

RUGGEDISED

Designing smart,
resilient cities for all

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Executive summary

The RUGGEDISED project acknowledged the importance of nestling the Fellow Cities' Replication and Investment Plans within broader and long-term Smart City Visions. To this end, WP7 has utilised a participatory foresight process in order to create shared strategic visions and roadmaps for the organisation of upcoming investments in the energy and mobility sectors. Participatory foresight allows strategic planning to break small organisational silos, overcome institutional inertia, and avoid sporadic action. It effectively establishes a collaborative forecasting platform that is able to channel the often-fragmented energy and intelligence present in our communities to design a concrete way forward.

The participatory foresight approach seeks to bring together institutional, technical, economic, ecological and societal stakeholders to perform a prospective analysis to create the shared vision of the future smart city (the strategic vision), as well as a mid-term tactical decision-making to accomplish that vision (the roadmap). The approach is increasingly used in EU projects and in planning efforts at national and local level. WP7 counted on specific expertise that was placed at the Fellow Cities' service, such as ISINNOVA, AIT and PICTEC. Each participatory foresight process has been tailored to the specific local requirements in terms of objectives, available resources and expertise, existing planning techniques and documents

A diverse range of local stakeholders was gathered by the Fellow Cities' governing groups to: a) review the usually dense strategic documents already delivered, b) discuss the likely, possible, or even just thinkable futures of their cities, c) understand and integrate the different roles and perspectives of the involved stakeholders, and d) deliver (or improve, adapt, depending on the individual case) the smart city vision and the roadmap for implementation.

The last block of this intensive process of capacity building and knowledge transfer has allowed the Fellow Cities to reach the formidable and arduous objective of delivering their respective Replication and Investment Plans. All Fellow Cities have finalised their individual Replication and Investment Plans, which effectively conclude 6 years of work in the project in view of adoption and deployment of the selected smart city actions as of the year 2023 (the post-project phase). Each Replication and Investment plans is summed up in this report.

In the case of Brno, the Replication Plan contains a list of smart solutions mainly concentrated in the intention of building the smart district Špitálka. In addition, there are also smart solutions that are of city-wide significance and not just related to a specific location, while other replicated solutions of citywide importance are also part of the current Action Plan of the city. Brno' Investment Plan is based on a financial pre-feasibility study, which aims to find a financially strong and experienced strategic partner. The study proposes two options: i) a Joint Venture with a Strategic Partner, and ii) a PPP (Public-Private Partnership) and a 30-year DBFM contract with an Availability Payment.

In the City of Gdańsk, the Replication Plan is mainly focussed on the regeneration of the Lastadia Quarter. There are other smart solutions beyond the RUGGEDISED project, such low-emission and zero-emission vehicles and renewable energy installations. However, the corresponding financial analysis is not optimistic and there are no convenient sources of soft financing in sight. The current Investment Plan of Gdańsk was updated in August 2022 by the Department for Investment Projects of the municipal office and details long- term investments in projects with co-financing of EU funds.

Parma identified the University Campus – the scientific centre of the University of Parma – as replication area. The Replication Plan of Parma shows that the city is going to implement several actions inspired by the solutions provided by the Lighthouse Cities of RUGGEDISED, but it also contains some actions that will be replicated at city level. The Investment Plan of Parma reports for each measure – among those that will be undertaken by the University of Parma and the Municipality – the budget and funding source. Regarding other actions that the City is going to implement in the coming years, a first financing evaluation has been done.



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1. Introduction

With the structure of a report, this document illustrates in details the individual Replication and Investment Plans of Brno, Gdańsk and Parma, which effectively conclude 6 years of work in the project in view adopting and deploying the selected Smart City actions as of the year 2023 (the post-project phase).

In essence, this report is intended to show the steps taken and the results obtained by the Fellow Cities in the course of building their Replication and Investment Plans. The city administrations were flanked by ISINNOVA, AIT and PICTEC during the entire process envisioned by WP7, which allowed them to agree on a Smart City Vision, to identify a roadmap and to culminate with the development of Replication and Investment Plans. The replication trajectory of the Fellow Cities actually concludes with the delivery of individual Replication and Investment Plans. For a more exhaustive explanation of the adopted methodology and particular details about the Visions and Roadmaps defined thanks to this participatory process, see D7.2 “Visions and Roadmaps”.

The structure of the document is as follows:

- Chapter 2 offers an overview of the whole replication process followed in RUGGEDISED.
- Chapters 3, 4 and 5 give respectively for every Fellow City detailed reports of the Vision, the Roadmap, the Action Plan, the Replication Plan and the Investment Plan.
- Finally, Chapter 6 outlines the main findings, conclusions and lessons learned from the replication paths followed by the Fellow Cities in their objective of becoming Smart Cities.



2. RUGGEDISED Replication process in a nutshell

The Replication process of RUGGEDISED was designed with the aim to guide and support the Fellow Cities of 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 were assisted in the development of their Replication and Investment Plans for the deployment of the local smart city projects. Each Fellow City determines 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 was set up and structured in four main blocks of activities unfolding both at European and local levels (Figure 1).

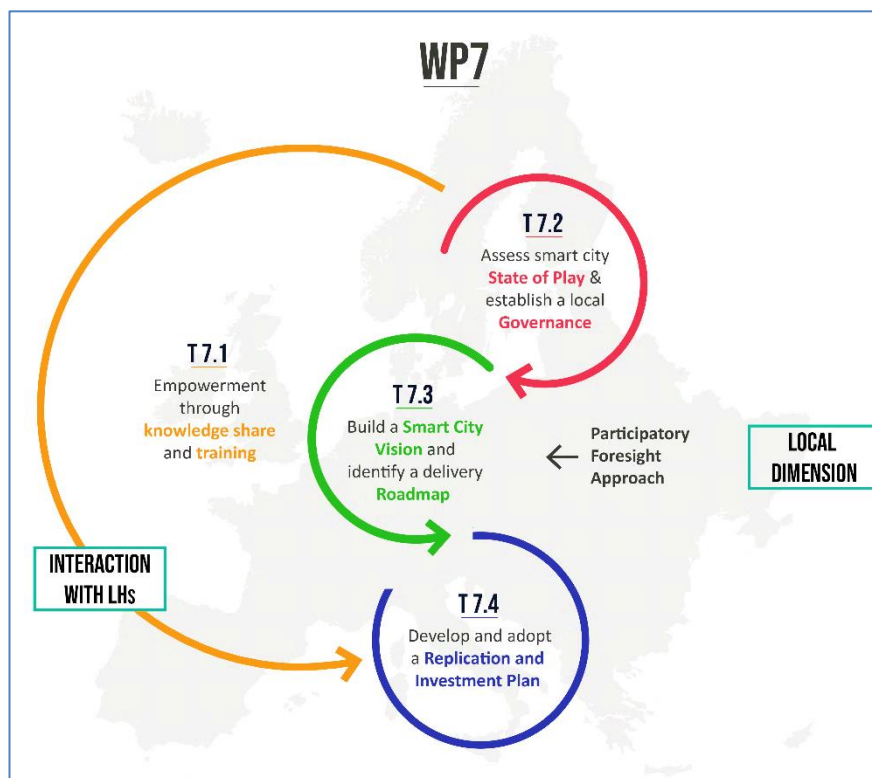


Figure 1: Replication process in RUGGEDISED (WP7)

❖ 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 were 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 were foreseen in the replication process in RUGGEDISED: Replication Workshops; Study Tours and ad hoc webinars, web meeting and conference calls¹.

The following three blocks of activities shall be understood as consecutive steps that took 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 was required. Moreover, to ensure that the Fellow Cities started off on the right foot the long way towards becoming a Smart City, proper forms of Smart City Governance were established in compliance with the local needs, requirements and traditions².

Significant results were achieved by each Fellow City, e.g. 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.

❖ ***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 was 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 already finalised their participatory foresight process³ and have defined their medium-long term city 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. The results of this work are described in this report.

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

² 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).

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



3. Brno

3.1 Brno Smart City Vision

Together with experts and inhabitants of Brno, a key document was prepared in 2017 called “**Vision of Brno in the Year 2050**”. In September 2020, Brno City Assembly approved an **update to the city’s long-term Vision 2050**. They confirmed the previously set long-term course of the city development and the values that the development is based on. Vision 2050 offers an answer to the question of what kind of a city Brno wants to be like in 2050 and which are the main targets to reach it.

Brno Smart City Vision sets the basic lines for the city’s development up to 2050, and indicates **goals** in terms of “**where we go**”:

„In 2050, Brno is a synonym for an attractive and at the same time sustainable city in international comparisons.

The people of Brno appreciate the high quality of life in the city, which offers them employment and business, entertainment and relaxation. The fruits of research and innovation are linked here with the economic prosperity of individuals and companies. The urban landscape mingles with the surrounding countryside. Openness and cohesion on the one hand, and a healthy and resilient environment on the other, create a home and safe background for half a million people.

The people of Brno are aware of the scarcity and limitations of natural resources; they support their efficient use, so that the city always has enough water, energy and resources for its development. They want to leave the city in an equal or better condition for future generations.

The people of Brno can see that the city is managed energetically, in a modern and efficient manner. The governance and development of the city are based on a cultivated public debate and long-term cooperation of all partners.

The city breathes for its inhabitants and they in turn can be proud of their city.“

Quality of life

The broadest area of Vision 2050 is represented by **quality of life**, which encompasses a wide range of key topics for the inhabitants of the city. These include a quality environment for life, safe and affordable housing, the opportunity to get a good education, an interesting and satisfying job or having basic services available.

The thematic area **Environment** encompasses a high-quality physical environment for the life of the inhabitants. Whether it is a natural environment, related to greenery in the city and a healthy living environment, or a man-made environment – from the point of view of urban development of the city and its architectural appearance. The basic prerequisite for a pleasant life in the city is safe and affordable housing. All of the above are then connected by the availability of easy and sustainable transport.

The thematic area **Prosperity** encompasses values that are part of the economic dimension of the quality of life of the city’s inhabitants. It includes affordable and quality education and the opportunity to get an interesting and satisfying job. At the same time, it further develops the profile of Brno as an important centre of science, research and innovation, with an international overlap and openness. The basic precondition for this position of the city is, among other things, its global accessibility.

An inseparable part of the quality of life of the population is the accessibility to basic **Services** – health care, social services and a broad range of leisure activities, such as cultural options, sports activities and other leisure activities that increase the attractiveness of the city. The basic requirement and precondition for the peaceful and harmonious coexistence of all the inhabitants of the city is to ensure their safety.

The ability to manage **Resources** efficiently and enabling their thoughtful use through appropriate strategic infrastructure is one of the conditions for ensuring a resilient economy and quality of life for the population. The city must be able to use water and energy economically and support new approaches and procedures heading



towards achieving a sustainable economy and life of the population. In doing so, a clean city should be a matter of course.

In the expert debate on sustainable development, not only at the level of cities but also of countries, and in the framework of international cooperation, an area that can be called "good governance" has been gradually gaining importance. Good governance – **Administration** – should function as a service to the public, from which residents expect responsibility, professionalism – quality and efficient work. At the same time, good governance is transparent and supports civil society, considers all groups of the population as well as their needs and gives them the opportunity to get involved.

Table 1: Overview of the thematic areas and strategic values of the Strategy #brno2050

QUALITY OF LIFE			RESOURCES	ADMINISTRATION
ENVIRONMENT	PROSPERITY	SERVICES		
Compact and balanced city	Prosperous city	Healthy people in a healthy city	City with efficient water management	Shared vision and good name of the city
Architectural face of the city	Central European centre of research, development and innovation	Cohesive and respectful city	Energy-saving, independent and resilient city	Functioning Brno Metropolitan Area
Nature in the city	Educated university city	Cultural city	Clean and circular city	Efficiently functioning electronic administration and open data
City with affordable housing	International city	City of sports		Participation of the public in the administration of the city
City with efficient and sustainable mobility	Globally accessible city	Safe city		
Healthy living environment				



The Vision of the City of Brno until 2050 consists of several interrelated features for each of the aforementioned values and seek answers to the following fundamental questions:



Value - What should the city be like in 2050? What values are essential for the future of the city, which of them should the city focus on? What should be the basic principles of the city's development? For each defined value, of which there are a total of 23 in the document, its basic description and its more detailed contribution to the development of the city are provided.

Goal - What should be the specific goals of the city within the given value? What specifically do we want to achieve? The value is always made up of one primary goal and additional partial goals.

Indicator - How and by what do we know that we have achieved the given goal? Which indicator best describes this goal? Each goal is assigned at least one indicator. For most of the indicators, their current value is already known. For some of the goals, a corresponding indicator has been set, but it has not yet been monitored (whether for technical or financial reasons). It will be necessary to find out this value later on in the future.

You can find a complete version of the Vision 2050 in English [on-line](#).

3.2 Roadmap towards Brno Smart City

Brno's Roadmap – a programme part of the Brno 2050 strategy called **PLAN 2030** – presents an extensive overview of the priorities and measures up to 2030, thus creating a medium-term level of the city's comprehensive strategic planning. It is the middle part of what is termed a "modular system" of the BRNO 2050 Strategy and seeks to present a result which makes clear "**what steps the city as a whole is going to take in the next 10 years**".

The programme part of the Strategy **builds on the long-term strategic values set out in the Vision 2050**, elaborating these as specific priorities and measures for the next 10 years, including:

- the proposals for stakeholders and institutions to implement them and
- a framework timetable specifying whether these are priorities and measures to be implemented on an ongoing basis or are one of the sub-periods, i.e. by 2022 / 2023–2026 / 2027–2030.

The draft priorities and measures, prepared by the guarantors of each of the values and members of their teams in autumn 2017, were produced and commented on by members of the thematic working groups. The thematic working groups were established across the different parts of the City's ecosystem to involve all types of stakeholders relevant to the theme.

In winter 2020-2021, based on the update of the strategic vision, an update was made of the following Plan for Brno for the next 10 years. It was updated with the help of experts so that now it reflects consequences of the actual pandemics, new findings in the field of circular economy or climate change adaptation. The vision thus became more specific. Now the city knows what it should work on in the following 10 years. **The City Assembly approved the second of the three parts of the strategy– PLAN 2030 in March 2021.**

You can find a complete version of the PLAN 2030 in English [on-line](#).

Meetings with representatives of the professional community: Overview

November – December 2017. Opening separate meetings of each of the thematic working groups, gathering inputs to develop the first draft of priorities and measures.

January – February 2018. The draft programme part was sent to officials of the city districts to study and provide feedback; there were individual meetings with selected mayors of the city districts and, during the spring with the population of the districts.

March 2018. A joint workshop held for the sponsors of all the Strategy values across thematic working groups, looking for connections, ties and links between the values, estimating the organisational and financial demand of each of the priorities.



April 2018. The second meeting of the thematic working groups as part of the annual meeting of the experts. The first draft list of stakeholders and institutions to contribute to implementing the priorities and measures; the initial collection of ideas and suggestions for specific projects and activities.

June 2018. The third meeting of the thematic working groups with representatives of stakeholders co-responsible for implementing the priorities and measures. Discussion on allocating responsibilities, the timing of the different priorities and measures, collecting ideas and suggestions for specific projects and activities. At the beginning of June 2018, the draft programme part of the Strategy was published and members of the professional community as well as the public were invited to make comments; all the members of the City's ecosystem were contacted directly about this, as well as officials and representatives of the Brno City Municipality, city-controlled enterprises, and co-funded organisations. By mid-July 2018, more than 100 comments had been received; these were subsequently handled by the individual value sponsors in July and August. The results of handling each of the comments are available on the Strategy website <http://www.brno2050.cz>.

September 2018. The Brno City Assembly took note of the submitted programme part of the #BRNO2050 STRATEGY.

January 2019 – August 2020. Meetings between members of the political clubs of coalition parties with specialists sponsoring the Vision 2050 values and the process of updating the #BRNO2050 STRATEGY strategic part was underway.

September 2020. The updated Vision 2050 was approved by the Brno City Assembly

November 2020. First meeting of the Strategy's Steering Committee, of which the members are the Mayor of Brno, the deputy mayors and the Head of the Strategic Development and Cooperation Department. The Steering Committee approved the proposal for the procedure for updating the programme part of the Strategy.

November 2020 – February 2021. Updating the programme part of the Strategy, involving the stakeholders responsible for implementing the individual priorities and measures of the 2030 Plan.

February 2021. First meeting of the Managing Committee; its membership included the heads of the MMB departments as well as managers of the City's co-funded organisations responsible for coordinating the 2030 Plan priorities and measures.

March 2021. The updated version of the programme part of the 2030 Plan was submitted for discussion to the Steering Committee and, subsequently, to the city authorities (Brno City Council, Brno City Assembly).

3.3 Brno Action Plan

The Programme part of the Strategy was followed by the last part, the **Action Plan**, that includes an overview of specific activities and projects for the coming years and a methodology describing how individual projects and activities will be carried out, defining specific entities responsible for the individual projects and activities and ensuring that these projects and activities are reflected in the city's annual budget while outlining, where appropriate, in what form projects of other entities that are consistent with the Strategy will be involved or supported by the City of Brno.

The Action Plan **PROJECTS 2021+** consists of three main parts:

- **Implementation** – definition of the implementation of the strategy and how it will be connected to day-to-day operation of the city, including links to budgeting, decisions, etc. It describes the organisational structure necessary for the effective strategy in practice, procedure of collection of projects that may be included in the Action Plan, or further work within working groups, criteria and evaluation process for projects, and how the Action Plan update will take place.
- **Monitoring** – it defines how the fulfilment of the strategy is monitored; how often and how the fulfilment of indicators is evaluated.
- **Overview of projects** – it is a summary of specific projects and activities of the city and other entities that will be realised in the near future. Included in the overview of projects is the project/activity inventory where a project/activity can become part of the Action Plan in upcoming years as a result of updates.



Until spring 2022 Brno worked on **a list of specific projects** for the coming years. The Action Plan as such is no longer a strategy paper in the true sense; instead, it is an operational part of a strategy paper that defines “what specific steps we intend to take in the coming years and how”. **The Action Plan together with the list of projects was approved by the City Assembly in April 2022.**

You can find the complete version of the Action Plan PROJECTS 2021+ in English [on-line](#).

Basic Principles of the Action Plan

An integral part of the process of strategy formulation – **Co-creation** with the involvement of a broad variety of actors – is transferred to the stage of implementation – as shared responsibility for the continuous fulfilment of goals via specific projects and activities. The Action Plan includes projects where the City of Brno is the implementer or project partner, or where it is interested in the implementation of the project, as it contributes to the fulfilment of the goals defined by the strategy.

#brno2050 ≠ strategy of the Brno City Municipality
#brno2050 = strategy of the City of Brno as a whole

The fundamental principle of the preparation of the Action Plan is **Selectiveness**. It is impossible to include all projects and activities carried out by the city or other entities in the Action Plan. Project selection is based on established criteria; it is first assessed by project owners (they must consider themselves whether their project or activity conforms to the criteria of the inclusion in the Action Plan), then it is discussed in working groups and evaluated by professional guarantors, representatives of the Executive Committee and the Steering Committee. The final decision regarding the selection of projects for the strategy Action Plan rests with the political representation – the Brno City Council and the Brno City Assembly.

#brno2050 ≠ overview of all projects
#brno2050 = selection of projects with significant degree of innovation and impact

The Action Plan for the #brno2050 strategy is proposed as **Continuous**. From the perspective of time, the Action Plan is flexible – initially, the first version of the Action Plan is prepared; it is then regularly (at regular intervals) amended and updated. Included in the Action Plan are projects that now are already in an advanced stage of preparedness, or even in implementation. Projects currently in the stage of ideas or project objectives to be finalised will be included in the “project inventory”; they may be elevated to the Action Plan status once their stage of preparation has advanced sufficiently.

#brno2050 = regularly updated Action Plan

Criteria for the selection of projects

All projects and activities submitted as potential parts of the Action Plans are evaluated regarding the following **basic factual criteria**:

- **Project impact** – the scale of the impact of the implementation of the project is assessed, if any. The Action Plan prioritises projects with impact on the entire city or a wider area.
- **Project innovativeness** – the project is assessed in terms of the potential for new or innovative solutions, or a new topic, new procedure etc. The Action Plan prioritises projects that, in terms of their subject matter or solution offered, are new or uncharacteristic of Brno, the Czech Republic or the EU, as applicable.

Based on the combination of the degree of both criteria, projects can be divided into several **categories** (see Table 2):



- **Flagship projects** – These are desirable, key strategy projects that combine at least city-wide relevance and a high degree of innovation.
- **Large projects** – These are projects of at least city-wide relevance, they address an important problem (even one which has been neglected for a long time), but they do not seek innovative solutions. Oftentimes, they are large investment projects especially in the area of infrastructure.
- **Innovative projects** – These are projects that bring a new topic or solution, and while still being pilot or local activities, they have the potential, if they prove effective, for larger-scale implementation.
- **Uncategorised projects** – These include largely local projects without a city-wide impact that also introduce what is rather a type of maintenance or expansion of current practice without significant changes in quality (e.g., expansion of capacity without qualitative change).

Table 2: Classification of projects based on basic factual criteria

new for/uncharacteristic of Central Europe or EU	INNOVATIVE PROJECTS	FLAGSHIP PROJECTS		
new for/uncharacteristic of the Czech Republic (other big cities)				
new for/uncharacteristic of Brno	UNCATEGORISED PROJECTS	LARGE PROJECTS		
maintenance / capacities expanded without change in quality				
	local impact on one city district only	more city districts	entire city	Brno metropolitan area and beyond

Also subject to evaluation are **additional factual criteria** aimed at the level of integration and the synergy of the projects as registered:

- **Level of integration** – where a project seeks to fulfil more than one goal and priorities from various strategy values, it is referred to as an integrated project “2 birds with 1 stone”.
- **Synergy** – if a project is conveniently combined with another thematic project or project carried out on the same territory, and if they boost their impact, it is the so-called synergic project “when 1 + 1 = 3”.

Those integrated and synergic projects that evidently link several levels of the topic in question or that mutually boost their impact are consequently favoured.

Meetings with representatives of the professional community: overview

During the initial stage of preparation of the overview of projects of the Action Plan, in **May–June 2021**, the **first round** of collection of projects and project objectives from individual departments of the Brno City Municipality, partially state budget-funded organisations and city-run organisations took place. Projects were collected via a simple online form completed by project owners.

In the **second round** of project collection in **June 2021** took place a joint meeting of all thematic working groups for #brno2050, in which all contacted entities were members of these individual working groups. They were entities from the public and private sector, as well from the education, science and research and the non-profit sectors. These entities had had the opportunity to take part in the creation of the long-term Vision 2050 and the medium-term Plan 2030, and still have the chance to take part via their specific projects and activities, the implementation of which will contribute to the fulfilment of the joint goals and priorities within the strategy. Essentially, it is a paraphrase of sorts of the so-called “corporate social responsibility” that consists in the involvement of companies (and numerous other institutions) in solving general social issues. All types of entities



in the City of Brno could declare – actively, knowingly, and publicly – their shared responsibility for the long-term sustainable development of the city.

Anyone interested in taking part was able to apply online with their project by **September 2021**. By fall of 2021 applications for **approximately 150 projects** were received.

In **October 2021** separate meetings of **five individual working groups** took place – **Environment, Prosperity, Services, Resources, Administration**. Members of the working groups were made familiar with the basic overview of projects submitted during the spring and fall; selected projects were introduced in greater detail and discussion took place on the possibility / need for other projects being submitted. A third round of project collection followed. Once again, these projects were added via the online form during **November and December 2021**. **By the end of 2021, the total number of registered projects was approximately 250**. All of them were subject to evaluation to determine whether they will be included in the Action Plan or moved to the project inventory.

Interactive dashboards of projects included in the Action Plan and the projects being part of the Project inventory are now available in Czech [on-line](#).

3.4 Brno Replication Plan

The replication of smart solutions within the RUGGEDISED project in the case of the city of Brno is mainly concentrated in the intention of building the smart district **Špitálka**. In addition, there are also smart solutions that are of city-wide significance and not just related to a specific location.

The Špitálka smart district is in the stack of projects in the Action Plan of the #brno2050 strategy - PROJECTS 2021+. It is in the project stack due to the project's state of development, where the assumption of implementation is 2027-2030. An inclusion of the smart district construction project Špitálka directly in the Action Plan is expected in 2023. Other replicated solutions of citywide importance listed below are also part of the current Action Plan.

3.4.1. Smart District Špitálka

The intention to build the smart district Špitálka is defined by two key documents. Firstly, it is the **Master plan for the construction of the smart Špitálka district** (MASTERPLAN - City Hub Brno 04/2020, author: A8000 s.r.o.). Secondly, it is the **White Paper of the Smart City District of Špitálka** (Version 1.00 – 2022/02/16, author: A8000 s.r.o.).

Context

The district called Špitálka is located on the eastern edge of the city centre, in the fulcrum of an old industrial wedge called ‘Moravian Manchester’, stretching around the river Svitava. This diverse area, sometimes nicknamed “Brnox” (verbal combination of Brno and Bronx), is on the eve of massive transformation, and our goal is to make the project of Špitálka become its flagship. The potential lying in the conversion of the industrial heritage brings great challenges of not only adaptation to the ever-present impacts of the climate change, but also of careful rethinking of the patterns of our urban life and setting up the new, sustainable way of living in the Brno of the second half of the 21st century.

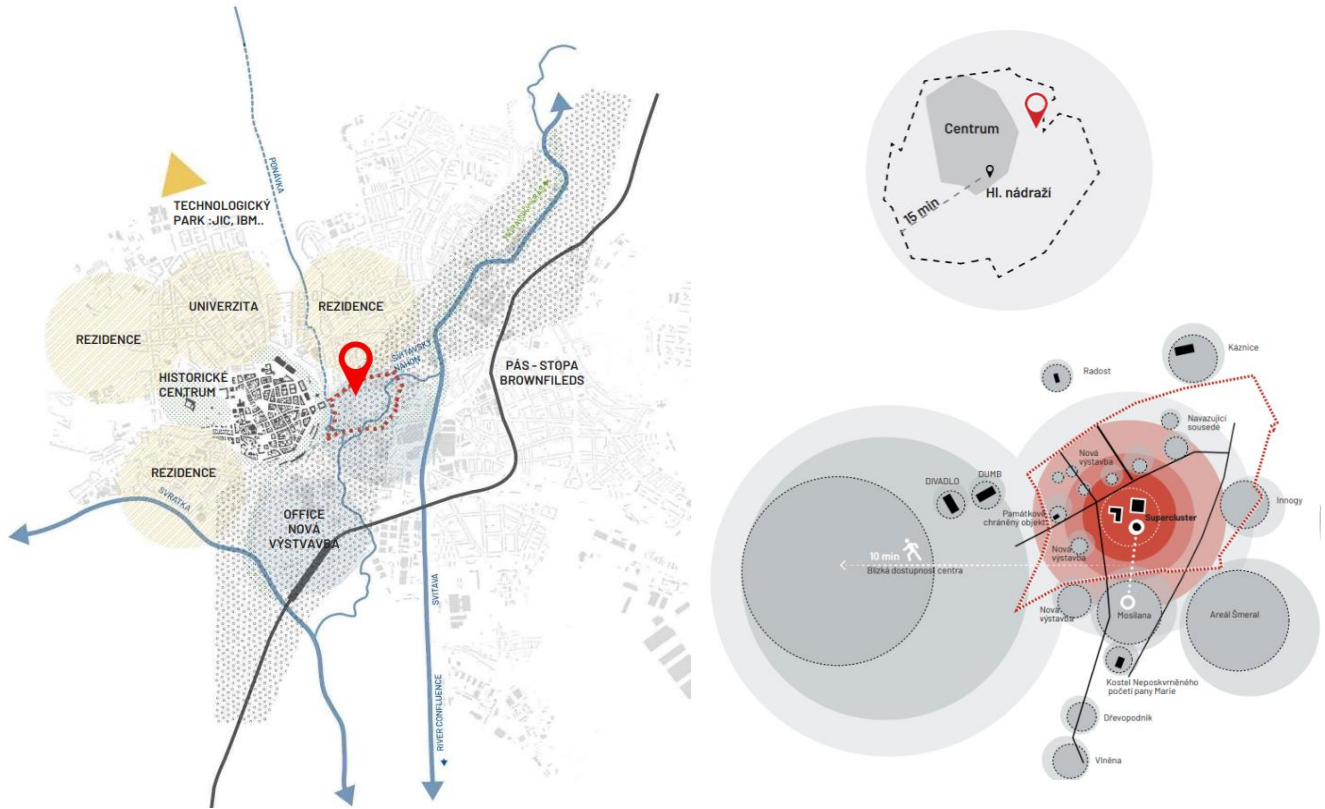


Figure 2: Location of Špitálka within Brno

Potential

The area of interest is in the walking distance from the focal points of life in the city – the pedestrian zone of the city centre, the main railway station, or the theatres and galleries located around the “ringstrasse”. As a redundant part of the complex of the City’s Heating Plant, the site inherited strong industrial genius loci, driven mainly by three dominant structures – the multi-storey building, the two-bay hall and the landmark of the site, the cooling tower. This “supercluster” of buildings with a strong identity brings a possibility to become a subcentre of the district, and even initiate a broader transformation of the neighbourhood.

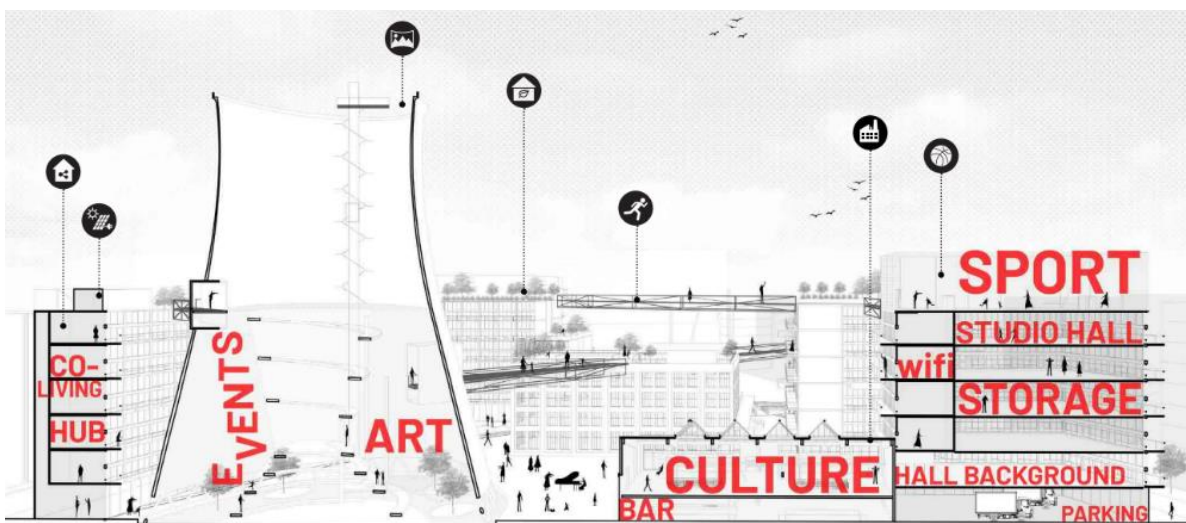


Figure 3: Functional concept of the Špitálka district



City Hub (Vision)

The programmatic concept for the area is based on a combination of the elemental functions (**Work&Live**), creating a stable, dense urban fabric, and the destination highlights (**Coworking + Culture + Event Hub**), initiating the cultural growth and attracting new inhabitants enriching the area. This is what we call a **City Hub** – a smart, dynamic district, a home for the diverse social groups and a focal point for new residents and visitors. All the actions on the site are based on the concept of **re- use/cycle/interpret** - not only in the sense of physical reconversion of the buildings on the site, but also in the careful work with the context and smart technologies, to create an interconnected and sustainable energetic, water and communication system.

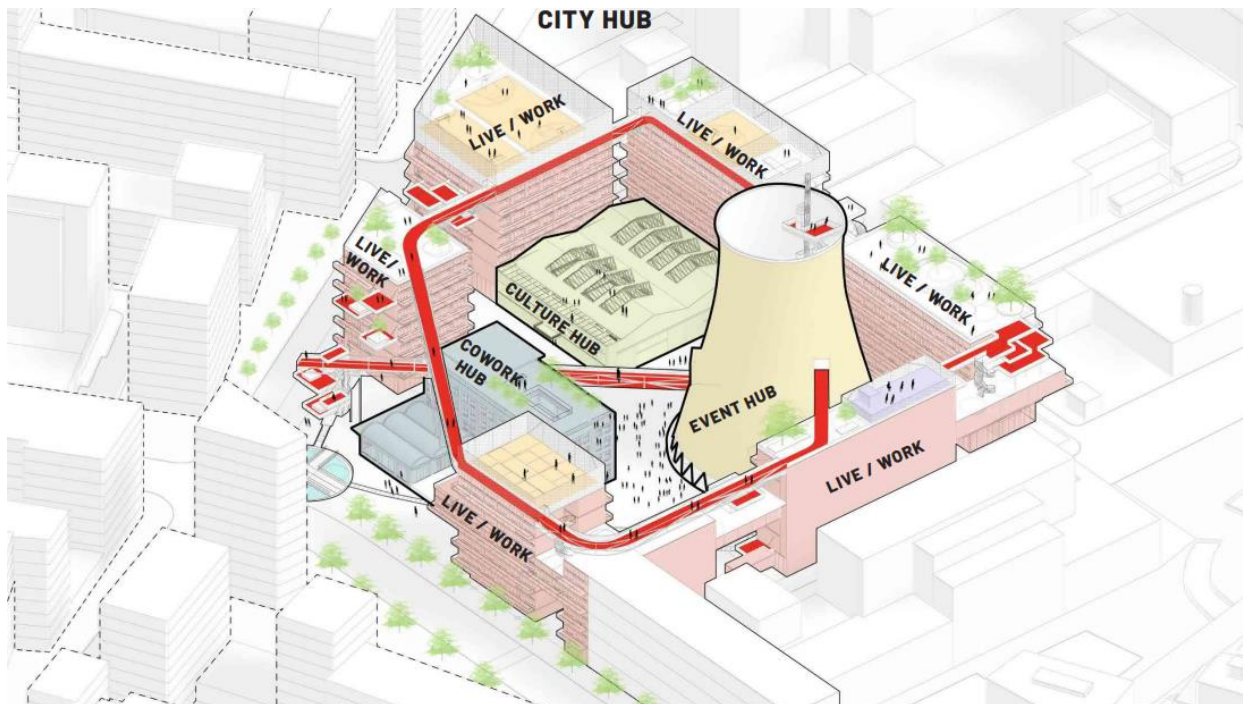


Figure 4: City Hub

The objectives of the project are listed below:

- Trigger future development of the broader area of Špitálka.
- Verify use of modern sustainable, green, and smart technologies and innovative approaches for their possible expansion all over the city.
- Create a lively and modern neighbourhood where people can comfortably live, work, and spend their leisure time

3.4.2. Masterplan

Masterplan is an urban-volumetric study outlining the principles of the use of the site. The masterplan is conceived around the three existing dominant buildings with new public functions, which extend into the public space in between them. The new structures are located on the edges of the area, redefining the area in between the buildings into an **urban square** with hubs acting as the focal points. On two of the sides, the area opens towards the newly conceived streets, and on the other sides the public space communicates with the surrounding industrial areas through the openings in the building volumes, awaiting their future transformation. The concept of visual and physical **permeability** emphasises the aim to make “Špitálka” a fundamental part of the whole district.

Work&Live

The new buildings serve both as a technological hearth, and as a liveable capacity for the area. The whole **live/work complex** would be able to serve up to 600 inhabitants in approx. 26,000 m² of gross floor area.

The structure is built up by the modular units with standard floor area of 28 m², with a construction height of 4.8m. This enables inserting a mezzanine floor, to create a flexible living space for 1-2 tenants per unit, or



workspace for a group of 3-4 tenants per unit, with possibility to connect more modules together. The flexibility of use should be enhanced by following the standards for permanent housing in at least 75% of all units. The live/work units are supposed to be affordable for a wide spectrum of social groups, from students and seniors to young prospective workers and managers. At least 15% of all the units will be transferred to the municipality ownership as the affordable units with a regulated rent.

Scope: 600 units for rental living/work (each 28 m² + ½ floor) – newly built. Gross Floor Area: 26,492 m² | Net FA: 19,937 m² | Build-up Area: 5,258 m².

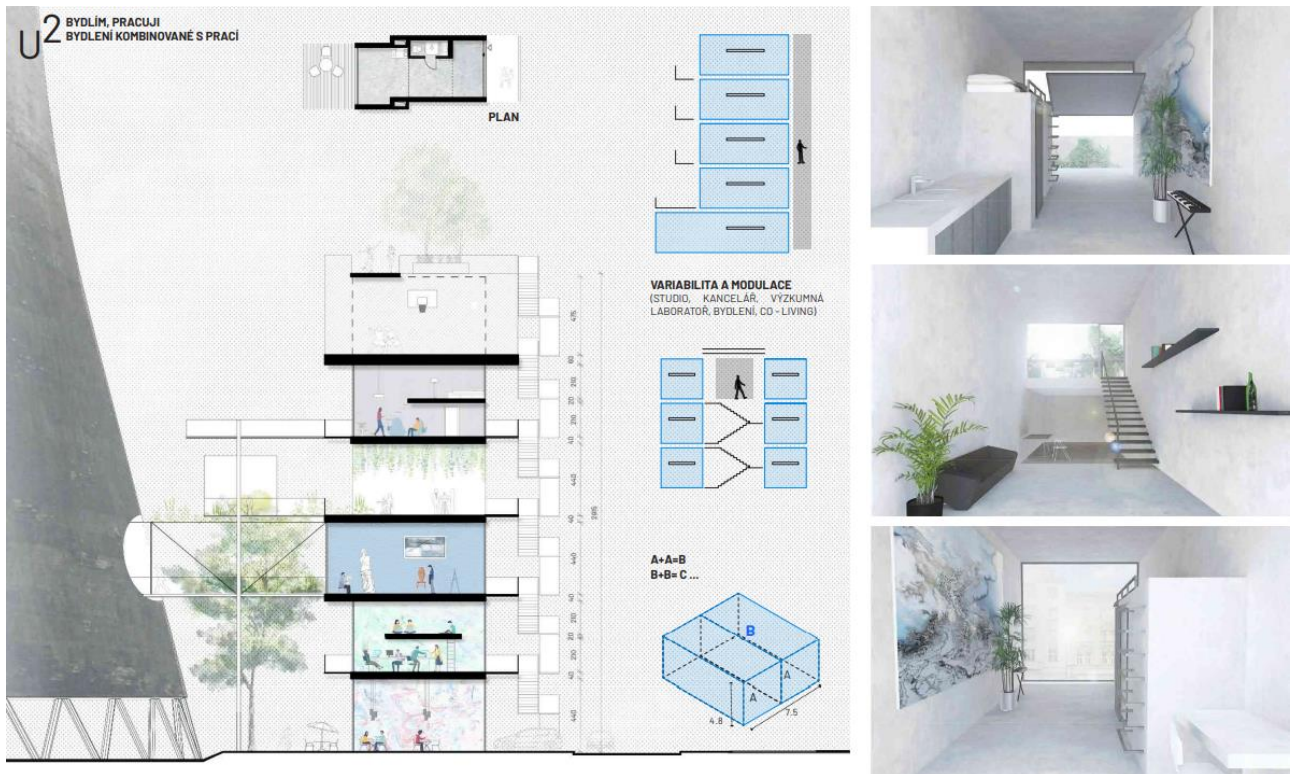


Figure 5: WORK&LIVE modular units with mezzanine floor

Coworking Hub

The multi-storey concrete skeleton building, where the archives are currently located, will be revitalised and opened for the **Coworking Hub**, as a hotspot for sharing ideas and knowledge. With 3,500 m² of floor area, it has the potential of becoming a strong community for young people working in technology companies, creative industries or in start-ups. Serving either for the locals living in the **City Hub**, or for the newcomers, these people will be the first users of the area, and the ones which will be shaping the activities there.

Scope: A major reconstruction of an existing building into a modern coworking/administrative building with a capacity of 150-200 people. Gross Floor Area: 3,469 m² | Net FA: 2,595 m² | Build-up Area: 320 m².



Figure 6: COWORKING HUB visualisations



Culture Hub

Two-bay industrial hall located in the hearth of the area, which will be transformed into a **Culture Hub**, has the potential to become a highlight of the area, and a key initiative point in the transformation of the surrounding area. The city currently has a gap in the mid-size category of multifunctional event spaces for 1000-1500 sitting guests or 1500-3000 standing guests. The hall consisting of two identical bays has a perfect layout to be transformed into a variable event space with a bar and utilities in one bay, and free space in the other one. With an approximate capacity of 1000 sitting guests and 3000 standing guests, it has the potential to serve concerts, conferences, box-layout events, and fashion shows as well, and take the advantage of 10-15 min walkable distance from the city centre. The events can expand into the surrounding public space, making the whole square one big event space.

Scope: Major reconstruction of an existing industrial building for cultural, sport or social events with a capacity for approximately 1,000 people seated or 3,000 people standing. Gross Floor Area: 3,912 m² | Net FA: 2,879 m² | Build-up Area: 1,667 m².

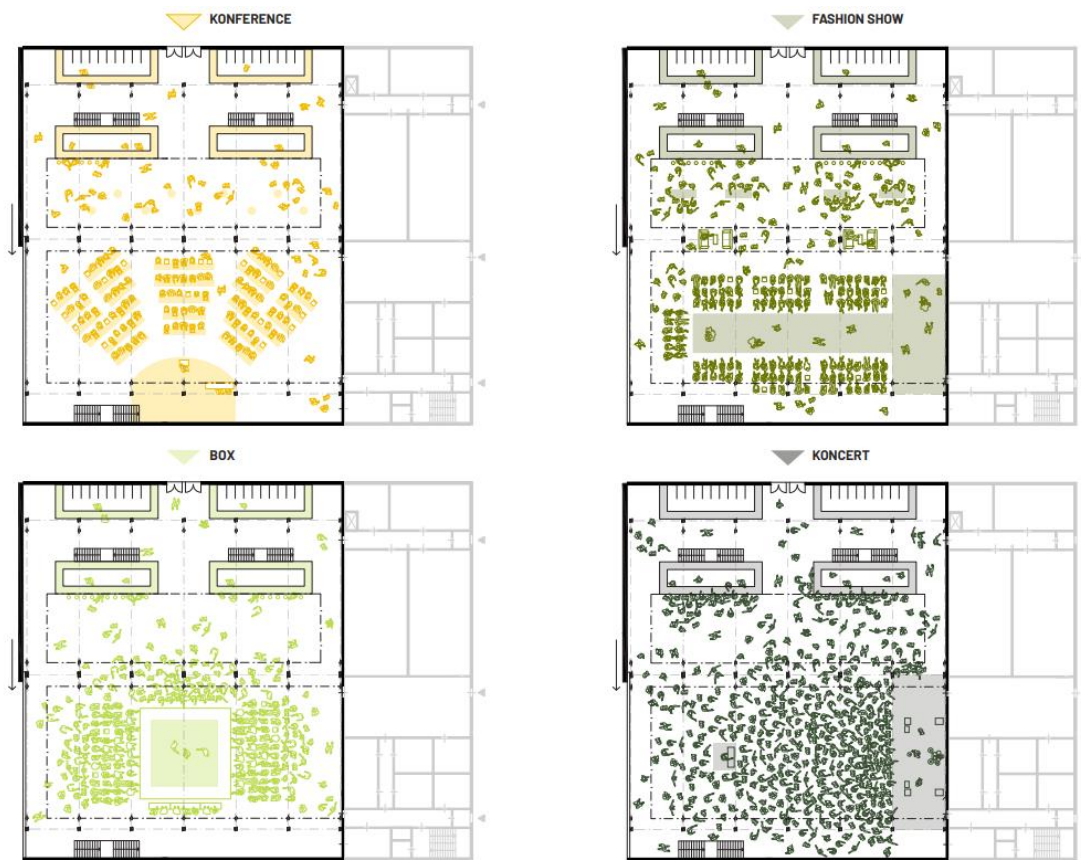


Figure 7: Visualisation of multifunctional use of the CULTURE HUB

Event Hub

The cooling tower has already become an icon in the cityscape. With the proximity to the city centre, this strong industrial memory is largely present in the street views and symbolises the Špitálka area as a lighthouse of an island. Its specific, conical space brings a potential to reference the iconic exhibition space of the Guggenheim Museum in New York by F. L. Wright, and create variable space for expositions and events, arranged around the spiral ascending ramp. The space inside the spiral opens towards the open top part accessible by a staircase, providing the visitors with the unique atmosphere of the existing space, as well as a new experience from yet unrevealed view over the cityscape of Brno.

Scope: Major reconstruction of an existing industrial cooling tower with a new-built event hall inside. Gross Floor Area: 6,196 m² | Net FA: 4,957 m² | Build-up Area: 1,486 m².

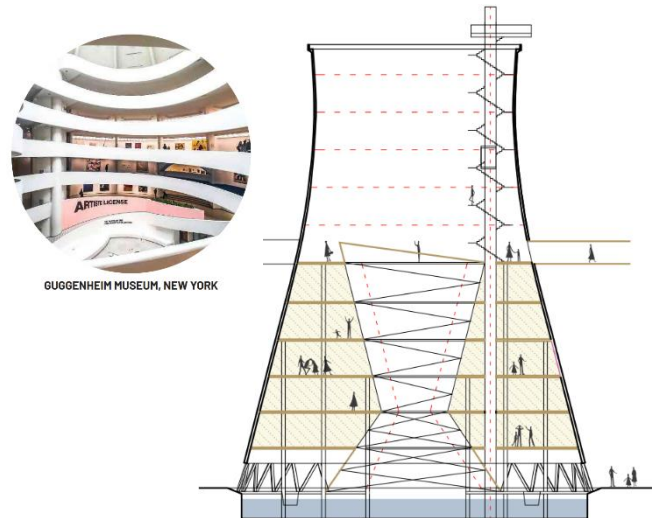


Figure 8: EVENT HUB visualisations

Public space

All the public spaces should be truly accessible to anybody; therefore, they will be open and barrier-free. The space between buildings, as a common space for the dense surrounding programme, will become a lively area full of action. As a part of the green-blue infrastructure, the roof will be largely covered with vegetation, consisting of 55% of intensive vegetation, and 45% of extensive green roof, partly covered with photovoltaic panels. The roof area will provide users with a space for communal gardening, sports facilities and a 400m long running loop connecting all the rooftops into one unique system of elevated public spaces.

Parking: Two-underground levels below **Work&Live** buildings, Gross Floor Area: 15,149 m².

3.4.3. White Book

White Book is a document aimed to define the fundamental principles and specific parameters for the future of the smart neighbourhood. The goals are to set up the requirements, standards and recommendations which would be required to be followed by the investors and contractors of the new Špitálka. The parameters embedded in the White Book are described by the specific definition, quantitative requirements, and wider principles to be followed. These specifications provide not only necessary fulfilment of the law, but they go beyond in favour of reaching the RUGGEDISED project goals.

The smart city district is supposed to be environmentally friendly, where modern technologies and approaches will serve to simplify and make the stay of residents and visitors more pleasant. A place where natural resources will be managed sustainably, where renewable energy sources will be used as much as possible and where community and individual life will develop in a socially and culturally rich and inspiring environment.

The document is trying to propose the scenarios of the future development – however, it is not able to predict the rapidly changing future of technologies, society, and legislation, therefore we must understand the White Book as a founding document, which will be consequently updated during the next phases of the project.

The White Book is available online in the English version [here](#).

3.4.4. Replicated Smart Solutions in ŠPITÁLKA

Heating and cooling

An **intelligent grid** connecting all the buildings with different programmes into one **centralised heating and cooling system**. Sustainability is achieved by extracting the geothermal heat, smart management of energetic demands and **clever usage** of building constructions and earth as thermal “batteries”.

The density of the built environment brings immense potential for achieving **high effectivity of the energy usage**. All the objects will be connected to one central energetic point, where the heat will be sourced, redistributed, and



stored. This centralisation enables the **effective distribution and recuperation of the heat between the buildings** with different programmes, and therefore different energy demands. By connecting them into one system it will also be possible to **shave the peak points of energy consumption**.

This principle may be achieved by centralising heat/cooling sources with mutual transfer of surpluses with an efficient distribution system. This means one common energy centre within the area under consideration (heat/cooling source). Heat/cooling is generated in the common energy centre and redistribution of heat/cooling according to the needs of the individual buildings. There is only heat/cooling consumption in the buildings and no sources or storage. The energy centre will be located in the underground space of the premises with one machine room, one control room, one access, and one operator.

The primary heat source will be a thermal grid of geothermal heat pumps, supported by the secondary heat source from the nearby heat plant. The supplementary heat will be extracted by recuperation of the heat from the ventilation system, and there is a possibility of extracting the waste heat from the nearby server building (to be explored).

Table 3: Summary of heat sources

Heat sources	
Primary	Geothermal borehole system with a heat pump
Secondary	Two-pipe connection to the return branch of the heating network (plus a spare connection to the supply branch) with a heat exchanger station
Supplementary	Heat recovery from wastewater and heat recovery from air conditioning
External	Use of waste heat from a nearby data centre (the issue of contractual guarantees)
Accumulation	Short-term water accumulators and long-term geothermal boreholes

The system will be designed with a higher cooling temperature obtained from the ground boreholes by direct extraction without using the compressor operation of the heat pump. The use of large-scale end-cooling elements (i.e., chilled ceiling and floor structures, chilled beams, etc.) is considered. Each unit must be provided with cooling options.

The balance of energy flows between the buildings will be assessed and according to the results, the use of short-term accumulation using water accumulators or geothermal boreholes for long-term accumulation will be proposed.

Energy recovery from wastewater is required in the **Work&Live** and **Coworking Hub** buildings. Recovery will be central (for each building separately). The system consists of a heat recovery exchanger where energy from waste hot utility water is transferred to clean cold water from the drinking water source using heat-exchanging surfaces.

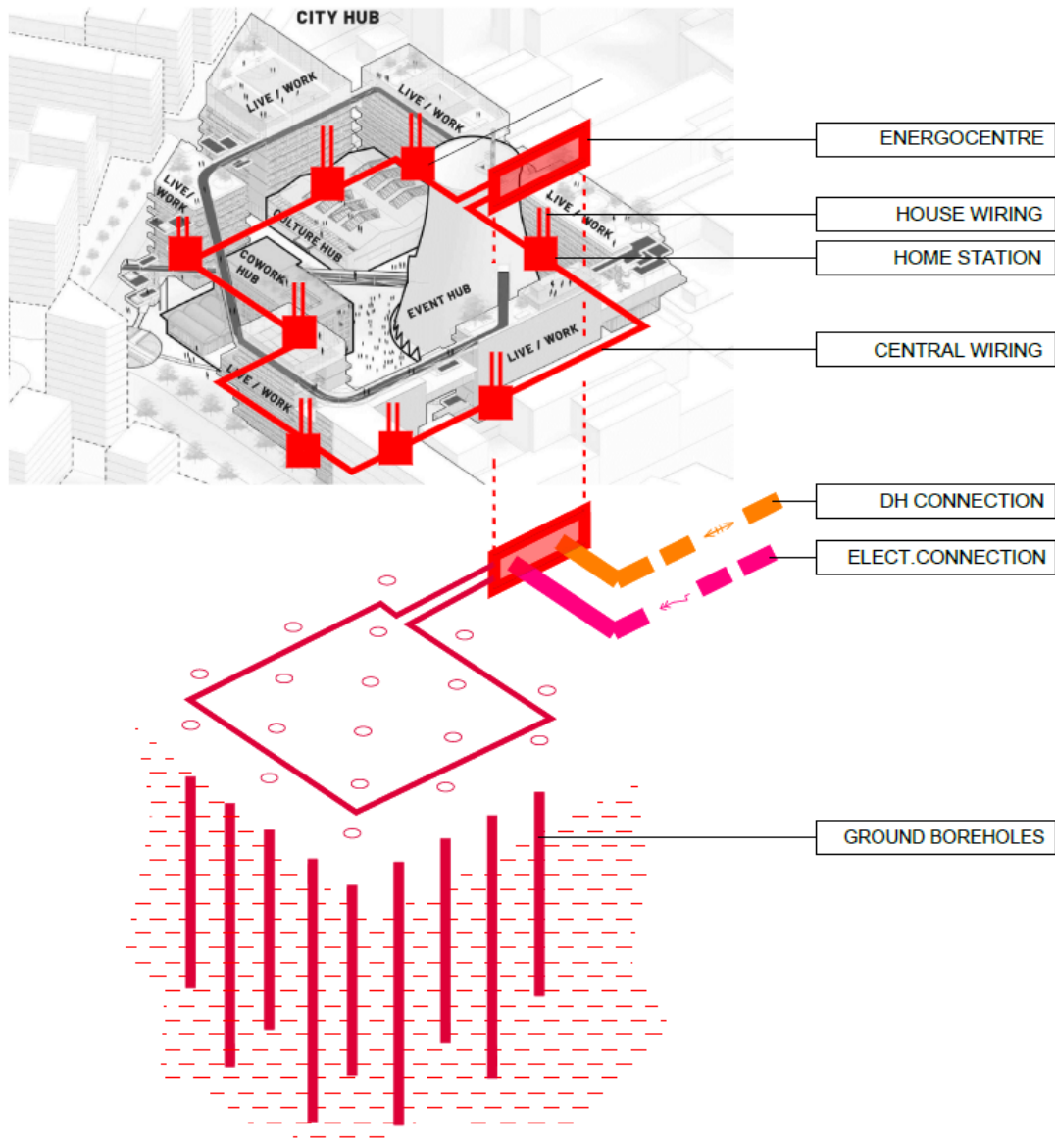


Figure 9: Overview scheme of technical equipment of the heating and cooling system

The thermal and technical design of the buildings will be in the passive standard. The requirement for values lower than UPAS,20 according to ČSN 73 0540-2 applies to the structures. The specific solution will have to be discussed after the submission of the design of the building envelope.

The thermal and technical design of the reconstructed buildings will be in the standard with near zero energy consumption (NZEB) – the buildings must comply with the PENB valid after 2022.

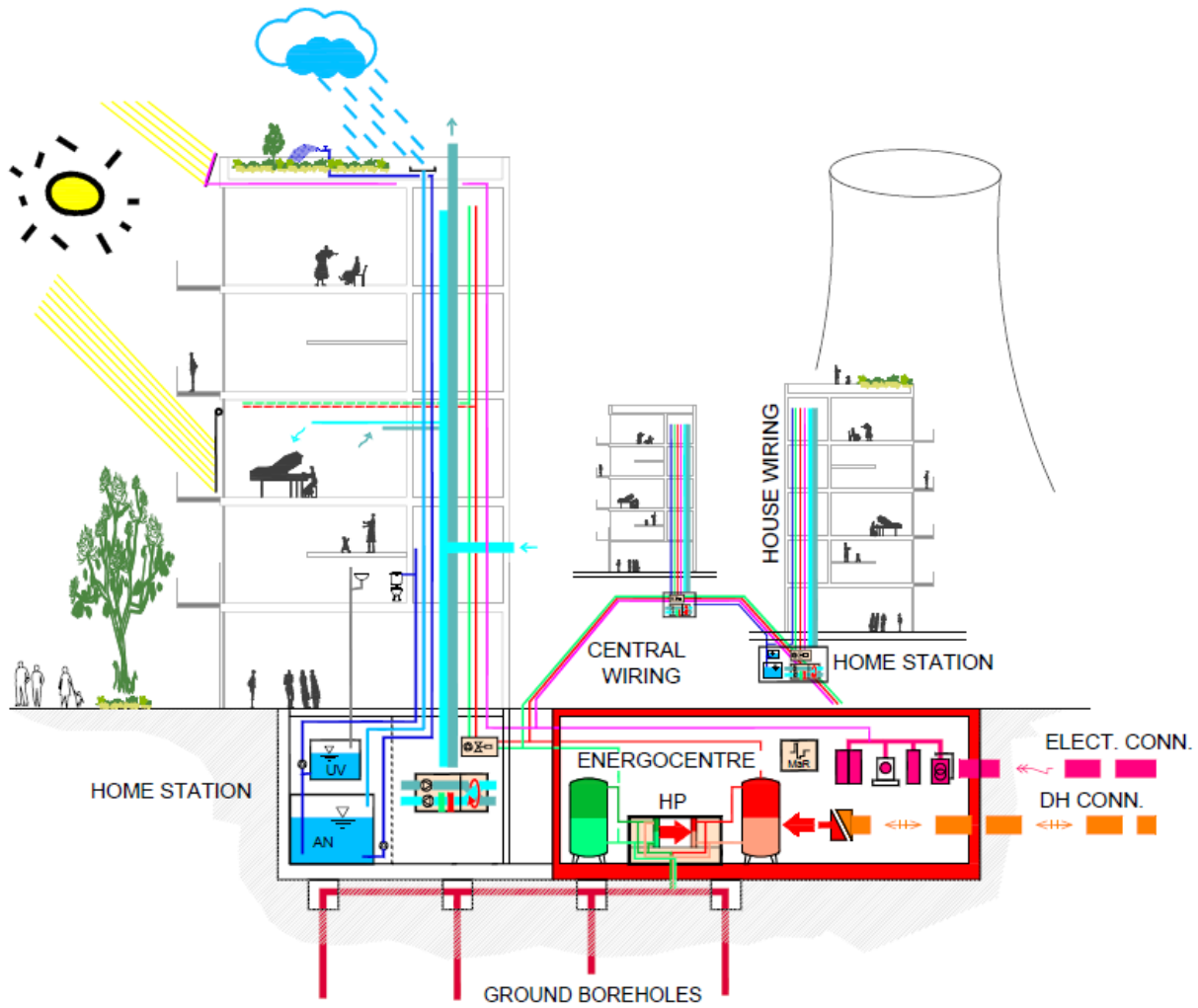


Figure 10: Overview idea scheme of technical equipment of the heating and cooling system

Table 4: Indicative balance of the technical equipment - heating and cooling

Heating	quantity	unit of measure
heat loss	613	kW
HVAC	527	kW
hot water heating	448	kW
heat demand	1 729	kW
mutual contemporaneity	0,62	-
installed power of the power supply	1065	kW
annual heat demand	2086	MWh/year
Cooling	quantity	unit of measure
cooling demand	1 771	kW
contemporaneity	0,75	-
installed power of the power supply	1 328	kW

Replicated smart solutions from RUGGEDISED project:

R1: Geothermal heat-cold storage and heat pumps

Note: This solution has the potential to be integrated with existing infrastructure and networks. The future developer of the site will be the primary stakeholder, but we also anticipate involvement of two



Brno city companies: Heating plant Brno and SAKO Brno (waste-to-heat plant) for their expertise. There is a significant challenge related to the complex industrial and environmental conditions on the site (groundwater, pipe debris, and collectors, a small area of land). Also, special consideration should be given to the energy management system, and the appropriate set-up of energy flows between buildings.

R2: Thermal energy from waste streams

G1: Heat and cold exchange - Connection of buildings to district heating network

Other RUGGEDISED smart solution with potential for future replication (to be more explored):

R4: Pavement heat-cold collector

Electric grid and e-mobility

An **advanced power distribution network** that allows **controlling of power generation and consumption in real time**. The network uses renewable energy sources (RES) and combination of a battery storage and smart demand energy management system to **shave the peak consumption and lower overall energy demand**.

A sustainable approach to a usage of electricity consists of several steps. First one is maximising the usage of the renewable energy sources – primarily by installing approximately 3,000 m² of photovoltaic panels. Due to the preference of using the roof for the activities of the inhabitants, and therefore lack of appropriate space for their installation, the aim is to embed them into the shading constructions and extensive green roofs, where the special transparent panels will be used – creating a “biosolar” roof.

The rest of the required amount of electric energy will remain to come from the public distribution network, although the aim is to make contracts for distribution only with non-emission/renewable energy producers.

The consumption of electric energy will be lowered by implementing the smart demand energy management system. By shifting the consumption of the energy-demanding appliances to off-peak hours, together with the battery storage, it will help with the “peak shaving”.

Table 5: Summary of electricity sources

Electricity sources	
Primary	Distribution network, external electricity supplier in the form of commercial contracts with RES/non-emission sources owners
Secondary	Photovoltaic panels
Accumulation	Battery storage

Estimated (required) area for PV panel installation – 3,000 sqm.

The energy obtained from the PV plant will be used for the needs of the site. According to the energy study, it is obvious that the demand of the site will be higher than the maximum installed capacity of the PV plant on the site.

Electric Mobility

Each parking space must be prepared from the point of view of energy infrastructure to be equipped (at least cable trays, DTS, etc.) with **slow charging stations for electric vehicles** (e.g. wallboxes). The installation of fast chargers for electric vehicles is not required.

In association with the promotion of electric mobility, it is necessary to ensure sufficient and suitable space for the installation of the DTS / transformer and at the same time to consider sufficient power capacity to equip all parking spaces with this type and nature of electric vehicle chargers. Similarly, charging of electric bikes, scooters, etc. must be ensured.



Battery storage

The battery storage will be used to improve the smart district’s DDS as a whole, e.g. through peak shaving, in order to positively impact the overall reserved power capacity of the smart district. The battery storage will be used to store cheaply purchased energy (off-peak); then the energy will be used on site during peak times.

The central battery storage facility will be located underground in the technological core of the site.

Table 6: Indicative balance of the technical equipment - electricity

Electricity	quantity	unit of measure
installed input power	7 615	kW
total contemporaneity	0,25	-
contemporary power input	1 917	kW
preliminary annual consumption	1 729	kW
Note: Electricity balances do not include electromobility, which will have to be assessed separately.		

Replicated smart solutions from RUGGEDISED project:

R6: Smart charging parking lots

Note: This solution has not been implemented in Rotterdam. However, its concept has been used as a source of inspiration for developing charging-related measures in Brno.

U6: E-charging hub & charging infrastructure

Note: City company Heating plant Brno plays a key role in building the public EV charging infrastructure across the city. In coordination with the developer of the site we expect that the Heating plant Brno will provide the new charger points and will connect them to the city-wide network system. As pedestrians will be given priority in Špitálka district, the main e-charging hub will be in underground parking garages. The main energy source could be electricity produced by PV panels on the site. In the year 2020, the first fast EV charger was already installed in the Špitálka district as part of the Heating plant Brno kick-off project. The other EV chargers will need to be installed after the new transportation infrastructure is constructed. Moreover, the new district must be integrated into the electromobility development plan.

G2: Deployment of a suitable battery storage technology in the project district

G4: Optimisation of the integration of near-site RES

Note: Heating plant Brno, which operates tens of charging stations in Brno, has begun to integrate solar panels on the roofs of its buildings during 2021. This solution focuses on balancing renewable generation, building electricity consumption, storing excess energy in batteries, and using it for e-mobility. The fact that the Špitálka district is located right next to Heating plant Brno's administrative building creates the opportunity for collaboration on business models for the use of renewable resources for Špitálka purposes. The legal parameters and the time schedule must be carefully considered. The reason for this is that the solar panels will probably be installed several years before the construction of the new district is completed.

Energy management and optimization of energy systems

The site will be equipped with a smart energy management system. Power consumption from major appliances will be **automatically shifted to off-peak hours** (cheaper energy rate). The system will be equipped with identification of low and high rates, including feedback to users, e.g. warning of excessive consumption during peak hours.

Full installation of smart metering / smart meters on the site. The deployment of **smart meters** is also assumed in the knowledge that the consumption of the individual consumption sites will be standard due to their planned nature, i.e. will be low compared to the consumption of 6 MWh/year.

It is required to provide intelligent building management with the possibility of data evaluation and its reverse application. Among other things, this will apply to metering of all media with evaluation in relation to current



prices, evaluation of the prediction of the development of the profitability of consumption in time zones, communication outputs for customers enabling automatic control of consumption, etc. Due to technical and legislative developments, significant advances are expected in the capacity to manage the electricity consumed (even fed back). The detailed solution will be a matter for the next phases of the project.

All low-current systems from security, CCTV, Internet, TV, Wi-Fi, etc. will be covered in the next phases of the project.

Replicated smart solutions from RUGGEDISED project:

R8: Energy Management

U2: Smart peak power control of district heating

Note: The current administration does not see this solution as a possibility to save energy resources. We assume that this is mainly due to the lack of knowledge about this possibility. Nevertheless, a demonstration project on a few selected buildings of the city and municipal companies would certainly be beneficial for possible promotion and dissemination. And Špitálka district has the needed potential to be the testbed. However, the implementation is possible only by the close collaboration with future developer. This depends on the scale of the implementation and an additional information and feasibility study is needed to calculate the costs.

U4b: Intelligent building control and end user involvement

U9: Demand Side Management

Intelligent LED street lights

Smart LED public lighting with **automatic dimming and brightness control** depending on time of day, amount of natural light and ambient traffic. Energy-efficient LED illumination will adjust its brightness based on the momentary public need and intensity of natural light according to the data obtained from sensors. Where appropriate, lamps can be fitted with chargers for electric vehicles.

Replicated smart solutions from RUGGEDISED project:

R11: Efficient and intelligent street lighting

Note: As the Špitálka district is getting a new engineering infrastructure, it is important to be careful to choose an innovative approach. The key player will be the city company Technical Network Brno, in collaboration with the city and the future developer. In this case, it is also possible to plan the additional integration of EV chargers into some of the lighting columns.

G8: Implementation of demand-side management technology in street lighting

A detailed description of the requirements for the construction of Špitálka smart district, including a description of other innovative approaches and smart solutions, that are not part of the replicated solutions of the RUGGEDISED project, can be found in the White Book in English [here](#).

3.4.5. City-wide Smart Solutions

In 2017, Špitálka was chosen to become the replication area for implementing the smart solutions into the city of Brno. However, the **impact of the smart city project is city-wide**, and many of the ideas will become a part of the **broader modernisation of the infrastructure of the city**.

Data Brno

Web data portal data.brno.cz (available in Czech and English) was launched in March 2018, targeting three distinct types of users. The first is a general public who can get to know more about their city through the data. Mainly, thanks to the City-state report, which has become very popular with the public and is always published at the end of April, it has managed to get a lot of basic information about the city into public awareness. The second type of user is professional public or students, for whom the website offers a lot of interactive long-term statistics about the city or applications, which have gained a lot of popularity overall. The third type of user is developers and IT professionals working with machine-processable datasets.

The database currently contains 143 data sets, and the number is constantly increasing. For instance, some data sets contain **data on traffic conditions** (based on WAZE for Cities), **air quality** (PM10, PM2.5, O3 and NO2), **location**



of public transportation vehicles, bike traffic, and car park capacity. Other data are regularly updated. In addition to technical information (traffic conditions, public lighting, recycling and waste management, etc.) the data sets also provide information on **economics, history, environmental, study, safety, and health.** As a result, it is possible to create an overall picture of the given location of the city together with social and economic aspects. The data are publicly available and open, allowing users to analyse or use the API to generate tools and applications.

The data are visualised in a 2D map only and there are currently no plans to import them into a 3D city model. The 3D model of the city is a separate application and contains data from the height measurement of buildings and tree mapping in the city. The data sets do not yet contain information about critical infrastructure such as water, electricity, etc.

Inspired by smart solutions from RUGGEDISED project:

G7 – Smart open data decision platform & central management system

U8 – Smart City open-data decision platform

Smart LED street lights and e-vehicle chargers

Energy efficiency, safety, and comfort – those are the challenges to achieve by rethinking the system of streetlights. In the city of Brno, the average power per light point is around 80 W. The share of LED lights within public lighting is 11 % and a gradual replacement of LED lights is planned for 2023 at a level of 13.5 %.

Sufficiency of light in the public spaces provides a feeling of safety and orientation, redundancy however creates light smog and negatively affects the health of the organisms. Intelligent street lighting has the ambition to balance these counterparts. Energy-efficient LED illumination will adjust its brightness based on the momentary public need and intensity of natural light according to the data obtained from sensors.

From November 2021 until April 2022, the visitors of the Lužánky city park had the opportunity to experience the light testing polygon, and vote for the most appropriate version for them. Throughout the test, the four different types of smart light were installed in four segments along the path in the Lužánky city park. The types differed in the system of dimming (autonomous control of light intensity according to the time of day vs. motion sensors) and in the chromaticity (from warm white orange, with option of changing the chromaticity). Public opinion poll revealed clear result - ¾ of the responders voted for the type with the warmest light (orange 1,800 K) and schedule of reduction of the power to 60% after 9 PM and 40% for the rest of the night, until 5 AM. This combination not only helps to reduce the power input, but also eliminates the harmful blue light spectrum.

Regarding the applicability of smart lights, Brno uses the DALI system for communication between street lighting and dispatching. Currently, the lights are controlled from 400 switching points, communicating with dispatch using a private radio network. Around 100 light points are already being dimmed to lower the power consumption.

Where appropriate, lamps can be fitted with **chargers for electric vehicles.** This solution applies mainly for the new smart street lights. However, it can be implemented even without the necessity of replacing the current lighting poles with brand-new ones. Taking Glasgow as an example, where this solution is already being tested, several limitations have also been dedicated. First, it is vital to adjust the cable connection to ensure that sufficient power is delivered. The solution is not suitable for fast charging. It is also necessary to move the poles to the side closer to the road, to prevent pedestrians coming into contact with the power cable, which could cause injury. Additional, near field communication (NFC) readers are installed on the columns, allowing authorised users to charge their cars.

Inspired by smart solutions from RUGGEDISED project:

G6: Integrated EV charging functionality in Intelligent LED street lights

Note: Heating plant Brno and Technical Network Brno are preparing to launch a test project for electric vehicle chargers at public lighting columns in Slatina district during the fall of 2022. As of now, the project will serve only as a demonstration, and no further expansion plans are currently in sight.

G8: Implementation of demand-side management technology in street lighting

Local energy from renewable resources

Energy produced by the local renewable energy resources will be **stored in batteries,** which will help to **balance the peak demand of energy** for the buildings and the vehicles. The inclusion of battery storage ensures that the



maximum onsite usage of the renewable energy can be achieved, minimising any imports from the national grid with a high tariff, or exports with 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.

The municipality has already begun with installation of photovoltaic panels on roofs of the buildings in municipal ownership – the goal is to reach the overall output of 43 GWh of electric energy, making it the second largest solar power plant in the Czech Republic. This will enable great production of renewable energy, without interventions into the landscape and environment. The coordinator of the project, municipal waste manager from SAKO Brno, has the ambition for the next five years to realise over 500 projects - in the first step for the energetic needs of the specific buildings in the municipal ownership. The first installation has been recently finished on the new social housing complex in the street Vojtova, as well as the Senior House Věstonická. Further on, the plan is to involve the private sector, and start selling the overflowing energy on the market.

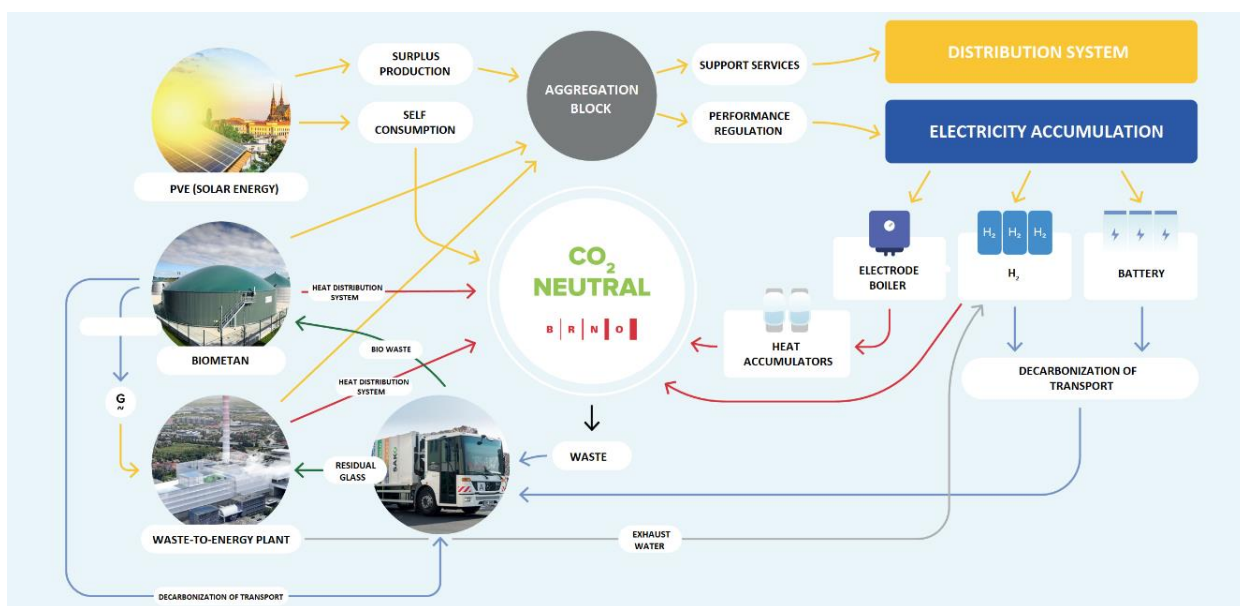


Figure 11: Visualisation of the Brno integrated energy system

Inspired by smart solutions from RUGGEDISED project:

G4: Optimisation of the integration of near-site RES

Smart waste management

Implementation of the filling degree metres into the municipal waste bins can greatly **improve the effectiveness of the waste collection** (in Rotterdam up to 25% in kilometres in the waste-collecting routes), and therefore **decrease the CO2 emissions from the collecting cars, reduce the waste collecting days** and generally **improve the cleanliness of the city** in Brno, the municipal company SAKO Brno is responsible for waste management.

SAKO Brno has also started with replacing the fleet of collecting cars - the first fully electric car is collecting the municipal waste since august 2022. The charging of the vehicle takes 11 hours, and with a full battery it can run up to 70 km in the streets of Brno, which enables smooth everyday operation with capacity of collecting up to 13 tons of waste per day.

Other improvements in the municipal waste management are proposed biomethane station that will transform the collected biological waste into the biogas for production of energy and heat and building of a new block of waste power plant, marked as "K1" in the area of SAKO Brno. Currently the energy from burning the waste supplies 20,000 homes with electric energy, and 40,000 homes with heat, with overall production of 46 GWh of electric



energy and 1 million GJ of heat from 230,000 tons of the waste per year. This means saving 250,000 tons of CO₂ every year, not only from replacing the energy from fossil fuels, but also from preventing the landfilling of the non-recyclable waste that would not have any further use. With the new block of the power-plant, SAKO Brno would be able to transform 352,000 tons (+60%) of waste into 1.5 million GJ of heat (+50%) and 158 MWh of electric energy (+230%). This means extra saving of equivalent 160,000 tons of CO₂ emissions per year.

3.5 Brno Investment Plan

The current investment plan is based on a financial **pre-feasibility study**⁴. Based on this study, Brno aims to find a financially strong and experienced strategic partner for the delivery of the Phase 1. The study proposed two options:

- **OPTION 1: Joint Venture** with a Strategic Partner. The city would need to find a Strategic Partner to create a Joint Venture and hold 20 % share for 30 years. Subject to a risk sharing matrix, the City will issue a Minimum Revenue Guarantee to retain demand risk related to certain/all facilities.
- **OPTION 2: PPP** (Public-Private Partnership) and a 30-year DBFM contract with an Availability Payment.

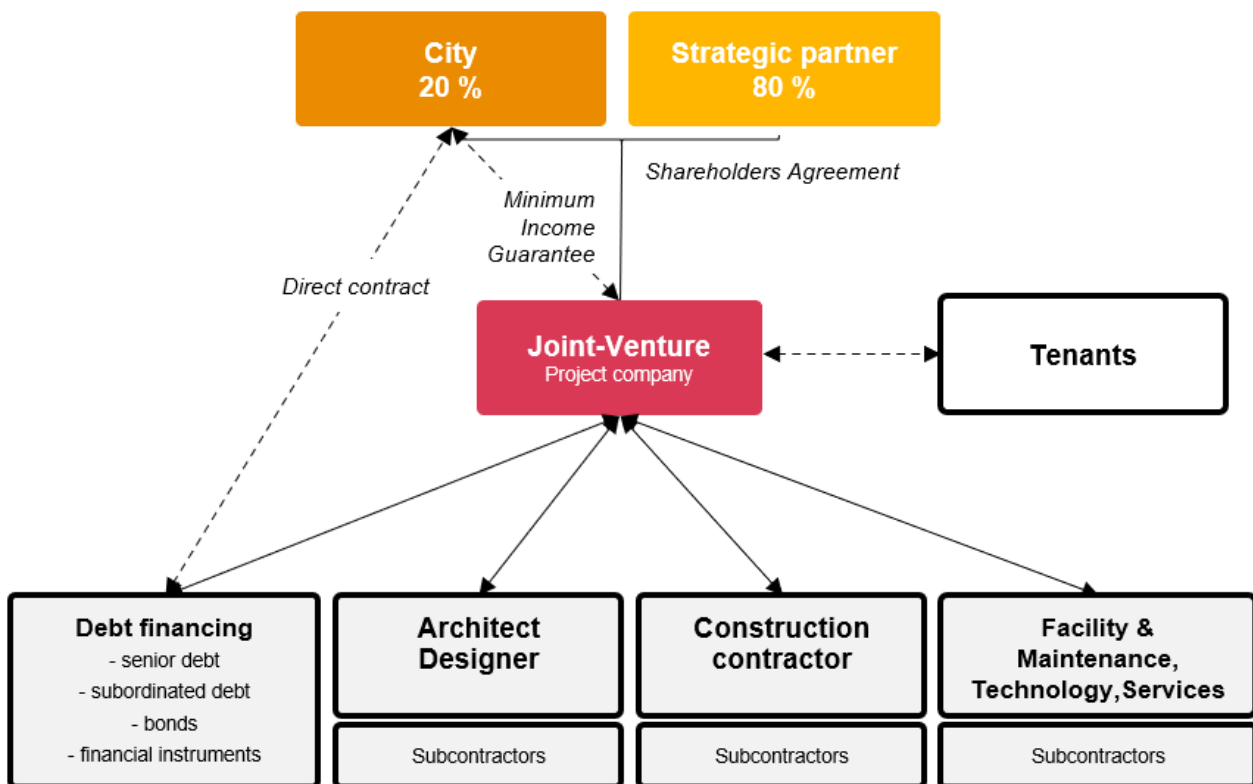


Figure 12: Scheme of the Joint Venture model

⁴ “Financing options and strategic approach for the implementation of the Špitálka smart district project”. 06/20220. PwC Czech Republic.

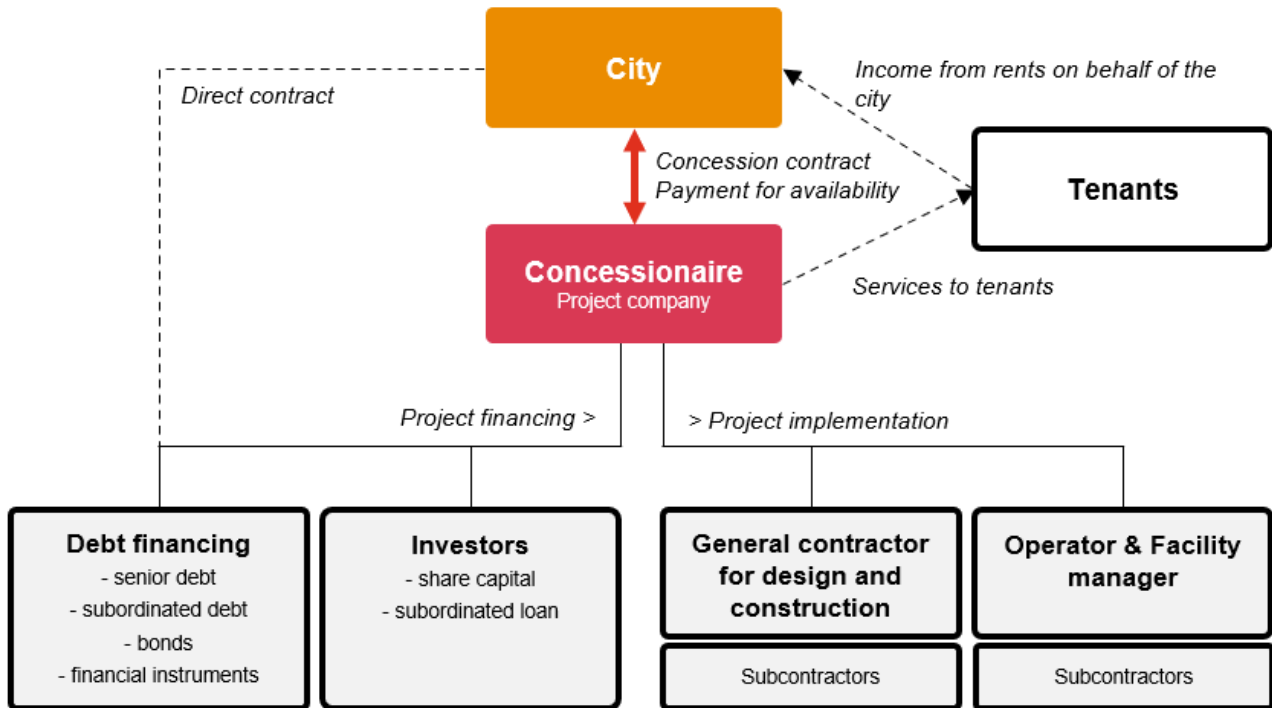


Figure 13: Scheme of the PPP model

Risks

The city is considering **retaining** the following major **risks**:

- Acquisition of land and obtaining zoning permit;
- Demand risk for most of the facilities (occupancy and rent) – subject to competitive dialogue.

The following major project **risks** to be **transferred** to JV or Concessionaire:

- Design and construction risk;
- Facility management and Operation & Maintenance;
- Life-cycle maintenance;
- Management of rental contracts and rent collection.

Shared risks might include:

- Obtaining a construction permit and some others.

PROFIT SHARING

The city will keep the demand risk. However, it is considering proposing a profit-sharing mechanism with the strategic partner. Commercial revenues (mainly rent) exceeding a certain base-case level to be shared to align motivations to maximise commercial profits and not rely solely on minimum-revenue guarantee or an availability payment. However, a maximum cap might be set.

CAPEX – Investment costs Phase 0 - Site preparation

- The costs for the preparation of the area, clean-up of the brownfield and construction of technical and transport infrastructure are estimated at € 34 million without VAT.⁵
- The financial model for Phase 1 for both JV and PPP options does not assume any expenditure for Phase 0.

⁵ Converted from CZK, where 1 EUR = 24.5 CZK



- The risks and investments of Phase 0 will not be transferred to the Strategic Partner. Site preparation and land purchases will be fully managed by the city.
- The construction of technical and transport infrastructure is difficult to transfer to the Strategic Partner as it extends beyond the territory of the Špitálka land.
- There is some possibility of drawing subsidy funds for brownfield preparation, but only the city must be the applicant.

Table 7: Investment costs Phase 0 - Site preparation

Phase 0	
Smart district (Phase 1 area)	thous. EUR
Plots of the Brno Heating Plant	10 571
Geometric measurement and surveys	122
Legal costs, due diligence	53
Other costs	422
Sub-total	11 169
Infrastructure (area outside Phase 1)	
Acquisition of land, buildings	8 163
Investment project (transport and technical infrastructure)	7 665
Demolition of buildings	7 307
Project engineering - demolition	146
Sub-total	23 282
Investment costs	34 451
Investment costs including VAT (21 %)	41 685

CAPEX - Investment costs Phase 1 - Realisation of the smart district Špitálka

- Construction costs of Phase 1 (CAPEX) are assumed to be € 119 million excluding VAT (including inflation of 2%, in 2027-2029 prices).
- Operating costs during construction and financing costs increased CAPEX by € 15,5-16,7 million.
- The total investment value of the construction phase to be financed is € 135 million excluding VAT.
- The innovation delta for the acquisition of smart technologies and the implementation of smart measures is included under Other (in Table No. 7), which amounts to € 12 million.
- This expenditure does not include any Phase 0 expenditure.

Table 8: Investment costs Phase 1 - Realisation of the smart district Špitálka

Phase 1		
Investment costs (nominal, including inflation)	thous. EUR	
WORK&LIVE	49 592	
COWORKING HUB	5 796	
CULTURE HUB	8 286	
EVENT HUB	22 000	
Parking	16 735	
Other	12 082	
Roof gardens	4 408	
Total CAPEX	118 899	
Option	JV	PPP
Financing costs during construction	12 449	11 184
Operating costs during construction	4 327	4 327
Total investment costs	135 551	134 286



4. Gdańsk

4.1 Gdańsk Smart City Vision

The document "Gdańsk 2030 Plus - City Development Strategy", adopted by a resolution of the Gdańsk City Council on September 29th 2022 defines the **framework for local development of the city** and is a key element of the city's strategic management. It is the basis for the creation and continuous socio-economic development of Gdańsk in order to improve the quality of life of its inhabitants. The most important activities during the preparation of the strategy change were: implementation of the social, economic and spatial diagnosis, on the basis of which it was possible to formulate the key development challenges of the city, which are reflected in the revised Strategy - for strategic purposes. The vision sets the goal of the city's development beyond the year 2030. The revised Strategy gained a spatial dimension, and among the biggest changes in the document, it is worth mentioning a new strategic goal: **Green City**.

"The vision of Gdańsk is a city that brings together and attracts what is most valuable - people proud of their heritage, solidarity, open-minded, creative, developing and shaping the future together.

Gdańsk 2030 Plus is a city of positive changes - always. We want Gdańsk 2030 Plus to be a modern city constituting the centre of the metropolitan area - a city inspiring others to act, attractive, safe, harmoniously developing, offering a high quality of life, open to diversity, providing good work and giving opportunities to all its inhabitants. We want Gdańsk 2030 Plus to be a city of prospects for people who are offered the best conditions for education, as well as personal and professional development. We want the inhabitants of Gdańsk to be active people, integrating and taking responsibility for the common good, fulfilling their aspirations and boldly looking to the future."



Figure 14: Gdańsk Strategic Goals⁶

Development activities in Gdańsk planned for the coming years result mainly from the city conditions and development trends, but also from the ambitions and expectations of the residents. They indicate the **most**

⁶ English version of the infographics was due in November 2022. The document that reflects the change in the city's strategy was adopted by the City Council on 29 September 2022.



important goals of social and economic life of Gdańsk, in close connection with the **development of space** in the city and the **protection of the natural environment**.

By 2030, Gdańsk has a chance to become a modern metropolitan city favouring mobility. Developing ports - sea and air - and transport systems (road and rail) are elements that create the present and future positive image of the metropolis. They also provide excellent conditions for the development of services and other forms of building the backbone of the modern economy. It is the seaside location, the economy and transport systems that are today the greatest advantages of the city, supporting its highly competitive position. Gdańsk as a space of flows and inspiration is an opportunity and a challenge for managers and residents. In order to be able to fully use the development potential of Gdańsk, it is necessary to care for the environment, constant cooperation and mobility, education and openness, in line with the following **strategic goals**:

- Objective 1. **GREEN CITY** - It is the protection of all environmental components, especially the most sensitive ones: green, water and air, as well as limiting noise and negative climate changes. Gdańsk wants to develop with respect for nature, in a responsible and sustainable way.
- Objective 2. **COMMON CITY** - This is a fair social and cultural development of the inhabitants of Gdańsk. It is important to strengthen the city's social and cultural capital through activity, cooperation and solidarity. Gdańsk wants to strive to create an open, socially responsible and coherent, wise city of well-being.
- Objective 3. **ACCESIBLE CITY** - It is the creation of a sustainable, safe and fair mobility and communication system. Gdańsk wants to create a city of friendly spaces, short distances, with convenient access to a wide range of services, accessible to everyone, including individuals and groups with special needs.
- Objective 4. **INNOVATIVE CITY** - It is a city based on a modern, responsible and sustainable economy, supporting the development of entrepreneurship, providing attractive working conditions and conducting competitive economic activity, leading the inhabitants to prosperity.



Figure 15: Gdańsk 2030 Plus - City Development Strategy



The idea of the Smart City for Gdańsk and the entire metropolis is an opportunity to improve the functioning of the area by **managing in an effective, economic and ecological manner**. This will translate into the efficiency of, among others the areas of **public services, mobility, energy, dialogue with citizens**. This assumption is part of the sustainable development policy of the European Union and it is an opportunity to change the face of the city for being more user-friendly.

You can find the complete version of the "Gdańsk 2030 Plus - City Development Strategy" in Polish [on-line](#).

4.2 Roadmap towards Gdańsk Smart City

In the seven years since the adoption of the Strategy in 2015, conditions at the local, regional, national and EU levels have changed. Social, economic, spatial and environmental phenomena, as well as technological trends, which largely influence the development of Gdańsk, have been dynamically transformed. In addition, **in November 2020 the legal regulations were amended**, which - for the first time in national legislation - specified the **substantive and procedural requirements for the development of a common strategy**.

The first step in the process of developing changes to the Strategy was the adoption of a resolution by the Gdańsk City Council on September 30th 2021 on the detailed procedure and schedule for developing changes to the document called "**Gdańsk 2030 Plus - City Development Strategy**".

The beginning of the process of **developing changes** to the "**Gdańsk 2030 Plus**" document was a good moment to analyse the directions of Gdańsk development and **adapt its provisions to the challenges and socio-economic changes as well as new goals of the cohesion policy emphasized in the EU perspective for 2021-2027**.

The new legal provisions put a strong emphasis on the **integration of spatial, economic and social dimensions**, which translated into the obligation to develop a new element of the Strategy - a model of the functional and spatial structure and recommendations for shaping and conducting spatial policy in the Municipality of the City of Gdańsk. This concept was developed by the Gdańsk Development Office. In this way, the development directions specified in the Strategy gained a visible spatial dimension.

As part of the preparation for the substantive work related to the development of changes to the Strategy, a **diagnosis** of the social, economic and spatial situation of Gdańsk was carried out, taking functional areas into account. Its scope included the **analysis of the conditions**, social, economic, spatial and environmental trends as well as the development challenges of Gdańsk. The conclusions formulated in the diagnosis made it possible to indicate **new strategic goals** and the corresponding directions of activities undertaken to achieve them.

The implementation of the process of changes in the Strategy also enabled the **participation of residents and local socio-economic partners** in thinking about the future of Gdańsk, identifying the challenges facing the city and planning its development for the coming years. The jointly developed document is more relevant if it reflects the **needs and aspirations of Gdańsk and its citizens**.

At the beginning of the process, a **series of workshops** entitled "**Let's talk about the future of Gdańsk and together change the City Development Strategy**" was organized. During the four workshops that took place remotely (due to pandemic restrictions) in November 2021, residents had the opportunity to discuss on what kind of city Gdańsk should be in 2030. The meetings were devoted to the social, economic and spatial dimensions of the city, and the last workshop summarized the entire cycle and focused on the development priorities of Gdańsk. A total of 212 participants registered for the workshops, and 76 took part in them.

The inhabitants of Gdańsk could also express their opinion on the development aspects of Gdańsk in the coming years by participating in a **survey**. The priority areas of development and the most important challenges were: greenery in the city (indicated by 63% of the survey respondents), public transport (54%), district revitalization (50%), environmental protection (49%), road infrastructure (49%) and preparation to the effects of climate change (46%). Over 4,000 people participated in the survey.

In the next stage of work, the assumptions for the **draft changes to the Strategy were developed**, which were based on the new guidelines of strategic and vision documents at the international, national and regional level, as well as on the conclusions of the diagnosis being the starting point for the development of changes to the Strategy and the postulates submitted by the residents. Compliance with the guidelines and assumptions of higher-order documents contributes to ensuring sustainable development and maintaining cohesion in the following dimensions: social, economic, spatial and environmental.



From March 26 to April 29 2022, the draft changes to the Strategy were subject to **public consultations**. The form of consultation allowed the residents of Gdańsk and stakeholders to submit written comments to the draft document and to express their opinion orally on the assumptions contained in the Strategy - during a public hearing broadcast live on the link to the www.gdansk.pl website and during **four thematic meetings** (also in the online formula) with representatives of local social and economic partners. After the thirty-five-day consultation, a **report** was drawn up, which summarized and resolved the comments and opinions expressed during the thematic meetings. Almost 400 people participated in the consultations. As regards the subject of consultations, i.e. the draft changes to the Strategy, 29 persons submitted 176 comments in total. The neighbouring communes and the State Water Holding Polskie Wody were also invited to consult. The comments collected during the consultations were analysed by the Public Consultation Team in terms of the legitimacy of their introduction, and **the Strategy document itself was supplemented with suggestions for changes proposed** in the positively considered comments. The process of developing changes to the Strategy was carried out in a **transparent manner** - both the planned stages and summaries of individual activities were posted on the website on an ongoing basis, a link to the City Development Strategy tab on the www.gdansk.pl website.

An additional statutory requirement was to carry out the strategic environmental impact assessment procedure. The Municipality of the City of Gdańsk applied for an agreement to withdraw from its implementation, arguing this with the fact that the implementation of the Strategy would not result in a significant environmental impact; the competent authorities agreed with the arguments and issued a decision **not to carry out a strategic environmental impact assessment**.

In order to verify the completeness, correctness and adequacy of the assumptions contained in the draft Strategy, the document was subject to prior **ex-ante evaluation**, i.e. the accuracy, expected effectiveness and efficiency of implementation. The evaluation recognized the merits of the document and its value as the basis for city development planning. The **compliance of the formulated visions and goals with the residents' expectations** expressed during participatory activities was emphasized. The conclusions of the evaluation were also suggestions for changes, the introduction of which increased the internal consistency of the document and clarified some of its provisions. In addition, the evaluation includes a detailed analysis of the Strategy's compliance with the National Urban Policy 2030 and the Development Strategy of the Pomeranian Voivodeship 2030, which confirms a very high degree of consistency between these documents.

The draft of the amended Strategy was also presented for the opinion of the Board of the Pomorskie Voivodeship on the manner of considering the findings and recommendations for shaping and conducting spatial policy, which is to **ensure the coherence of strategic documents and complementarity of activities at local and regional levels**. The opinion of the Management Board concerned the compliance of the Strategy with the Development Strategy of the Pomorskie Voivodeship 2030 and was positive.

4.3 Gdańsk Action Plan

Reduction of greenhouse gas emissions and air pollutant emissions

The activities planned in this area are intended to **increase the efficiency of energy use** in Gdańsk and provide the residents of Gdańsk with **ecologically clean heating at competitive prices**. In order to achieve this, it is necessary to develop the municipal heating network, liquidate old coal-fired boiler houses and energy-modernization of residential buildings, public utility buildings and existing street lighting. As a result of the planned works, the unit consumption of heat and electricity should be reduced, while increasing the comfort of living and significantly reducing the emission of pollutants and greenhouse gases into the air. Due to many years of neglect and a very high cost, energy modernization of historic buildings is a particular challenge. Building the lighting of streets, squares, pedestrian and bicycle routes will increase the sense of security of the city residents, while improving the attractiveness of pedestrian, bicycle and city transport.

Modernization of public utility buildings and residential buildings

- i. Comprehensive energy modernization of selected public buildings. Comprehensive energy modernization of selected municipal residential buildings from areas intended for revitalization.
- ii. Connecting public utility buildings and residential buildings to the district heating network and adapting the heating infrastructure to the needs of consumers and environmental protection requirements.



- iii. Comprehensive modernization and expansion of the municipal heating network and integration of selected local heating systems with a centralized system.

Supporting the liquidation of coal-fired boiler houses

- i. Financial and institutional support for individual recipients in the field of thermo-modernization activities and connections to the municipal heating network.
- ii. Development and implementation of a support program for the thermal modernization of historic residential buildings.
- iii. Publication of a good practice guide for thermal modernization.

Supporting residents in obtaining aid funds

- i. Financial and institutional support for the construction, expansion and modernization of installations using renewable energy sources in public utility buildings, communal buildings and housing communities.
- ii. Supporting residents in obtaining aid funds and extending the scope of municipal subsidies.

Effective management of media consumption

- i. Implementation of a media consumption management system in public utility buildings (electricity, heat, gas, water).
- ii. Conducting educational activities in cooperation with energy companies.

Mobility

Public transport is essential for shorter and longer distances in an urban area. The conditions of its operation and the way of organizing collective transport have a direct impact on its popularity and indirectly affect the use of private cars. The currently observed trend of decreasing the share of public transport in favour of individual motorization is highly detrimental to urban mobility, contributes to the formation of traffic congestion and adversely affects the demand for road infrastructure, the construction and maintenance of which consumes a significant part of the city's budget.

In terms of **increasing the attractiveness of public transport**, it is planned to expand and modernize the rail and road infrastructure of public transport and to modernize the rolling stock. The adaptation of the fleet to the needs of people with disabilities has already improved, seniors, parents with children.

However, further work is needed to adapt the stops and organize the connection network to the needs of these people. In addition, the **expansion and modernization of the network of stops and integration nodes** will be carried out. Much emphasis will be placed on improving the conditions for the movement of trams and buses by giving them greater privileges in street traffic, as well as improving the organization and user-friendliness of public transport. It is planned to expand nodes integrating various forms of transport, especially bicycle with rail transport

The spatial development of the city and its economic success require measures to improve some elements of the road and rail infrastructure and efficiently operating maritime and air links. The improvement of external road accessibility should be implemented in a way that is not conducive to the processes of suburbanization and in accordance with the principles of **creating a city of short distances** (compact city).

In this respect, the expansion and modernization of the city's transport infrastructure will be carried out, as well as the expansion and modernization of the infrastructure of development and industrial areas. An important element will be the implementation of the Gdańsk South Transport Program and the further development of Gdańsk's function as a European transport hub. It is of great importance to properly organize the transport of goods and to eliminate the harmful effects of transit.

Within the competences of the city, it is also possible to support projects of "railway" companies by, for example: recapitalizing the SKM company in order to develop or extend the line, construction of accompanying infrastructure for PKM stops by the city and cooperation with PKP, including participation in projects improving the safety of Gdańsk residents, including in at railway crossings.

Investment activities aimed at the development of the city's transport system should be supported by promotional and information activities that shape the attitudes of residents in the area of mobility. In this regard, it will



undertake projects encouraging the use of public transport, bicycle or combining both of these forms of transport when making a trip.

Creating new pedestrian connections to help you reach your destination faster and more conveniently (the principle of directness)

- i. Construction of bicycle routes in accordance with the System of Bicycle Routes in Gdańsk, including: networks of fast bicycle routes in accordance with standards of the European Cyclists' Federation.
- ii. Creating new and expanding the existing pedestrian and pedestrian-bicycle zones, including: in the areas of residential districts.
- iii. Modernization and renovation of sidewalks, bicycle routes, pedestrian and bicycle zones.
- iv. Extension of parking infrastructure for bicycles, including:
- v. Creating safe and functional bicycle parking lots at transfer junctions.

Building a metropolitan public bicycle system

- i. Improving the quality, cleanliness and winter maintenance of streets, pavements and bicycle routes.
- ii. Expansion and modernization of the road and rail public transport network as a priority over expansion road layout.
- iii. Extension and modernization of pedestrian, pedestrian and bicycle routes,
- iv. walking and driving connecting directly residential buildings with public transport stops, including: with integration nodes.

Expansion and modernization of the network of stops and integration nodes of public transport

- i. Expansion and modernization of the public transport fleet and development and modernization of service facilities.
- ii. Development of the public transport system, incl. creation of complementary bus lines.
- iii. Expanding the passenger information system, also addressed to passengers with special communication needs.
- iv. Integration of timetables for various forms of transport, also on a metropolitan scale.
- v. Integration of tariffs and tickets in Gdańsk and in the metropolitan area with the use of tariff solutions aimed at increasing the competitiveness of collective transport in relation to individual transport and the tariff attractiveness of public transport
- vi. Adaptation of the connection network, frequency of public transport vehicles and timetables to the needs of residents with the introduction of social participation mechanisms in the development of a network of connections and timetables.
- vii. Improving driving comfort in public transport vehicles.
- viii. Increasing the attractiveness of the tariff and ticket offer and improving the possibility of purchasing tickets, including through ticket machines and e-tickets
- ix. Combining the offer of public transport with mass events.

The Smart City ecosystem

The Smart City ecosystem of Gdańsk was initiated during the implementation of the ACCUS project (Adaptive Cooperative Control of Urban Subsystems). This initiative was carried out by a consortium of 28 scientific institutions and companies from eight EU countries, including Poland. The ACCUS project was financed under the ARTEMIS mechanism under the EU's 7th Framework Program, implemented was realised in the form of a public-private partnership, in which funding was provided partly by interested companies, and partly by FP7 and the National Centre for Research and Development (NCBR).

The aim of the project was to create an **innovative Smart City platform that will allow to intelligently manage the city**. Various applications have been integrated under one operating system, allowing for effective management of the broadly understood city life. The **pilot version** of the system was tested in Gdańsk from January 2015. 10 applications integrated in it allowed, among others, for: controlling city lighting, monitoring traffic on streets and road conditions, numerical weather forecasting, automatic vehicle identification (barriers protecting entry to various types of protected areas will open in front of police vehicles), or energy management in buildings.



This project, completed in 2016, was a testing ground for the city's activities in the field of intelligent solutions. A specific laboratory created under the ACCUS project supported the efficiency of management processes in the city through a better organized information flow. The experience gained during the ACCUS- project was used in the implementation of the Open Data project of the Public Transport Authority.

Smart City is an important element of the actions specified in City Operational Programmes, which include the implementation of **innovative IT and telecommunication tools**, including - where possible - **open source solutions**. On the one hand, modern technologies will help to improve the management of the city and facilitate certain processes, and on the other, they will allow the inhabitants and entrepreneurs to use more **high-quality public services** related to infrastructure, transport, education and others. It will also be necessary to further develop the channels that improve access to information for the inhabitants and improve communications through modern information and consultation devices. By pursuing the policy of openness, Gdańsk plans to provide the gathered data and new technologies to the inhabitants in order to support **transparent governance**. The gradual release of public data by publishing them in open and structured formats will enable their use by interested users. Access to these data will also allow the inhabitants to easily become familiar with how the city functions, to increase the involvement in public affairs and facilitate new social and business initiatives. Innovative IT and telecommunication tools, the policy of openness, as well as the form of a transparent city that listens to the inhabitants will enable further development of Gdańsk in the spirit of the idea of a “smart city” - which initiates well-thought projects through the dialogue and partnership with organisations, businesses, universities, administration, young people in education and the education sector. Gdańsk will continue the actions aimed at increasing the awareness of the inhabitants and their participation as well as at stimulating sustainable development of the city in all its areas.

4.4 Gdańsk Replication Plan

In Gdańsk, the replication of smart solutions within the RUGGEDISED project is mainly focussed on the **regeneration of the Lastadia Quarter**. However, it was known from the beginning of the project that the extent of the replication process in Gdańsk would be limited due to several factors. Moreover, the unfortunate death of the mayor in Gdańsk in 2019 slowed down the activities. On the other hand, it can be said that the foresight process strengthened the long-term innovation capabilities within the city – as an important prerequisite for further replication and smart city activities.

REGENERATION OF THE LASTADIA QUARTER

The Gdańsk's replication area is the **Lower Town district** – Lastadia Quarter. This place was chosen as an example of deep thermal modernization, in which the historic substance is kept despite the introduction of modern energy-saving technologies. At **Targ Maślany** (The Buttery Market), adjacent to the investment, guests will see an example of the reconstruction of the city square in terms of a small retention while maintaining recreational values.



Figure 16: Post office superintendent at Lastadia 2, Winter's Fountain in front of it. Photo from 1881. Source: Archive of the Museum of Natural History / heritage-gdansk.pl



Figure 17: City Gymnasium at ul. Lastadia 2, photo taken before 1903. Source: Archive of the Museum of Natural History / heritage-gdansk.pl



Figure 18: View of the revitalized former City Gymnasium in Gdańsk at ul. Lastadia 2 modernized 'neighbor'

The buildings of the former Municipal Gymnasium and Dormitory (at Lastadia Street 2 and 41) are an important element of the **architectural heritage of the city**. Thanks to the carefully carried out **restoration**, they regained their former splendor, and also became the seat of the Department of Geodesy and the Gdańsk Labor Office. The investors' effort was also rewarded, the restored buildings won the Construction of the Year 2019 competition organized by the Polish Association of Construction Engineers and Technicians in cooperation with the Ministry of Development and the Central Office of Building Supervision. The complex consisting of two buildings was subject to restoration. The former Municipal Gymnasium and Dormitory was opened on August 3, 1837. It was the first



neo-gothic style building in Gdańsk. Thus, it set trends in the nineteenth-century architecture of Gdańsk. One of the most important artists of the era, Karl Friedrich Schinkel, took part in its construction. The edifice received a plaque with the inscription *Artium Liberalium studiis sacrum* (The sanctuary of liberal sciences studies) (see Figure 20). The brick façade was decorated with pilasters and cornices. Unfortunately, the facility was destroyed in 1945 during the conquest of the city by the Red Army. The second building at Lastadia Street 41 in Gdańsk was erected in the years 1875-1878 as the seat of the post office. It was built in the neo-gothic style with numerous ornaments in the form of arches, pilasters, columns and cornices, as well as traceries made of ceramic fittings. The pilaster consoles and the column heads were decorated with ceramic moldings with plant and animal motifs. The northern gables above the entrance were decorated with the remains of the existing rosette. Pinnacles protruded above the roof, they had lost their finials. There were dormers on the roof, which were located lower than the historical ones during the reconstruction of the roof after being destroyed during World War II.



Figure 19: View of the revitalized former City Gymnasium in Gdańsk at ul. Lastadia 2 modernized 'neighbor'. Source: Gdańsk Waters



Figure 20: The main elevation of the former City Gymnasium at ul. Lastadia 2 in Gdańsk. Source: Gdańsk Waters



Social significance

The **regeneration of the Lastadia quarter**, known as the Gdańsk neo-Gothic corner, is related to the revitalization of the Lower Town district, which has been carried out in stages for many years. This Lower Town is inhabited by 5,868 people and covers an area of 61.8 ha, it is located 10-15 minutes away from the Old Town. One of the most serious problems of the district was the poor condition of underground infrastructure, public spaces, buildings and street surfaces. The condition of the rainwater drainage system was particularly bad.

Apart from infrastructure, the district's problem was a difficult socio-economic situation. Constantly deteriorating indicators of unemployment and the level of poverty of the local community are visible. This situation is conducive to the emergence of social pathologies, mainly manifested by addictions and domestic violence, which results in the Lower Town being recognized as an area of low residential, tourist and investment attractiveness. Therefore, the City of Gdańsk has prepared a **district revitalization program** that includes both **social and investment projects**. Social programs are conducted primarily by partners selected in competitions.

Impact on the Environment

Thanks to the EU subsidy, it was possible to conduct comprehensive **thermal modernization** and increase **energy efficiency**. Insulation was made from the inside - so as not to disturb the historical appearance of the buildings. It is also a decrease in greenhouse gas emissions (estimated around 545.44 t CO₂ per year), which is particularly important in the era of inevitable and progressive climate change.

The breeding sites of mazurkas and swifts have been reconstructed in the walls of the buildings. The nest niches in the façade were blinded with brick fragments - identical to those used in the building (the visible element is only the inlet opening). The drainage of the area is supported by small retention facilities - rain gardens, in which special plant species have been used to retain and filter rainwater.

Economic Importance

The investment, carried out by the municipal company the Gdansk Waters (Gdańskie Wody), helped restore the splendor of the facility. The Architectural and construction company STYL from Gdańsk was responsible for the design, and POLAQUA company was the general contractor. As part of the work, the northern wall of the former gymnasium building was unveiled and the flat roof, which was originally hidden behind a high attic, was reconstructed, and the gables in the roof of the former post office building were rebuilt. All activities were carried out taking into account the **historical value of the buildings**, under the supervision of conservationists.

The users directly involved in the process are:

- City of Gdansk
- The Gdansk Waters Company
- The Marshal Office of the Pomeranian District
- The Gdansk Labor Office
- Local NGOs

OPEN DATA PLATFORM

The **"Open Gdańsk Platform"** was implemented in Gdańsk in 2015 and met with great interest. While the idea was brilliant, it raised concerns. The challenge was to open data around the clock by a public entity, costs, including investment and servicing, increasing the tasks of a slim five-person team. Therefore, it was concluded that the system should be automated as much as possible.

The data in the largest center of the Tri-City was opened in 2017 and, above all, was made available to the largest **public transport operators**. The database for compiling the timetable programs has been handed over to the operators. Thanks to this, they can supply their systems with such information faster, and then modify it and transfer it to their systems. This data is also used by other local government units, including Metropolitan Union of Gdańsk Bay. A cost-free contract was also signed with Google Transit, thanks to which the data on our timetables is sent to Google. Above all, however, as part of "Open Gdańsk", a new collection was created, available



to everyone without the need to register, subject to few terms and conditions, such as the source and date of information.

The **shared data** has been divided into two categories - static and dynamic. The static data are updated once a day according to a fixed schedule, and the dynamic are updated several times a minute as required for data. The static data include: timetables, stop locations, routes as well as the positions of stop posts and a list of operators. They were integrated with the ticket system, and as a result, a resource was created to contain information about current and valid tickets, a list of ticket machines that can be found in Gdańsk and the types of tickets issued.

Similarly, three types of dynamic data are made available from the Tristar system. These are: the predicted departure times from the stops, the current GPS position of the vehicles implementing the selected line, as well as messages placed on the stop boards. It was found during the sharing of data in places where there are boards, that there is still too little amount to provide information about the current communication situation. The **website of the Public Transport Authority** has been integrated, where the central office publishes information about sudden traffic disruptions in a dedicated tab.

The success of the system requires **daily checking** of the process of generating statistical data and immediate reaction in the event of stopping access to the data. The data sources are being taken care of by updating the timetable system. A precise topology is very important. In addition, there are almost 550 devices installed in vehicles and 660 SIM cards installed in both vehicles and stop signs under maintenance. The activities of the Public Transport Authority also include checking the timeliness and quality of service works. At the end, user comments are also collected, which help determine the direction of development.

The **statistical data** began to be collected from June 2019. In the first year, the number of downloaded data was around 24,000 queries per month. In 2020, the number of inquiries increased ten-fold, especially about the resource entitled "List of stop boards" (about 250,000 inquiries per month). Another, two-fold increase in the number of inquiries compared to the previous year, is observed in 2021. Again, the reason is the increased demand for data on the resource containing the list of stop plates.

In the meantime, new resources appeared. In addition to the list of stop plates, the data attractive to programmers include:

- *List of stops in Gdańsk*: that is only stops served on the current day by ZTM in Gdańsk. The resource was prepared from the general list of all stops appearing in the current timetables in the entire TRISTAR network (i.e. in Gdańsk and Gdynia),
- *Vehicle database*: a manual database of vehicles performing transport tasks commissioned by the ZTM in Gdańsk. The resource was made public in April 2021 and is gaining more and more popularity.

In 2022 there is a drop in inquiries, similar to 2020. Currently, it can be seen that the number of inquiries about the "List of stop plates" has been significantly reduced, and there has been a greater variety of inquiries about other resources. This trend is positive as it may indicate that there are more programmers.

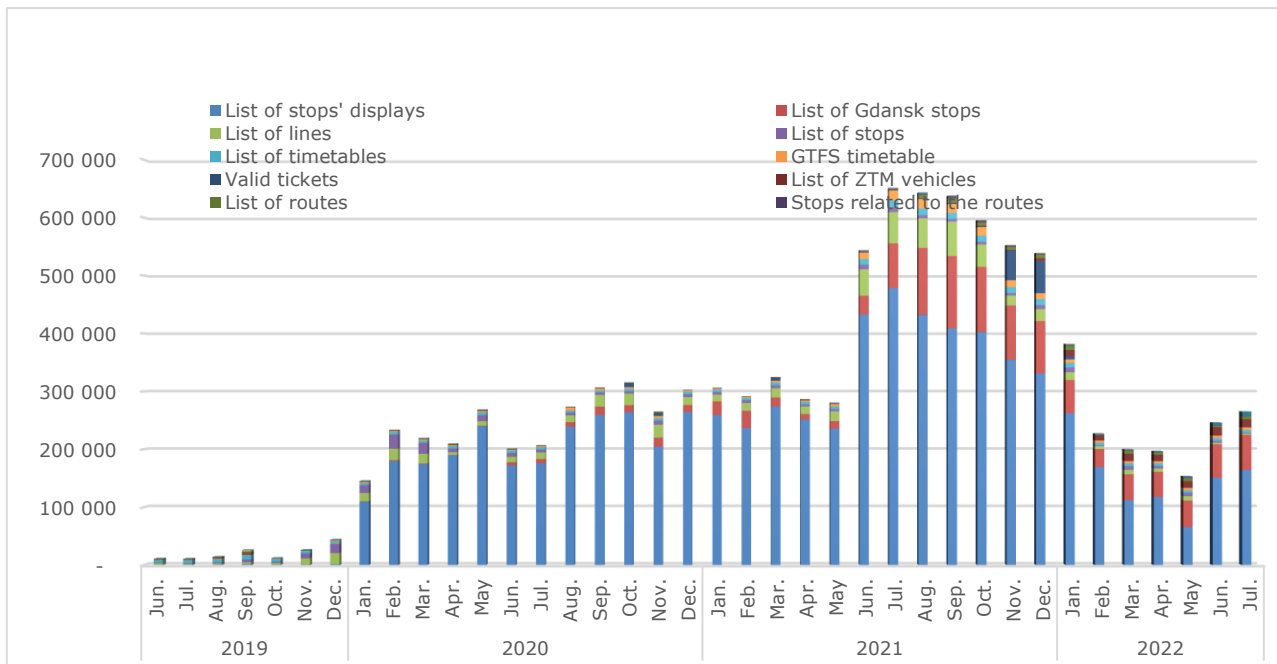


Figure 21: Public Transport Authority in Gdańsk (ZTM) OpenData: Number of static data requests

The resources most frequently polled are:

- Virtual online departure boards*: This resource was subject to many modifications. Among other things, in 2021, it was possible to download collective information for all bars with a single query. As a result, the number of inquiries has slightly decreased. In May and April this year, we know that the data was downloaded in large numbers by the student preparing his master's thesis.
- The Current Communication Situation*: Resource launched on its own. Contains announcements of the Traffic Head Office of the Public Transport Authority in Gdańsk about the difficulties in the current transport situation, which met with great interest of programmers.
- GPS positions* of the vehicles of the Municipal Transport Authority in Gdańsk
- GTFS RT*: The resource was made public to all interested parties in December 2020, after the completion of work with Google Transit. It contains real-time data, i.e. the actual implementation of timetables (provided by Google in the GTFS standard). Statistically speaking, our system currently supports an average of over 15 queries per second for 24h / 7 days.

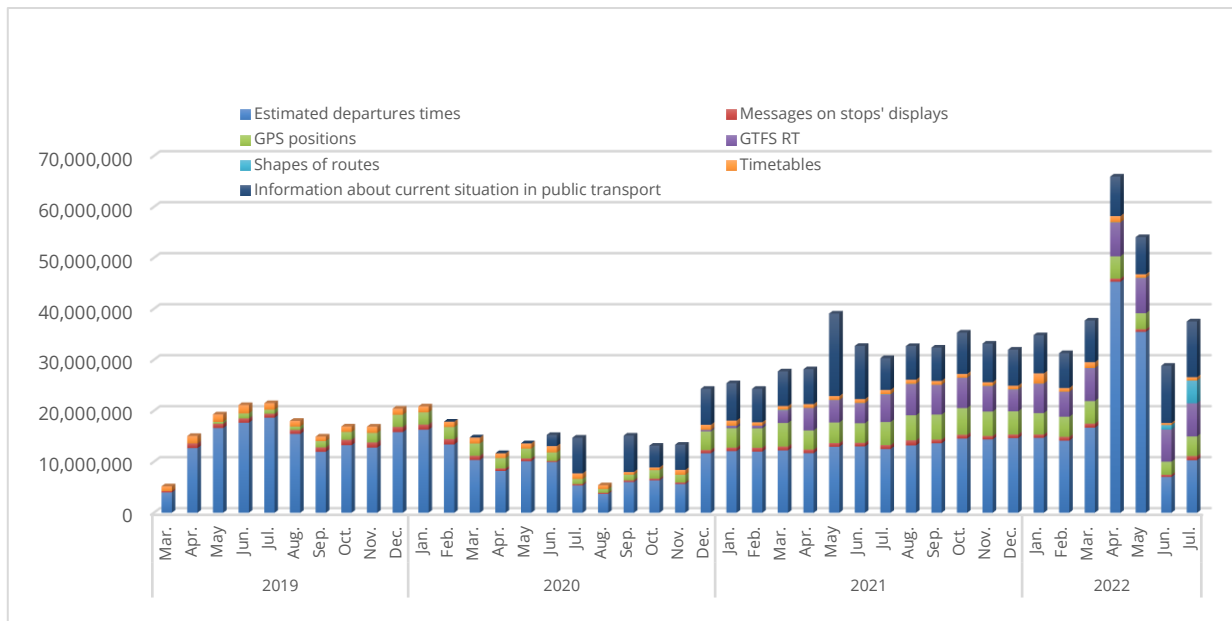


Figure 22: Public Transport Authority in Gdańsk (ZTM) OpenData: Number of dynamic data requests

Finally, it is worth mentioning the product manufactured by ZTM in Gdańsk for public transport users. This is the "Tram & Bus Online" map, available [here](#). It was launched in June 2021. Its main goal was to make passenger information in Gdańsk more attractive and to show the possibilities offered by Open Data.

The basic assumption of the map is to show the current state of the public transport, including:

- a) GPS position of buses and trams running our lines,
- b) information on the features of a given vehicle (does it have a wheelchair ramp, air conditioning, ticket machine, number of places for bicycles),
- c) routes of selected lines.

In addition, the map allows for a search of an interesting stop on the Tram & Bus Online Map. Virtual stop boards with information about the actual departure times are available for all stops. If, in the Current Communication Situation, the ZTM Traffic Headquarters in Gdańsk informs about failures and sudden changes, the Map will also display the content of such a message. On the prepared website, you can also search for the nearest stationary ticket machine, where the passenger will be able to buy our ticket. Marketing activities and placing QR codes with entering the website significantly increased the attractiveness of the map. This product is quite young, it is only one year old. In the figure below the number of page views is presented - in the period from the beginning of publication to July 2022.

At the moment, the biggest challenge is to maintain the high quality of shared data, including continuous improvement. This is related to the work at the grassroots level, i.e. in the source system itself (the Traffic Management System and the SIP Passenger Information System). As source systems have been operating in Gdańsk continuously since 2009 (with expansion and inclusion in the TRISTAR system in 2015), its architecture is quite outdated, and therefore difficult to develop.

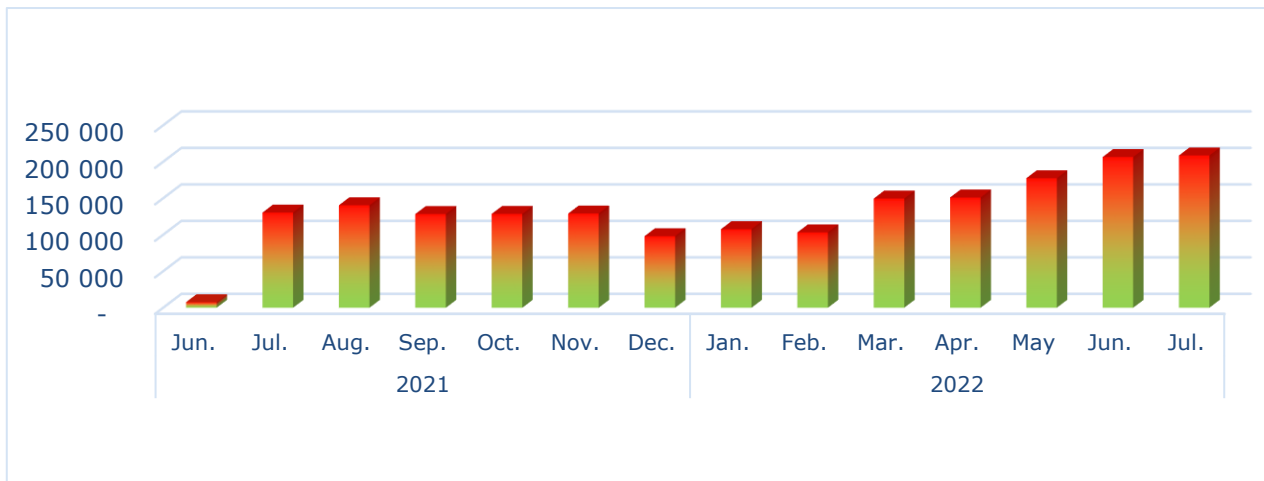


Figure 23: Public Transport Authority in Gdańsk (ZTM) Visiting Tram&Bus Online. Source: mapa.ztm.gda.pl

Social significance of the Open Data ZTM project in Gdańsk

It ensures **economic growth** in the private sector, giving opportunities for the development of new applications, new ideas - also for small start-up companies. Open Data ZTM enhances transparency in the operation of public administration, and thus increases the public's trust in it. It is a vehicle for greater social welfare, open data supports collaboration, participation and social innovation.

Economic importance

Mainly Open Data ZTM improved the **operations of public administration**. The well-being of a society increases when it can benefit from transparent and accessible information. The economy can benefit from easier access to information, content and knowledge equally (without discriminating against anyone), which in turn translates into the creation of innovative services and new business models. By sharing data between different sectors, it is possible to increase the efficiency of public processes and services, enabling faster access to data

Impact on the natural environment

Open Data ZTM offers the possibility of increasing the effective and more **optimal use of public transport**. The more people are convinced to use public transport instead of individual transport, the greater the environmental protection in the city.

The users directly involved in the process are

- ZTM employees, mainly from:
 - o the System Maintenance Section, taking care of both PCS and SIP (devices in vehicles and correct and up-to-date data), as well as Open Data of ZTM in Gdańsk and the Tram & Bus Online Map (care for the process of aggregating and sharing data),
 - o the Traffic Headquarters using the online preview in PCT and providing current information on ad hoc changes on the SIP tables and to the ZTM website (from there the data is also sent to the OD-ZTM),
 - o the Transport Department arranging timetables, also making them realistic with the actual performance available in the PCS databases;
- programmers: using ZTM Open Data in Gdańsk, creating proprietary applications, without the need to submit and register.
- Passengers: using T&B Online Maps and other applications created by the above-mentioned programmers.



Table 9: Costs incurred by ZTM in Gdańsk for the performance of the above-described works

Open data of the Public Transport Authority in Gdańsk	Net Cost	year
Accuss - data import and sharing	32 064,00 PLN	2017
installation and inclusion of an additional service in the software	40 000,00 PLN	2018
extension modification and maintenance of the data set Open Data	272 580,00 PLN	2018
GTFS RT: przygotowanie i dostawa oprogramowania, utrzymanie i wsparcie	70 450,00 PLN	2020
GTFS RT: software preparation and delivery, maintenance and support	56 285,00 PLN	2020
broadening the scope of Open Data	18 480,00 PLN	2021
modifications of the PCM for the purposes of Open Data - incl. new webservices and modification of the existing ones	92 400,00 PLN	2021
TOTAL	582 259,00 PLN	

Mapa Tram&Bus Online	Net Cost	year
wykonanie mapy z prpreparation of a map with the presentation of ZTM Open Data in Gdańsk	39 240,00 PLN	2019
modernizacje Mapy	81 120,00 PLN	2021
TOTAL	120 360,00 PLN	

Links with other projects

The basic connection is the above-mentioned source systems: Passenger Information System and Public Transport Management System, which are elements of the Integrated Management System TRISTAR.

OTHER SMART CITY SOLUTIONS BEYOND RUGGEDISED

The city of Gdańsk wants to focus on **low-emission and zero-emission vehicles**. The Mayor of Gdańsk announced that the city will no longer buy combustion buses emitting CO2. Building a fleet of electric buses is a top priority for the Gdańsk authorities. The Gdańsk Buses and Trams Company announced a tender for the supply of 18 electric city buses, including 10 standard buses and 8 articulated buses. The Gdańsk fleet is to be supplied with new vehicles as early as next year. Later this year, 3 Karsan Jest Electric mini electric buses will reach Gdańsk, which will serve the area of the Old Town and the Main Town. The buses selected in the tender are to have the greatest possible range and the greatest possible battery capacity. The vehicles are to be serviced by the Gdańsk lines without having to be loaded in the city during the courses. They will be charged at the depot.

The project requires **financial instruments from different sources** (municipal, national, and EU funds) both for the purchase of buses and charging stations. The company Gdańskie Autobusy i Tramwaje (The Gdansk Buses and Trams) applies for co-financing of the project of building a charging station in the form of a grant from the National Fund for Environmental Protection and Water Management. Unfortunately, the funding possibility is only up to 20 percent. Therefore, the city can only apply for PLN 2 million in funding. The application has already passed the formal way, waiting for the final decisions on obtaining funds. There has been another application for 14 buses to the Polish Deal program. There, the total amount of the order is PLN 35 million, the city applies for PLN 30 million, for a total of 40 vehicles. Within the next year and a half, 40 electric vehicles might reach the city and carry passengers in the public transport system.

The electric vehicles are not the only environmentally friendly transport solution that may be used in Gdańsk public transport in the future. The Gdańsk authorities are also considering expanding the bus fleet with vehicles powered by hydrogen fuel.

The city of Gdańsk intends to invest the potential of **renewable energy installations** that can be installed on the roofs of public buildings providing educational and social services. This action fits perfectly in the pursuit of climate neutrality due to the energy and educational effect. In the first place, the city plans to invest in photovoltaic installations. They have relatively better profitability ratios. Secondly, it will invest in solar collectors for heating



domestic hot water, only in facilities with a continuous demand for domestic hot water during the summer period (e.g. in nursing homes).

However, the corresponding **financial analysis is not optimistic**. There is no convenient sources of soft financing in sight, and the portfolio on the other funding models is limited. It is not excluded that the quantity available subsidies and preferential loans will be a significant limitation of the broad use of renewable energy in public utility buildings social and educational services. The use of third-party services may, in turn, encounter an access barrier for soft financing. So far, there have been no successful implementations of this the model in combination with grant financing. In the priority program Energy + National Fund for Environmental Protection and Water Management (NFOŚiGW), an option appears to obtain a preferential loan by the company ESCO. Perhaps in the future this approach it will be more popular and it will also be subsidized. If this had not happened, the City would not have much choice - it remains in the traditional one a model in which it is an investor and operator of renewable energy sources, and an entity acquiring soft and commercial finance for coverage.

4.5 Gdańsk Investment Plan

In August 2009, the Public Finance Act was amended, introducing principles and procedures for the development and adoption of a long-term financial forecast for a local government unit. In 2010, the first Long-Term Financial Forecast (WPF) of the Gdańsk City Commune for 2011-2037 was developed. Introduction of WPF, which includes the implemented long-term projects along with the specified, inter alia, total financial outlays and expenditure limits in individual years, weakened the financial dimension of the Long-Term Investment Plan (WPI), giving it the character of a factual description of the Gdańsk Development Strategy.

In order for the WPF document not to be identified with the WPI, the idea was born to create a document, i.e. the Investment Priorities Database (BPI), which will allow to collect data on the City's investment needs and select priorities that will be implemented successively depending on the City's financial capabilities. On April 23, 2012, the procedure for the preparation and adoption of the BPI was adopted. Below is a brief description of the city's most important investment packages in force.

CITY'S COMMUNICATION FRAMEWORK

For many years, one of the most important development priorities of the city has been the creation of the city's communication framework and the development of pro-ecological public transport. The following two projects implement this priority.

Viaduct Biskupia Górka in Gdańsku

The investment is the last stage of the reconstruction of the St. Wojciech, an element of the target road system along DK91 reaching the seaport (Nowy Port) and connecting Pomerania with the south of the country.

The project involves the reconstruction of the route of the St. Wojciech from ul. Toruńska to ul. Bushes with a crossing over the railway tracks, led through two new arched viaducts. Each of the engineering structures has a two-lane road with an additional bus lane. The first viaduct was built on the side of the existing buildings at ul. Okopowa in Gdańsk, and the second one was built in place of the previously used over 50-year-old viaduct.

Co-financing: European regional development fund Operational Program Infrastructure and Environment for 2014-2020 Priority Axis IV. Road infrastructure for cities Measure 4.2. Increasing the transport accessibility of urban centers outside the TEN-T road network and relieving cities from excessive road traffic

Total cost: 138 613 158,91 PLN

Gdańsk Public Transport Project - stage IV A

The project is part of a long-term and multi-stage investment of the Municipality of the City of Gdańsk, implemented under the common name "Gdańsk City Transport Project" (GPKM), aimed at creating and maintaining a competitive public transport system, adapted to the needs of residents and people coming to Gdańsk. The main goal of the project is to increase the share of environmentally friendly public transport in servicing Gdańsk residents through the construction and modernization of tram lines and the purchase of modern



energy-saving tram rolling stock, which will increase the attractiveness of clean, safe and effective public transport. Investments covered by the project will improve passenger travel conditions in terms of time, comfort, accessibility and safety.

Co-financing: Cohesion Fund Operational Program Infrastructure and Environment for 2014-2020, Priority axis VI. Development of low-emission collective transport in cities Measure 6.1. Development of collective public transport in cities.

Total cost: 643 8 32 353,42 PLN



Figure 24: A new tram line in ul. Nowa Bulońska Północna (currently named after Paweł Adamowicz) together with the bridge structure - GPKM IV A. Photo by the City of Gdansk

WATER MANAGEMENT

The water and sewage project is the first project in which co-financing from the European Union fund was allocated to the development of the Gdańsk water and sewage system. It has been implemented in our city since 2006. The effect of the Gdańsk water and sewage project is to improve the condition of the natural environment, water and soil purity, protect human health and adjust the water and sewage management of the city of Gdańsk to the environmental requirements of Poland and the European Union. As a result of this investment, the quality of the supplied water has improved, the possibility of supplying Gdańsk residents with deep water intakes has increased, and the safety of supplying drinking water to the city has increased. In addition, about 6,000 inhabitants of Gdańsk have been able to connect to the sanitary sewage system. As a result of the modernization of the Gdańsk East Sewage Treatment Plant and the liquidation of the Zaspas Sewage Treatment Plant, the quality of the Gdańsk bathing areas has improved.



Gdańsk water and sewage project, stage III

The main objective of the Project is to reduce the effects of extreme meteorological phenomena in Gdańsk, in particular intense rainfall, by adapting the City of Gdańsk to climate change, thanks to increasing the possibility of rainwater retention and the construction of a rainwater sewage system.

Beneficiary: Gdańsk Water and Sewage Infrastructure

Co-financing: Cohesion Fund Operational Program Infrastructure and Environment for 2014-2020 Priority axis 2. Environmental protection, including adaptation to climate change Measure 2.3. Water and sewage management in agglomerations

Total Cost: 138 921 168,78 PLN

Rainwater management systems in the city of Gdańsk

Co-financing: Cohesion Fund Operational Program Infrastructure and Environment for 2014-2020 Priority Axis: 2. Environmental protection, including adaptation to climate change 2.1 Adaptation to climate change along with securing and increasing resistance to natural disasters, in particular natural disasters and environmental monitoring

Total cost: 29 683 728,25 PLN



Figure 25: A Drainage of the area for the stadium as part of the Gdańsk Bay Water Protection - construction and modernization of the rainwater drainage system in Gdańsk. Photo by the City of Gdansk

REVITALISATION

Revitalisation is a cross-cutting challenge that connects various areas of strategic actions. It concerns the revitalisation of degraded areas of Gdańsk. This area, where there is a particular concentration of negative phenomena, requires comprehensive actions aimed at leading the area out of crisis. Only an integrated, holistic



and complex approach to revitalisation guarantees success. Actions in the broadly defined social area are of key importance, and need to be supported by actions related to the management and renewal of urban space. The revitalisation process must take into account the welfare and needs of the Gdańsk community and be superior to purely technical renewal of the urban tissue. Gdańsk has been implementing a package of comprehensive revitalization projects for degraded districts for many years. Their goal is to solve complex socio-economic and spatial problems. Revitalization carried out as a multi-annual, interdisciplinary process is an important element of a sustainable urban policy. The revitalization process is aimed at a permanent improvement in the quality of life of residents in the areas requiring support. The project is implemented in partnership with the Municipality of the City of Gdańsk with Housing Communities and the Gdańsk Housing Cooperative. Project partners were selected in the manner and on the terms set out in the Act on the principles of implementing programs in the field of cohesion policy in the 2014-2020 financial perspective, and the tasks carried out by them result directly from the needs of the area's inhabitants. The revitalization package includes the following projects:

Revitalization of Orunia in Gdańsk

Beneficiary: Municipality of the City of Gdańsk, PIU - Gdańsk Development Office, Directorate for the Development of the City of Gdańsk, Municipality of the City of Gdańsk, Gdańsk Development Office, Directorate for the Development of the City of Gdańsk, Gdańsk Real Estate, Gdańsk Water and Sewage Infrastructure

Co-financing: European regional development fund Regional Operational Program of the Pomeranian Voivodeship 2014-2020 Priority axis 8. Conversion 8.1. Comprehensive revitalization projects - Grant support 8.1.1. Comprehensive revitalization projects

Total cost: 39 744 640,51 PLN

Revitalization of the Lower Town and Wałowy Square together with the Old Suburb in Gdańsk

Beneficiary: Municipality of the City of Gdańsk, Gdańsk Development Office, Directorate for the Development of the City of Gdańsk, Gdańsk Real Estate, Gdańsk Water and Sewage Infrastructure

Co-financing: European regional development fund Regional Operational Program of the Pomeranian Voivodeship 2014-2020 European regional development fund Regional Operational Program of the Pomeranian Voivodeship 2014-2020 Priority axis 8. Conversion; 8.1. Comprehensive revitalization projects - Grant support; 8.1.1. Comprehensive revitalization projects

Total cost: 54 451 821,24 PLN

Revitalization of Biskupia Górka and Stary Chełm in Gdańsk

Beneficiary: Municipality of the City of Gdańsk, PIU - Gdańsk Development Office, Directorate for the Development of the City of Gdańsk, Gdańsk Nieruchomości, Gdańsk Water and Sewage company

Co-financing: European regional development fund Regional Operational Program of the Pomeranian Voivodeship 2014-2020 Priority axis 8. Conversion 8.1. Comprehensive revitalization projects - Grant support 8.1.1. Comprehensive revitalization projects

Total cost: 60 460 069,48 PLN

Revitalization of the Nowy Port area with the Wisłoujście Fortress in Gdańsk

Beneficiary: the Municipality of the City of Gdańsk, PIU - Gdańsk Development Office, Gdańsk City Development Directorate, Gdańskie Nieruchomości, Gdańsk Water and Sewage company

Co-financing: European regional development fund Regional Operational Program of the Pomeranian Voivodeship 2014-2020

Total cost: 25 564 195.65 PLN



Figure 26: Development of the Spa House in Brzeźno

ENERGY EFFICIENCY

The City of Gdańsk conducts comprehensive thermal modernization projects for buildings owned by the city as part of the Integrated Territorial Investments (ZIT). An individual project has been prepared for each building, taking into account increasing energy efficiency, reducing low emissions and reducing the costs of their use. It is planned to replace non-ecological heating sources with new, most often system-based heating from the municipal heating network. The scope of repairs includes, among others making insulation, changing the heating method to ecological, renovating roofs and facades, and replacing or restoring woodwork. The entire interior will also be renovated. This applies to both staircases and apartments. As a result, functional and ecological apartments will be created in residential buildings. On the other hand, public buildings will be equipped with modern systems reducing energy demand, which will reduce their maintenance costs.

Comprehensive energy modernization of residential and commercial buildings located in the Municipality of the City of Gdańsk

Beneficiary: municipality of Gdansk

As part of the Project, the implementation of, among others, such tasks as: execution of insulation works on walls, ceilings, flat roofs and roofs, replacement of external window and door joinery, installation of building heating and domestic hot water installations, liquidation of existing heat sources, installation of a compact heat distribution center, introduction of an energy management system with monitoring and automatic control, modernization of the ventilation system, installation of humidity-controlled air vents.

Co-financing: European regional development fund Regional Operational Program of the Pomeranian Voivodeship 2014-2020

Total cost: 52 097 223,25 PLN



Comprehensive energy modernization of utility buildings belonging to the Municipal Headquarters of the State Fire Service in Gdańsk

The implementation of the project will contribute to the reduction of heat and electricity consumption, reduction of heat losses, reduction of air pollution with dust, reduction of CO2 emissions into the atmosphere, and increased use of energy from renewable sources. Thanks to the implementation of the project, the operating costs of the PIU will also be reduced and the working conditions of firefighters will be improved.

Co-financing: European regional development fund Regional Operational Program of the Pomeranian Voivodeship 2014-2020 Priority axis 10. Energy Measure 10.1. Energy efficiency - the Integrated Territorial Investments mechanism Sub-measure 10.1.1. Energy efficiency - subsidy support

Total cost: 4 523 959,54 PLN

Comprehensive energy modernization of utility buildings under the care of the conservator of monuments belonging to Gdansk Waters

The subject of the project is the thermal modernization of buildings under conservator's care at ul. Lastadia 2 and ul. Lastadia 41 (former Gdańsk Dormitory and the Municipal Gymnasium). The works that have been performed as part of the project include replacement of window and door joinery with a more effective one, installation of domestic hot water heating. Previous ineffective heat sources were also be liquidated in favor of a new heat substation. Thanks to the automatically controlled energy management and monitoring system, electricity will be used more economically. The ventilation system was also be modernized, in which hygroscopic air vents will be installed. These activities follow the recommendations of the previously conducted energy audit and are aimed at improving the energy efficiency of both facilities. The implementation of the project will reduce the consumption of heat and electricity, and thus will contribute to the reduction of the operating costs of buildings. the era of inevitable and progressive climate change.

Beneficiary: Gdansk Waters

Co-financing: European regional development fund Regional Operational Program of the Pomeranian Voivodeship 2014-2020 Priority axis 10. Energy Measure 10.1. Energy efficiency - the ZIT mechanism Sub-measure 10.1.1. Energy efficiency - ZIT mechanism - subsidy support

Total cost: 17 698 880,00 PLN



Figure 27: View of the revitalized former City Gymnasium in Gdańsk at ul. Lastadia 2 modernized 'neighbor'. Photo by Gdańsk Waters



WASTE MANAGEMENT

One of the most important regional investments is the Municipal Waste Thermal Transformation Plant in Gdańsk, which is also commonly known as an incineration plant, which is being built in Gdańsk. It is a modern installation enabling the thermal transformation of municipal waste and the production of electricity and heat from the energy (residual) fraction of waste. In other words, it is a heat and power plant in which the fuel used is waste, which is left over from the sorting process, which cannot be recycled, and cannot be landfilled under the applicable law.

Construction of a municipal waste thermal processing plant in Gdańsk

Beneficiary: Clean Energy Port – municipal company

Co-financing: Cohesion Fund Operational Program Infrastructure and Environment for 2014-2020 2. Environmental protection, including adaptation to climate change 2.2. Municipal waste management

Total cost: 735 591 457,02 PLN

Modernization of the waste sorting plant at the Utilization Plant in Gdańsk.

Beneficiary: Utilization Plant

Co-financing: Cohesion Fund Operational Program Infrastructure and Environment for 2014-2020 2. Environmental protection, including adaptation to climate change 2.2. Municipal waste management

Total cost: 68 880 000,00 PLN

Construction of Selective Collection of Municipal Waste Points located in Gdańsk at:

a) ul. Meteorytowa (precinct 3, plot no. 112/13) - location no. 1,

b) ul. Elbląska 66 (precinct 101, plot No. 61/13) - location No. 2

Co-financing: Priority axis II Environmental protection, including adaptation to climate change Project type 2.1.5. Rainwater management systems in urban areas

Total cost: 135 616 036,47 PLN



Figure 28: One of the vehicles during the action "Great Cleaning of Gdańsk-Południe"



Table 10 shows the current Investment Plan of Gdańsk. These are projects with co-financing of EU funds and amounts are given in PLN. The table was prepared on the basis of source materials of the Department for Investment Projects of the municipal office in Gdańsk responsible for the long-term investment plan of the city of Gdańsk, updated in August 2022.

Table 10: Long-term investment plan. Department for Investment Projects of the municipal office in Gdańsk

Project name acc. To Subsidy contracts	Beneficiary / Leader Partner / Partners	Project value (PLN)		Project costs (PLN)		Co-financing (PLN)		Co-financing Source of funding: Fund Operational Programme	Number and name of the Priority / Measure / Sub-measure
		Total	Commune of the city of Gdańsk	Eligible	Ineligible	Total	Commune of the city of Gdańsk		
I. GRANT AGREEMENTS SETTLED BY THE INVESTMENT PROJECT FACULTY OF THE UMG									
Gdański Szlak Wodociągowy	Leader: Gdańska Infrastruktura Wodociągowo-Kanalizacyjna Sp. z o.o., JRP: Municipality of the City of Gdańsk	5.860.375	1.138.365	4.514.265	1.346.110	3.159.985	679.170	Europejski Fundusz Rozwoju Regionalnego Regionalny Program Operacyjny Województwa Pomorskiego 2014-2020	Oś Priorytetowa 11. Środowisko Działanie 11.4 Ochrona różnorodności biologicznej
Rewaloryzacja i adaptacja Wozowni Artyleryjskiej wraz z otoczeniem, na potrzeby Centrum Hewelianum w Gdańsku	Beneficiary: Municipality of the City of Gdańsk	10.079.561	10.079.561	8.154.115	1.925.446	4.892.469	4.892.469	Europejski Fundusz Rozwoju Regionalnego Regionalny Program Operacyjny Województwa Pomorskiego 2014-2020	Oś Priorytetowa 8. Konwersja Działanie 8.3 Materialne i niematerialne dziedzictwo kulturowe
Dokumentacja projektowa i środowiskowa dla rozbudowy i modernizacji węzłów sieci bazowej w Porcie Gdańsk w zakresie infrastruktury drogowo-kolejowej	Leader: Zarząd Morskiego Portu Gdańsk SA Partner: Municipality of the City of Gdańsk	4.497.502	1.006.140	676.498	3.821.003	2.248.751	410.104	Instrument CEF "Łącząc Europę"	Sektor: TRANSPORT Projekty morskie Priorytet: Urban Notes
Modernizacja oświetlenia zewnętrznego na energooszczędne na terenie Centrum Hewelianum w Gdańsku, z zastosowaniem	Beneficiary: Municipality of the City of Gdańsk	1.109.109	1.109.109	776.000	333.109	659.600	659.600	Europejski Fundusz Rozwoju Regionalnego Regionalny Program Operacyjny Województwa Pomorskiego 2014-2020	Oś Priorytetowa 10. Energia Działanie 10.4. Redukcja emisji



towarzyszącego systemu zarządzania energią									
Viaduct Biskupia Górka in Gdańsku	Beneficiary: Municipality of the City of Gdańsk	138.613.158	138.613.158	138.463.008	150.150	117.693.557	117.693.557	European regional development fund Operational Program Infrastructure and Environment for 2014-2020	Priority Axis IV. Road infrastructure for cities Measure 4.2. Increasing the transport accessibility of urban centers outside the TEN-T road network and relieving cities from excessive road traffic
Stormwater management systems in urban areas - the City of Gdańsk	Beneficiary: Municipality of the City of Gdańsk	135.616.036	135.616.036	94.888.471	40.727.565	80.655.200	80.655.200	European regional development fund Operational Program Infrastructure and Environment for 2014-2020	Priority axis II Environmental protection, including adaptation to climate change Project type 2.1.5. Rainwater management systems in urban areas
Construction of Gdańsk Rębiechowo and Gdańsk Osowa integration nodes with access routes	Leader: Municipality of the City of Gdańsk Partner: Żukowo Commune	38.583.650	14.287.706	32.704.076	5.879.573	16.446.398	7.237.032	European regional development fund Regional Operational Program of the Pomeranian Voivodeship 2014-2020	Priority axis 9. Mobility Measure 9.01. City transport Sub-measure 9.01.01. City transport - the ITI mechanism
Integration nodes: Gdańsk Główny, Gdańsk Wrzeszcz and access routes to the junctions of the Pomeranian Metropolitan Railway and Rapid Urban Railway in the Municipality of the City of Gdańsk	Beneficiary: Municipality of the City of Gdańsk	101.994.784	101.994.784	97.463.937	4.530.846	57.056.431	57.056.431	"European regional development fund Regional Operational Program of the Pomeranian Voivodeship 2014-2020 "	Priority axis 9. Mobility Measure 9.01. City transport Sub-measure 9.01.01. City transport - the Integrated Territorial Investments mechanism
Comprehensive energy modernization of utility buildings belonging to the Municipal Headquarters of the State Fire Service in Gdańsk	Beneficiary: Municipality of the City of Gdańsk - City Headquarters of the State Fire Service in Gdańsk	4.523.959	4.523.959	4.263.180	260.779	1.128.415	1.128.415	European regional development fund Regional Operational Program of the Pomeranian Voivodeship 2014-2020	Priority axis 10. Energy Measure 10.1. Energy efficiency - the Integrated Territorial Investments mechanism Sub-measure 10.1.1. Energy efficiency - subsidy support

G1 - Comprehensive energy modernization of educational and sports buildings belonging to the Municipality of the City of Gdańsk - in 2017-2020	Beneficiary: Municipality of the City of Gdańsk	84.301.428	84.301.428	66.770.710	17.530.718	38.964.452	38.964.452	European regional development fund Regional Operational Program of the Pomeranian Voivodeship 2014-2020	Priority axis 10. Energy Measure 10.1. Energy efficiency - the ITI mechanism Sub-measure 10.1.1. Energy efficiency - ITI mechanism - subsidy support
The Pomeranian Cycling Routes of international importance R10 and the Vistula Bicycle Route R9 - section R10 Gdańsk	Beneficiary: Municipality of the City of Gdańsk	19.999.999	19.999.999	19.949.999	50.000	9.046.345	9.046.345	European regional development fund Regional Operational Program of the Pomeranian Voivodeship 2014-2020	Oś Priorytetowa 8 . Konwersja Działanie 8.4 Wsparcie atrakcyjności walorów dziedzictwa przyrodniczego RPO WP 2014-2020
Pomeranian Cycling Routes of international importance R10 and the Vistula Bicycle Route R9 - section R9 (the Vistula Bicycle Route) Gdańsk	Beneficiary: Municipality of the City of Gdańsk	10.053.789	10.053.789	10.003.789	50.000	5.266.006	5.266.006	Europejski Fundusz Rozwoju Regionalnego Regionalny Program Operacyjny Województwa Pomorskiego 2014-2020	Oś Priorytetowa 8 . Konwersja Działanie 8.4 Wsparcie atrakcyjności walorów dziedzictwa przyrodniczego RPO WP 2014-2020
Pomeranian canoe trails - the Motława and Martwa Wisła trail	Leader: Municipality of the City of Gdańsk Partner: Pruszcz Gdański Commune Partner: Suchy Dąb Commune Partner: Cedry Wielkie Commune	4.660.503	2.826.474	4.614.895	45.608	3.837.041	2.402.503	European regional development fund Regional Operational Program of the Pomeranian Voivodeship 2014-2020	Priority axis 8 Conversion Measure 8.4. Support for the attractiveness of the natural heritage values
Gdańsk Public Transport Project - stage IV A	Leader: Municipality of the City of Gdańsk Partner: Gdańskie Autobusy i Tramwaje Sp. z o.o.	643.832.353	470.033.353	389.008.606	254.823.746	324.900.584	206.886.607	Cohesion Fund Operational Program Infrastructure and Environment for 2014-2020	Priority axis VI. Development of low-emission collective transport in cities Measure 6.1. Development of collective public transport in cities.
Tourist trail through the Tri-City Landscape Park with connectors	Leader: Municipality of the City of Gdańsk Partner: Gdynia City Commune Partner: Commune of the City of Sopot	12.760.790	7.314.334	9.090.909	3.669.881	4.999.999	2.905.499	European regional development fund Regional Operational Program of the Pomeranian Voivodeship 2014-2020	Priority Axis 11. Environment, Measure 11.4. Protection of biodiversity
Construction of Selective Collection of Municipal Waste Points located in Gdańsk at: a) ul. Meteorytowa (precinct 3, plot no. 112/13) - location no. 1, b) ul. Elbląska 66 (precinct 101,	Beneficiary: Municipality of the City of Gdańsk	6.744.936	6.744.936	3.835.758	2.909.177	3.260.395	3.260.395	Cohesion Fund Operational Program Infrastructure and Environment for 2014-2020	121 / 5 000 Wyniki tłumaczenia Priority Axis: 2. Environmental protection, including adaptation to climate change Measure: 2.2 Municipal Waste Management



plot No. 61/13) - location No. 2									
Stormwater management systems in urban areas - stage 2	Beneficiary: Municipality of the City of Gdańsk	10.593.641	10.593.641	7.297.861	3.295.780	6.203.182	6.203.182	Cohesion Fund Operational Program Infrastructure and Environment for 2014-2020	Priority Axis: 2. Environmental protection, including adaptation to climate change 2.1 Adaptation to climate change along with securing and increasing resistance to natural disasters, in particular natural disasters and environmental monitoring
Górki Zachodnie - expansion of the yacht port	Beneficiary: Municipality of the City of Gdańsk	19.199.182	19.199.182	15.669.251	3.529.930	11.774.953	11.774.953	European regional development fund Regional Operational Program of the Pomeranian Voivodeship 2014-2020	Priority Axis: 8 Conversion Measure: 8.4. Support for the attractiveness of the natural heritage values
Sobieszewo Nadwiślańska - construction of a marina	Beneficiary: Municipality of the City of Gdańsk	6.769.141	6.769.141	5.471.855	1.297.285	4.651.077	4.651.077	European regional development fund Regional Operational Program of the Pomeranian Voivodeship 2014-2020	Priority Axis: 8 Conversion Measure: 8.4. Support for the attractiveness of the natural heritage values
Rainwater management systems in the city of Gdańsk	Beneficiary: Municipality of the City of Gdańsk	29.683.728	29.683.728	17.624.614	12.059.113	14.980.922	14.980.922	Cohesion Fund Operational Program Infrastructure and Environment for 2014-2020	Priority Axis: 2. Environmental protection, including adaptation to climate change 2.1 Adaptation to climate change along with securing and increasing resistance to natural disasters, in particular natural disasters and environmental monitoring
Revitalization of the Lower Town and Wałowy Square together with the Old Suburb in Gdańsk	Beneficiary: Municipality of the City of Gdańsk	54.451.821	44.127.871	45.239.531	9.212.289	18.756.627	11.920.651	European regional development fund Regional Operational Program of the Pomeranian Voivodeship 2014-2020 European regional development fund Regional Operational Program of the Pomeranian Voivodeship 2014-2020	Priority axis 8. Conversion; 8.1. Comprehensive revitalization projects - Grant support; 8.1.1. Comprehensive revitalization projects carried out at OMT



Revitalization of Orunia in Gdańsk	Beneficiary: Municipality of the City of Gdańsk	39.744.640	36.222.593	29.543.447	10.201.192	18.471.830	15.766.492	European regional development fund Regional Operational Program of the Pomeranian Voivodeship 2014-2020	Priority axis 8. Conversion 8.1. Comprehensive revitalization projects - Grant support 8.1.1. Comprehensive revitalization projects carried out at OMT
Revitalization of Biskupia Górka and Stary Chełm in Gdańsk	Beneficiary: Municipality of the City of Gdańsk	60.460.069	50.935.906	34.903.615	25.556.453	26.565.963	20.064.261	European regional development fund Regional Operational Program of the Pomeranian Voivodeship 2014-2020	Priority axis 8. Conversion 8.1. Comprehensive revitalization projects - Grant support 8.1.1. Comprehensive revitalization projects carried out at OMT
Rewitalizacja obszaru Nowy Port z Twierdzą Wisłoujście w Gdańsku	Beneficiary: Municipality of the City of Gdańsk	25.564.195	22.049.580	21.056.312	4.507.883	15.188.835	12.388.339	Europejski Fundusz Rozwoju Regionalnego Regionalny Program Operacyjny Województwa Pomorskiego 2014-2020	Oś priorytetowa 8. Konwersja 8.1. Kompleksowe przedsięwzięcia rewitalizacyjne - Wsparcie dotacyjne 8.1.1. Kompleksowe przedsięwzięcia rewitalizacyjne realizowane na OMT
Kompleksowa modernizacja energetyczna budynków mieszkalnych i użytkowych zlokalizowanych na terenie Gminy Miasta Gdańska - w latach 2017-2020	Beneficiary: GMG (GZNK SZB na podstawie pełnomocnictwa)	52.097.223	50.613.649	39.519.711	12.577.512	20.436.579	19.326.029	Europejski Fundusz Rozwoju Regionalnego Regionalny Program Operacyjny Województwa Pomorskiego 2014-2020	Oś priorytetowa 10. Energia Działanie 10.1. Efektywność energetyczna - mechanizm ZIT Poddziałanie 10.1.1. Efektywność energetyczna - mechanizm ZIT - wsparcie dotacyjne
G3 - Comprehensive energy modernization of utility buildings under the care of the conservator of monuments belonging to "Gdańskie Wód"	Beneficiary: Gdańskie Woda Sp. z o.o.	17.698.880	-	17.475.271	223.609	7.863.871	-	European regional development fund Regional Operational Program of the Pomeranian Voivodeship 2014-2020	Priority axis 10. Energy Measure 10.1. Energy efficiency - the ITI mechanism Sub-measure 10.1.1. Energy efficiency - ITI



Sp. z o.o. (companies of the Municipality of the City of Gdańsk)									mechanism - subsidy support
Construction of a municipal waste thermal processing plant in Gdańsk	Beneficjent: Port Czystej Energii Sp. z o.o.	735.591.457	-	499.819.392	235.772.065	270.696.804	-	Cohesion Fund Operational Program Infrastructure and Environment for 2014-2020	2. Environmental protection, including adaptation to climate change 2.2. Municipal waste management
Gdańsk water and sewage project, stage III	Beneficiary: Gdańska Infrastruktura Wodociągowo-Kanalizacyjna Sp. zoo.	138.921.168	-	80.055.240	58.865.927	68.046.954	-	Cohesion Fund Operational Program Infrastructure and Environment for 2014-2020	Priority axis 2. Environmental protection, including adaptation to climate change Measure 2.3. Water and sewage management in agglomerations
Modernization of the waste sorting plant at the Utilization Plant in Gdańsk.	Beneficiary: Zakład Utylizacyjny Sp. z o.o.	68.880.000	-	36.235.294	32.644.705	30.800.000	-	Cohesion Fund Operational Program Infrastructure and Environment for 2014-2020	2. Environmental protection, including adaptation to climate change 2.2. Municipal waste management



5. Parma

5.1 Parma Smart City Vision

Thanks to the **PARMA FUTURO SMART** participative foresight process, Parma set the **goals for 2030**. The Administration decided to accelerate the pace to fully turn Parma into a green city and the Smart City Action and Investment Plan will be totally consistent with these goals and will help to achieve them.

Parma pursues the farsighted 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 wellbeing at the urban level generated by a green economy. This view is also reflected in the **five core pillars** of the infrastructural and urban development planning of Parma, a city without suburbs, with the aim to sew up the urban fabric:

- i. Urban regeneration of the existing city
- ii. Reduced land sealing
- iii. Hydraulic and geological land safety
- iv. Widespread service network
- v. Facilitating the birth of centres of excellence.

The 2022 City's commitment and policy guidelines are centered on **three major goals**:

- i. The city of people: Focusing on a people-centered community, which knows how to be enriched by mutual differences, work as a team without leaving anyone behind. An inclusive city that takes care of all.
- ii. The changing city: A city that is ready to bet on a regenerated urban fabric, a widespread and diverse culture, a business community that wishes to thrive in a revival, spreading from neighbourhood to neighbourhood, a vibrant and robust economic and forward-looking framework. A city that is ready to bet on its expertise and excellence to grow further.
- iii. The city of tomorrow: A city that is ready to become the place where people want to live, a green, safe, traffic-free, breathing place, connected to the rest of the world in a click.

To achieve the 2030 goals the City is scaling up the most successful initiatives and fostering the implementation of the **priority strategies** identified by the planning documents (SECAP, SUMP, MSP, etc...), and in particular:

- i. increase the number of schools interested by seismic and energy efficiency actions
- ii. achieve all the SUMP objectives, in particular a 40% reduction in the use of private vehicles, which will lead to a substantial reduction of emissions deriving from the transport sector
- iii. increase the production of energy from renewable sources, up to at least 15% of the total energy requirement;
- iv. complete the retrofitting of the public lighting network.
- v. implement urban reforestation projects under the MSP Plan, including, in particular, the so-called Green Kilometre Project;
- vi. increase energy efficiency in the industry and services sector processes and infrastructures, continuing the win-win partnership between the public sector and private businesses.

5.2 Roadmap towards Parma Smart City

From the stakeholders' engagement process, the City of Parma has identified the actions described below that will be further defined in the official Replication and Investment Plan.

TOWARDS SMART, SHARED AND SUSTAINABLE MOBILITY (2020 – 2025)

Intelligent mobility flow management

Traffic optimization through the implementation of a centralized system. Centralization allows to improve the environmental performance, to allow the prioritization of local public transport, to improve the use of shared mobility vehicles (car, bike and electric scooters) and to modify in a smart and adaptive way the responses to certain traffic scenarios.



Intermodal and shared mobility

Adoption of actions of multi-modal integration with cycling and other forms of shared transport, also through the increase of the interchanges and park and rides. Integration of the physical system with vertical and transversal information dashboards through the real-time collection of data related to urban mobility. Implementation of an urban MaaS (Mobility as a Service) platform.

Dissemination of sustainable mobility practices

Awareness-raising and dissemination of sustainable mobility practices, such as increasing cycling (more bike lanes, bike racks and bike sharing) and cycling safety, dissemination of sustainable home-work mobility practices (car-pooling), increase of pedestrianized areas, increase of public transport (day and night), electric mobility.

TOWARDS A CARBON NEUTRAL CITY (2021 – 2030)

Smart buildings and smart neighbourhoods

Realization of energy requalification projects of buildings through the introduction of innovative technologies and solutions, also through the FEASIBLE project (H2020), which focuses on the fostering of actions for the energy efficiency upgrading of residential and public buildings. Piloting of PED (Positive Energy Districts) solutions and creation of green infrastructure for the removal of CO₂ from the atmosphere and contrasting heat island effect. Data acquisition through drones on thermal bridges / heat points in buildings.

Sustainability and Carbon Neutrality practices in the business world

Dissemination of circular economy, carbon footprint analysis and sustainability reporting actions in companies in Parma. Use of international references to improve the sustainability profile with the 17 Sustainable Development Objectives (SDGs) of the UN Agenda 2030.

Smart Energy Grids

Dissemination of widespread renewable energy production systems by private individuals. Collaboration with energy providers in order to create synergies through the development of Power2X centralized systems, and relationship with end users for local DSM (Demand-Side Management). Use of energy consumption forecasting models based on RES (Reference Energy System). Creation of energy communities.

TOWARDS DIGITAL TRANSITION AND INNOVATION: THE CITY AS A LABORATORY (2021 – 2030)

Smart Platform of Urban Governance

Development of a distributed IoT (Internet of Things) infrastructure for the creation of a system of data collection and use in order to promote urban governance. Provision of the available open data to the administration and local stakeholders (companies, start-ups and citizens). Accessibility to all network nodes to promote the growth of the system and the interoperability of applications with other services.

Strengthening of the enterprise acceleration system

Collaboration between territorial actors to facilitate the birth of new innovative enterprises and the development of skills for entrepreneurship in the digital and environmental sustainability sectors. Use of the existing structures on the theme of business acceleration and the provision of services to young creative people.

Widespread system of environmental monitoring

Realisation of a network of sensors located in public places (e.g. sensors for wind measurement, flooding, air quality) and private places (e.g. indoor building quality, security, etc.) for the monitoring of urban environmental variables. Use of drones for real-time data collection and creation of 3D maps and real-time data accessibility.



TOWARDS A CREATIVE, CULTURAL AND INCLUSIVE CITY (2020 – 2030)

Attractively based on culture and creativity

Increasing the ability to attract talent from other Italian regions and abroad, through innovation of products, processes and services to develop excellence, coordination of territorial marketing activities and strengthening of cultural activities. Creation of new spaces of culture, comparison and knowledge on the local territory.

Competence Economics

Support to the development of new transversal key competences for the future of employment and new economic scenarios among companies and schools in Parma. Improve information on demand and supply of new skills with appropriate training and refresher courses. Dissemination of soft skills and the culture of sustainability starting from schools.

Multi-Stakeholders Partnership

Promotion of partnerships between the business and non-profit world on thematic projects in line with the 17 SDGs of the UN Agenda 2030, encouraging engagement modalities such as corporate volunteering. Promoting the inclusion of disabled people also using tools such as agreements (foreseen by a regional law).

5.3 Parma Action Plan

Parma is constantly looking to find new means to further **sustainable development** that ensures the **well-being of its citizens, growth of the businesses** and a **reduction of the impact on the environment**. RUGGEDISED was a formidable enabler for Parma for bringing smart city and climate neutrality concepts on top of the agendas of the city decision makers: thanks to the process activated within RUGGEDISED, the Administration has been able to define a roadmap to 2030, designed together with the local business community, universities and public bodies, securing collaboration and committed involvement from all key stakeholders.

Thanks to **Parma Futuro Smart**, the Municipality of Parma was indeed able to create an ecosystem ready to **foster innovation**. During the foresight process, the Administration was able to engage more than 50 stakeholders representing the quadruple helix (research institutions, public bodies, private companies, citizens' association), 40 of which have signed in May 2019 a smart city protocol committing to set up a joint approach, and align project planning and investments with the other signatories, and realize smart city projects.

Being part of the RUGGEDISED project provided Parma a great number of **innovative and effective smart related solutions**, tested by the 3 Lighthouse Cities Rotterdam, Umeå and Glasgow, which can be the backbone of the journey towards being a **climate neutral and smart city** and gaining the **well-being for its citizens and businesses**. Parma identified 10 of them, which are **replicable and more tailored** to its local situation.

The aim of this plan is to support the City of Parma and its stakeholders in the **replication of these solutions** in the next years. The document provides with a detailed list of prioritized selected solutions to be implemented in Parma, which has been defined following a **detailed assessment of local challenges and needs**. For each measure the plan contains specifications of the replication activities and assessment of the techno-economic feasibility, as well as financing opportunities. The RUGGEDISED replication and investment plan of the City of Parma supports the efforts of the city to realize its vision to become a sustainable, green municipality with a special focus of creating a smart community.

The main **replication area** is the University Campus, while some measures are expected to be replicated at a **wider city level**. The City of Parma actively involved the main stakeholder of the replication area, the University of Parma, in the realization of the Replication Plan. The focus has been on the analysis of the lighthouse cities' (LH) demonstrations, and in creating a connection into the needs and objectives of Parma vision to 2030 and 2050. Through the Parma Smart City plan, Parma aims to lay the foundation for a **robust replication process** for the demonstrated replicable solutions. Additionally, ongoing discussions and contact with the presented **local key stakeholders**, as well as **regional and national funding agencies**, have been kept. This is to help all parties to be fully aware of the situation analysis, to enable knowledge sharing and discovery of possibilities and measures aiding the replication activities.



The methodology included analysis of **local challenges and needs**, deep **study on the demonstrated solutions**, inclusion of other smart city measures emerged from the four working tables, analysis of **local context** as well as **knowledge exchange** activities.

5.4 Parma Replication Plan

Parma identified a replication area, the University Campus (which is the scientific centre of the University of Parma) while some actions will be replicated at City level. Starting from the solutions provided by the Lighthouse Cities, the City of Parma is going to implement several actions:

Table 11: Parma’s Smart Solutions

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

In May 2021 the University of Parma signed an important public-private partnership regarding also the energy service at the University Campus. In particular, an EPC (Energy Performance Contract) was signed, where the payment of the activities carried out is strictly linked to the achievement of the expected and declared services. Within this contract, the implementation of a new plant and interventions on the building shell is envisaged. The aim is to reduce the energy consumptions by 20%. These measures are scheduled for 2023.

P1: New CHCP plant for district heating connection

A new trigeneration plant with one cogeneration engine of 1,501 kWe and an absorption refrigeration unit of about 1,200 kWf will be installed at the University Campus.



The recovered energy will produce hot water to be used for heating utilities, the production of domestic hot water and the production of chilled water through the absorption refrigeration unit.

This power plant is connected to the buildings via a district heating network. Further measures will involve the revamping of distribution networks and heat exchange substations, by inserting a heat exchanger in all substations. At the same time, the complete redevelopment of the hot/cold distribution circuits is also planned.

P2: Energy Management System

The monitoring of thermal and electrical energy consumption of buildings will be achieved through the use of smart meters. These data, together with the introduction of an intelligent energy management system (integrated into the University buildings), will ensure a significant improvement in terms of efficiency. The monitored parameters will be the following: gas flow rates, thermal and cooling energy flows, electricity, water flow rates as well as temperatures and environmental parameters.

The proposed solutions provide that the automatic management systems operate in synergy with the energy-climate monitoring infrastructure, in order to record and remotely make available all the environmental parameters detected and the energy consumption of the individual structures. It is emphasized that all the measured quantities, both energy and climatic, as well as the status of the remote-controlled systems, will be made constantly accessible to the staff of the University of Parma.

In order to maximize the efficiency of the systems, an optimization tool will be installed: this will control the operation of the systems in real time on the basis of adaptive-predictive algorithms and machine learning (Eurekam system). In particular, the system will manage both the production of energy in the thermal power plant and the heating and cooling of the buildings. The software will communicate with the various control units of the energy plants located within the city, in order to optimize the operation of the energy systems to ensure indoor environmental comfort and reduce the environmental impact.

The optimized supervision control is divided into three phases which are repeated in real time:

- on the basis of historical data, the system learns the dynamic behavior of the user (complex to manage) in relation to the external temperature, the heat supplied and the desired internal temperature. Learning takes place thanks to the statistical calibration of physical models that determine the sensitivity of the user with respect to the supply and dispersion of heat.
- the system identifies the optimal operation of the system in the next 48 hours thanks to dynamic programming algorithms that aim to minimize energy waste. By integrating the most recent weather data and having a forecast perspective, the system is able to anticipate user requests and maintain the desired temperature level while minimizing consumption.
- the system gives proper commands using the configuration identified for the next instant. In particular, the system regulates the activation of the systems through insertion and modulation of the different machines of the plant, as well as the management of the internal comfort of the buildings.

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

The installation of new PV systems is planned to integrate the existing ones on University buildings. One of them (at the Campus) will be connected to the e-charging systems. In particular, the following systems will be built:

- University Campus: construction of a 74 kWp photovoltaic system on shelters for shading the Scientific Engineering car park and installation of e-charging columns;
- “Polo Biotechologico integrato”: construction of a 30 kWp photovoltaic system;
- “Polo Kennedy”: construction of a 30 kWp photovoltaic system;

P4: Intelligent building control

The control of University buildings will be made through the Eurekam system, as described in P2. The installation of a metering system with centralized information collection is also planned.



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 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 and 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 already exists. 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.

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.

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.

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 have been already installed. 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 CO₂);
- 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 Infrastructure and Key Resources	Value Proposition	Buy in and support	Beneficiaries	Environmental Benefits	Social Benefits
P1: New CHCP plant for district heating connection	University of Parma, Campus heat management company	Business model, public procurement	Technical office, energy department	New efficient plant, CO ₂ reduction	Information, formation to students and citizens	Students, workers, all citizens	Allows a reduction in environmental impacts, both in terms of service effectiveness and atmospheric noise pollution	
P2: Energy management system	University of Parma	Implementation of a monitoring system	Sensors, dedicated system	Knowledge, awareness, CO ₂ reduction	Information, formation to students and technical office, heat management company	Students, workers, all citizens	CO ₂ reduction, preventive planning activities; reduction of energy consumption, reduction of air quality impact	
P3: Solar PV and supply of energy to EV charging infrastructure	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	Students, workers, all citizens	Optimizing energy flows	
P4: Intelligent building control	University of Parma	Implementation of a monitoring system	Sensors, dedicated system	Knowledge, awareness, CO ₂ reduction	Information, formation to students and technical office, heat management company	Students, workers, all citizens	CO ₂ reduction, preventive planning activities; reduction of energy consumption, increasing of internal comfort, better internal conditions	
P5: Local Public Transport	Municipal sector (planning, energy,	Assessment of the local context, then identifying the needs; Shared	-Human: people from Municipality and TEP –SMTP	It will make it possible to improve the service and its	-Municipality: technical, financial, political	Citizens, Municipality, all partners will benefit from	CO ₂ reduction, allows a reduction in environmental impacts, both in terms of service effectiveness	Decrease the flows of polluting traffic, towards more



Smart Solution	Key Partnership	Key Activities	Key Infrastructure and Key Resources	Value Proposition	Buy in and support	Beneficiaries	Environmental Benefits	Social Benefits
	ITcity, Infomobility, Parma Infrastrutture Environment (Mobility) Multy Utility (Ireti) TEP e SMTP	management; Analysis of timing, risks, barriers; Business model; Public procurement/ tender; Building of SW/analysis algorithm/ different access levels GDPR/security issues	for building strategies of TPL -Financial: public funds; EU Fund Physical: buying new sustainable electric/ Hybrid Bus. -Intellectual: connection among ICT, data science, and service TPL	impact on the city, also through the innovation of services	support -Partner: technical and financial support	the integration of the new services for greater efficiency	and atmospheric noise pollution	sustainable vehicles to reduce environmental impact in urban areas
P6: Mobility Planning	Municipal sector (planning, energy, ITcity, Infomobility, Parma Infrastrutture Environment (Mobility) Multy Utility (Ireti)	Assessment of the local context, then identifying the needs; shared management; Analysis of timing, risks, barriers	-Human: people from Municipality and stakeholders for building strategies of urban mobility -Financial: public funds; Physical: building connection among sectorial mobility plan	It will make it possible to improve the service and its impact on the city, also through the innovation of services	-Municipality: technical, financial, political support -Partner: technical and financial support	Citizens, Municipality, all partners will benefit from the integration of the new services for greater efficiency	CO2 reduction, allows a reduction in environmental impacts, both in terms of service effectiveness and atmospheric noise pollution;	Less traffic flows and respiratory diseases



Smart Solution	Key Partnership	Key Activities	Key Infrastructure and Key Resources	Value Proposition	Buy in and support	Beneficiaries	Environmental Benefits	Social Benefits
			-Intellectual: connection among ICT, data science, and planning mobility					
P7: Smart Waste Management	Municipal sector (IT- GIS, Environment Mobility) Multy Utility (Iren)	Assessment of the local context, then identifying the needs; Shared management; Analysis of timing, risks, barriers; Development of a business model; Public procurement/ tender; software + sensors; GDPR/security issues	-Human: people from Municipality and IREN for building software and sensor -Financial: public funds; -Physical: building HW, SW, sensors -Intellectual: SW development, connection among sensors, data science	It will allow to acquire data in real time on the separate collection service in the city to allow a better management of the service	-Municipality: technical, financial, political support -Partner: technical and financial support	Citizens, Municipality, all partners will benefit from the integration of the new services for greater efficiency	CO2 reduction, allows a reduction in environmental impacts, both in terms of service effectiveness and atmospheric noise pollution;	Increase the level of hygiene and decorum of the city
P8: Creation of a query based geo-spatial Data Based Decision Platform	Municipal sector (Mobility, Energy, IT, GIS, Environment, Maintenance)	Assessment of the local context, then identifying the needs; General agreement on data property (identify legal	-Human: people from the different stakeholders for building, developing and managing the	It will allow to acquire data in real time on the separate collection service in the city to allow a	-Municipality: technical., financial, political support -Partner: technical and	UPI Citizens, tourists, Municipality, all partners will benefit from the platform	CO2 reduction, risk prevention and preventive planning activities; reduction of energy consumption, reduction of air quality impact, improvement of the quality of urban greenery	



Smart Solution	Key Partnership	Key Activities	Key Infrastructure and Key Resources	Value Proposition	Buy in and support	Beneficiaries	Environmental Benefits	Social Benefits
	, Civil Protection, Local Police) Infomobility, Parma Infrastrutture , Multy Utility (Iren, Siram) City Green Light, Arpae, TEP, Parking owners/ managers, Logistics operator	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	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	better management of the service	financial support			
P9: Smart Open Data City Decision platform	Municipal sectors	Assessment of the local context, then identifying the needs; Shared management; Analysis of timing, risks, barriers; Development of a business model; Public procurement/ tender; Software + sensors;	-Human: people from Municipality and IREN for building software and sensor -Financial: public funds; Physical: building HW, SW, sensors/	It will allow to share multiple data	-Municipality: technical, financial, political support -Partner: technical and financial support	Citizens, tourists, Municipality, all partners will benefit from the platform	Review, transparency, accountability participation, and the identification of knowledge gaps on environmental issues	Enabler, citizen awareness



Smart Solution	Key Partnership	Key Activities	Key Infrastructure and Key Resources	Value Proposition	Buy in and support	Beneficiaries	Environmental Benefits	Social Benefits
		GDPR/security issues	-Intellectual: SW development, connection among sensors, data science					
P10: Smart public lighting	Municipal sector (Energy, IT, GIS, Environment, Maintenance, Civil Protection, Local Police) Parma Infrastruttura, Multy Utility (Iren), City Green Light, ARPAE, ITCity, UNIPR	Assessment of the local context, then identifying the needs; Identify legal challenges; Shared management; Analysis of timing, risks, barriers; Development of a business model; Public procurement/ tender; Building of the infrastructure + sensors; Different access levels; GDPR/security issues; Evaluation on engaging other stakeholders	-Human: people from the different stakeholders for building, infrastructure of sensor; -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	It will allow to acquire real time data on the entire city for a better management of unplanned events	-Municipality: technical, financial, political support -Partner: technical and financial support	Citizens, tourists, Municipality, all partners will benefit from the information	CO2 reduction, real data monitoring allows for a potential reduction of impacts	Increase the level of security, both real and perceived



5.5 Parma Investment Plan

In the table below, it has been reported the investment plan for each measure. The ones undertaken by the University of Parma and the Municipality the right budget and funding source have been identified. Regarding the other actions the City is going to implement in the coming years, data have been reported after a first evaluation.

Table 13: Investment plan – Parma

Smart Solution	Budget Cost	Funding Source and Scheme	Funding timeline	Environmental cost	Social cost
P1: New CHCP plant for district heating connection	6,7 M€	Public, Private, PP ERDF	2021 EPC signed		
P2: Energy management system	1 M€ (P2 + P4)	Public, Private, PP ERDF	2021 EPC signed		
P3: Solar PV and supply of energy to EV charging infrastructure	500 k€	Public, Private, PP ERDF	2021 EPC signed		
P4: Intelligent building control	1 M€ (P2 + P4)	Public, Private, PP ERDF	2021 EPC signed		
P5: Local Public Transport	20 M€	Public	2019	0	0
P6: Mobility Planning	200 K€	Public	2021	0	0
P7: Smart Waste Management	500 K€	Public and private	2018	0	0
P8: Creation of a query based geo-spatial Data Based Decision Platform	3 M€	Public and private and EU funds	2023	0	0
P9: Smart Open Data City Decision platform			2023		
P10: Smart public lighting (intelligent)	1 M€	Public and private and EU funds	2024	No notable impacts from project outside of temporary impacts resulting from construction/installation	No notable impacts from project outside of temporary impacts resulting from construction/installation
P10: Smart Public lighting (LED)	9 M€	Public and Private	2017 - 2035	No notable impacts from project outside of temporary impacts resulting from construction/installation	No notable impacts from project outside of temporary impacts resulting from construction/installation



6. Conclusions and Lessons Learned

This report shows how through the RUGGEDISED replication process the three Fellow Cities of Brno, Gdańsk and Parma have been guided and supported in their path towards the future replication of smart solutions. In the past two years (2021-2022), the Fellow Cities have focused their efforts on the development of their own Replication and Investment Plans which have been built upon the long - term strategies and roadmaps defined in this engaging and successful foresight exercise, which allowed them to select and properly identify the most suitable Smart Solutions from those under implementation in the Lighthouse Cities.

Each participatory foresight process in RUGGEDISED has been tailored to the specific local requirements in terms of objectives, available resources and expertise, existing planning techniques and documents. A wide audience of stakeholders collaborated under the guidance of the Fellow Cities' governing groups, which ensured overall coordination, cutting across administrative silos, created public-private partnerships and pro-actively involved local communities.

The respective Action Plans include an overview of specific activities and projects for the coming years and a methodology describing how individual projects and activities will be carried out, defining specific entities responsible for the individual projects and activities and ensuring that these projects and activities are reflected in the cities' annual budget while outlining, where appropriate, in what form projects of other entities that are consistent with the Strategy will be involved or supported by the Fellow Cities.

The Replication and Investment Plans are the final stage of the replication process in each Fellow City and effectively conclude 6 years of work in the RUGGEDISED project in view of adoption and deployment of the selected Smart City actions as of the year 2023 (the post-project phase).

To have a master plan is an obligation for each city. To have a strategy, how to develop the city, is a choice – and the Fellow Cities of RUGGEDISED are up to it. Brno, Gdańsk and Parma do not want to grow only on the basis of isolated ad-hoc decisions. They want to develop themselves systematically, with a clear vision of their future, together with local people. Thanks to the systematic approach of RUGGEDISED, it will be possible to continuously update individual parts of the Strategy while maintaining a long-term vision of the city's development.

The municipalities of Brno, Gdańsk and Parma decided to accelerate the pace to fully turn themselves into smart cities and the Action, Replication and Investment Plans will be totally consistent with these goals and will help to achieve them.

The RUGGEDISED project has helped the Fellow Cities to break organisational silos, overcome institutional inertia, and avoid sporadic action. It effectively established a collaborative forecasting platform that was able to channel the often-fragmented energy and intelligence present in our communities to design a concrete way forward.

The results are not limited by the specific margins of the project, some solutions go beyond the designated replication areas and have a city-wide impact. Moreover, the results are expected to live beyond the end of RUGGEDISED and many of the ideas will become a part of the broader modernisation of the infrastructure of the cities.

Below we report what emerged regarding the **individual lessons learned** from Brno, Gdańsk and Parma as well as some **recommendations** that they elaborated for other cities wishing to undertake the same path.

Summary of the replication process

Lessons Learned and Recommendations:



For the city of **Brno**, a crucial aspect in the replication process is **being prepared in advance**. Thanks to the RUGGEDISED project, the city was able to focus on the industrial area of the Brno Heating Plant and systematically prepare the transformation even before the area would be abandoned. This long-term “**prevention**” of brownfields is a method in which we plan to continue, as the city of Brno undergoes a transformation from economy of production to economy of services, scientific research, and care.

"Planning and designing the construction of an innovative district is very complex and integrates many topics and expertise. In Brno we appreciate most that we have managed to activate a large number of stakeholders and relevant institutions, which brings a very good opportunity for successful horizontal cooperation. Moreover, this network of partners is something that goes beyond the time and space of the smart neighbourhood project and has the potential to open a whole new chapter of communication between the public and private sectors in Brno.

If we succeed in building the smart district Špitálka, it will have a huge impact on other development projects in the city and this district can become an inspiration for other cities, not only in the Czech Republic. This would not be possible without the cooperation and exchange of experience between cities and other partners within the RUGGEDISED project."

Lukáš Grůza, project RUGGEDISED city manager

Brno

Gdańsk initially assumed that participation in the RUGGEDISED project would be a **kind of incubator**, where smart city ideas could take the right shape before they are implemented. It turned out that during the six years of the project implementation, several of these solutions, which at first seemed too advanced for the city ecosystem, were **successfully implemented** in Gdańsk.

"From my point of view, one of the most valuable elements of the project was modelling the future development of the city using the foresight method. During a series of meetings with representatives of local government, universities and business, we had the opportunity to reflect on the vision of our city in the perspective of 2050. What kind of city will Gdańsk be then? How should we deal with the effects of the climate crisis? How will we move around the city, live, face demographic challenges? There is no doubt that Gdańsk is facing very ambitious development challenges. This is in line with a wider trend in which cities are primarily a place of debate about difficult, often costly and risky, but necessary changes: abandoning coal energy, an economy based on unlimited use of the environment or high-emission transport.

Joanna Zbierska, project officer of the City of Gdańsk

Gdańsk

Parma's team stresses the importance of building a “**smart community**” rather than a smart city: technology is not a goal itself but is a fundamental enabler of a city which is attractive, sustainable and inclusive with all the people living, working and studying there.

Parma



After joining the project, the city of Parma has taken a step forward in terms of the permanent involvement of stakeholders and local companies. Before there was perhaps a mainly institutional dialogue with industrial partners, now instead, thanks to the project activities, through workshops and round tables and other related events and a dedicated website (Parma Futuro Smart), a local governance has been created to support all activities for the development of the Action Plan.”

Enzo Bertolotti – City of Parma



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