b> Geothermal heat-cold storage and heat pumps



<b>GDA4:</b> <i>Innovations in water utilities: generic solution for waste-heat recovery; system for energy-optimization of water infrastructure</i>	<b>G1:</b> Heat and cold exchange: Connection of buildings to a district heating network <b>R2+R3:</b> Thermal energy from waste streams and surface water heat-cold collector <b>R4:</b> Thermal energy from asphaltic pavements
<b>GDA5:</b> <i>EV recharging points</i>	<b>R5+R6:</b> DC grid, PV and storage for mobility and smart-charging parking spaces <b>U6:</b> E-charging Hub & charging infrastructure
<b>GDA6:</b> <i>Geographic Information System for heat, electricity, and water network</i>	<b>R9:</b> 3-D city operations model
<b>GDA7:</b> <i>Open-data standards for energy consumption monitoring in public buildings</i>	<b>U8:</b> Smart City open-data decision platform <b>G7:</b> Smart open data Decision Platform & central management system

#### **GDA1: RES-ready urban energy management system**

Two systems are designed in microscale and will be tested in different city areas. The first one, for two historical multifunctional buildings (offices, hotel's rooms, historical exhibitions and conference room), includes water heat pumps and PV panels "solar tree". Electric energy obtained from PV installation will be combined with electricity from the grid. Logical design of the system including Building Management System (BMS) has been based on Rotterdam's solutions for energy consumption balance. The second one has been designed for modern test bed building. The system includes different types of renewable energy sources (i.e. solar, wind) with highly efficient building construction.

#### **GDA2: Advanced energy management and integration system for public school building**

At a first stage of the project, Gdańsk is analyzing energy consumption of the school buildings and all contract terms with energy suppliers. The second stage will be prepared based on Glasgow (G7 Smart open data Decision Platform & central management system) and Umeå (U4 Intelligent building control and Gamification for and user behavioural change in energy consumption) experience.

#### **GDA3: Refurbishment, modernization, and ICT for buildings in Lastadia street**

The project included two phases. The first stage covered refurbishment and construction works of two buildings, connecting to the municipal heating network and installation of energy-efficient elevators with energy-recovery mechanisms have been installed. Both buildings have been equipped with a BMS, which will provide a comprehensive control of room comfort and communication lighting, as well as monitoring - including operation of elevators. Thanks to the modern materials used, the thermal insulation effect is similar to wall insulation with foam polystyrene about 15 cm thick. As result of the work carried out, the reduction of the operating costs of the facilities is expected, while maintaining architectural qualities, as well as reduction of the consumption of electricity and heat and greenhouse gas emissions (according to estimates, around 545.44 t CO<sub>2</sub> per year). The objects have also been insulated from the inside, and their brick facade restored. In the second stage, Gdańsk deployed smart building technologies, including energy management system and building automation in line with the smart home approach. Advanced integration with RES (PV, storage, grid) was also implemented. This project also included energy-storage and proper energy-grid integration solutions.

#### **GDA4: Innovations in water utilities: generic solution for waste-heat recovery; system for energy-optimization of water infrastructure**

Innovative technical and institutional solutions applied during the construction of the AHOY Congress and Exhibition Centre in Rotterdam, related to the use of geothermal energy and heat recovery from wastewater are the basis for generic projects. As a part of cooperation with a local heat distributor, two projects are being prepared. The first one is oriented to the sale of the heat recovered from sewage, at the Ołowianka pumping station premises, for the needs of the philharmonic's air conditioning and heating system. The second one assumes the construction of a connection line supplying excess thermal energy from the WWTP to the municipal heating system.



#### **GDA5: EV recharging points**

Because of current legal regulations, Gdańsk concentrates on small scale, PV based charging points. Mainly, for municipal vehicles.

#### **GDA6: Geographic Information System for heat, electricity, and water network**

Gdańsk has been transforming its Geographic Information System. The goal set for the project team is to deliver a product that supports the management of the city by giving better situational awareness. Better understanding of underground networks was identified as one of the requirements for the new solution. The solution should provide flexibility in building new layers, data analytics, as well as delivering open data to the public. The delivery of the solution is expected for 2021.

#### **GDA7: Open-data standards for energy consumption monitoring in public buildings**

Gdańsk has established an open data policy that supports the process of dataset publications. According to the policy, data should be transparent, accessible without restrictions and machine-readable. The good practice in this area was the opening of the transportation data in Gdańsk. Real-time data on buses and trams is delivered every 60 seconds in JSON format, and almost 20 million HTTP requests are sent to our servers monthly. We believe this practice, related to delivering big amount of real time data, can be a foundation for energy consumption monitoring in public buildings. Currently, we have been researching the possibility of the publication of open data on energy consumption in another project, CRUNCH <sup>10</sup>.

---

<sup>10</sup> Climate Resilient Urban Nexus CHoices: operationalising the Food-Water-Energy Nexus” joint call ‘SUGI, Urban Europe JPI and the Belmont Forum, support EU UMO-2017/25/Z/HS6/03050. More information can be found here: [www.crunch.edu.pl](http://www.crunch.edu.pl)



Table 7: Business model canvas for the Smart solutions included in the Replication Plan – Gdańsk

Smart Solution	Key Partnership	Key Activities	Key Resources	Value Proposition	User Relationships	Key End Users
<b>GDA1:</b> RES-ready urban energy management system	SMEs (ICT sector), PCTEC	Deployment of RES-ready solution that enables (a) energy consumption monitoring and profiling; (b) cost control; (c) controlling of RES energy production and its effectiveness, (d) integration of CPSs (cyber-physical systems), telemetry, and telematics. System provides monitoring features with regard to RES-energy production and storage.	Expertise on IoT architectures, smart technologies offered by local industry	CO2 reduction, reduced energy costs	Promotion of RES, offering interfaces for energy-data exchange with other parties	Citizens of Gdańsk, city authorities and city departments, ICT sector (application/system developers)
<b>GDA2:</b> Advanced energy management and integration system for public school building	GPEC, Schneider-Electric, SMEs	<i>Stage 1</i> - Refurbishment and thermo-modernization of a public school building. <i>Stage 2</i> -implementation of BEMS (building energy management system), employment of RES, energy-storage, electricity-grid integration, ICT platform to integrate CPSs in energy domain. Project will involve SME sector focused on the integration of RES with building-heating systems, smart HVAC solutions adjusted to building exploitation profiles, including air-ionization technologies.	Energy cost and consumption analysis Schneider-Electric solutions	CO2 reduction, reduced energy costs	Demonstration of RES-focused technology to increase the uptake of similar solutions in public buildings	Public education system, citizens, pupils, teaching staff
<b>GDA3:</b> Refurbishment, modernization, and ICT for buildings in Lastadia street	GPEC, GDMEL	<i>Stage 1</i> - Refurbishment and construction works in Lastadia street buildings including connection with urban heating network and installation of energy-efficient elevators with energy-recovery mechanisms. <i>Stage 2</i> - Deployment of smart building technologies, including energy management system and building automation; advanced integration with RES, energy-storage and energy-grid integration.	GPEC heating technology, GDMEL expertise	CO2 reduction, reduced energy costs	Demonstration of state-of-the-art solution in smart building domain, promotion of RES for wider uptake of proposed technological solutions	Citizens (Downtown inhabitants), industry, public administration
<b>GDA4:</b> (A) generic solution for waste-heat recovery	GIWK	TBD	TBD	TBD	TBD	TBD



<b>(B) system for energy-optimization of water infrastructure</b>						
<b>GDA5: EV recharging points</b>	Energa	Deployment of 10 FEV recharging points in Gdańsk Downtown area. The project includes ICT integration and tools for the management of EV recharging points as well as employment of Renewable Energy Sources and complementary energy-storage solutions. One of the objectives is to offer public electric scooters and bicycles that will be charged with the use of EV charging stations.	Low-cost charging devices available on the market	CO2 reduction	Raising proactive attitude of citizens towards low-carbon economy; education of citizens regarding of e-scooters and e-bikes; wider uptake of EV mobility	Citizens (FEV users), public administration
<b>GDA6: Geographic Information System for heat, electricity, and water network</b>	Energa, GPEC, GIWK, SMEs (ICT sector)	Implementation of digital maps and GIS technology for heat, electricity, and water networks together with decision-support and planning tools. It is planned that the energy-related geospatial information will be provided to Gdańsk open-data platform.	ICT department staff, already existing urban GIS datasets	Access to geospatial information for business, citizens, administration; decision and planning support	Training programmes and organizational changes to use GIS for evidence-based decision making in city departments	Citizens, municipal departments, municipal companies, business
<b>GDA7: Open-data standards for energy consumption monitoring in public buildings</b>	SMEs (ICT sector), research and technology organizations	Exposure of public energy-related datasets with the use of ACCUS platform as a gateway to integrate energy systems and provide data to CKAN open-data platform.	ICT department staff, expertise of PICTEC, ACCUS platform, CKAN portal	Access to wide range of public data for monitoring; growth of smart city services	Communication activities to reach stakeholders: citizens and businesses that will exploit the data	Citizens, public administration, ICT sector





Table 8: Investment plan – Gdańsk

Smart Solution	Estimated Cost	Funding Source and Scheme	Funding Timeline	Link with other existing initiatives
<b>GDA1: RES-ready urban energy management system</b>	1 M€	Gdańsk is considering two options: (A) system will be purchased in PPP model; (B) project will be funded by Gdańsk municipal funds, EU funds	2022	
<b>GDA2: Advanced energy management and integration system for public school building</b>	0.8 M€	Interreg Baltic Sea Region 2014-2020 (PV), public-private partnership (EDF, Schneider-Electric), Integrated Territorial Investments (ZIT = 60%), own investment (Gdańsk)	Up to 2021 (refurbishment); beyond 2021 (ICT, integration, RES)	
<b>GDA3: Refurbishment, modernization, and ICT for buildings in Lastadia street</b>	10 M€	Integrated Territorial Investments (ZIT) and Gdańsk Drainage (GD MEL)	Up to 2020 (refurbishment and construction); beyond 2021 (ICT, integration, RES)	
<b>GDA4: (A) generic solution for waste-heat recovery (B) system for energy-optimization of water infrastructure</b>	TBD	Gdańsk Water and Sewers Infrastructure (GIWK), TBD	TBD	
<b>GDA5: FEV recharging points</b>	TBD	Municipal companies, EU-funds, Gdańsk municipality	2021+	
<b>GDA6: Geographic Information System for heat, electricity, and water network</b>	4–5 M€	Municipal companies, EU-funds, Gdańsk municipality	2020+	
<b>GDA7: Open data standards for energy consumption monitoring in public buildings</b>	TBD	Municipal companies, EU-funds, Gdańsk municipality	2020+	





Table 9: Replication Roadmap – Gdańsk

Smart Solution	Design	Procurement	Deployment	Other Phases
<b>GDA1: RES-ready urban energy management system</b>	2019-2021	2021-2022	2023+	N/A
<b>GDA2: Advanced energy management and integration system for public school building</b>	2018 (refurbishment and construction works); 2020 (ICT-RES innovations)	2020 (refurbishment and construction works); 2021 (ICT-RES innovations)	2021 (refurbishment and construction works); 2022+ (ICT-RES innovations)	N/A
<b>GDA3: Refurbishment, modernization, and ICT for buildings in Lastadia street</b>	2016 (refurbishment and construction works); 2020 (ICT-RES innovations)	2017 (refurbishment and construction works); 2021 (ICT-RES innovations)	2018-2019 (refurbishment and construction works); 2022+ (ICT-RES innovations)	N/A
<b>GDA4:</b> (A) generic solution for waste-heat recovery (B) system for energy-optimization of water infrastructure	2020	2021	2022+	N/A
<b>GDA5: FEV recharging points</b>	2020	2021	2022+	N/A
<b>GDA6: Geographic Information System for heat, electricity, and water network</b>	2020	2021	2022+	N/A
<b>GDA7: Open data standards for energy consumption monitoring in public buildings</b>	2020	2021	2022+	N/A



#### 4.4 Other relevant smart solutions, not included in the Replication Plan

**Open-Data Programme** – Open Gdańsk project has been a part of transparency policy in Gdańsk since 2015. Founded on a few pillars (transparency, technology, education), it gives residents of Gdańsk better access to information on the city. One of the most important parts of it, is a daily register of all invoices and expenses paid by the city hall. The city encourages developers to build their own applications on open data. Transportation data is heavily used in many applications, including Google Maps. About 20 million HTTP requests per month are sent to our open data server, which help us build further open data solutions, like opening data on parkings or traffic congestion.

**Gdańsk Contact Center** started in 2018 with the aim to provide residents and tourists with 24/7 information on the city, no matter what channel of communication they choose: phone, mail, Facebook. This is a one stop shop with information on the city hall services and also a place where you can submit a notification about a pothole or a damage to a city infrastructure. A mobile application will be developed to further improve the quality of contacts between residents and the city hall.

**Development of e-services** – city hall aims to offer as many of its services as possible on the internet. In addition to GCC, e-services are developed on ePUAP platform (national platform for services of public sector). City hall procedures are analysed, and – if feasible – new services are offered on ePUAP. A website [oplaty.gdansk.pl](http://oplaty.gdansk.pl) was developed to help residents pay for city hall services over the internet, with no need to pay in cash or via a bank transfer.

**Parking Gets Smart (PGS)** project receives funding from the INTERREG programme. Key objective of the initiative is to demonstrate a multi-modal journey planning solution to increase the **share of public transportation in the modal split**. The main innovation of the adopted approach is its reference to real-time accessible **parking data** to enable travelling to parking lots by private car and then change modality to public transportation. Project is carried out by several municipalities located in the South Baltic Sea region. **PICTEC**, the RTO partnering to Gdańsk in RUGGEDISED project, is responsible for the implementation and deployment of the **parking data hub** and **multi-modal journey planning software components**.

**CRUNCH** is a project funded by H2020 programme of the European Commission. Key activities of the project cover development of a decision support system for food, water and energy management. Innovation activities are supported with in-depth studies of food, water and energy systems understood as one **complex system** subjected to transdisciplinary analysis. Project will demonstrate **urban living labs** based on the principles of **circular economy** across all cities participating in the project: Gdańsk, Taipei, Miami, Glasgow, Portsmouth, Eindhoven, and Upsala.

#### 4.5 Integration and Long-Term Sustainability of the Smart Solutions

The status and future activities related to the integration of smart solutions in Gdańsk have been explained in Table 9 above. Beyond that, however, smart solutions play an essential role in long-term planning of Gdańsk investments concerning the development of smart city capacity.

Gdańsk foresight process was supposed to address innovations essential to preparing the city for future challenges. This objective is supposed to be achieved through the “Urban Innovation Agenda”, a document providing an overview of technological requirements and social settings necessary to face threats such as global warming, food shortage or urban pollutions. To that end, the “Urban Innovation Agenda” is expected to answer the following question: **what R&D&I activities are required to ensure the optimal and long-term functioning of the urban system?**

In order to answer the question, the participatory foresight process has been properly readapted by PICTEC to provide deep insight into the matters of the smart city enabling technologies. PICTEC proposed to identify “**innovation missions**” for Gdańsk in a sense that has been recently advocated by Mariana Mazzucato to the



European Commission concerning the planning and implementation of the 9th Framework Programme called “Horizon Europe”<sup>11</sup>.

As a result, the “Urban Innovation Agenda” and its inherent technology development roadmap will consist of several innovation missions specifying general societal, technological, or environmental challenges which have to be addressed by projects initiated by local actors, including academia, public sector, NGOs, and industry. The technology roadmap will include all seven smart solutions (GDA1-7) as first and paradigmatic investments that will pave the way for further development and innovations in urban management.

These smart solutions proposed by Gdańsk as replication projects and designed through experience and lessons drawn from the initiatives implemented by the Lighthouse Cities in RUGGEDISED project, will be thus taken into account during the preparation of the “Urban Innovation Agenda” programme. Moreover, since the agenda covers activities to be executed by 2050, **smart solutions will provide a foundation for socially responsible and environmentally sustainable development of Gdańsk in the long-term perspective.**

#### POLICY-RELEVANCE OF THE “URBAN INNOVATION AGENDA”

The draft document addressing 8 detailed innovation missions is currently consulted with stakeholders, including all participants of foresight fora held so far in Gdańsk. Further it will be presented to experts from municipal departments and companies for feedback. Eventually, final version will be presented to the Gdańsk City Council for approval and adoption as official strategic document to:

- A. provide additional inputs for future extensions of Gdańsk 2030+ Strategy;
- B. outline priorities for the preparation of Gdańsk operational and investment plans beyond 2021.

The “Urban Innovation Agenda” envisages eight different priorities or innovation missions (below identified as M1-8) of which five are specifically connected with the replication solutions.

The ambition to achieve (M1) **Energy Self-Sufficiency (2050)** will be, among other things, realized through implementation of the solution titled “Innovations in water utilities: generic solution for waste-heat recovery and a system for energy-optimization of water infrastructure” (GDA4). Innovations in sustainable urban mobility suggested in (P2) **Sustainable and Accessible Multimodal Mobility (2040)** as well as in (M2) **Modal Split in Favour of Carbon-Neutral Mobility (2030)** will be partially addressed in the solution covering development and deployment of “EV recharging points” (GDA5). Significant contributions to priorities (M3) **Zero-Emission Gdańsk (2050)** and (M4) **Green Energy Generation and Management (2050)** will be made through the following replication solutions: “RES-ready urban energy management system” (GDA1), “Advanced energy management and integration system for public school building” (GDA2) and “Refurbishment, modernization, and ICT for buildings in Lastadia street” (GDA3). Finally, in order to achieve the grand objective of (M5) **Friendly and Resilient Infrastructure (2030)** Gdańsk will implement “Geographic Information System for heat, electricity, and water network” (GDA6) and “Open-data standards for energy consumption monitoring in public buildings” (GDA7).

The remaining three priorities, i.e. (M6) “Zero-Waste City”, (M7) “Local Food Supply Chain”, and (M8) “Green Infrastructure”, are not directly connected RUGGEDISED replication solutions. Nevertheless, during the participatory foresight process, several milestones and composite projects or technological building blocks were identified. They will be addressed in RUGGEDISED-external initiatives, including H2020 or Horizon Europe projects.

<sup>11</sup> M. Mazzucato, *Mission-Oriented Research & Innovation in the European Union. A problem-solving approach to fuel innovation-led growth*. Luxembourg: Publications Office of the European Union, 2018.



Due to the COVID-19 outbreak and the containment period in Poland, the process of reviewing the “Urban Innovation Agenda”, involving experts from municipal departments, had to be modified timewise. In result, the pillars mentioned above (M1-8) might be subjected to change (e.g. restructuring, merging or detailing) which, however, **will not affect ongoing or planned replication projects (GDA1-7)**.

Innovation missions Sustainable Urban Mobility Plans (SUMP) or Sustainable Energy Action Plans (SEAP). For reference (see table below), both the innovation missions (M1-M8) and Gdańsk RUGGEDISED replication projects (GDA1-7) have been mapped onto sectoral action-types monitored within the Covenant of Mayors for Climate and Energy (CMCE) initiative, i.e. industry, local electricity production, local heat/cold production, municipal buildings equipment, public lighting, residential buildings, tertiary buildings equipment, and transport.

**Table 10: Gdańsk innovation missions mapped onto priorities of CMCE initiative**

Innovation Missions	Gdańsk replication solutions	CMCE priority
<b>(M1) Energy Self-Sufficiency</b>	Innovations in water utilities: generic solution for waste-heat recovery and a system for energy-optimization of water infrastructure (GDA4)	industry, local heat production, municipal buildings equipment, residential buildings, tertiary buildings equipment
<b>(M2) Modal Split in Favour of Carbon-Neutral Mobility</b>	EV recharging points (GDA5)	transport
<b>(M3) Zero-Emission Gdańsk</b>	RES-ready energy management system (GDA1)	local electricity production, local heat and cold production, municipal buildings equipment, residential buildings, tertiary buildings equipment
<b>(M4) Green Energy Generation and Management</b>	Advanced energy management and integration system for public school building (GDA2)	
	Refurbishment, modernization, and ICT for buildings in Lastadia street (GDA3)	
<b>(M5) Friendly and Resilient Infrastructure (2030) Gdańsk will implement “</b>	Geographic Information System for heat, electricity, and water network (GDA6)	industry, local electricity production, local heat and cold production, municipal buildings equipment, residential buildings, tertiary buildings equipment
	Open-data standards for energy consumption monitoring in public buildings (GDA7)	
<b>(M6) Zero-Waste City</b>	not linked directly to RUGGEDISED replication plans of Gdańsk	relevance analysis outside of RUGGEDISED scope
<b>(M7) Local Food Supply Chain</b>		
<b>(M8) Green Infrastructure</b>		



## 5. Intermediate Replication Assessment in PARMA

### 5.1 Update of Parma Smart City context

The City of Parma is a virtuous example of high quality of life, well-being, social, cultural and environmental quality. A unique public and private partnership model, a strong bond with the academic and research world, a close relationship between the green economy and urban regeneration, social inclusion and cultural production. Parma is also characterized by a top-notch cultural youth-friendly system; a city with refined event management capabilities at a national and international level. The uniqueness of the City of Parma also lies in its ability to establish an open dialogue with its local community.

Parma pursues the goal to become a green city, based on the most crucial aspects of environmental quality, efficiency and circular use of resources, mitigation and adaptation to climate change, enhancing the economic and social implications of a better quality of life and well-being at the urban level generated by a green economy. As Parma chose a citizen-focused concept of smart city, becoming one in this context means developing a strategically thought out smart city plan that can help solve and overcome the main challenges modern cities are facing, such as the pressure that growing populations have on built and natural ecosystems like infrastructures and housing, mobility flows and congestion, climate change, air and water pollution, being, at the same time, stressed by , , rapidly changing technology and competitiveness challenges.

The City of Parma embraced the challenge of becoming a smart city within RUGGEDISED and launched the PARMA FUTURO SMART initiative aimed at fostering the governance model, developing urban innovations that will benefit citizens and creating a permanent cooperation platform with the main stakeholders to co-create and co-manage the city of the next decades. PARMA FUTURO SMART is the tool the City of Parma identified to manage the foresight process and defining together with industry, research and citizens (represented with associations and NGOs) what the city really needs, what the citizens want, and how that technology would benefit and impact our community. The main goal is to find common solutions to challenges, and then find investments so that those solutions can be executed on the ground.

Since its launch in November 2017 PARMA FUTURO SMART attracted several dozens of stakeholders in the definition of a smart city vision to 2050 and a replication and investment plan to 2030 that will be included in the wider Parma Smart City Plan 2030. The process so far included 3 big events:

- **Kick off conference** - 30<sup>th</sup> November 2017, to officially launch *Parma Futuro Smart* and start defining a detailed plan with a list of concrete actions that must be undertaken and implemented in Parma by 2030;
- **Scenario workshop** - 6<sup>th</sup> April 2018, developing a multi-stakeholder comparison for the co-definition of reference scenarios for Parma Smart City (2030) as the starting point for the creation of a common vision for Parma Smart City, and to support the definition of the Action Plan;
- **Vision Forum** - 9<sup>th</sup> November 2018, with the aim to consolidate the 2050 Vision of Parma and to start building the Parma 2030 Roadmap and culminated in the subscription of a Smart City Protocol on the 28<sup>th</sup> of May 2019 with around 40 signatories among the most important enterprises, research centres, associations and public authorities of the territory.

Besides the measures selected included in the replication plan (see section 5.3), the discussion with the stakeholders led to include other topics in the smart city plan that are relevant for the development of a smart ecosystem:

- Development of PEDs, Positive Energy Districts;
- Industry 4.0, to bring innovation and decarbonisation in the productive sector;
- Sustain start-up and green economy for the creation of integrated measures on jobs, sustainability and innovation.

The process for the definition of the Parma Smart City Plan, that will be drafted by the end of 2020, includes two more meetings with selected stakeholders to define the actions, key actors, investments and timeframe.





Thanks also to the participative process of PARMA FUTURO SMART, during the past 2 years Parma set the goals for the next decade. The Administration decided to accelerate its pace to fully become a green city and the Parma Smart City Plan will be totally consistent with these goals and will help to reach them. In February 2019, it signed the "Covenant of Mayors for Climate and Energy". Through the Sustainable Energy and Climate Action Plan (SECAP), currently under draft and to be completed in 2020, Parma is committed to reducing CO<sub>2</sub> emissions (and possibly other greenhouse gases) by at least 45% by 2030 and become carbon neutral in 2050. To respond to the worldwide mobilization of youth, in July 2019, the City Council declared the Climate and Environmental emergency engaging the Mayor and the City Board to take action in the following 6 months to reinforce further the GHG reductions, renewable energy use, climate adaptation measures through the elaboration of a dedicated plan and energy efficiency measure in urban planning, mobility and buildings sectors. In September 2019, the City submitted its application to the ECGA (European Green Capital Award), endorsing the engagement of the City to become a green city with bold sustainable actions carried out in cooperation with the private sector.

## 5.2 Parma Replication Area

More than one Replication area has been identified: some actions will be replicated at City level, and others in the University Campus, which is the scientific centre of the University of Parma. It covers an area of about 77 hectares located in the south of the city, with several buildings for teaching and scientific research.

The heated volume is about 300,000 m<sup>3</sup> and every day more than 7,000 people live, study and work there. The Campus energy consumptions are mainly due to building heating and cooling, domestic hot water, indoor and outdoor lighting. All buildings are currently served by a by a district heating/cooling system<sup>12</sup>, which is connected to a thermal power plant (based on methane gas boilers), and by cooling machines for air conditioning.

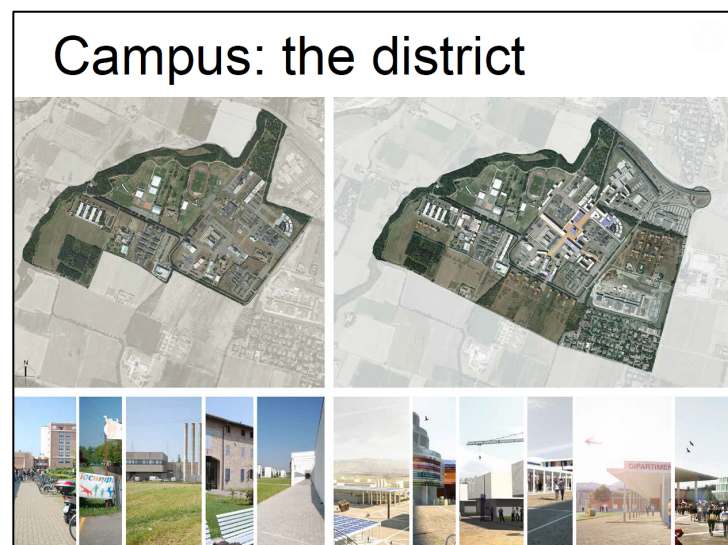


Figure 15: Parma University Campus

## 5.3 Lighthouse solutions to be replicated in Parma

Starting from the solutions provided by the Lighthouse Cities, the City of Parma is going to implement several actions, as described below. These actions could change during the replication process.

<sup>12</sup> The “hardware” is owned by the University, but the system is managed by a private utility. There’s a public procurement to be published soon, now stopped due to the COVID pandemic.



Table 11: Parma Smart Solutions to be replicated

Smart Solutions	LHs Smart Solutions
<b>P1:</b> New CHCP plant for district heating connection	<b>G1:</b> Heat and cold exchange. Connection of buildings to a district heating network
<b>P2:</b> Energy management system	<b>R8:</b> Energy Management System <b>R13:</b> Smart Waste Management
<b>P3:</b> Solar PV and supply of energy to EV charging infrastructure	<b>G5:</b> EV Charging hub in city centre car park
<b>P4:</b> Intelligent building control	<b>U4:</b> Intelligent building control and end user involvement
<b>P5:</b> Local Public Transport	<b>R7:</b> Optimising the E-bus fleet of RET
<b>P6:</b> Mobility Planning	<b>U6:</b> E-charging Hub & charging infrastructure <b>G5:</b> EV Charging hub in city centre car park
<b>P7:</b> Smart Waste Management	<b>R13:</b> Smart Waste Management
<b>P8:</b> Creation of a query based geo-spatial Data Based Decision Platform	<b>R9:</b> 3-D City operations model <b>G7:</b> Smart open data Decision Platform/central management system <b>U8:</b> Smart Open Data City Decision Platform
<b>P9:</b> Smart Open Data City Decision platform	<b>R9:</b> 3-D City operations model <b>G7:</b> Smart open data Decision Platform/central management system <b>U8:</b> Smart Open Data City Decision Platform
<b>P10:</b> Smart public lighting	<b>G6:</b> Intelligent LED street lights with integrated EV charging functionality, wireless communications network, and air pollution monitors <b>G8:</b> Implementation of demand-side management technology in street lighting <b>R11:</b> Efficient and intelligent street lighting

**P1: New CHCP plant for district heating connection**

New plants for distributed energy generation will be implemented in the thermal power station serving the district heating and cooling of the University Campus: in order to optimize heating loads, a thermal storage will be also implemented. A public procurement has been developed and prepared, but it has not been published yet, due to the COVID situation.

**P2: Energy management system**

Energy demand and supply information of buildings will be provided by using smart meters and the BIM-model. These data together with the introduction of the energy management system will ensure an efficient energy-exchange between the assets. In every building of the University of Parma located at the Campus, an energy management system will be implemented, in order to measure temperature, pressure, energy flows.

**P3: Solar PV and supply of energy to EV charging infrastructure**

In the University Campus a 700 kWp plant has been installed, as well as EV chargers. The idea is to evaluate the possibility of using the surplus electric energy from PV systems to serve storage batteries to EV chargers.

**P4: Intelligent building control**





In some buildings of the University of Parma, an intelligent control system for the internal climate will be installed: a continuous monitoring system will allow the optimization of the indoor climate depending on the weather and uses, and then energy consumptions will be reduced. To encourage users to save energy, digital real-time information, statistics on climate impact and suggestions to put the homes in “saving mode” will be showed to the end users. The Municipality worked on the EFFICITY project, which is strictly linked to these topics.

#### **P5: Local Public Transport**

The solution involves the implementation and renewal of the management software of two services, called "Prontobus" (a bus service ‘on demand’) and the school bus service called "Happy Bus": both are operated by the local LPT company (TEP). Information about traffic and mobility will be collected in order to optimize these services. Expected results are an increase of users per year up to 60,000 (Prontobus) and 1,600 (Happy Bus).

Moreover, the local public transport company is working on an EU project called LOW-CARB, financed by the INTERREG program: the aim is to serve a whole urban bus line (number 8) with e-buses. In the last station of this line very fast e-charging points (plug in) will be installed and could be used also by cars. This last station could become a very important intermodal exchange point.

Today, the city has 5 lines served by trolleybuses: the LPT company is also working on optimizing the bus fleet, in order to implement 85 new and low emissions buses (under evaluation, but they could be 7 electric/bimodal and 78 natural gas vehicles/e-buses).

#### **P6: Mobility Planning**

In order to optimize mobility aspects in Parma, several activities are foreseen. The first one is to develop a new smart control unit to manage urban traffic in order to monitor traffic flows through data from mobile companies, pilot projects with start-ups, cameras and existing detection loops, to send information on variable message boards, to allow a real-time traffic lights diagnosis and to improve traffic control cameras and electronic access control gates in restricted areas or bus reserved lanes.

This will help to plan a sustainable mobility strategy, also towards e-mobility. An e-mobility plan is foreseen in order to realize additional hubs for e-vehicle charging suitable for car sharing, bike sharing, electric cars, electric bikes powered by RES. These e-charging hubs will be super-fast and placed at special spots, developing business cases for concentrated deployment of EV chargers, connecting the charging hubs to RES and battery storages.

#### **P7: Smart Waste Management**

The Municipality has been working a lot on waste strategies in the last years: a 78% share of recycling has been achieved. Now, the City is going to work on several aspects through different actions with the aim to further improve what is already existing.

In the last years the amount of not recyclable waste produced by every user has been measured with the help of an RFID system, both on the trash bins and the trash bags, read by an antenna on the garbage truck. That led to a correct fee for the users. Regarding the aspect of plastic bottles and tin cans, compact containers for the collection of empty plastic bottles and empty tin cans are used also as Wi-Fi point. The collectors have been used since last year, and their number is growing at city level. The use of these machines helps to reduce littering and the amount of total waste in the street waste bin.

In order to improve the waste management, a first action will consist of a monitoring system of the filling degree and collection vehicles’ route optimization. This solution will be applied on the collection of the glass banks in the Campus and in the nearby district (80 glass banks) as a pilot phase and could be extended to the whole city (1,300 glass banks).

Furthermore, in order to support the door to door waste collection system, the Municipality is going to provide some Smart Mini Eco stations. These structures are equipped with nozzles for different types of waste (plastic, aluminium and Tetra Pak packaging) and can be electronically opened with the health card associated to the user. The goal is to make the recycling system more flexible and while providing some smart services at the same time.

All stations are equipped with surveillance systems in order to avoid improper abandonment of waste and vandalism. These systems are not only fixed collection points but structures with integrated functions that involve aspects related to culture, promotion of the territory and also safety (Figure 16).



Figure 16: Smart Mini Eco Stations (rendering)

### P8: Creation of a query based geo-spatial Data Based Decision Platform

An integrated system of data monitoring and analysis will be assembled and configured from multiple systems: this will produce multiple analyses and "accommodate" all modelling calculations. In addition, it will provide users with a decision support tool for environment & energy planning and control. The system will be set up so that it can be used for future developments of different types of data, and it can integrate new functional modules of the mobility-environment system of Parma.

#### 3D RTE Parma Information Management

The Civil Protection Department of the Municipality of Parma has developed a geo-cartographic software for planning, managing emergencies and for supporting decisions during critical phases. This SW is linked to the Geographic Information System (GIS) of the Municipality, and uses a GPS system and a digital modelling. It contains different kinds of data, ranging from existing infrastructures to elderly people served by the municipal social services. The geo-cartographic core is the basis on which a whole series of services and functionalities can be implemented. The purpose is to share all the information already held by the Municipality, that now remains in different departments. Moreover, this will ensure the full operation in terms of better knowledge, integration and protection: the management and the planning of the City and its resilience during critical events will be improved.

Also, through unmanned aerial vehicle, the idea is to implement it with new data (e.g. buildings, new infrastructures, 3D ground modelling etc..) and with simulators of fire or flood propagation.

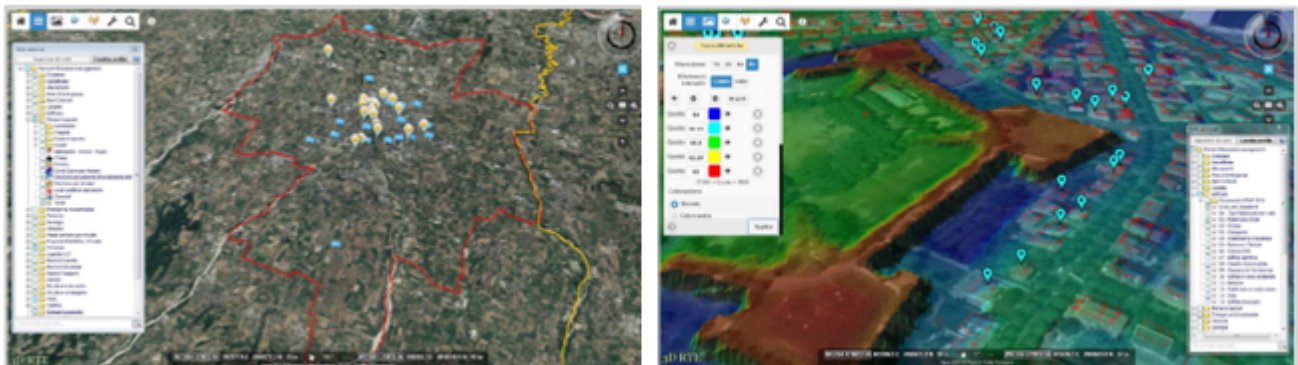


Figure 17: 3D RTE Parma Information Management (screenshots)

### P9: Smart Open Data City Decision platform

The solution will complement P8, by integrating collected data from other areas such as buildings, mobile devices and other "objects" that communicate with the territory.

The Municipality of Parma has already started creating an open data platform: the open data project is currently in a preliminary phase. The ultimate goal is to respond to the needs of citizens, associations and local businesses, making available several kinds of information. The Open Data project of the Municipality of Parma is part of a national strategy called Digital Agenda.



This Open Data platform could be then integrated, by creating a specific IT infrastructure dedicated to sharing a 3D RTE geo-cartographic scenario with citizens. Through a simple free software every citizen will be able to view all the territorial information the institution will open, also creating an app dedicated to that.

#### **P10: Smart public lighting**

In December 2017 the refurbishment plan of the public lighting network of the City of Parma was approved.

The urban lighting redevelopment plan involves a radical modernization of the city network, replacing the old systems with new LED ones, enabling a smart management, installing new surveillance and traffic control cameras and new sensors.

Out of a total of 36,613 lighting points, approximately 24,000 new LED lighting systems will be installed and the network will be extended by 3.5 km.

The project will end in 2035, with a total investment of 29 million € (EPC contract signed by the Municipality).

Thanks to this intervention, it will be possible to:

- reduce pollution by 65%, from an average annual consumption from about 21 million kWh to around 7 million kWh (equivalent to 4,670 tons of CO<sub>2</sub>);
- reduce energy costs for public lighting, with an annual saving on the energy bill of around 2.6 million €;
- reduce light pollution;
- integrate new smart city systems, such as intelligent cameras in order to increase urban security and improve a sustainable mobility, new sensors to monitor the environment (e.g. hydrometric sensors for underpass structures) and enable Wi-Fi connection.





Table 12: Business model canvas for the Smart solutions included in the Replication Plan - Parma

Smart Solution	Key Partnership	Key Activities	Key Resources	Value Proposition	User Relationships	Key End Users
<b>P1: New CHCP plant for district heating connection</b>	University of Parma, Campus heat management company	Business model, public procurement	Technical office, energy department	New efficient plant, CO <sub>2</sub> reduction	Information, formation to students and citizens	Students, all citizens
<b>P2: Energy management system</b>	University of Parma	Implementation of a monitoring system	Sensors, dedicated system	Knowledge, awareness, CO <sub>2</sub> reduction	Information, formation to students and technical office, heat management company	Technical office, students, all citizens
<b>P3: Solar PV and supply of energy to EV charging infrastructure</b>	University of Parma	Implementation of a storage system, business model	E-storage system	Pilot project on an e-storage system that could be replicated in other parts of the city	Knowledge, awareness	All citizens
<b>P4: Intelligent building control</b>	University of Parma	Implementation of a monitoring system	Sensors, dedicated system	Knowledge, awareness, CO <sub>2</sub> reduction	Information, formation to students and technical office, heat management company	Students, all citizens
<b>P5: Local Public Transport</b>	TEP, start-up, private companies	Business model, LPT e-mobility plan	New buses, dedicated SW, infrastructure	Better LPT services, CO <sub>2</sub> reduction	Knowledge, awareness	All citizens
<b>P6: Mobility Planning</b>	Enel, IREN, private companies	Traffic monitor, mobility plan, e-mobility plan	Dedicated SW, infrastructure	Sustainable mobility, CO <sub>2</sub> reduction	Knowledge, awareness	All citizens
<b>P7: Smart Waste Management</b>	IREN Spa, Begeo srl	RFID Tracked Bins, Collect PVC bottles and tin cans, Recycle	RFID Chip, reader, Smart interaction with user, Wi-Fi, Smart card, reader, infrared sensor	Great increase in recycling, awareness, complete the door-to-door waste harvest	Information, formation and details, Prize for each use, Free to use, 24 hours per day, in public parking spots	All citizens, tourists
<b>P8: Creation of a query based geo-</b>	Municipal sector (Mobility, Energy, IT,	•Assessment of the local context, then identifying the	•Human: people from the different stakeholders for	Better control of the territory,	Knowledge is awareness, a citizen	All citizens



<b>spatial Data Based Decision Platform</b>	GIS, Environment, Maintenance, Civil Protection, Local Police) Infomobility Parma Infrastrutture Utility (Iren, Siram) City Green Light Arpae TEP Parking owners/managers Logistics operator	needs •General agreement on data property (identify legal challenges), sharing + shared management •Analysis of timing, risks, barriers •Development of a business model •Public procurement/tender building of the infrastructure + sensors •Building of SW/analysis algorithm/different access levels •GDPR/security issues. •Evaluation on engaging other stakeholders	building, developing and managing the platform •Financial: public/private funds, EU funds •Physical: building /space, HW, SW, sensors and infrastructure •Intellectual: SW development, connection among sensors, data science, response to city users	advanced capacity of analysis of possible problems, quicker and more efficient rescue interventions, greater sharing and participation in the management of the city, greater resilience to disasters.	who knows his territory, lives it consciously and, if needed, knows how to cope with the risks. The system foresees, in addition to the sharing from the geo-cartographic data, an important data collection section (mail and mobile of individual citizens, companies, schools, sensitive structures, etc...) to facilitate a quick and certain contact in case of danger or Important communications from the authorities.	
<b>P9: Smart Open Data City Decision platform</b>	Lepida Spa, ItCity Spa	Collect datasets from different internal resources, standardize datasets, publish dataset on Open Data Portal, publish datasets from external resources	Data Owner in every office of the municipality	To give a web platform where to find different data to collect and to link: this will help to take more targeted decisions	Citizens can propose data or topics to be added to the portal	Every citizen, research and educational system, industry
<b>P10: Smart public lighting</b>	Municipal sector (Mobility, Energy, IT, GIS, Environment, Maintenance, Civil Protection, Local Police) Infomobility Utility (Iren, Siram) City Green Light	•Assessment of the local context, then identifying the needs •General agreement on data sharing + shared management •Analysis of timing, risks, barriers	•Human: people from the different stakeholders •Financial: public/private funds, EU funds •Physical: infrastructure, sensors, communication system, EV chargers •Intellectual: integration, data	4,670 tons of CO <sub>2</sub> reduction, annual savings of 2.6 M€, get real time data for a better planning and managing of the city	Knowledge, awareness	Every citizen





	Arpae TEP Parking owners/managers Logistics operator	<ul style="list-style-type: none"> <li>•Developing a business model Integration EV chargers/columns</li> <li>•Placing sensors (which, where, how many) <ul style="list-style-type: none"> <li>•Developing a communication system</li> </ul> </li> <li>•Developing the integration to the platform</li> <li>•Evaluation on engaging other stakeholders</li> </ul>	science	Improve services and e-services		
--	--	--	---------	---------------------------------	--	--

Table 13: Investment plan - Parma

Smart Solution	Estimated Cost	Funding Source and Scheme	Funding Timeline	Link with other existing initiatives
<b>P1: New CHCP plant for district heating connection</b>	1.5 M€	Public, Private, PP ERDF	2020	
<b>P2: Energy management system</b>	150 k€	Public, Private, PP ERDF	2020	EFFICITY
<b>P3: Solar PV and supply of energy to EV charging infrastructure</b>	1 M€	Public, Private, PP ERDF	2021	
<b>P4: Intelligent building control</b>	250 k€	Public, Private, PP ERDF	2020	EFFICITY
<b>P5: Local Public Transport</b>	34 M€	Public, Private, PP ERDF	2020/2021	LOW-CARB
<b>P6: Mobility Planning</b>	300 k€	Public, Private, PP ERDF	2020	
<b>P7: Smart Waste Management</b>	400 k€	Public	2018/2020	



<b>P8: Creation of a query based geo-spatial Data Based Decision Platform</b>	400 k€	Public, European funds	2022	Data Warehouse Municipality of Parma
<b>P9: Smart Open Data City Decision platform</b>	65 k€	Public	2021	
<b>P10: Smart public lighting</b>	29 M€	Municipal funds	2017-20135	New traffic control unit, data platform

Table 14: Replication Roadmap – Parma

Smart Solution	Design	Procurement	Deployment	Other phases
<b>P1: New CHCP plant for district heating connection</b>	2019	2020		
<b>P2: Energy management system</b>	2019	2020		
<b>P3: Solar PV and supply of energy to EV charging infrastructure</b>	2020	2021		
<b>P4: Intelligent building control</b>	2019	2020		
<b>P5: Local Public Transport</b>	2019	2020/2021		
<b>P6: Mobility Planning</b>	2020	2021		
<b>P7: Smart Waste Management</b>	2018	Ongoing	10 years	
<b>P8: Creation of a query based geo-spatial Data Based Decision Platform</b>	2020	2021		
<b>P9: Smart Open Data City Decision platform</b>	2020	2021		
<b>P10: Smart public lighting</b>	EPC contract	Done in 2017	The contract will end in 2035	2019 end of replacing systems



## 5.4 Other relevant smart solutions, not included in the Replication Plan

Beyond the replication of the smart solutions described above, Parma is going to implement, during the five-year period of the project, many other relevant solutions which are preliminary to the development of the Replication Plan. These solutions are in particular:

### **Refurbishment of building blocks**

The City of Parma is the coordinator of the FEASIBLE project (EU funded – H2020), with the aim of upgrading the energy efficiency of residential and public buildings. The target audience of the project are owners and renters of apartments pertaining to a same condominium as well as owners/managers of public living-assisted places. With FEASIBLE, the City of Parma aims to work with 100 condominiums with the ultimate goal of starting the renovation of at least 40 buildings.

### **Expansion of the district heating network**

The City of Parma is served by an extensive district heating network, powered by a waste to energy plant. At City level, the heated volume is about 6 million cubic meters. Considering the CO<sub>2</sub> reduction goal of 5.435 tons/year, together with the private Utility managing the network, the City will evaluate to extend the system, in order to reach SEAP and SECAP objectives. Parma has also worked with the local Utility on a feasibility project for improving a secondary district heating network, considering the possibility to interconnect several buildings and to optimize energy flows.

### **Harmonizing SEAP and SUMP**

The City has been working on the EU SIMPLA project for 2 years (2017-2019), with the aim of harmonizing SEAP and SUMP. Thanks to this work, many actions of the SUMP have been included in the SEAP/SECAP.

## 5.5 Integration and Long-Term Sustainability of the Smart Solutions

The RUGGEDISED smart solutions that the City of Parma will adopt aim at creating a smart district with an integrated management of energy efficiency, sustainable mobility and ICT. The package of smart solutions has been selected to meet the ambition of Parma to become a smart city in a few years. The guiding principles in setting this package have been: the feasibility of the solutions in the local context of Parma, the up-scaling potential of solutions in other city districts and the integration of the solutions to overcome the usual sectorial approach. The replication plan will enhance the integration between energy efficiency, renewable energies, energy storage, monitoring consumptions, sustainable mobility and data flows. The solutions can be connected to existing or already planned projects and integrated into the city's existing plans and in plans that are being revised or prepared (SEAP, SUMP, SECAP, etc.), which will support their sustainability.



## 6. Evaluation assessment of the Replication process in Fellow Cities

In this chapter, the assessment of activities in the Fellow Cities is provided.

- In the first paragraph (6.1) a general overview of the expected activities and impacts is reported along with an update on the current status.
- In the subsequent paragraphs (6.2 and 6.3) a specific analysis of baseline and ex-ante expectations of the RUGGEDISED Fellow Cities is reported. This assessment was done at the beginning of the project with the aim to define the methodology and set up the indicators needed to monitor the effects of the local processes of foresight as well as the impacts that the knowledge transfer and capacity building process will have on the three Fellow Cities. A second and final assessment will be done at the end of the project, when the final results will be compared with the initial expectations.

### 6.1 Assessment of activities in the Fellow Cities

The evaluation process in the Fellow Cities assesses activities in Parma, Gdańsk and Brno to improve cooperation and capacity within RUGGEDISED and to enable an environment for the replication of solutions implemented by Lighthouse Cities. Specifically, two aspects will be evaluated:

- The **improvement of the level of cooperation** among the relevant stakeholders taking part in the local smart city projects. These indicators are measured in terms of **number of meetings of the local governing groups** and **number of estimated participants to each meeting**. All three cities have already running forms of governance that will be enhanced in RUGGEDISED through knowledge exchange of local practice and adoption of co-creation approaches. Accordingly, the 3 Fellow Cities estimate an **improvement of the level of satisfaction with the local cooperative processes**. This indicator is a local expert estimation measured as an increase percentage over the **2016 baseline** (See Paragraph 6.2).
- The **improvement of the level of capacity necessary to effectively replicate the selected smart solutions** after the end of the project. This dimension is assessed through the delivery of a number of key planning documents (the Smart City Vision, the Roadmap to Implementation, and the Replication and investment Plan) as well as the **acquisition of organisational and technical competence transferred from the Lighthouse Cities and necessary for the actual smart solutions deployment**. Capacity improvement is a local expert estimation measured as an increase percentage over the **2016 baseline** (See methodology in Paragraph 6.3).

The table below shows the list of activity indicators to be monitored along the overall duration of the project. In the proposal phase some targets have been identified, but within this new version some of them have been revised. An update on the status of the work is reported in the last column.



Table 15: Evaluation framework for the Fellow Cities

Expected result	Objectives	Outcomes	Expected Outputs	Current Status (April 2020)
Improvement of the cooperation	Create physical and virtual environments for stakeholder and community interaction and involvement in the follower cities	Local smart city cooperation (institutions, utilities, industries, businesses, civil society)	<ul style="list-style-type: none"> <li>3 running and permanent local Governing Groups</li> <li>Governance Steering Groups meetings (Core Team+ Expert Group + Decision Group):               <ul style="list-style-type: none"> <li>10 in Brno - each attended by 15 individual participants</li> <li>10 in Gdańsk - each attended by 12 individual participants in Gdańsk</li> <li>12 in Parma - each attended by 15 individual participants in Parma</li> </ul> </li> <li>Improvement in the level of local cooperation<sup>13</sup> (calculated in % improvement over 2016 baseline).               <ul style="list-style-type: none"> <li>Brno: + 73%</li> <li>Gdańsk: +51%</li> <li>Parma: + 125%</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>3 Local Governing Groups established</li> <li>Continuous meetings organized whenever appropriate and necessary</li> </ul>
				to be checked at the end of the project according to the methodology described in the next paragraphs
Improvement of the capacity	Define the vision and the path to smart solutions replication	Long-term and tactic planning	<ul style="list-style-type: none"> <li>Adoption of 1 strategic Vision and 1 Roadmap to implementation in Brno</li> <li>Adoption of 1 strategic Vision and 1 Roadmap to implementation in Gdańsk</li> <li>Adoption of 1 strategic Vision and 1 Roadmap to implementation in Parma</li> </ul>	<ul style="list-style-type: none"> <li>Brno: Vision + Roadmap developed</li> <li>Gdańsk: Vision + Roadmap developed</li> <li>Parma: Vision ready; Roadmap ongoing</li> </ul>
	Acquire the necessary competences to replicate the smart solutions	Local and inter-project capacity building	<ul style="list-style-type: none"> <li>6 Replication Workshops, each attended by 4 experts in Brno, 4 in Gdańsk, and 4 in Parma</li> <li>4 Governance Workshops, each attended by:               <ul style="list-style-type: none"> <li>20 individual participants in Brno;</li> <li>20 individual participants in Gdańsk</li> <li>20 individual participants in Parma</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>4 Replication Workshops organized so far. Other 2 will be held in the next months</li> </ul> <p>The Foresight process was structured into 4 Participatory WS: Kick-off; Vision; Scenarios and Roadmap</p> <ul style="list-style-type: none"> <li>Brno: 5 Governance WS held with more than 20 participants</li> <li>Gdańsk: 4 Governance WS held with more than 20 participants</li> </ul>

<sup>13</sup> The percentages are calculated according to the methodology of Evaluation in Fellow Cities reported in the following paragraphs





Expected result	Objectives	Outcomes	Expected Outputs	Current Status (April 2020)
			<ul style="list-style-type: none"> <li>3 intensive Study Tours, each attended by 4 experts from Brno, 4 from Gdańsk and 4 from Parma</li> </ul>	- Parma: 3 Governance WS held with more than 20 participants - <b>ongoing</b> Each Fellow City has decided to organise its own study tours independently from the others: <ul style="list-style-type: none"> <li>Brno: 2 study tours (Glasgow and Rotterdam)</li> <li>Gdańsk: 2 study tours (Rotterdam and Umeå)</li> <li>Parma: plan to go to Rotterdam</li> </ul> This activity is ongoing and other study visits will be organised in the next months by the three Fellow Cities
			<ul style="list-style-type: none"> <li>1 international Study Tour attended by 4 experts from Brno, 4 from Gdańsk and 4 from Parma (tbc)</li> </ul>	tbc
			<ul style="list-style-type: none"> <li>Overall perception of improved smart city capacity thanks to project activities (calculated in % improvement over 2016 baseline):                             <ul style="list-style-type: none"> <li>Brno: 20%</li> <li>Gdańsk: 20%</li> <li>Parma: 40%</li> </ul> </li> </ul>	to be checked at the end of the project according to the methodology described in the next paragraphs
Deliver Replication and Investment Plans	Detailed planning of smart solutions replication	<ul style="list-style-type: none"> <li>Adoption of 1 Replication and Investment Plan in Brno</li> <li>Adoption of 1 Replication and Investment Plan in Gdańsk</li> <li>Adoption of 1 Replication and Investment Plan in Parma</li> </ul>		work in progress



## 6.2 Overall Satisfaction with the level of Cooperation: methodology and ex-ante assessment

Generally speaking, “*cooperation*” can be interpreted as working together with a common purpose and toward a common benefit.

One of the key requirements for becoming a Smart City is to set up an effective and permanent city governance structure, that involve all city relevant departments (Energy, Mobility, ICT, Waste management, etc.). The aim of this governance group is to open and maintain a communication channel across the different sectors, that would otherwise continue working with their silos-thinking approach and thus hinder a strategic, integrated and smart way of planning. It is within this context that the term “**cooperation**” gains its smart city prominence.

In RUGGEDISED, a key aspect to be monitored in the Fellow Cities is the “satisfaction with the level of cooperation” (see Table 15). To best assess and quantify this qualitative indicator, it was assumed the work developed by the project [CITYKeys](#), where a complete and exhaustive set of KPIs has been developed and validated to allow for a common and consistent monitoring and comparison of smart city solutions across European cities.

Therefore, from the CITYKeys list, the following six indicators have been identified and adapted to the specific needs of our work:

- 1) Leadership
- 2) City Departments Involvement
- 3) Balanced Project Team
- 4) Clear Division of Responsibility
- 5) Stakeholders Involvement
- 6) Interoperability

The **level of cooperation within the city's governance** can be quantified by **combining these 6 factors**. The more these 6 factors are successful, the higher the cooperation level will be.

The assessment of these indicators has been done through ad-hoc questionnaires circulated by ISINNOVA to the members of the Core Team, Expert Group and Decisions Group, as well as to other relevant stakeholders involved in the joint execution of the replication plans in Brno, Gdańsk and Parma. This assessment is to be done in **two specific moments in time**:

- At the beginning of the project, in order to build a **baseline** and an **ex-ante evaluation of city expectations** (results of this assessment are reported within this report)
- At the end of the project (by M60), when an **ex-post evaluation** and a comparison with the ex-ante expectations will be done. This will in turn allow to identify the main barriers and success drivers to improve cooperation.

### 6.2.1 Questionnaire on Cooperation: baseline and expectations

Within this paragraph, the structure of the questionnaire is shortly presented (the full version is in Annex 1). It is made up of 6 blocks of multiple-choice questions based on a Likert scale (1-5). The answers are referred to the beginning of the RUGGEDISED project, when activities had not yet started.

The tables below provide the general definition of the six components that constitute the cooperation level and report the specific questions addressed to the Fellow Cities in the questionnaires.



## 1. LEADERSHIP<sup>14</sup>

Definition	Questions
<p>Many of the current examples of smart city projects in Europe appear to have required significant leadership from certain actors who have the determination and desire to create something new and challenging, and for such a project to succeed.</p> <p>Leadership at the individual or organizational level is critical in shaping sustainable urban development (UN-Habitat 2011, Romero-Lankao 2012).</p> <p>Aspects of leadership include framing, bridging, lobbying and persistency:</p> <ul style="list-style-type: none"> <li>• Framing: explaining why this smart city approach is better than the 'old' way of doing things.</li> <li>• Bridging: fostering collaboration, bringing people together, connecting different interests, and forming a supportive group of stakeholders.</li> <li>• Lobbying: creating the right connections to government officials (municipalities etc.) and industry, as well as creating support for the project.</li> <li>• Persistency: persevering in his/her endeavour to realise the project plan (including its ambitions &amp; targets), also in adverse conditions, to ensure the continuity of the project.</li> </ul>	<p>a) To which extent have the leaders of your Smart City project been able to garner support and attract stakeholders?</p> <p>b) Where do you expect leadership to be at the end of the project?</p> <p><b>Not at all – 1 – 2 – 3 – 4 – 5 – Very much</b></p>

## 2. CITY DEPARTMENTS INVOLVEMENT

Definition	Questions
<p>Smart city projects are integrative projects. The number of departments that are involved, whether by contributing human or data resources, says something about the extent to which the city administration understands the integrated structure of smart city projects and its facilitation needs.</p>	<p>a) To which extent is the local authority involved in the development of your Smart City project and how many departments are contributing?</p> <p>b) What are your expectations for the end of the project?</p> <p><b>Not involved – 1 – 2 – 3 – 4 – 5 - Very much involved</b></p>

## 3. BALANCED PROJECT TEAM

Definition	Questions
<p>Smart city projects are inherently of an interdisciplinary nature, since every aspect of the built environment affects and is affected by other aspects, and they benefit from an integrated approach and design. The largest gains can be reached when all key members of the smart city project team (e.g. architects, designers, installers, construction company, sustainability consultant etc.) are brought together in the earliest stages of the project.</p>	<p>a) Was the Smart City Governance (intended as your Steering Group) able to include relevant experts and stakeholders from the start?</p> <p>b) What are your expectations in terms of inclusion for the end of the project?</p> <p><b>Not at all – 1 – 2 – 3 – 4 – 5 – Excellent</b></p>

## 4. CLEAR DIVISION OF RESPONSIBILITY

<sup>14</sup> CITYKeys



Definition	Questions
It is important that roles and responsibilities are well defined and clearly assigned to the specific actors and stakeholders involved in the smart city governance. Without a clear division of responsibility in steering the Smart City activities, the risk of not achieving the targets and goals set in the planning phase could become true.	a) Are roles and responsibilities in your Smart City project clearly assigned to the specific actors / stakeholders? b) What are your expectations in terms of roles and responsibilities assignment at the end of the project?  <b>No -Yes</b>

## 5. STAKEHOLDERS INVOLVEMENT

Definition	Questions
Stakeholders in the urban environment are increasingly required to adopt sustainability principles, a process that requires integrated approaches across sectors and disciplines in order to be properly managed (Peris Blanes 2008, Corfee-Morlot, et al. 2009). For smart city projects to be successful in addressing the broad array of sustainability issues and interconnections, a large number of professionals must be engaged, each of whom will bring a different approach or concept of what is important (Suzuki, et al. 2010). In this context, relevant stakeholders may include: industry or business associations, local councils, government departments, politicians, environmental organisations, architects, project developers, citizens associations, etc. Through systemic stakeholder collaboration, integrated planning and management can lead to significantly greater benefits.	a) To which extent have stakeholders outside the Steering Group been involved in the planning process of your Smart City project? b) What are your reasonable expectations at the end of the project?  <b>No involvement – 1 – 2 – 3 – 4 – 5 – High involvement</b>

## 6. INTEROPERABILITY

Definition	Questions
Interoperability is the ability of a system to work with other systems by providing services to and accepting services from other systems and to use the services so exchanged to enable them to operate effectively together (ISO/TS 37151). While the term was initially defined for information technology or systems engineering services to allow for information exchange, a broader definition takes into account social, political, and organizational factors that impact system to system performance. The challenge is to build coherent services for users when the individual components (a set of specific data) are technically different and managed by different organizations (e.g. sectors, city departments. Etc.).	a) What is the level of interoperability between (data) systems used by different city-departments/services/sectors? b) What are your expectations for the end of the project?  <b>Not at all - 1 – 2 – 3 - 4- 5 – Excellent</b>

### 6.2.2 Results: Baseline and expectations

The questionnaires have been distributed to the Fellow Cities and, according to the answers collected, an average score was calculated for each indicator. Therefore, the perceived level of cooperation was obtained both for the current situation (2016- beginning of project) and for the future expectations (2021- end of project).



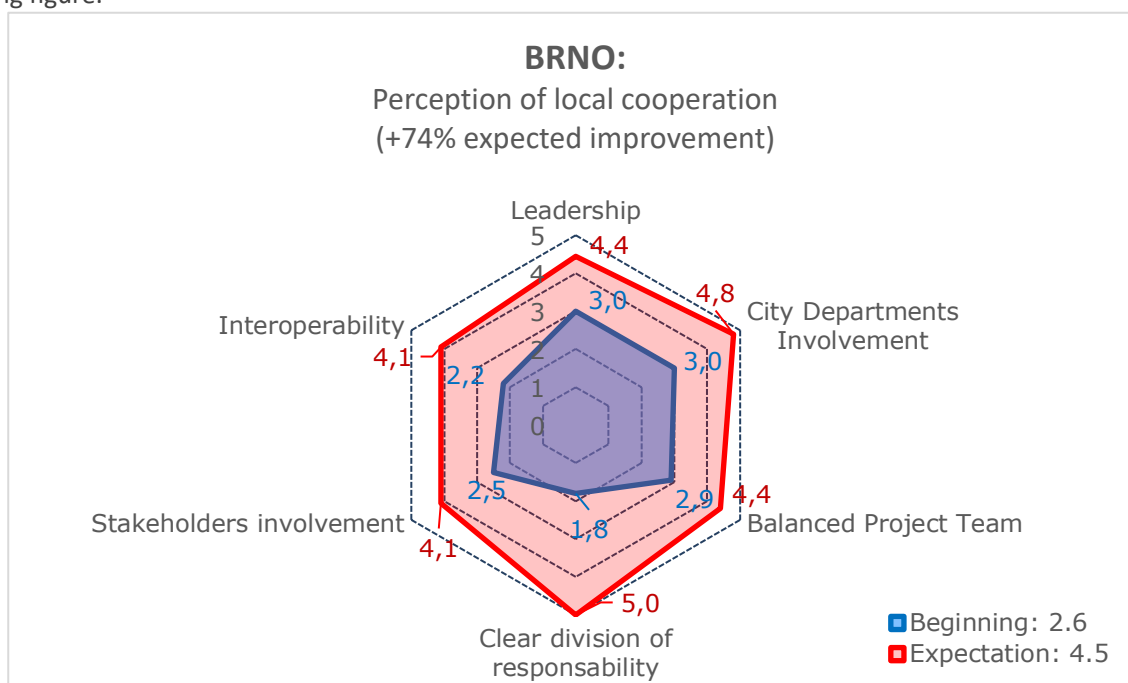
Thanks to this analysis it was possible to estimate the expected improvement in the local cooperation (calculated in % improvement over 2016 baseline) reported in Table 15.

**Note:** The levels calculated do not correspond to the actual level of the city but to the individual perceptions of the governance members surveyed (average).

What is interesting is the % of Improvement over the project duration. This is a measure of the effectiveness of WP7 activities of capacity building and knowledge transfer. It is not to be intended as a comparison/ranking of cities.

#### ❖ BRNO

The members of the Core Team, Expert Group and Decision Group of Brno were asked to answer to the questionnaire. Nine members from different sectors participated to the survey and the results are reported in the following figure.



**Figure 18: Brno- perception of local cooperation level (baseline and expectation)**

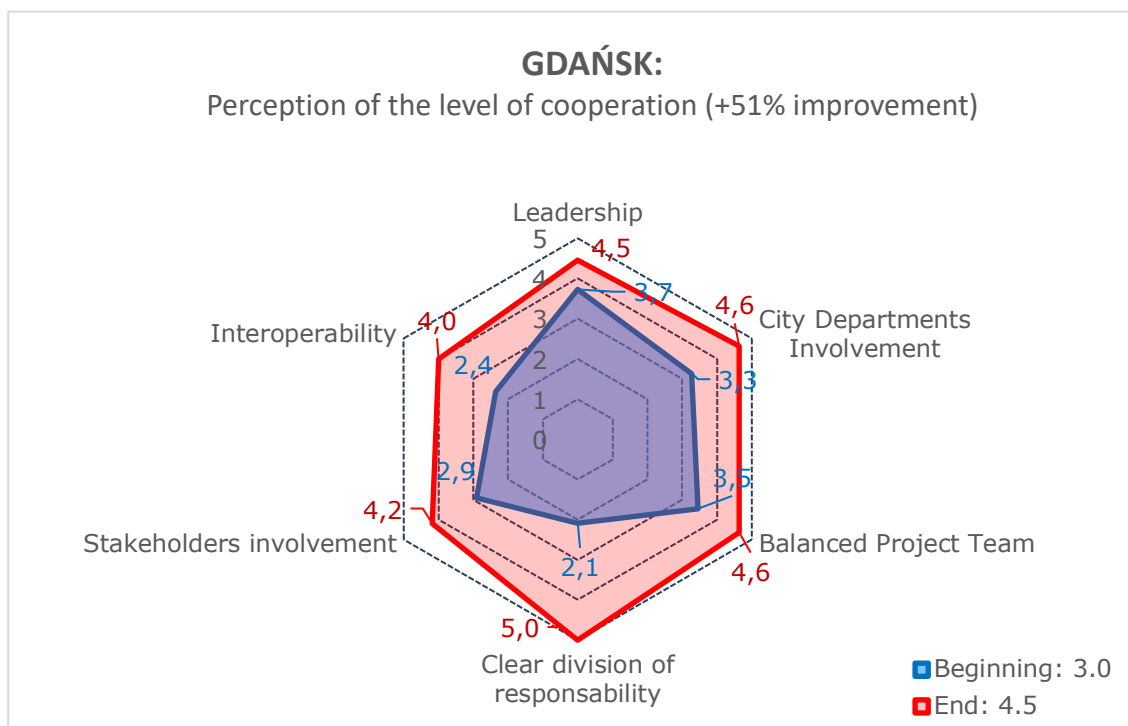
On average, the perceived level of local cooperation **before the beginning of RUGGEDISED was poor** (2.6 out of 5). One of the weakest points had been identified in the unclear division of responsibility that, likely, had also an impact on interoperability and on the project team that seems to be quite unbalanced. Poor was also the level of stakeholders' involvement. On the other hand, the leadership as well as the involvement of the most relevant city departments weren't working that bad.

The expectations at the end of the project are ambitious and the final level they aim to reach is close to excellence and, according to the path that Brno is undertaking within RUGGEDISED, these targets are not so far from reality.

#### ❖ GDAŃSK

The results of the survey show that the level of cooperation perceived in Gdańsk at the beginning of the project was not so low. Nevertheless, the expectations reported by the members of the Smart City Governance are high.





**Figure 19: Gdańsk - perception of local cooperation level (baseline and expectation)**

The strongest point upon which Gdańsk could count is the robust leadership of the city that put a lot of effort into attracting a wide range of stakeholders, including big companies, start-ups and NGO's. Already before the start of the project, Gdańsk secured partners such as Gdańsk Water Utilities and PICTEC to join the consortium. Moreover, since "Gdańsk 2030+" strategy was prepared, the city increased its interest and capacity to involve relevant stakeholders.

Despite the fact that three departments have already been involved or at least aware of the project's intentions, it is hoped to improve the involvement of other departments of the city.

Furthermore, the need to involve more experts from the mobility and ICT sector, as well as from the energy and academic world, has been reported and it is believed that the project will eventually involve cross-domain expertise.

The main problem identified in the division of responsibilities is that Smart City solutions are typically implemented horizontally in a cross-domain way, therefore it's hard to assign such competences to some selected actors only, that's why responsibilities are not clearly assigned in some cases. It is expected and desirable that with the development of the project, roles, responsibilities and actors involved will be clarified.

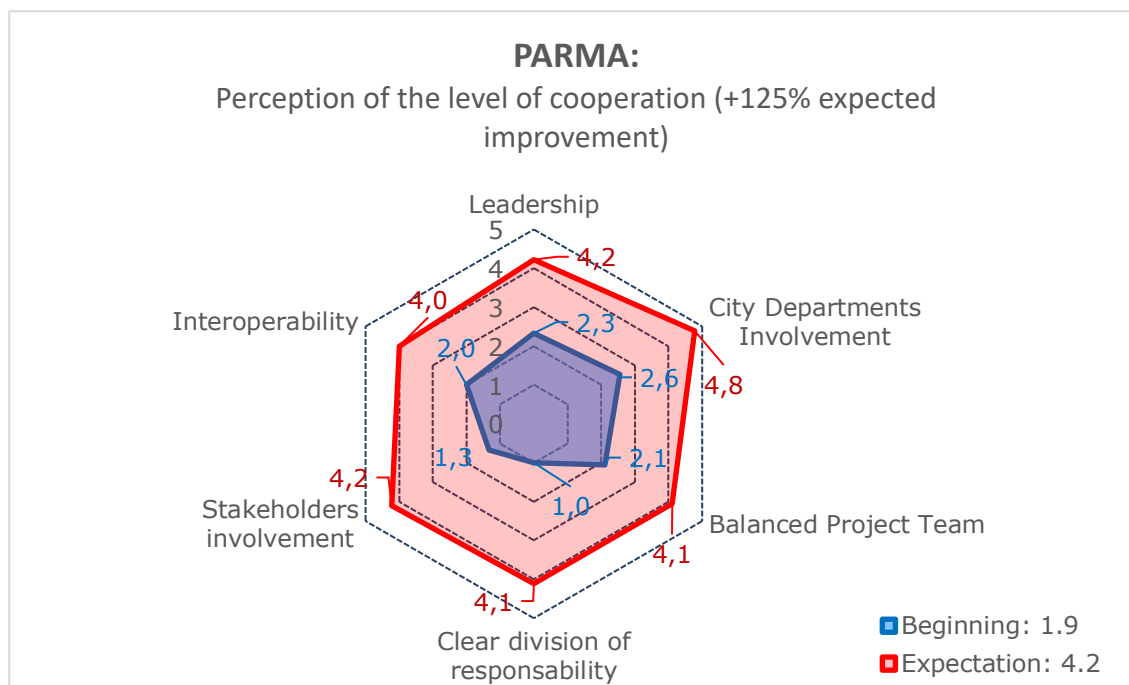
Progress is expected for what concerns stakeholders' involvement and more inclusive and participatory initiatives, which will be carried out in order to establish and maintain a long-term partnership.

Concerning Interoperability, significant progress is expected and the challenge is to bring it one step further. Currently there is a low level of interaction and data are replicated in various databases. Moreover, in many cases urban ICT infrastructure suffers from the so-called vendor lock in. These are the main reasons why data architecture changes are necessary. However, it must be said that during these 5 years project it is unlikely that ICT infrastructure would undergo a revolution, but it is sure some reasonable plans could be prepared. For sure, the direction to be followed is the introduction of open data standards so that public units could use them to optimize processes in the city.



### ❖ PARMA

Nine persons from the Smart City Governance established in Parma answered to the questionnaire. Figure 20 below shows that the local cooperation level perceived before RUGGEDISED was very low.



**Figure 20: Parma- perception of local cooperation level (baseline and expectation)**

Indeed, before the start of project activities, the concept of integrated Smart City governance had not been sufficiently considered in Parma. One of the main problems was found in the unclear division of responsibilities, aspect that was unanimously recognized by all the respondents. Activities of stakeholders' involvement were not adequately addressed and a clearly defined leadership directing and driving any smart city initiative or city strategy in an integrated way was not yet in place. As a consequence, a lack of involvement of all the relevant city departments and the marginal importance given to crucial concepts like interoperability contributed to this low level of cooperation perceived by Parma.

Encouragingly, Parma's expectations are very ambitious and, again, not far from being fulfilled (as can be seen in the activities of Parma described in D7.1 and within this report).

## 6.3 Improved Smart City capacity

As previously mentioned, for "*Smart City capacity*" we intend the level of capacity necessary to effectively replicate the selected smart solutions after the end of the project.

During the lifetime of RUGGEDISED, numerous opportunities are offered to cities to share, transfer and gather knowledge thanks to the dialogue with experts of other cities (within and outside RUGGEDISED). During these events, both technical and non-technical aspects related to Smart Cities are deepened.

The aim of this package of activities is to improve the capacity level of Fellow Cities on Smart Cities topics. In order to assess this improvement, several questionnaires have been prepared. These have been and will be distributed in three different occasions:

1. At the beginning of the project to assess the capacity level before RUGGEDISED (see the next paragraph);



2. After each knowledge transfer event (Replication Workshop; Liaison Groups Meetings; Smart Solutions Webinars; CoP meetings; Study Tour, etc.), to assess the quality of the event and keep into consideration comments, suggestions, impressions, feelings in order to improve the format and contents to be addressed in next similar events
3. At the end of the project in order to finally quantify the improvement obtained.

### 6.3.1 Smart City capacity level at the beginning of the project

A self-assessment on the governance capacity level was performed at the beginning of the project on the following horizontal themes<sup>15</sup>:

- **Decisions:**
  - **Policy and regulation:** creating the enabling environment to accelerate improvement.
  - **Integrated Planning:** how to work across sector and administrative boundaries and manage temporal goals.
  - **Citizens Focus:** how to include citizens into the process as an integral actor for transformation.
- **Insights:**
  - **Knowledge Sharing:** how to accelerate the quality sharing of experience to build capacity to innovate and deliver.
  - **Metrics and Indicators:** enabling cities to demonstrate performance gains in a comparable manner.
  - **Open Data:** understand how to exploit the growing pools of data; making them accessible- yet respecting privacy.
  - **Standards:** providing the framework for consistency commonality and repeatability; without shifting innovation.
  - **Foresight:** systematic way to examine alternative futures in order to inform decision making today.
- **Funds:**
  - **Business Model, Procurement and Funding:** integrating local solutions in an EU and global market.

A first round of questionnaires has been distributed asking the City Governance to quantify their level of knowledge and experience on the themes listed above. As a result, the capacity level baseline was calculated per each Fellow City.

**Note:** At the end of the project, the questionnaire will cover technical themes related also to the three vertical areas to which the RUGGEDISED Smart Solutions belong: **Smart Electricity & E-Mobility; Smart Thermal Grid; Energy management and ICT.**

**The improvement in the level of capacity of both vertical and horizontal smart cities' themes will be quantified.**

#### ❖ BRNO

The results of this first self-assessment have shown how the capacity level perceived by the members of the Core Team and Expert group of the City of Brno is barely sufficient (Figure 21). The weakest point was found in the poor level of knowledge on foresight topics. This gap has been already bridged during the past months thanks to the foresight process undertaken by the city and we expect to report an increase in the final assessment.

The other horizontal themes are relatively known but not enough deepened by any actors. All these themes will be addressed in the Replication events foreseen in WP7 and progress will be assessed at the end of the project.

<sup>15</sup> Strategic Implementation Plan, October 2013. [http://ec.europa.eu/eip/smartcities/files/sip\\_final\\_en.pdf](http://ec.europa.eu/eip/smartcities/files/sip_final_en.pdf)

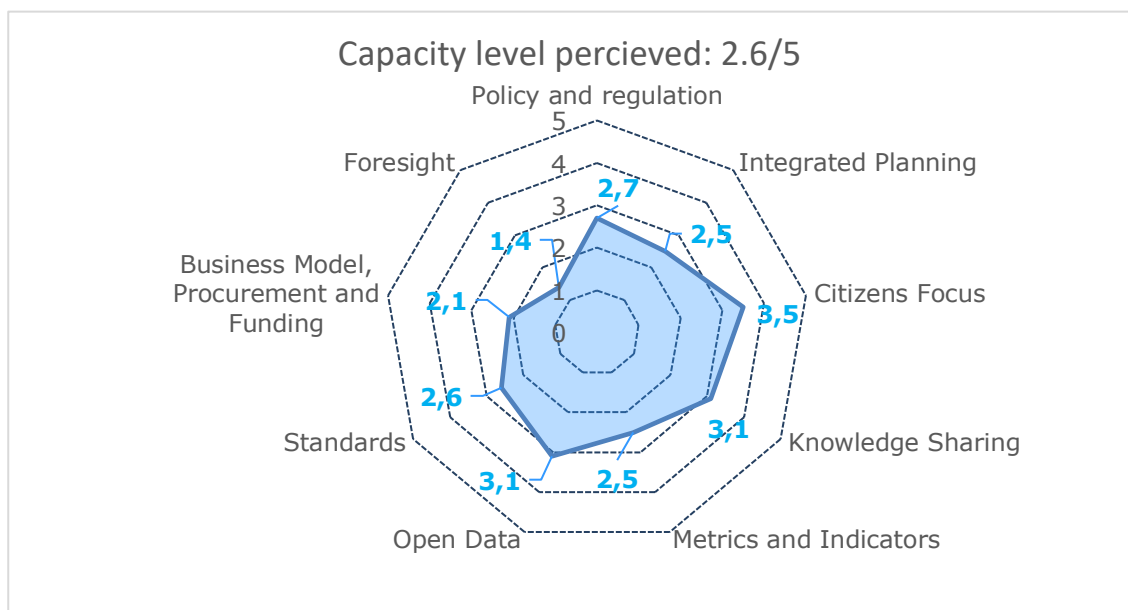


Figure 21: Brno- perception of Smart City Capacity level – Baseline

It is interesting to see also statistics on the answers provided in the questionnaires. Only 4% of the sample declare to be expert in some themes, while most of the respondents feel poorly prepared on other aspects (Figure 22).

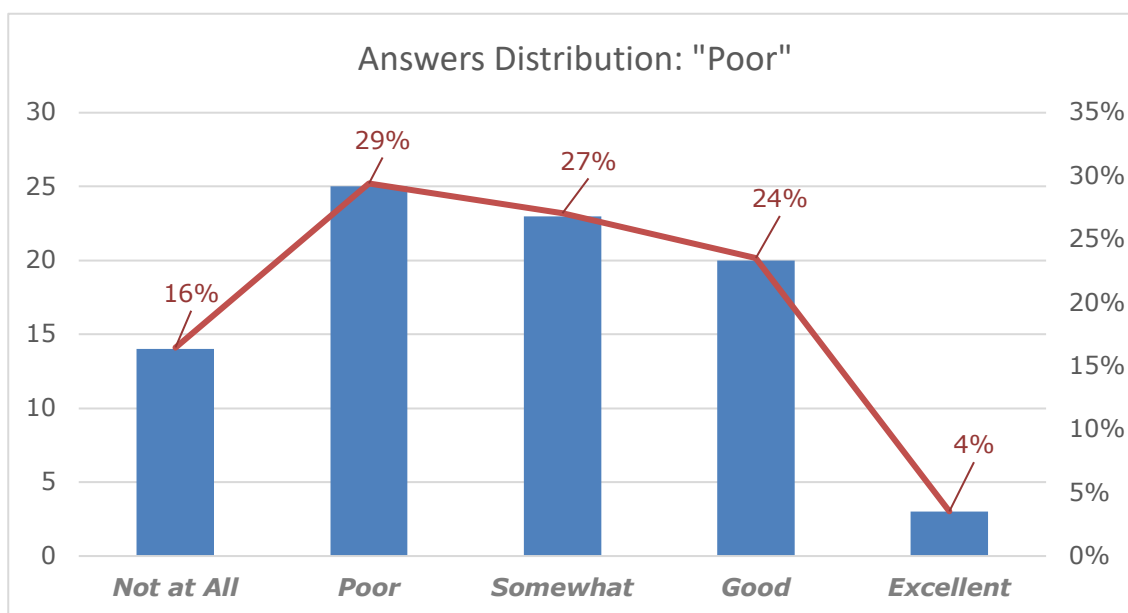
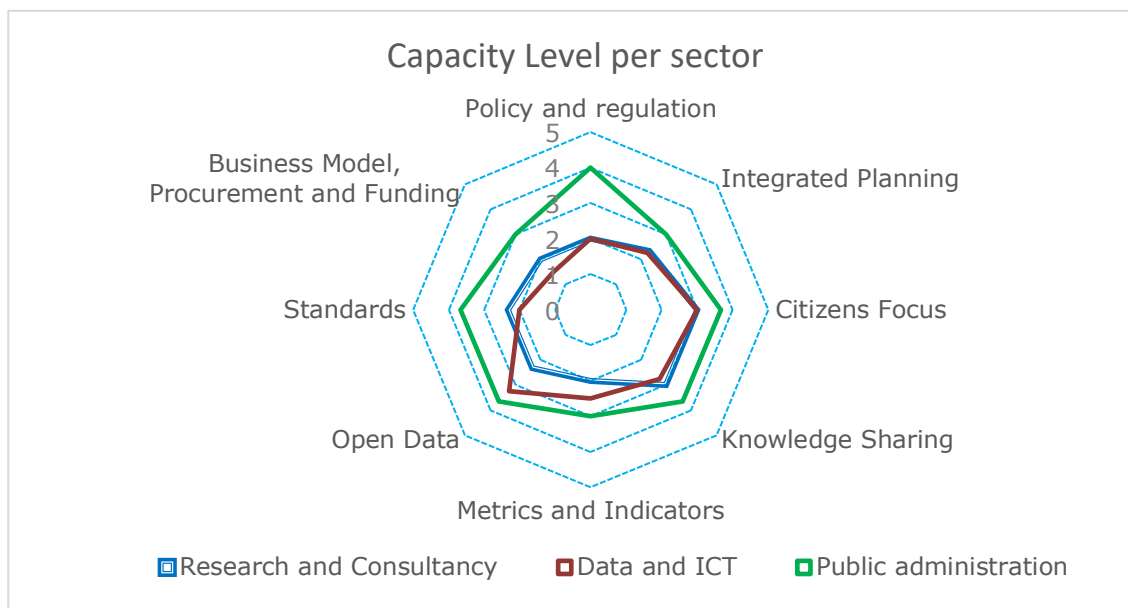


Figure 22: Brno - Answers distribution – Baseline

Moreover, it is curious to see the answers' distribution per sector covered by the governance members: people working in the public administration feel more confident with all these horizontal themes while researchers, consultants and data experts seem to be more prudent in their answers. Anyhow, the sample is small and it is not representative for drawing statistical conclusions.

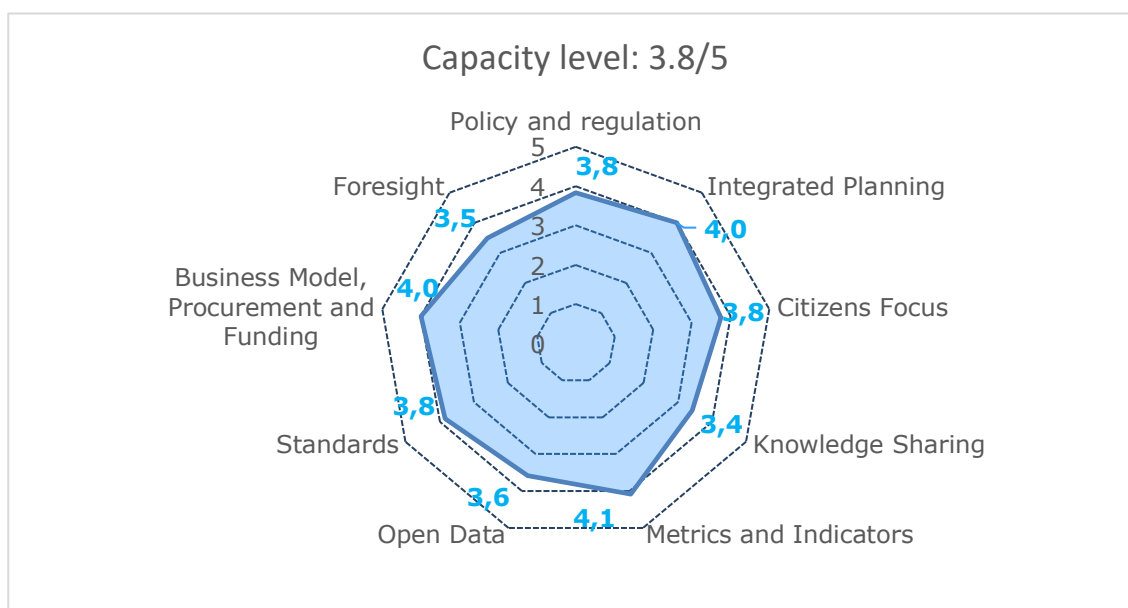


**Figure 23: Brno - Capacity level per sector - Baseline**

#### ❖ GDAŃSK

The overall capacity level perceived by the governance group in Gdańsk is quite good. Everybody feels familiar with the smart city horizontal themes, especially on issues related to Integrated Planning and Business Model, Procurement and Funding (Figure 24). In confirmation of that, no answers are registered below the “Somewhat” threshold and half of the responses collected report a “Good” level of knowledge on several fields (Figure 25).

Finally, from the analysis of the answers per sector, it comes out that there is a good balance among energy, ICT and mobility sectors. It is evident that all the governance members regard themselves as well prepared in the smart city horizontal themes (Figure 26).



**Figure 24: Gdańsk - perception of Smart City Capacity level – Baseline**



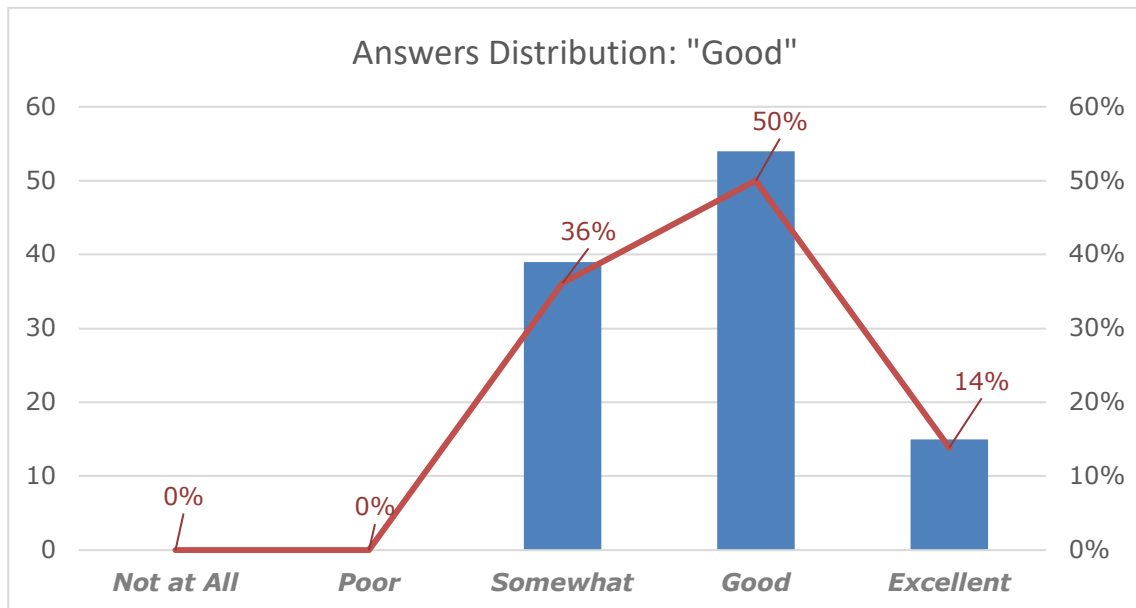


Figure 25: Gdańsk - Answers distribution – Baseline

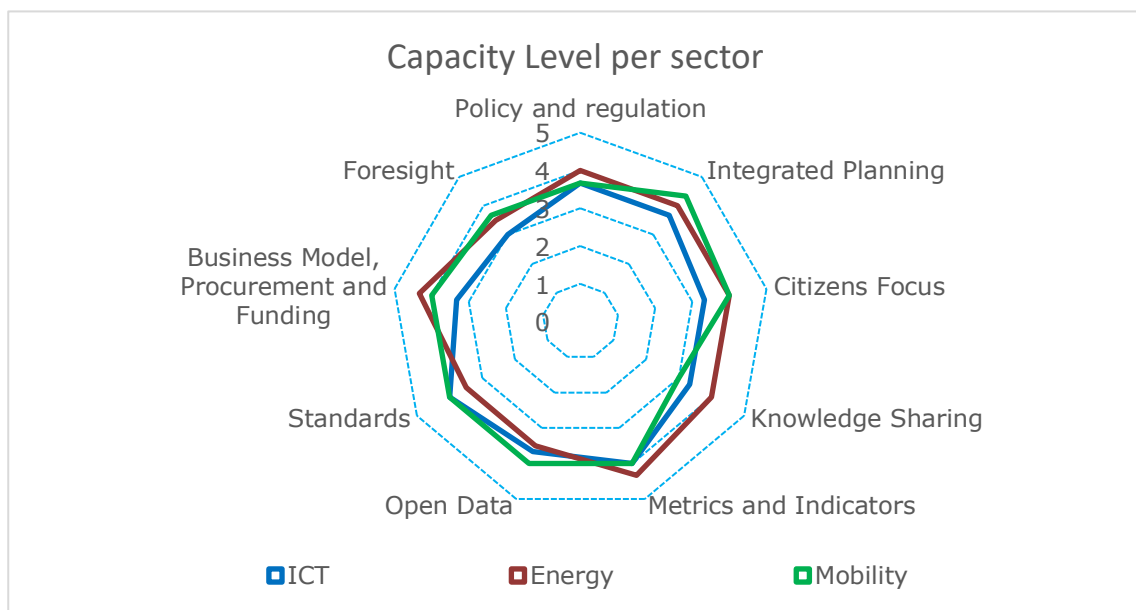


Figure 26: Gdańsk - Capacity level per sector - Baseline

#### ❖ PARMA

In Parma, the theme where the members of the governance feel less familiar is foresight (Figure 27). This is the first shortcoming that they were seeking to fix thanks to RUGGEDISED activities.

All in all, more than half of the answers (64%) is above the “Somewhat” threshold (Figure 28) and looking at the breakdown per sectors, it seems that almost all aspects are sufficiently covered and it is a measure of the balanced governance team set up in the City of Parma (Figure 29).

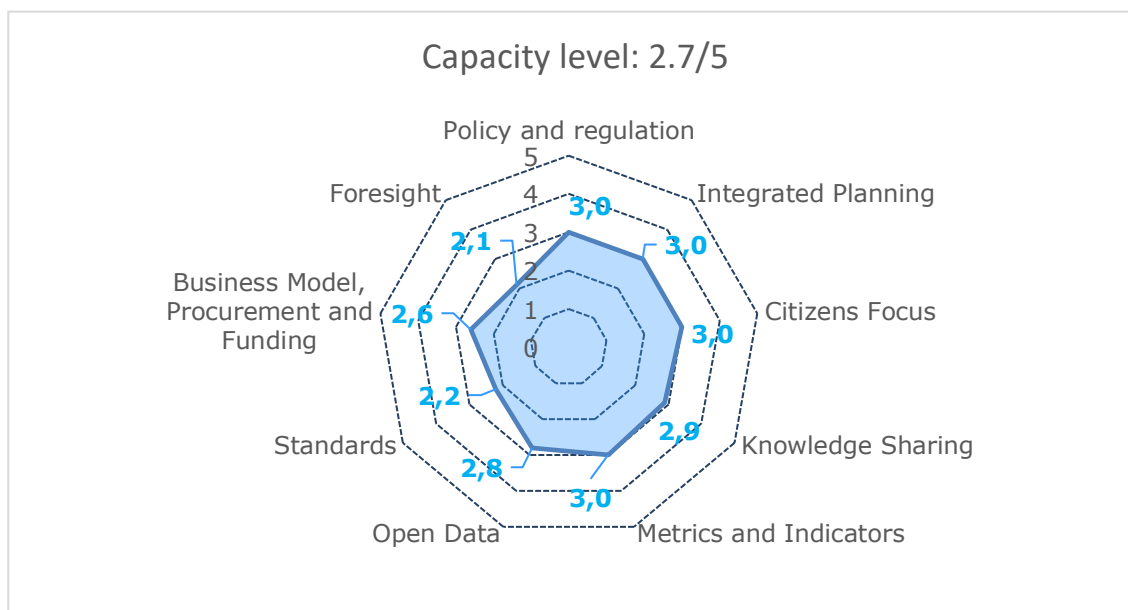


Figure 27: Parma- perception of Smart City Capacity level – Baseline

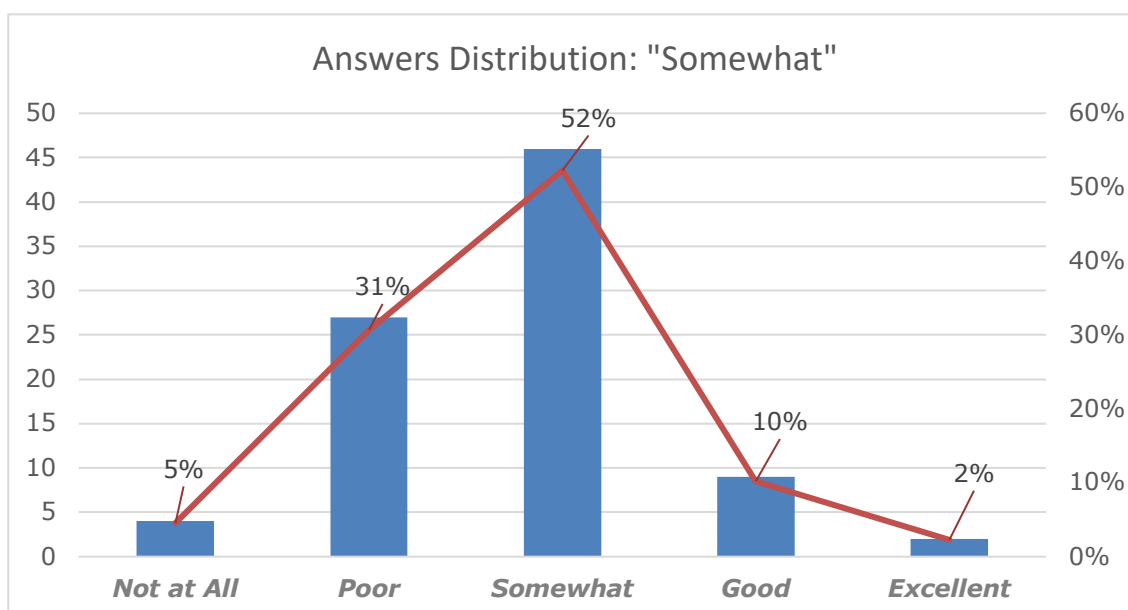
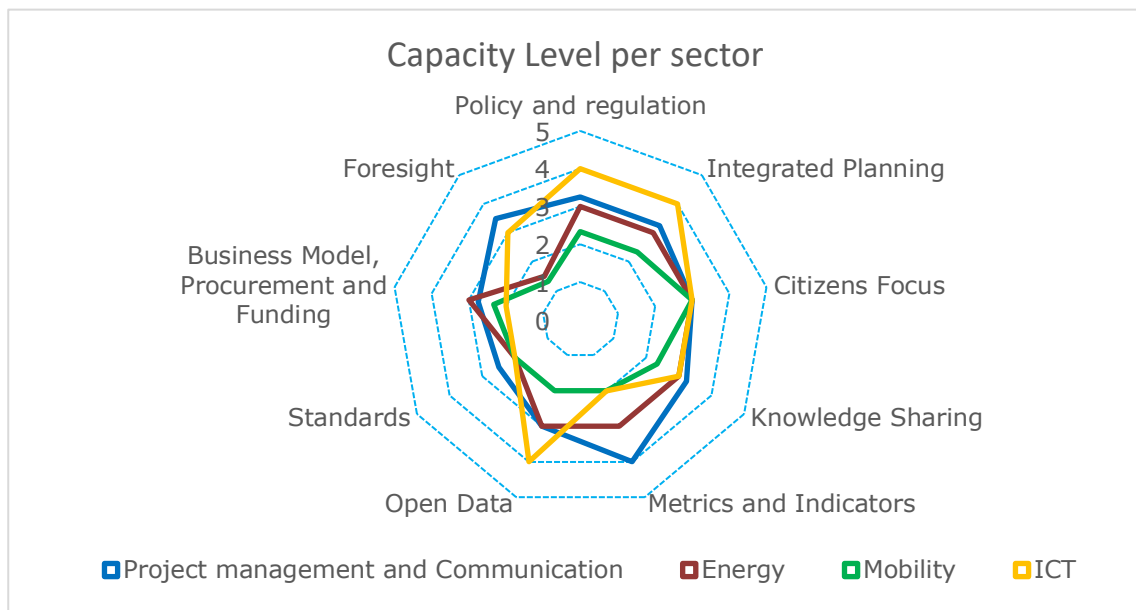


Figure 28: Parma - Answers distribution – Baseline



**Figure 29: Parma - Capacity level per sector - Baseline**

## 6.4 Next steps

The results reported in this report define the state of the art of the three Fellow Cities at the beginning of RUGGEDISED (2016) and constitute the reference baseline for evaluating the effectiveness of the knowledge transfer and capacity building activities foreseen in WP7.

At the end of the project, this same analysis will be done again in order to monitor the improvement and progress made during this five-years project and to verify whether the expectations (in terms of level of cooperation) are met or not. This analysis will help the identification of the most relevant strengths and weakness of the process and will also enable to find the best ways to overcome potential barriers that may hinder the replication path.



## 7. Conclusions and next steps

This report shows the progress of local activities in Brno, Gdańsk and Parma in the first 44 months of the project. From this second assessment it can be seen that **all three Fellow Cities are at a very advanced stage in the replication process and in their pathway to become Smart Cities**. In particular:

**Brno is firmly committed to the Smart City concept**, and this is documented by the job done by its advisory board for a smart and participatory city and its Department of Strategic Development and Cooperation. The approval of the main strategic document of the City of Brno **#Brno2050** has set the principal targets for the future development of the city and aims to create a strategy to address three areas of interest (resource management, quality of life, good governance) into three interconnected process steps (a long-term Vision 2050, three mid-term plans and several short-term action plans). A **Sustainable Energy and Climate Action Plan** and a **Sustainable Urban Mobility Plan** have also been approved.

RUGGEDISED has been present in the platform **Brno City Ecosystem** helping in the organization of several workshops with the aim to create a new city strategy.

The City of Brno co-organizes the **URBIS Smart City Fair** in which RUGGEDISED has had an important role from the very beginning, which has led to the hosting of the General Assembly of the project in 2019 and the Fourth Replication Workshop about the most innovative smart solutions throughout Europe.

The **Smart City Guidance Package** integrates Sustainable Energy Action Plan, Sustainable Urban Mobility Plan, #Brno2050 and RUGGEDISED to provide the necessary support for planning and managing smart city projects.

Brno launched an online platform for **open data** at [data.bрно.cz](https://data.bрно.cz), which can be used as a first step to replicate the Open-data decision platforms created by Glasgow and Umeå in RUGGEDISED.

Concerning the **evaluation assessment** in Brno and regarding the perceived level of **local cooperation** in the city, before the beginning of RUGGEDISED it was poor. However, the expectations at the end of the project are ambitious and the final level they aim to reach is close to excellence and, according to the path that Brno is undertaking within RUGGEDISED these targets are not so far from reality.

The **capacity level** perceived by the members of the Core Team and Expert group of the City of Brno was barely sufficient due to the poor level of knowledge on foresight topics. This gap has been already bridged during the past months thanks to the foresight process undertaken by the city and we expect to report an increase in the final assessment.

*Brno*

**Gdańsk is fully prepared to face possible futures** and to that end has developed scenarios, visions and roadmaps for technology development with the help of several foresight forums that included the participation of a broad range of stakeholders. The official **Gdańsk Operational Programmes beyond 2023** are being designed based on the outcomes of all of the aforementioned meetings and will cover all main domains of the city governance. **Gdańsk 2030+** development strategy is planned for evaluation.

The experience gathered during the cooperation in RUGGEDISED will help the city to shape the new **open, smart city strategy**. Issues covered by the RUGGEDISED project are in line with the new deputy mayor's responsibilities, which include overseeing adaptation of the city to climate change, public transport and ICT.

With more than 20 million HTTP requests sent monthly to the city **open data server**, Gdańsk is providing external partners with data for applications and websites and is also

*Gdańsk*



working on unlocking further potential on open data, mostly about making public transit more accessible and easier to use.

The results of the self-assessment survey show that the **level of cooperation** perceived in Gdańsk at the beginning of the project was not so low. Nevertheless, the expectations reported by the members of the Smart City Governance are high.

The overall capacity level perceived by the governance group in Gdańsk was quite good. Everybody feels familiar with the smart city horizontal themes and all the governance members regard themselves as well prepared.

**Parma pursues the goal to become a green city**, based on the most crucial aspects of environmental quality, efficiency and circular use of resources, mitigation and adaptation to climate change, enhancing the economic and social implications of a better quality of life and well-being at the urban level generated by a green economy.

The City of Parma embraced the challenge of becoming a smart city within RUGGEDISED and launched the **Parma Futuro Smart** initiative aimed at fostering the governance model, developing urban innovations that will benefit citizens and creating a permanent cooperation platform with the main stakeholders to co-create and co-manage the city of the next decades. Parma Futuro Smart has attracted several dozens of stakeholders in the definition of a smart **city vision** to 2050 and a replication and investment plan to 2030 that will be included in the wider **Parma Smart City Plan 2030**. A kick off conference, a scenario workshop - developing a multi-stakeholder comparison for the co-definition of reference scenarios for Parma Smart City (2030) -, and a Vision Forum - with the aim to consolidate the 2050 Vision of Parma and to start building the Parma 2030 Roadmap and the subscription of a **Smart City Protocol** - have been held so far.

Parma has set the goals for the next decade with its Administration decided to accelerate its pace to fully become a green city. It has signed the "Covenant of Mayors for Climate and Energy"; it has declared the Climate and Environmental emergency to take action to reinforce further the GHG reductions, renewable energy use, climate adaptation measures through the elaboration of a dedicated plan and energy efficiency measure in urban planning, mobility and buildings sectors and it has submitted its application to the ECGA (European Green Capital Award).

The local **cooperation level** perceived by the members of the Smart City Governance team before RUGGEDISED was very low and even the very concept of integrated Smart City governance had not been sufficiently considered before the start of project activities. Encouragingly, Parma's expectations are very ambitious and, again, not far from being fulfilled.

The first shortcoming that the members of the governance were seeking to fix in their **capacity level** was their lack of familiarity with foresight. All in all, it seems that now almost all aspects are sufficiently covered, and it is a measure of the balanced governance team set up in the city.

#### Parma

In the coming months, an overview on the results of the participatory foresight process will be provided in **D7.2 "Visions and Roadmaps"**. A final evaluation assessment of RUGGEDISED activities in the Fellow Cities will be done at the end of the project and results will be reported in **D5.7 "Monitoring report on measures to maximize the impact"**.

Finally, by the end of the project, three **D7.4 "Replication and Investment Plans"** will outline in detail the selected smart solutions that will be implemented in the Replication areas identified by the Fellow City.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 731198. The sole responsibility for the content of this document lies with the Ruggedised project and does not necessarily reflect the opinion of the European Union.