URBAN WEGENERATION ACTION PLAN AND IMPLEMENTATION ROADMAP – BUCHAREST

D5.1

WeGenerate

PEOPLE-CENTRIC SUSTAINABLE NEIGHBOURHOODS

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LIST OF ABBREVIATIONS

ADP - Administration of Public Domain

ASCB - Bucharest Construction Students Association

BEM - Building Energy Management System

COP – Coefficient of Performance

EPBD - Energy Performance in Buildings Directive

EU – European Union

GIS – Geographical Information System

HVAC – Heating Ventilation and Air Conditioning

MODIS - Moderate Resolution Imaging Spectroradiometer

MSG - Meteosat Second Generation

NASA - National Aeronautics and Space Administration

NGO - Non-Governmental Organization

NRRP – National Recovery and Resilience Plan

NZEB - Nearly Zero-Energy Building

PED - Positive Energy District

PUG - General Urban Plan

PV - photovoltaic

TERMOENERGETICA - Bucharest Autonomous Thermal Energy Distribution Company

SEVIRI - Spinning Enhanced Visible and Infrared Imager

UHI – Urban Heat Island

UTCB – Technical University of Civil Engineering Bucharest

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EXECUTIVE SUMMARY

The Action Plan and Implementation Roadmap for Bucharest outlines a comprehensive strategy for urban regeneration in District 2, focusing on sustainability, inclusivity, and innovation. This initiative seeks to address the district's environmental, social, and economic challenges by implementing advanced energy solutions, community-focused design, and modernized infrastructure. In line with the European Union's Mission 100 Climate-Neutral and Smart Cities initiative, the roadmap aims to establish District 2 as a model of sustainable urban transformation.

The main goal for the Demo area is the transformation of the Tei University Campus into a dynamic, open space that integrates renewable energy, promotes community interactions, and enhances urban sustainability. This intervention includes the retrofitting of key campus buildings, such as the student dormitory, school, and canteen (supported by side projects), to improve energy efficiency and align with nearly zero-energy building (nZEB) standards. By opening the campus to the public, the project aims at creating a green, accessible, and interconnected environment that connects the academic sphere with the nearby local community.

Energy efficiency is the principal purpose of this transformation. The plan incorporates renewable energy technologies, including photovoltaic systems and ground-water heat pump, to significantly reduce reliance on carbon-based fuels. These measures are expected to lower greenhouse gas emissions. Another central feature of the energy strategy is the establishment of an energy-sharing platform, which will enable the campus and surrounding buildings to operate as a localized microgrid. This system will dynamically balance energy supply and demand, ensuring resilience during peak periods and reducing dependence on external grids. The incorporation of digital twin technology will further optimize energy management by providing real-time monitoring and predictive analytics.

The project also addresses the district's mobility challenges by prioritizing pedestrian-friendly design and sustainable transportation options. Current reliance on private vehicles has led to congestion and pollution – issues that the roadmap aims to mitigate through infrastructure improvements. Planned upgrades include the installation of bike lanes, EV charging stations, and extended walkways.

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Community engagement is very important, ensuring that the project aligns with the needs of local stakeholders. Educational initiatives and consultation programs will highlight the benefits of renewable energy, energy efficiency, and sustainable mobility, helping the community to actively contribute to the district's transformation.

In addition to environmental and social goals, the roadmap emphasizes economic revitalization through public space development. The redesign of underutilized areas, such as the canteen courtyard, will create vibrant spaces for cultural, recreational, and social activities.

The Action Plan also addresses the aging building stock in District 2, many of which lack adequate energy performance and seismic resilience. The retrofitting of these structures will prioritize both energy efficiency and safety, ensuring compliance with modern standards. For instance, the planned upgrades to the Tei neighbourhood include high-performance insulation, modern HVAC systems, and advanced lighting solutions to reduce energy consumption and operational costs. These interventions will also address larger urban challenges such as the urban heat island effect and air quality deterioration, contributing to a healthier and more climate-resilient city.

The lessons learned from this project will inform similar initiatives across other European cities, advancing the EU Green Deal's objectives of climate neutrality by 2050. The roadmap highlights the potential of District 2 to serve as an example for urban regeneration, implementing innovative solutions that balance environmental protection, technological advancement, and community well-being.

By integrating renewable energy systems, participatory design, and advanced digital tools, the roadmap establishes a path for a resilient and inclusive urban future. It highlights the importance of collaboration among residents, businesses, and institutions to create a sustainable and equitable district.

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INTRODUCTION

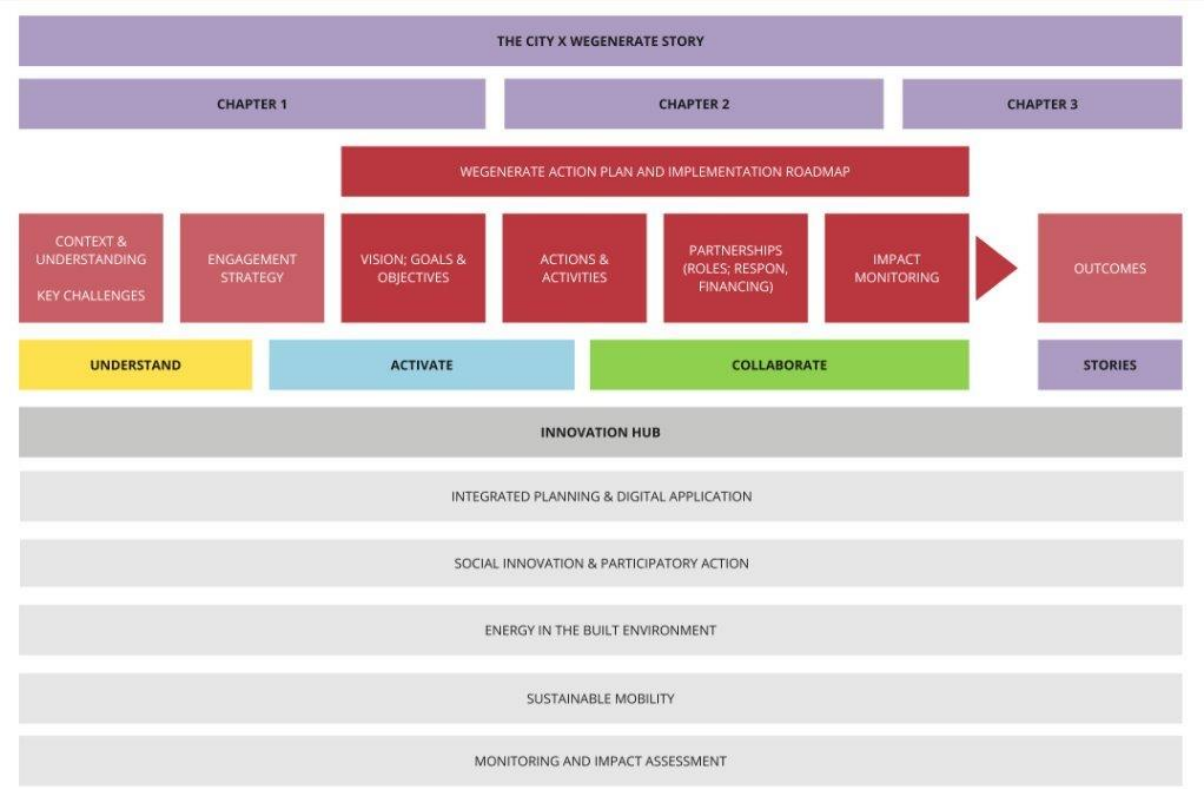

Figure 1 - WeGenerate Action Plan & Implementation Roadmap process diagram

Section	Main contents/objectives
1. Demo Intervention Site Overview	Overview of District 2, project site details, and transformation goals.
2. Local Stakeholders Engagement Strategy	Strategies for involving residents, businesses, and institutions in planning and decision-making.
3. Co-Created Visions	Shared objectives for urban regeneration, sustainability, and community development.
4. Pilot Transformation Activities	Specific interventions, including building retrofits, energy systems, and public space improvements.
5. Implementation Road Map	Step-by-step timeline for achieving project milestones and objectives.

Table 1 - Main sections of the document

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ACTION PLAN

1. Demo Intervention Site Overview

Bucharest City

Bucharest, the capital of Romania, is the country's largest city and a key political, economic, and cultural hub. With a population of around 2 million, it is the most populous city in Romania and serves as a central point for business, industry, education, and tourism. Often referred to as "Little Paris" due to its historical architecture and vibrant urban life, Bucharest has evolved into a dynamic European metropolis with a blend of old-world charm and modern infrastructure. However, the city, situated in a seismically active zone, has also faced devastating earthquakes, such as the 1977 tremor that shaped much of its modern infrastructure.

Administratively, Bucharest is divided into six sectors, each functioning as its own district with its own mayor and local council. These sectors are numbered from 1 to 6 and span the entirety of the city in a radial pattern starting from the city center. Each sector has its own unique character, infrastructure, and mix of residential, commercial, and green spaces. The division of the city ensures more efficient governance and development, allowing each sector to focus on local issues while contributing to the overall growth of the capital.

2nd District of Bucharest Municipality

2nd District of Bucharest is located in the northeastern part of Bucharest, covering both residential and commercial areas, as well as significant green spaces. This sector is diverse, housing a mix of older neighbourhoods with historical significance and newer developments. Some of its well-known areas include Colentina, Iancului, Tei, and Pantelimon.

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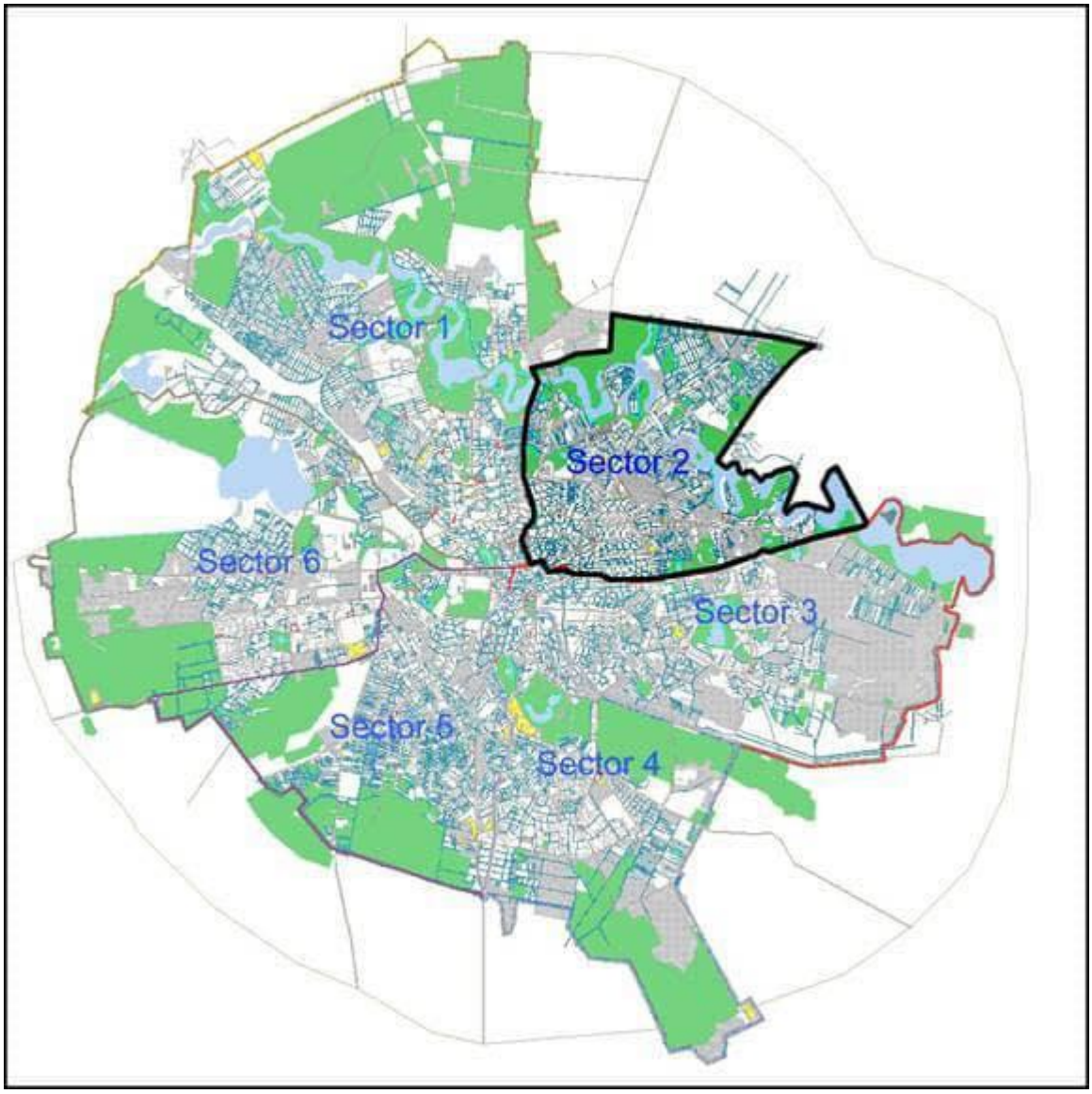

Figure 2 - Boundaries of Bucharest's 2nd district

One of the defining characteristics of 2nd District of Bucharest is its greenery, with large parks such as Tei Park and Plumbuita Park, offering residents and visitors recreational spaces amidst the urban environment. The Tei Lake and nearby parks enhance the sector's appeal as a family-friendly area. Additionally, 2nd District of Bucharest is home to several cultural and educational institutions, including universities, museums, and theatres.

Economically, 2nd District of Bucharest benefits from its proximity to the city center, serving as a hub for various businesses and commercial activities. Over the years, it has experienced growth in both residential real estate and office spaces, attracting a diverse population and offering a balance between modern living and historic charm.

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Overall, 2nd District stands out as a dynamic part of Bucharest, combining residential comfort, recreational options, and economic opportunities, making it a vital part of the city's landscape.

In recent years, Bucharest has experienced a notable population growth, largely driven by both internal migration from other parts of Romania and international immigration, as well as natural population increases. While the city's population saw a general decline in the early 2000s due to economic challenges and emigration, the trend has shifted in the last decade, with increasing urbanization and economic opportunities attracting more residents.

Between 2015 and 2020, Bucharest's population grew by approximately 4-5%, with some sectors seeing sharper increases due to new housing developments, improved infrastructure and rising job opportunities. 2nd District of Bucharest has been part of this growth, benefitting from its mixed-use neighbourhoods, proximity to the city center and appeal to younger professionals and families. However, overall, a slight decrease has been noticed at city level due to migration toward outskirts of the city.

Bucharest has experienced a population increase, reaching 1.83 million residents in 2024, putting significant strain on its infrastructure and public services. This rapid growth presents an ongoing challenge for the city's ability to manage resources and maintain a high quality of life for its inhabitants. Additionally, the surge in construction to meet growing demand has contributed to rising temperatures (UHI) and worsening air quality. Combined with the effects of global warming, this has led to more unpredictable weather patterns, further exacerbating pollution and negatively impacting residents' quality of life, while testing the city's adaptability to these environmental challenges. The city's growing urban landscape faces significant challenges from climate change, prompting efforts to modernize its infrastructure.

The population in 2nd District has grown by an estimated 3-4% over the last decade. This sector has seen significant residential development, with new apartment complexes and improved public services drawing in more residents. The presence of educational institutions and parks has also made it attractive to families and students, contributing to its demographic expansion.

The growth in 2nd District reflects Bucharest's overall urban development trend, where modernization, housing investments, and economic opportunities have led to a steady population increase in certain sectors of the city.

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Bucharest Demo Site

The Demo site is located in District 2, a northeastern sector, that blends historic Belle Époque architecture with modern residential and commercial growth, mirroring the city's transformation. It has been chosen for its potential in urban regeneration, aiming to retrofit key public buildings and expand green spaces to create a more sustainable and liveable environment.

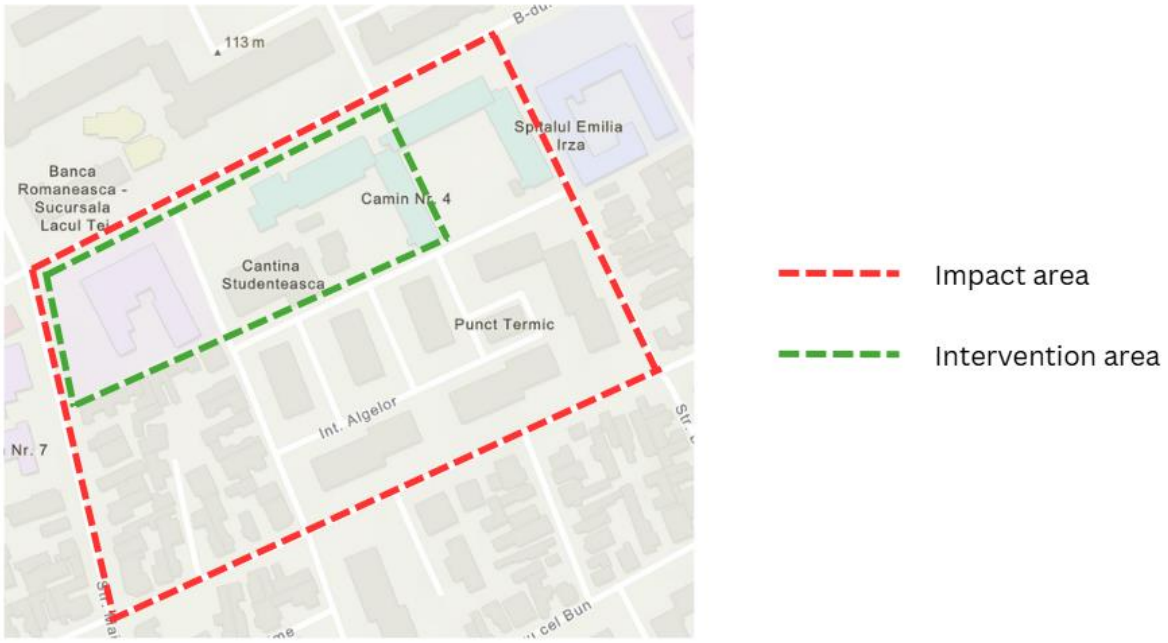

Figure 3 - Intervention and impact area

The Bucharest Demo Site is cantered around transforming the Tei University Campus, owned by the UTCB, into an open, community-friendly space that fosters social interaction and cohesion. The project's primary goal is to turn this academic environment into an attractive and accessible green space for residents, while addressing the challenges of shared community energy through the integration of renewable energy sources.

A key element of the project is the concept of an open campus entitled **"Open Campus for Neighbourhood and Climate"**, exemplified by the transformation of the UTCB campus, which includes a canteen, student dormitories, school, and surrounding underutilized areas. By opening up pockets of green spaces within the university grounds to the surrounding community, the initiative aims to strengthen the social fabric of the area, fostering inclusion and creating opportunities for interaction. The project envisions removing existing fences to

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make the campus more inviting and accessible, transforming these spaces into vibrant urban zones with greenery and shared amenities. The “Open Campus for Neighbourhood and Climate” initiative will demonstrate how a sharing economy model can be realized through urban regeneration, retrofitting these areas into hubs for community-driven efforts in sustainability. Comprehensive renovations enhanced green spaces, and essential urban amenities will not only benefit the students but also nearby schoolchildren and residents, fostering greater community engagement and raising awareness of sustainable practices.

The Bucharest Demo Site thus embodies a dual focus: promoting environmental sustainability through innovative energy solutions and enhancing social cohesion by creating a vibrant, interconnected community space within the campus. This transformation will ultimately bridge the gap between the academic world and the local population, making the university a central player in the area’s urban regeneration.

The presence of a grade school and several university student dormitories highlights the area's focus on youth and their impact on the community. Meanwhile, the numerous surrounding apartment blocks, comprising over 1000 units, emphasize the needs of families and older generations, demanding that the site interventions support residents at every stage of life. The Demo site concentrates on a small section of the area, yet it has a significant impact on all the surrounding residents and those who interact with it.

The buildings included in the intervention area will benefit from energy-efficient upgrades and become part of an energy-sharing community centre as mentioned in the open campus initiative before. Residents will also benefit from planned improvements in public spaces, such as increased walkability and better access to green areas. However, some challenges exist, such as potential opposition from nearby residents to changes, like parking reductions and street closures. Stakeholder engagement, particularly with students, faculty, and residents, is essential to the success of these initiatives.

Key actions planned for the Demo site involve extensive building retrofits and renewable energy solutions. These facilities will form an interconnected energy-sharing community centre that maximizes resource efficiency. Open spaces in and around the Demo site are also planned for improvements, with objectives to enhance walkability, expand green space, and

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introduce several urban furniture facilities and accessories to promote sustainable mobility and safety and accessibility.

A core objective of the WeGenerate project is to create an inclusive, people-centric urban environment that places the needs and well-being of local communities at the heart of urban regeneration efforts. This involves designing public spaces and infrastructure that are accessible to everyone, fostering a sense of belonging and social cohesion. By prioritizing sustainable practices, such as enhancing green infrastructure, promoting active modes of transport like walking and cycling, and reducing CO_2 emissions, the project aims to cultivate neighborhoods that support healthy, low-carbon lifestyles.

WeGenerate emphasizes the importance of community engagement in shaping these spaces, ensuring that residents, businesses, and academic institutions actively participate in co-creating their urban environment. This collaborative approach not only helps to address the challenges of climate change but also builds stronger, more resilient communities by making urban spaces more inclusive, vibrant, and focused on the needs of people rather than just infrastructure and vehicles. The result is a more sustainable, human-centered city that improves quality of life for all its inhabitants.

Demo Site Location

As shown in Figure 4, the city of Bucharest is divided into six administrative districts (called *sectors* in Romanian) for practical and historical reasons related to governance, urban planning, and service distribution. Each sector functions semi-independently but coordinates with the larger city's general administration. This structure helps Bucharest manage its diverse needs efficiently. Bucharest covers a total area of 228 square kilometres and a population of 1.83 million. The Demo site from WeGenerate project is located in District 2 which covers an area of 32 square kilometres and a population of 345.370 representing around 20% of the total population in Bucharest.

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Figure 4 - Bucharest map and demo site location

This map of District 2 from Figure 5 illustrates different land use types across the city.

- **Urban or Developed Areas (Purple)**: Concentrated mainly in the and northeast corners of Sector 2, these regions likely represent built-up urban or industrial areas. Smaller patches are scattered throughout the map, indicating smaller settlements or isolated infrastructure within the sector.
- **Green Spaces or Agricultural Land (Green)**: Found throughout the central and southern portions of Sector 2, these green areas represent forests or designated green zones.
- **Water Bodies (Light Blue)**: A network of light blue areas, primarily through the central and eastern parts of the sector, representing rivers, streams, or small lakes.

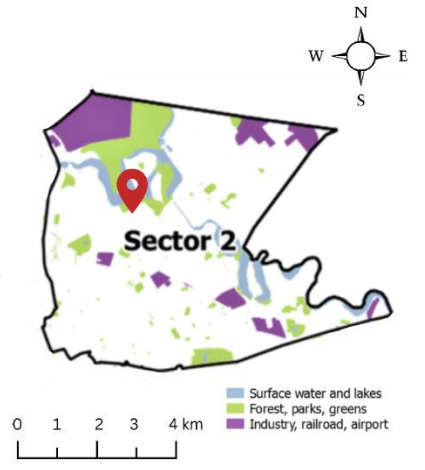

Figure 5 - District 2 land use map

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Figure 6 presents a detailed map of District 2, highlighting the demo site location for the WeGenerate project. In terms of infrastructure, District 2 features major roads and is well-connected to other parts of the city via public transportation, including metro stations, streetcars, and bus routes. It is home to educational institutions, shopping centers, and healthcare facilities, making it a well-rounded district. Additionally, it has some industrial zones, particularly in the northern areas, though these have gradually shifted toward residential and commercial use in recent years.

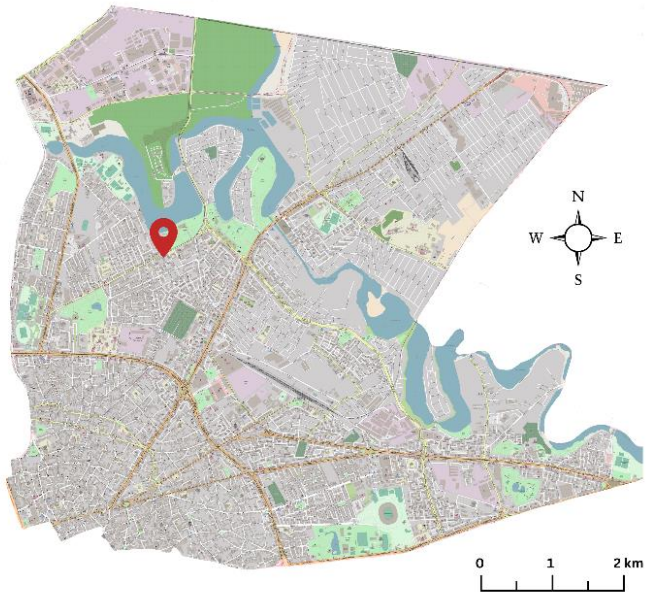

Figure 6 - Detailed map of District 2, Bucharest, and demo site location

A detailed map of the demo site with intervention and impact area is shown in Figure 7. The demo site (total impact area) spans a total area of around 30,000 square meters, showcasing the three buildings from the intervention area, seven apartment buildings, 3 dormitories for students and around 30 private homes. The three buildings from the intervention area, also shown in Figure 8, will later be integrated into the energy-sharing community.

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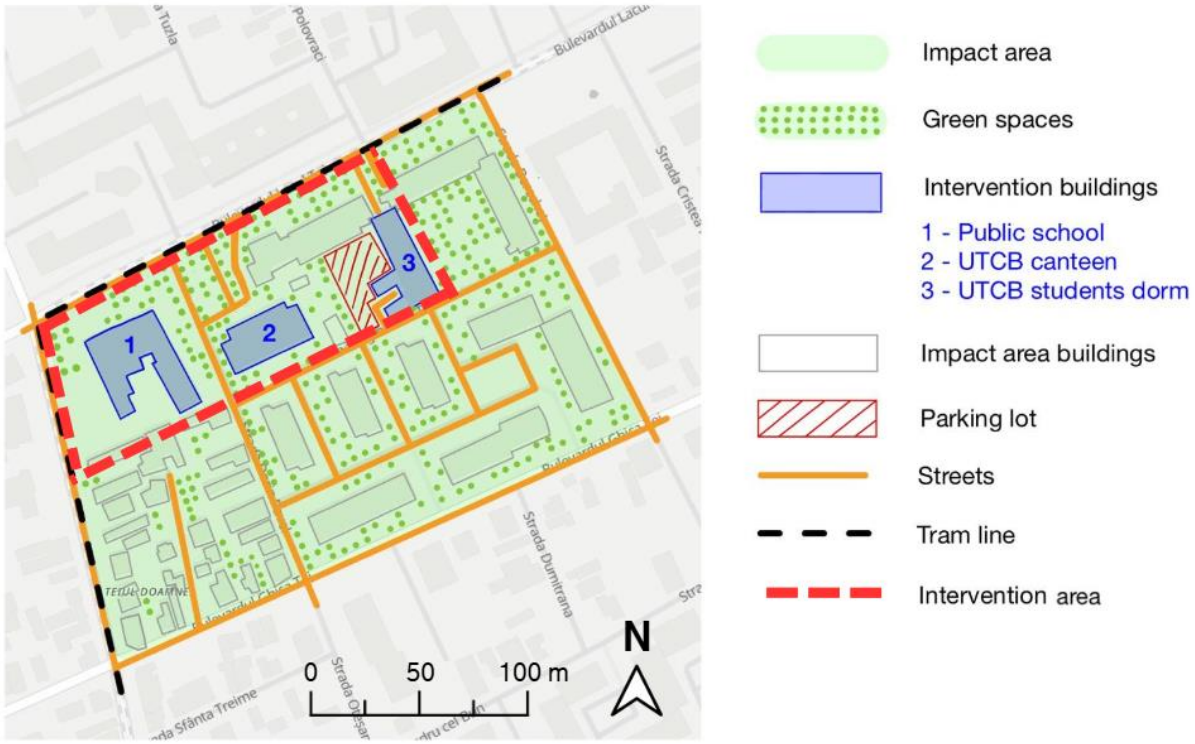

Figure 7 - Detailed plan of the Demo site in Bucharest

The canteen is planned for renovation and the campus area will undergo retrofitting to enhance urban spaces and increase green areas. The area contains multiple residential buildings and individual housings, students' dorms from different universities and some economical entities.

Figure 8 - Energy-sharing community buildings in the demo-site (student residence, the canteen and the school)

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The demo site is surrounded on two sides by a tram line and bus stops. In Figure 9, the walkability of the demo site is highlighted in blue, representing pathways for pedestrians and certain urban areas located between buildings

Figure 9 - Map of walkable pathways and zones in the demo area

Demo site summary

History of the area and its story of decline

The intervention area reflects a dynamic of intense urbanization, specific to periods of accelerated development, which leads to a significant overcrowding of public spaces. Originally designed to accommodate a much smaller population, the area has faced a dense growth of buildings and infrastructure without providing adequate green spaces to balance the needs of the residents. This imbalance generated not only a lack of places for recreation and socialization, but also a negative impact on the quality of life. In addition, many of the buildings in the area have suffered degradation, being neglected in terms of maintenance and modernization.

The lack of effective measures to increase the energy performance of buildings has further aggravated the situation, leading to increased maintenance costs and a decrease in the attractiveness of the area. These problems gradually led to the social and economic decline of the neighbourhood, pointing out the urgent need for urban regeneration initiatives to revitalize and transform it into a sustainable and attractive space.

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The Tei neighbourhood in District 2 of Bucharest has a rich history that reflects the broader socio-economic changes in the city. Originally developed in the early 20th century, Tei was characterized by its residential buildings and vibrant community life. The area was known for its green spaces and accessibility, attracting a diverse population. However, over the decades, Tei has experienced a decline due to various factors. The industrialization of Bucharest led to urban sprawl, with many residents moving to newer developments in search of better living conditions. Additionally, the political and economic upheavals during the late 20th century, particularly the fall of communism, resulted in significant demographic shifts and a decrease in investment in infrastructure and public services. As a result, many buildings fell into disrepair, and the neighbourhood faced challenges such a decline in local businesses. Efforts to revitalize the area have been made in recent years, focusing on urban renewal and community engagement, but the legacy of decline remains a significant aspect of Tei's story.

Many residential buildings in Bucharest were constructed between 1956 and 1990, making them vulnerable to seismic events, especially given the impact of the 1977 earthquake. While some buildings have undergone thermal rehabilitation to improve energy efficiency, many were not reinforced for seismic risks during this process. In Figure 10 it is shown a map of the buildings that have been rehabilitated or are ongoing to be rehabilitated in terms of thermal systems. This has raised concerns about their overall safety, as energy renovations are often not paired with the necessary seismic strengthening measures.

In District 2 of Bucharest, including Tei, there are both low- and high-rise buildings classified into various seismic risk categories. The local government, alongside national programs, is tasked with assessing and addressing these risks, but progress has been slow in some cases due to financial and technical constraints.

However, ongoing studies and projects are focused on improving both the energy efficiency and seismic resilience of residential buildings through integrated strategies.

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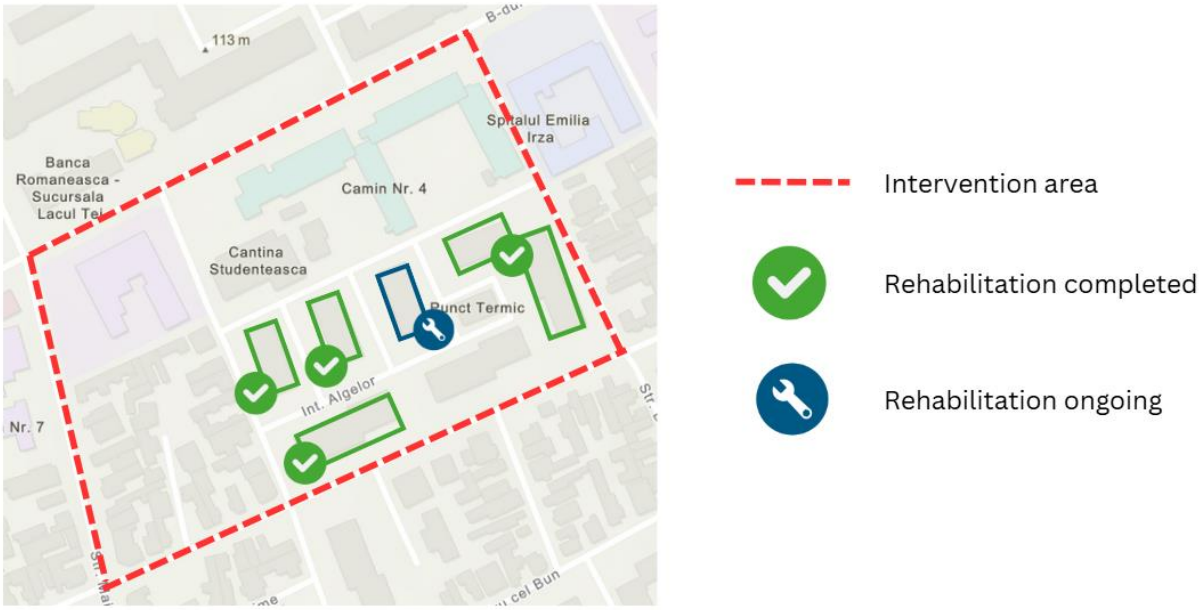

Figure 10 - Thermal rehabilitation map of the intervention area for 2024

Overall, Area Today (Size, Population, Major Features / Landmarks)

The Tei neighbourhood in 2nd District has an area of 138 hectares and, according to archaeological excavations, the existence of man in this space has been signalled since the Bronze Age. It is a very developed area in terms of real estate and with a dense population.

The 36 streets with a total length of 12 km are surrounded by huge green spaces: Tei Park and Lake and Circului Park. Along with these we can add the access to the numerous means of transport and in this way, we find out some of the assets of the neighbourhood.

In Tei Park, with an area of 7 hectares, the two main alleys are dedicated to the enchanted land of childhood: swings, carousels, a roller coaster, the Ferris wheel and many other wonders to entertain children and adults alike.

The Tei Lake project appeared in 1935 and was carried out by Professor Dorin Pavel under the coordination of Nicolae Caranfil. The park was rehabilitated in 2002 by the City Hall of 2nd District of Bucharest.

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In 2007, a massive modernization of parks and playgrounds was carried out with material support from the Republic of Azerbaijan. As a sign of gratitude, an alley was named after the Azerbaijani president Heidar Aliev. Also, here you can admire a decorative fountain cast in cast iron in Paris in the 1930s.

On an area of approximately 11,000 square meters, on the southern side of Plumbuita Park, there is an architectural jewel in the Italian neoclassical style - the Ghica Palace. Built between 1822 and 1832, it is the foundation of Grigorie Dimitrie Ghica, the first Romanian ruler after the end of the Phanariot era. Nearby is the Teiul Doamnei Church, built a year later by the same Grigorie Ghica. It is the only round church in Bucharest.

Housing blocks were built in the 70s on both sides of Lacul Tei Boulevard, the area's main artery. There is also an area of typical houses on the right side of the boulevard, houses that were built in the 1930s as a result of subdivision. They were built by the "Communal Society for Cheap Housing". At that time, the approval of both the City Hall and the Ministry of Public Works was needed to build a neighbourhood of this kind. Housing of this type was bought in instalments by a certain socio-professional category as civil servants.

In Tei there are headquarters of state institutions such as the General Inspectorate for Emergency Situations, the Institute of Energy Studies and Designs, the Institute for Mother and Child Protection, the printing house of the Ministry of Internal Affairs and the Faculty of Civil Constructions.

The Demo Site is a dynamic and diverse urban area covering 30,000 square meters in the heart of the Lacul Tei neighbourhood, where the past meets the potential for a more connected and sustainable future. The site is framed by the bustling tram lines of Lacul Tei Boulevard and Maica Domnului Street on one axis and the quieter Ghika Tei Boulevard and Berechet Street on the other. It is a microcosm of urban life, with its mix of residential homes, educational institutions, and small businesses reflecting both the challenges and opportunities of modern city living.

The intervention area consists of 3 main buildings: to the west School no. 31, a functioning educational institution serving local students, to the east a student dormitory and between them an old canteen belonging to the Technical University of Civil Engineering Bucharest. The

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canteen and its surrounding courtyard, though currently underutilized, are poised to become a vibrant public space—a symbol of renewal and community spirit.

The area features seven apartment buildings, 40 individual houses, and various small businesses such as shops and bars. Streets are poorly equipped for cycling and pedestrian movement, with 12 small roads suffering from informal parking and inefficient traffic flow.

The site lacks sufficient community spaces and requires upgrades to its infrastructure, including the renovation of the canteen courtyard and improvements to pedestrian, cycling, and traffic facilities. The intervention will focus on enhancing mobility, public space accessibility, and community functionality.

Socio-Economic Characteristics (Including Existing Businesses)

District 2 presents a diversified socio-economic profile, characterized by a combination of factors that reflect both stability and vulnerabilities among the population. One of the dominant characteristics of this sector is the presence of a well-defined middle-class population, made up mostly of people who benefit from financial and social stability. However, there are also parts of the community that face significant economic challenges. The constant increase in the cost of living in recent years, as well as the insufficiency of essential infrastructure in certain areas, have created economic difficulties for certain more vulnerable groups. In many cases, the more vulnerable segments of the population are socially and geographically isolated from opportunities for economic development, which widens the gap between different groups in the community.

The planned improvements in mobility and public spaces are of crucial importance for the economic revitalization of the sector. Infrastructure projects, such as expanding and modernizing the public transport network, are essential to facilitate residents' access to jobs and essential services, thereby contributing to increased productivity and quality of life.

Investments in public spaces, such as parks, squares and recreation areas, are equally important. These will not only improve the overall aesthetics of the sector but will also create opportunities for local economic development by attracting businesses and visitors to these areas. Creating well-maintained and accessible public spaces will encourage social interactions and increase the sense of belonging to the community, thus having a beneficial

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effect on social cohesion. In addition, these spaces can become catalysts for cultural events and recreational activities, which will contribute to the dynamism and economic vitality of the sector.

These initiatives have the potential to increase the economic competitiveness of the sector, reduce social inequalities and create a more attractive and sustainable urban environment for all its inhabitants.

The socio-economic profile of District 2 is mixed. While the area has a well-established middle-class population, certain segments of the community face economic challenges due to rising living costs and lack of infrastructure. Businesses in the area include small-scale retail shops, local services and informal economic activities. The planned improvements in mobility and public space aim to enhance the overall economic vitality of the area.

Land Uses and Urban Structure, Building Typologies and Age Range

The demo site is characterized by a mix of educational/utility facilities (public school, canteen, student dormitories) and private residential single and multi-family buildings. More precise there is one elementary and middle public school, one student canteen, 5 student dormitories from 3 different universities, 7 11-story multi-familial buildings, around 10 economical entities and around 40 individual housings. The demo site area directly impacts approximately 4,000 people, including students in dormitories, school children, and residents of individual houses and apartment buildings, encompassing individuals across all age ranges.

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Figure 11 - Campus space to be renovated in front and to the side of the Canteen

Most of the buildings date from the mid-20th century (even 70's) and vary in typology, with most of the structures showing signs of wear and in need of retrofitting. The area is predominantly residential, with public facilities that are integrated into the urban structure but not optimally connected to the city environment.

The main buildings from the demo site are the following:

- Middle School no. 31
- Students Canteen from UTCB
- Students Dorm C4 from UTCB

Middle School no. 31

Middle School Nr. 31, was built in 1924. Initially, the school consisted of two distinct sections that were not linked with each other: the wing facing Maica Domnului Street was the "Primary School for Girls No. 36," while the wing facing Dorin Pavel Street was the "Primary School for Boys No. 36." The sections of the school are presented in Figure 12.

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Figure 12 - Middle School no. 31

Starting from the 1948-1949 school year, both schools offered primary and gymnasium education. Following the education reform in 1956, the two schools merged into a single entity known as "School No. 31 Mixed."

Although the school had electric lighting from its inauguration, it only received solid fuel heating in the mid-1980s, marking the beginning of its modernization with the introduction of central heating. In 1977, due to an increase in the student population, a second building was constructed adjacent to the wing on Dorin Pavel Street, furthering the modernization process.

The school is equipped with 25 classrooms, laboratories for biology, physics, and chemistry, computer rooms, a library, a sports hall and field, a dining room, a dormitory, a medical office, and a dental office. The teaching staff is well-prepared professionally, as evidenced by inspections for obtaining teaching degrees or specialties, the results achieved, and their interest in participating in continuous training courses. A total of 649 students benefits from all these advantages.

The two sections of the school, building C1 and building C2, have height regimes of GF+1F and GF+2F, covering a total built area of 3,798.56 sqm. These sections are now connected by corridors, and there are no joints between the segments. The exterior walls of the building

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are constructed from brick masonry and finished with decorative exterior plaster, while the interior walls are made of masonry. Additionally, the exterior walls are insulated with 10 cm of expanded polystyrene. The structural framework of the building consists of reinforced concrete frames (columns and beams made of reinforced concrete).

Regarding the building's installations, both the heating system and the domestic hot water preparation system are provided by the district heating system. The electrical lighting installation is connected to the national power grid and utilizes fluorescent tubes and incandescent bulbs. There is no ventilation or air conditioning system in the school.

According to energy audit, all these characteristics result in the following values for the annual specific energy consumption:

- Heating → 150.9 kWh/m²·year
- Domestic Hot Water → 27.6 kWh/m²·year
- Lighting → 31.6 kWh/m²·year
- Thus, the total primary energy consumed by the building is 210.1 kWh/m²·year.

Students Canteen from UTCB

The UTCB canteen is a building built in 1975, located at Street Inginerilor Tei 11, District 2, Bucharest. It consists of a single section and has a height regime PB+GF+1.

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Figure 13 - UTCB students' canteen

Due to its age and the relative lack of interventions for modernization over time, the building does not meet current energy efficiency requirements, both in terms of the insulation capacity of the envelope and the energy supply installations. The building has undergone repairs and alterations in the past, but no structural work has been carried out. The building is in a state of considerable physical and moral wear and tear, both in terms of structural design and technological equipment specific to its function, as well as in terms of finishes and architectural features. The exterior walls of the building are made of brick and plaster, and the building's structural framework consists of reinforced concrete frames. The facade does not have any distinctive architectural elements, and the roof is constructed as a terrace.

On the systems side of the building, heating is provided centrally through district heating system. The heat supply is considered to be intermittent., with the building's heating requirement being 415.17 kW. At the moment, the indoor heating system is characterized by poor operation in terms of heat transfer efficiency, which is caused by deposits of organic and inorganic matter inside the heating elements and pipes. The hot water is also provided by district heating system.

The building is supplied with cold water through the mains, connected to the city network and is not equipped with mechanical ventilation, cooling or air conditioning systems in the

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centralized system. The lighting system consists mostly of fluorescent luminaires. The installed power of the installation is approximately 15.2 kW.

As indicated in the energy audit, the characteristics mentioned result in the following values for the annual specific energy consumption:

- Heating → 300.02 kWh/m²·year
- Domestic Hot Water → 45.1 kWh/m²·year
- Lighting → 25.5 kWh/m²·year

Students Dormitory C4 from UTCB

The student dormitory C4 from UTCB is an 8-storey building built in 1979. The building capacity has a total accommodation for 558 students

Figure 14 - UTCB's students dormitory C4

The building's structural framework consists of monolithic reinforced concrete structural walls. These walls border each room, making the structure similar to a honeycomb type. The exterior cladding consists of non-load-bearing prefabricated panels, while the interior walls are either load-bearing reinforced concrete or partition walls made of brick masonry.

Regarding the building installations, both heating and hot water production for domestic use are provided through district heating. The mechanical ventilation system for extracting stale air from the common sanitary facilities is achieved with the help of 11 ventilation columns

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located at the attic level. The lighting is mixed, featuring both incandescent and fluorescent lamps.

The characteristics presented, as identified in the energy audit, result in the following values for the annual specific energy consumption:

- Heating → 41.8 kWh/m²·year
- Domestic Hot Water → 65.3 kWh/m²·year
- Mechanical ventilation → 1.6 kWh/m²·year
- Lighting → 17 kWh/m²·year

Mobility Patterns / Modal Split

Mobility in District 2 is dominated by private car use, which contributes to traffic congestion and pollution. The modal split reveals limited adoption of sustainable transportation options, such as cycling or walking, due to insufficient infrastructure. The current situation of the demo area is characterized by low accessibility for residents and limited walkability, as illustrated in Figure 15. Efforts are underway to encourage more sustainable mobility patterns, including plans to install bike racks or EV charging devices and improve pedestrian pathways around the canteen and school. However, challenges like opposition to reducing parking spaces and the high cost of green mobility initiatives remain.

Figure 15 - Photos of the demo-site area: low accessibility for residents

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In the Tei neighbourhood of Bucharest, traffic and public transportation are influenced by its proximity to both residential and educational areas, particularly the UTCB. Here's an overview of the transport situation:

Road Traffic

Tei Boulevard and surrounding streets experience significant congestion during peak hours due to the flow of commuters and students. Like much of Bucharest, the area can be affected by heavy traffic, especially during morning and evening rush hours. Local streets, such as Strada Teiul Doamnei, are often used as shortcuts but still suffer from bottlenecks. Figure 16 illustrates traffic patterns using Google Maps data, comparing a typical day, often observed on weekends, with the heightened traffic during weekday rush hours, which generally coincide with the time when children finish their school schedule.

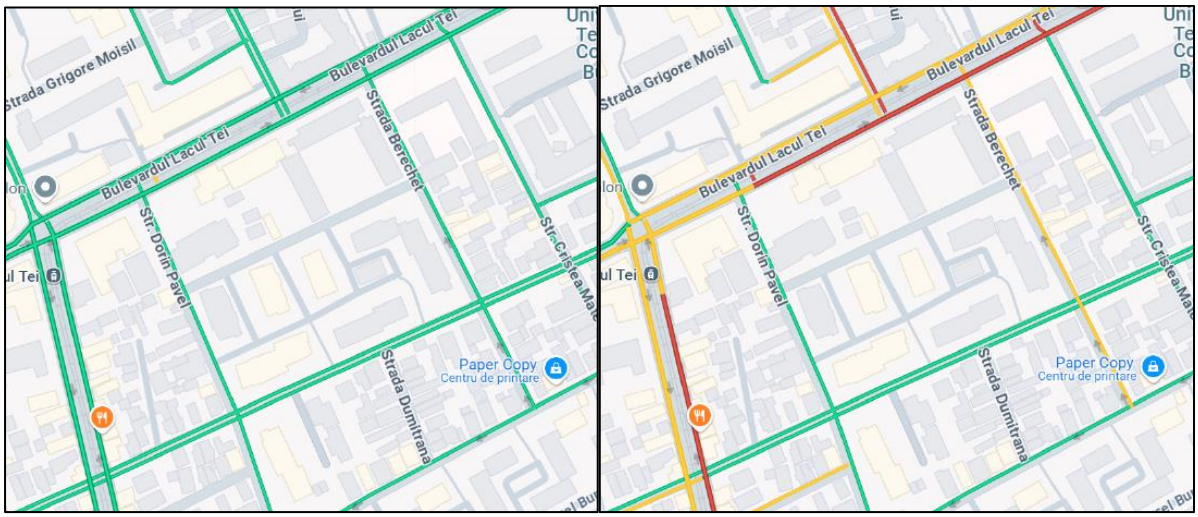

Figure 16 - Traffic patterns comparison: Weekends (left) vs. Weekday Rush Hour (right)

Public Transport

Bus lines and trams serve the Tei area. For instance, bus lines 182, 282 and N103 and tram lines 16, 17 and 36 are available routes, connecting the neighbourhood to the city center and other parts of Bucharest. The proximity to Obor and Stefan cel Mare metro stations makes public transport fairly accessible for residents.

The Bucharest Municipality network ensures regular bus and tram services, though occasional delays are expected due to the traffic congestion mentioned above.

Cycling Infrastructure

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Tei Park offers some space for recreational cycling, but dedicated bike lanes are limited. There has been increasing advocacy for improved cycling infrastructure in Bucharest, but in the Tei area, facilities remain underdeveloped. Cyclists often have to navigate regular traffic, which can be challenging and unsafe at times.

Complementary to the actions developed within Wegenerate 2nd District of Bucharest Municipality signed the financing contract for the implementation of the project "Development of bicycle paths within the radius of District 2 of the Municipality of Bucharest" - C10-I1.4-410, submitted through the National Recovery and Resilience Plan (PNRR) - Component C10 – Local Fund, Investment I.1.4 – Ensuring infrastructure for green transport – bike lanes (and other light electric vehicles) at local / metropolitan level.

The objectives and activities of the project are correlated with the directions and action measures established in the Integrated and Sustainable Local Development Strategy of District 2 for the period 2016-2025, regarding the appropriate infrastructure to support low-emission modes of travel, by reducing the number of trips by car individually in favour of non-motorized means of transport and the outline of a bicycle network.

Through the implementation of the project, the arrangement of 36.45 km of bike paths that will connect points of local interest located on the territory of District 2 of the Municipality of Bucharest is pursued. The velo network will have mixed utility, being able to be used both for leisure purposes and to ensure the mobility of residents of residential areas to objectives of civic or professional interest. The project will be carried out on the basis of a partnership concluded between the Municipality of Bucharest and District 2 of the Municipality of Bucharest, to be implemented on main and secondary roads owned or managed by both partners.

The total value of the project is 42,704,914.77 lei with full financing from NRRP.

The project implementation period is 29 months, respectively 30.12.2022 - 30.05.2025.

Two of the routes part of the project (route 3 and route 4) pass through the impact zone and delimit the demo area of the Wegenerate project, as can be seen from the map below (Figure 17).

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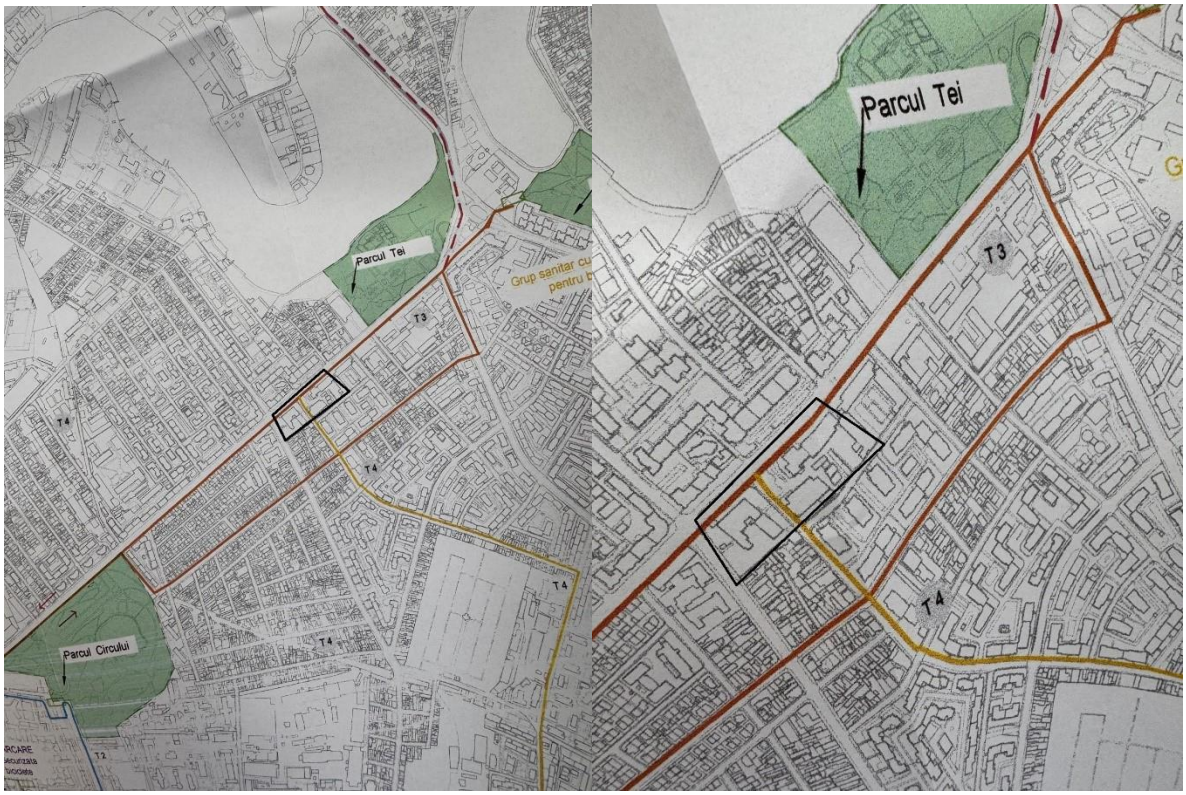

Figure 17 - Route 3 (orange) and Route 4 (yellow) bicycle paths; WeGenerate Demo site (black)

Route 3: Parcul Circului -B-Dul Lacul Tei -Parcul Tei -Parcul Plumbuita

Route 4: Bulevardul Lacul Tei - Str. Dorin Pavel - Str. Otesani - Str. Maşina de Pâine - Şos. Ştefan cel Mare, Rond Obor;

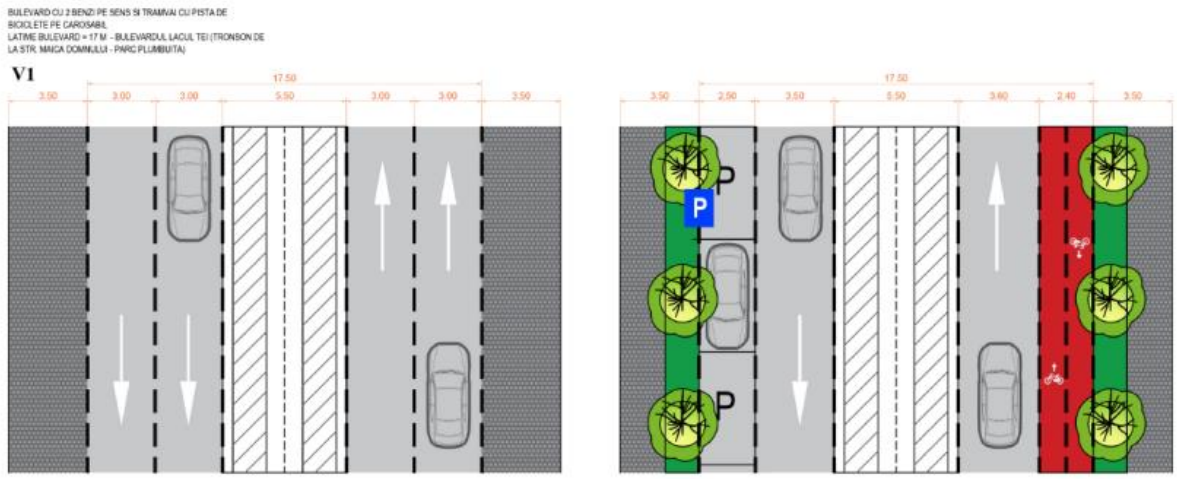

Figure 18 - Current Blvd. Lacul Tei layout (left) and proposed street improvement (right)

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Currently, Boulevard Lacul Tei prioritizes vehicles, with wide driving lanes, limited sidewalks, and no dedicated cycling infrastructure. Informal parking dominates the curbside, while pedestrian crossings are sparse and inconvenient, discouraging walking and cycling.

The proposed improvements reimagine the street as a people-friendly corridor. Dedicated bicycle lanes will ensure safe cycling, while the sidewalks will be further away from the traffic, enhancing walkability. Green strips will introduce much-needed greenery, and formalized parking will replace informal spots, creating a more organized and welcoming environment. Traffic calming measures will further support a balanced, multi-modal street that prioritizes accessibility and sustainability.

Scooters

Electric scooters have become increasingly popular in Tei, with several companies (like Bolt and Lime) offering rentals through mobile apps. Scooters are frequently used for short commutes, especially by students and young professionals in the area, though the lack of dedicated lanes can sometimes pose a safety risk.

In summary, Tei is well-connected via public transport, though road traffic can be heavy. Cycling and scooters are growing in popularity, but infrastructure improvements are needed to make these options safer and more accessible. A map that summarises all the means of transport in the demo area is shown in Figure 19.

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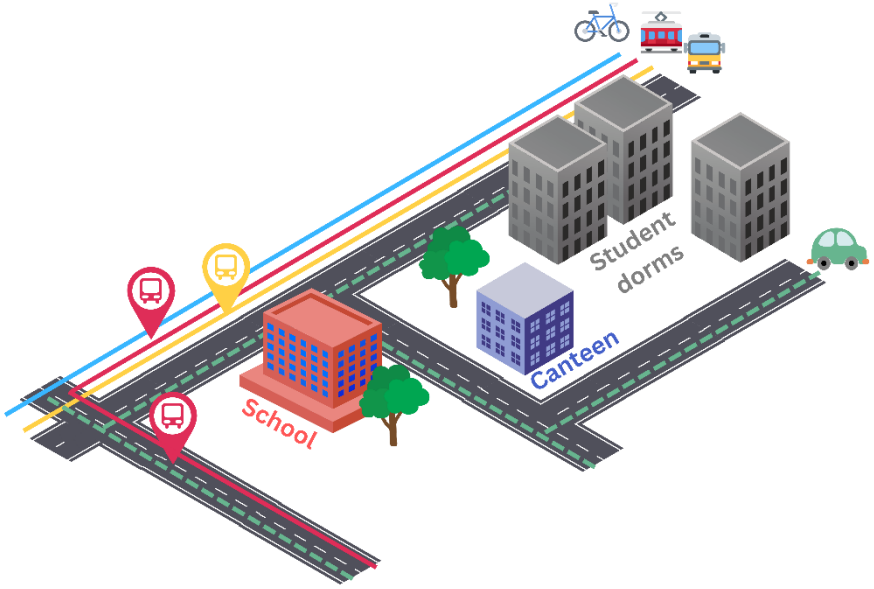

Figure 19 - Means of transport around the demo area

Energy Mix, Distribution System(s)

The energy system in the Tei neighbourhood, like in many other urban areas, consists of a network for the supply of electricity, natural gas, and, in some cases, centralized heating systems. Generally, the neighbourhood benefits from the national energy infrastructure, which includes substations and distribution lines.

Electricity is supplied through electrical networks, and consumers can access various offers from suppliers. Natural gas is available for heating and cooking, and the distribution networks are managed by specialized companies. Additionally, in the context of the transition to more sustainable energy sources, there are local initiatives promoting the use of renewable energy, such as solar panels, especially among residential buildings. Electrical Energy Distribution Company in Bucharest 2nd District of Bucharest is E-DISTRIBUTIE MUNTENIA SA company.

The buildings from the demo site are currently connected to the Bucharest electric grid and central heating. Some buildings use their own heating system such as natural gas heating system. As for the Bucharest central heating system (Termoenergetica), they use fossil fuels as their primary source to create hot water and thermal agent for domestic heating. In the last year, the main sources for electricity production in Romania was fossil fuels (33.5%), hydropower (28.7%), nuclear power (20.5%), wind (12.5%), solar (3.8%) and biomass (1%)

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(Source: Transelectrica). In the hot season, most individual houses and apartments rely on air conditioning for cooling.

Sustainability and Energy Efficiency Aspects

The University Canteen

The canteen is currently out of service, having ceased operations in 2020. Before its closure, the building used the district heating system for both heating and domestic hot water. Despite being cost-effective, the city's district heating system, particularly in our area of interest, often struggles with deficiencies in heat and hot water delivery. Considering the intermittent operating schedule due to the canteen's hours of operation, the energy audit for the scenario in which the canteen was still operational indicated an annual heating energy requirement of 828,320 kWh, resulting in a specific energy consumption rate of 326.11 kWh/m² per year. Additionally, the domestic hot water requires 124,550 kWh/year, corresponding to a specific energy consumption rate of 49.04 kWh/m² per year.

Figure 20 - Interior building system of the non-retrofitted canteen

Heat pumps offer a technologically advanced alternative, using renewable energy to transfer thermal energy from the air, ground, or water into the building's systems. The canteen project is well-suited for this transition, particularly as heat pumps reduce primary energy usage by achieving a higher efficiency (expressed as COP).

The heat pump system which will pe implemented in UTCB canteen has a thermal power of 30 kWt and will operate with an average COP of 4.

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This means that the heat pump would generate approximately 4 units of heat for every unit of electricity consumed, significantly lowering both energy demand and operating costs. For a facility with the high occupancy rates and extensive operational hours of a university canteen, these savings are substantial.

The transition to heat pumps would also directly impact the canteen's carbon footprint. Based on the audit data, CO2 emissions associated with the existing system amount to over 150 kgCO2 per year. Heat pumps, particularly when powered partially or fully by renewable electricity, such as the planned on-site photovoltaic system with an expected capacity of 20 kWp, would reduce these emissions. To ensure the efficient operation of the heat pump, water storage tanks will be installed for the hot water circuit and the chilled water circuit, according to the equipment supplier's requirements. The storage tank provides an additional amount of heat for situations where the heat pump compressor does not operate within the required parameters. The connecting pipes between the equipment are made of galvanized steel and are thermally insulated.

This renewable electricity source will support the heat pump system and other electrical demands, reducing the building's reliance on non-renewable grid electricity and lowering overall CO2 emissions.

In parallel with the thermal energy production system, a thermal energy recovery system from wastewater will be installed. This system will comprise a heat recovery system with a 2 m^3 retention basin, a 60 kWt heat exchanger, a grinder, and a circulation pump.

By integrating renewable energy enhancements, the project anticipates a marked reduction in primary energy consumption and a positive environmental impact, directly supporting the building's nZEB classification and aligning with both national and EU energy efficiency targets.

These savings in energy translate to reduced greenhouse gas emissions, potentially bringing the building's CO2 emissions down to less than 20 kg CO2/m^2 per year—a considerable improvement in alignment with sustainability goals.

Beyond immediate environmental and economic benefits, this project sets a precedent for sustainable retrofits in educational facilities.

In parallel with the solutions which will be integrated through WeGenerate, UTCB student canteen renovation will take place through "UTCB Canteen – Infrastructure for an Equitable

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Academic Space" project part of the National Recovery and Resilience Plan (*Planul Național de Redresare și Reziliență* - PNRR). PNRR is a strategic framework designed to help Romania recover from the economic and social impact of the COVID-19 pandemic while promoting long-term growth and sustainability. Funded by the European Union through the Recovery and Resilience Facility (RRF), the plan outlines investments and reforms across key areas to support economic modernization, digital transformation, and environmental sustainability.

The above-mentioned project highlights the importance of the building's insulation system. A well-insulated building envelope is critical for minimizing heat loss, ensuring indoor comfort, and reducing energy demand for heating and cooling. The UTCB canteen's walls, roof, and foundation will undergo substantial insulation improvements using high-performance materials like mineral wool or high-density polystyrene, with 15 cm thickness.

These materials have a good thermal resistance, contributing to a building envelope that prevents unnecessary heat exchange with the outdoor environment. Insulating the foundation and substructure is equally essential as it diminishes heat transfer through the ground, a common area of energy loss in older buildings. These upgrades are designed to create a tightly sealed, energy-efficient envelope that not only reduces heating and cooling costs but also aligns with nZEB standards, introduced by the national norm MC001:2023.

Improving indoor air quality and climate control are also high priorities for the renovation. The ventilation and climate control system will incorporate heat recovery, which captures thermal energy from vitiated air and reuses it to pre-heat inlet fresh air. This not only maintains comfortable indoor temperatures but also minimizes the energy required for heating and cooling. The result is a system that can provide fresh air without significant energy loss, reducing the building’s overall demand for heating or cooling while ensuring a healthy and comfortable indoor environment for students and staff.

Lighting in the canteen will also undergo significant upgrades. Energy-efficient LED systems will be installed throughout the facility. This project not only follows but also exemplifies best practices for public building renovations as outlined by EU directives. The high-efficiency HVAC systems, and an optimized building envelope all work together to bring the canteen to nZEB standards. By focusing on these areas, UTCB is positioning the canteen as a model of

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sustainable design, contributing to long-term goals of reducing the environmental impact of public facilities.

The Middle School no. 31

Middle School no. 31, similar to the canteen, also faces high energy consumption and CO2 emissions. Heating and domestic hot water are provided by the district heating, resulting in an annual energy consumption of 164 kWh/m² for heating and 30 kWh/m² for domestic hot water. To align with current European requirements, the renovation aims not only to achieve energy savings for the building but also to meet the thermal comfort parameters required by regulations.

For the heating system, the proposed solution involves installing a new high-efficiency heat source to create an alternative system – an air-to-water heat pump integrated with the existing heating system. Additionally, ceiling-mounted fan coil units are planned for classrooms, offices, and the teachers' lounge. The system will be equipped with programmable control devices to reduce room temperatures during nighttime or unoccupied periods, ensuring optimized energy use.

In the case of the domestic hot water system, the proposal includes both the refurbishment and replacement of defective or deteriorated plumbing installations, as well as the implementation of a solar panel system, considering the city's potential to harness solar radiation. The solar panels will serve the entire building. The domestic hot water preparation using renewable energy will also include a storage tank with two heat exchangers—one connected to the solar panels installed on the building and the other to an auxiliary heat source.

Currently, the building lacks ventilation or air conditioning systems. Therefore, the energy audit recommends the installation of a ventilation system with heat recovery to improve indoor air quality and energy efficiency. Heat recovery ventilation is a modern and efficient solution for ensuring indoor air quality in a school while simultaneously reducing thermal energy losses. This system is particularly important in educational buildings, where many people spend long hours in classrooms. Implementing this system in the building is both a sustainability measure and an energy efficiency solution, having a positive impact on both the environment and the building's users.

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To reduce energy consumption associated with lighting, a renewable alternative is also being adopted. Photovoltaic panels will be installed, transforming solar energy into electricity, allowing the institution to reduce its reliance on conventional energy sources and adopt sustainable solutions.

The Student Residence, Dormitory C4

The energy performance of a building is an important factor in evaluating its overall sustainability and environmental impact. The student dormitory has an annual specific energy consumption of 41.8 kWh/m² for heating, 65.3 kWh/m² for domestic hot water, 1.6 kWh/m² for mechanical ventilation, and 17 kWh/m² for lighting, as indicated by the energy audit. These energy uses contribute to a total annual carbon footprint of 27 kg CO_2/m². Heating and domestic hot water are supplied through the district heating system, which, while reliable, relies on fossil fuels, resulting in significant CO_2 emissions.

These results were indicated following the building's thermal rehabilitation in 2015, which improved its insulation and energy efficiency. However, the current energy performance suggests room for further improvements to align with modern sustainability standards and European regulations, such as nZEB requirements.

To achieve additional reductions in energy consumption and greenhouse gas emissions, the implementation of renewable energy sources is strongly recommended. While the thermal rehabilitation has brought improvements, adopting renewable energy technologies remains a key step in ensuring the building meets future energy efficiency and environmental targets. This approach would not only reduce operational costs but also support broader climate and sustainability goals.

The Energy-Sharing Center

The demo site will provide an innovative **Energy-Sharing Center.** The energy solutions being implemented include PV installations on the top of the canteen, a ground-water heat pump, and energy-efficient retrofits of two buildings (school and canteen, both retrofit projects being funded through other sources). The school, canteen, and students' dormitory are all part of this shared energy system, which aims to reduce reliance on carbon-based energy sources by incorporating renewable energy technologies.

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The system is designed as a possible future PED, where the installation of solar photovoltaic panels on the rooftop is designed to make use of the district's solar potential. These PV systems will not only provide electricity to the connected buildings but will also supply energy for the ground-water heat pump that supports both heating and cooling demands. By using these types of renewable thermal energy sources, the district reduces its dependence on fossil fuels and significantly reduces greenhouse gas emissions.

Moreover, the energy efficient retrofits include implementing of insulation materials, which improve the thermal performance of the building envelopes, thus reducing heating and cooling loads. The integration of advanced BEMSs will allow real-time monitoring and optimization of energy consumption across the campus. This will facilitate intelligent energy distribution among the buildings, enabling them to balance supply and demand dynamically.

One important aspect lies in the energy-sharing platform. This platform will manage the distribution of surplus renewable energy generated by the PV system, allowing the interconnected buildings (school, canteen, and students' dormitory) to share energy effectively, transforming the site into a localized microgrid. The microgrid will improve energy resilience, allowing the community to operate independently from the broader municipal grid during peak demand periods or in the event of power outages.

Several key parameters were estimated:

- Installed power: 20 kWp, including 10 kWhp storage batteries
- Installation (on building or on ground): on building
- Estimated annual electricity production:23893 (kWh),
- Investment Cost: 1185€ /kWp
- Maintenance cost: 25, per year €/kW

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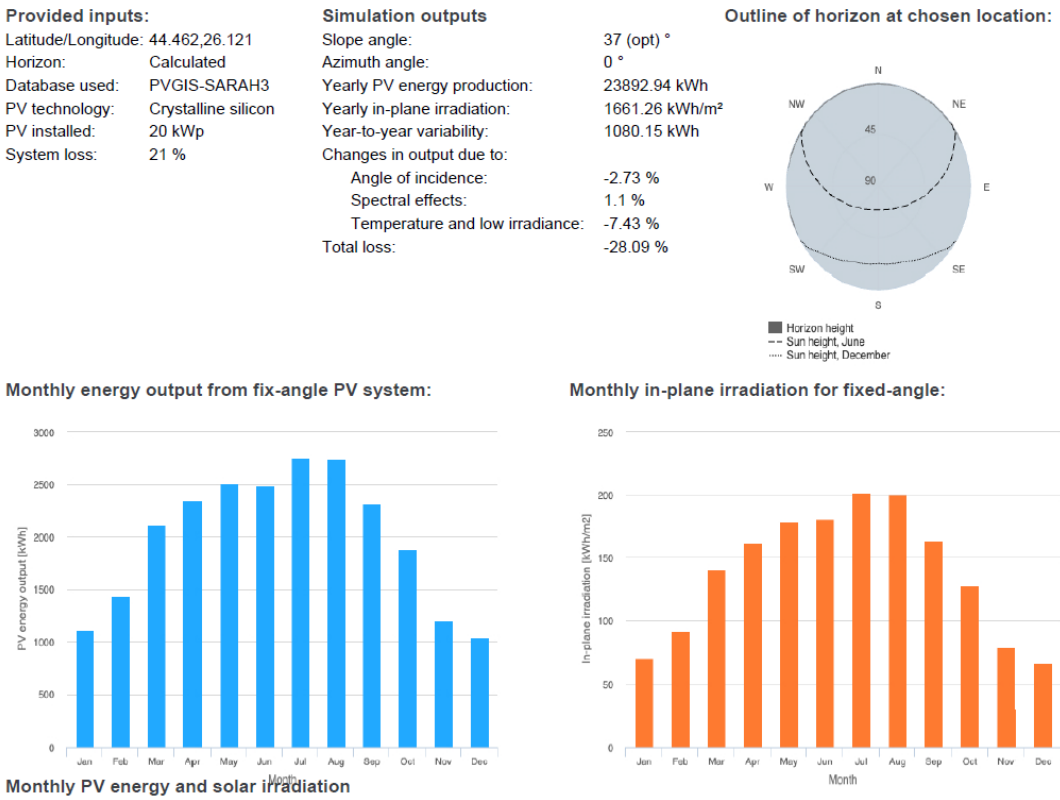

Figure 21 - Simulation of the possible energy production

A focus of the project is to initiate circular energy economy approaches within the demo. Beyond generating energy, the system will also capture and reuse waste heat from building operations and kitchen processes in the canteen (wastewater energy recovery). This waste heat recovery system will preheat the water needed for hot water consumption, further reducing reliance on external energy sources.

The digital twin technology plays a crucial role in this transformation, enabling detailed simulations and data analytics to assess the potential for energy savings and environmental benefits. The digital twin model will also be used to explore different scenarios for expanding the energy community beyond the demo site, analysing how such systems can be scaled to cover larger districts within Bucharest.

The Shared Energy Center will also serve as an educational hub, where students and citizens can learn about renewable energy technologies, sustainability practices, and energy management.

The Bucharest Demo Site is an innovative initiative in energy transition and urban regeneration. Through the integration of modern renewable energy systems, advanced

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retrofitting methodologies, and creative community engagement approaches, the project seeks to provide an input for a future model for energy-positive district. The ultimate objective is to establish a scalable model that can be applied to other Bucharest districts and other European cities, thereby supporting the larger EU Green Deal goals of attaining climate-neutral cities by 2030.

Community spaces quality

The Demo Site faces significant spatial and functional challenges due to aging infrastructure, limited green spaces, and a lack of cohesive urban design. Despite these constraints, the planned regeneration project aims to redefine the area as a more inclusive, sustainable, and pedestrian-friendly environment. The interventions are designed to enhance cultural and spatial qualities, create vibrant public spaces, and modernize key community facilities to better serve both the local community and the student population.

One of the WeGenerate key transformations will involve the canteen and its surrounding courtyard. Currently enclosed by a fence, this area is underutilized and disconnected from the broader urban fabric. By removing the fence, the canteen will be opened to the public, integrating it into the neighbourhood and making it accessible for diverse uses. The courtyard will undergo a complete renovation to transform it into a high-quality public space. Once revitalized, the courtyard will feature areas for relaxation, informal gatherings, and cultural or community events, providing a much-needed venue for interaction and social engagement in the area.

To further enhance connectivity and prioritize pedestrians, a section of Dorin Pavel Street, which is located near the canteen, is planned to be closed to car traffic.

The Sector 2 City Hall has formally requested the transformation of the section of Dorin Pavel Street (between Bd. Lacul Tei and Str. Inginerilor Tei) into a pedestrian zone, addressing this request to ADP Sector 2, which is the administrator of the public domain. Since ADP Sector 2 does not have the authority to make this decision, the request has been forwarded to the Technical Traffic Commission within the Bucharest City Hall. The Commission will analyse the feasibility and decide on the necessary actions to be taken.

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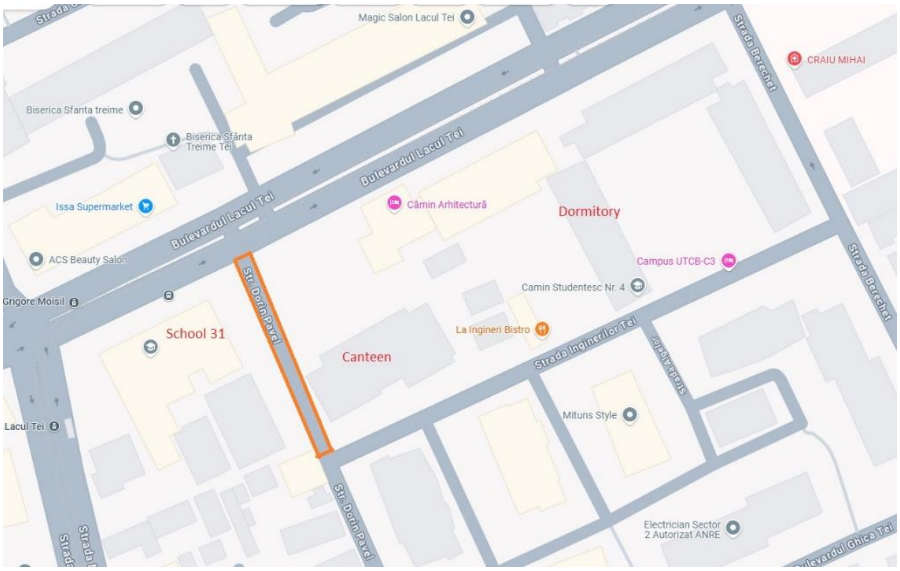

Figure 22 - Future pedestrian area on Dorin Pavel Street

This intervention (funded from other sources) will reduce traffic congestion and create a safer, more inviting pedestrian-friendly zone. ADP Sector 2 will implement this action from its own budget once it receives the approval and recommendations from the authority responsible for road systematization.

The redesign will encourage walking and cycling while establishing stronger spatial links between the canteen, the school, and other community landmarks.

Another major improvement involves addressing the cluttered and car-dominated streets within the site. Currently, many sidewalks are obstructed by parked cars, limiting pedestrian movement and reducing safety. As part of the WeGenerate efforts, these sidewalks will be cleared, reclaiming them for pedestrian use. The intervention will not only improve accessibility but also enhance the overall visual and functional quality of the streetscape.

To support sustainable transportation, the renovated courtyard will feature a smart bicycle parking system. This facility will include charging stations for scooters and electric bikes, making it easier for residents and students to adopt environmentally friendly mobility options. By encouraging alternative transport methods, this addition will also help alleviate traffic congestion in the area.

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Through these interventions, the demo site will become a more cohesive and vibrant urban environment. The school and the canteen will be connected as part of a unified urban landscape, fostering a sense of community and interaction between students and residents. Expanded green areas and modernized infrastructure will address the site's current deficiencies, while the creation of pedestrian-friendly zones and sustainable mobility solutions will make the area more liveable and resilient.

This regeneration project is not just about physical improvements—it is an opportunity to transform the demo site into a model for urban renewal that balances cultural, social, and environmental needs, creating a space where the local community and students can thrive.

Community Issues and Attitudes (Towards Pilot, About Actions)

Community engagement is a key part of the demo site project, although there have been some challenges. There is a general openness to improvements, particularly among students and younger residents, who favour sustainability initiatives. However, resistance has been noted, particularly regarding the reduction of parking spaces and other actions that could disrupt daily routines. The project has included approaches to involve local residents in discussions about the potential benefits of improved public spaces.

Currently, there is insufficient data on the local stakeholders and community, making it necessary to gather information before moving forward with any actions that address the population's needs and characteristics. To address this issue, we plan to carry out activities and tasks focused on data collection, which will be completed before taking action in other areas.

In the future, we plan to organize various urban activities, workshops, and competitions to enhance community engagement and raise awareness about the project. By fostering an educated and informed community, we aim to create long-term benefits, not only for this project but for future initiatives as well.

Digital Infrastructure

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The digital infrastructure in the Tei neighborhood of 2nd District of Bucharest, Bucharest, has seen significant developments in recent years, benefiting from Bucharest's overall push toward improving connectivity and digital services. Here are the key aspects:

Internet Connectivity

High-speed broadband is widely available in Tei, with fiber-optic networks providing fast and reliable internet services. Major providers like Digi (RCS&RDS), Telekom, and Orange offer fiber-optic connections, which can reach speeds of up to 1 Gbps in both residential and commercial areas.

Public institutions such as universities (e.g., UTCB) and libraries often have free or subsidized Wi-Fi networks (e.g. Eduroam), enhancing access to digital resources for students and the general public.

Mobile Network Coverage

Tei benefits from robust 4G and 5G mobile network coverage, especially given the increasing demand for mobile data. Leading telecom operators have expanded their 5G infrastructure, with speeds significantly higher than traditional 4G. The neighborhood has extensive coverage from all major mobile operators, ensuring stable mobile internet and telecommunications services.

Smart City Initiatives

While Bucharest has been gradually implementing Smart City solutions, including Wi-Fi in public spaces and digitalized municipal services, these initiatives are still in early stages in some neighbourhoods, including Tei. However, there are ongoing efforts to introduce more smart street lighting, sensor-based traffic management and enhanced public safety systems as part of Bucharest's broader digital transformation goals.

Education and Innovation Hub

The presence of UTCB makes the area a minor educational and digital innovation hub. Students and faculty engage with cutting-edge research in civil engineering and related fields, including digital simulations, smart infrastructure, and renewable energy solutions. This contributes to a tech-friendly environment.

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UTCB enhances its role as an educational and innovation hub through its vibrant student associations and initiatives. Activities like ConstructFEST (Figure 23) exemplify the university's commitment to bridging academic knowledge with practical industry experience. This event brings together students, professionals, and companies in the construction and engineering sectors, fostering collaboration and innovation.

Figure 23 - Poster of the 8th edition of ConstructFEST

Another standout event is Construction Student's Week (Figure 24) a dynamic platform that brings together students, faculty and industry leaders for a week-long exploration of advancements in the construction and engineering sectors. This event features workshops, competitions, and presentations that encourage collaboration and knowledge sharing, while also fostering a spirit of innovation.

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Figure 24 - Poster of the Construction Student's Week event, organized by ASCB

Additionally, the associations at UTCB play a critical role in organizing internship programs, providing students with hands-on experience in their fields of study. These opportunities enable students to apply cutting-edge research in areas such as digital simulations, smart infrastructure, and renewable energy solutions, further strengthening their skills and industry readiness.

Figure 25 - Participants engaging in a hands-on activity organized by a UTCB association

Through these programs, along with workshops, hackathons, and networking events, UTCB not only supports personal and professional growth but also solidifies its standing as a minor educational and digital innovation hub in the region. The university's partnerships and access to research networks further promote digital literacy and innovative solutions in the community.

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Planning Process History

The planning process history in the Tei district of 2nd District of Bucharest, Bucharest, has undergone significant shifts, especially in recent years. Focus has been placed on urban regeneration and retrofitting efforts, which aim to modernize the area's infrastructure, reduce seismic risks, and improve energy efficiency. One major initiative in the Colentina-Tei zone involves combining earthquake risk management with urban regeneration through citizen-driven planning processes. This includes public consultations to better understand local needs and to propose solutions for upgrading infrastructure while enhancing community engagement. These consultations, often held in collaboration with local experts and institutions, highlight the area's seismic vulnerability and propose energy-efficient renovations, aligning with broader sustainable urban development goals.

These planning efforts are also supported by digital tools like GIS, which have been used for spatial analysis and smart urban planning, enabling authorities to better align zoning regulations and planning processes with sustainability and safety objectives. This includes analyzing population growth and infrastructure needs to ensure better living standards in the Tei neighborhood.

In conclusion, the recent planning focus in Tei revolves around seismic risk management, energy efficiency improvements, and fostering a more connected, sustainable community through participatory approaches and technological integration.

This project is part of a broader push for urban regeneration, backed by both local and international policies aimed at combating climate change and enhancing urban livability.

Urban Planning and Design Approaches in Tei

In Bucharest's District 2, the ADP plays a critical role in shaping the quality of life for residents by managing and enhancing public spaces. This includes parks, playgrounds, parking areas, and streets, all of which are vital to the urban fabric. In the Tei neighbourhood, ADPS2 has taken on a series of initiatives designed to address longstanding issues while fostering a more vibrant, sustainable, and bike-friendly community.

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A key focus is on revitalizing the gardens surrounding apartment blocks, which have often been neglected over the years. These spaces, once meant to provide greenery and a sense of calm in an urban environment, will be transformed into well-maintained, accessible areas that invite residents to connect with nature and one another.

Another significant effort is the rehabilitation of streets and sidewalks. Aging infrastructure and poor pedestrian pathways have long been a challenge in Tei, but planned upgrades will ensure safer, more accessible routes for all, including those with mobility challenges. To further support sustainable mobility, dedicated bicycle lanes will be introduced, signalling a shift towards a more bike-friendly neighbourhood. This effort will not only promote cycling as an alternative mode of transport but also enhance the safety and convenience of navigating the area on two wheels.

The introduction of one-way traffic systems is also on the agenda, aimed at easing congestion and creating a more orderly flow of vehicles. Complementing these efforts is the elimination of informal parking spaces, which have not only cluttered the neighbourhood but also impeded mobility. By removing them, the neighbourhood will regain valuable public space, paving the way for more organized parking solutions, better urban design, and enhanced cycling infrastructure.

The municipality is also prioritizing the renovation of school buildings, a project that goes beyond mere functional upgrades. These buildings will become canvases for beautiful murals, transforming them into landmarks of cultural and artistic expression. The murals are intended to inspire students and enhance the neighbourhood's visual identity, creating a more engaging and welcoming environment for residents and visitors alike.

These initiatives reflect a comprehensive approach to urban renewal in the Tei neighbourhood. By addressing both functional and aesthetic aspects of public spaces, ADPS2 is not just managing infrastructure but actively working to create a more connected, sustainable, and bike-friendly community that prioritizes people over cars and fosters a healthier urban lifestyle.

Urban Planning and Smart Solutions

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Tei is subject to the city's zoning regulations, which aim to balance residential, commercial, and green spaces while addressing seismic and environmental risks. In addition to green infrastructure and energy-efficient developments, 2nd District of Bucharest's inclusion in the Smart City mission will see the implementation of cutting-edge technologies to improve urban mobility, energy systems, and public services. The goal is to create a more efficient and connected urban environment that meets the needs of both residents and businesses.

The sector will use smart urban design approaches such as blue-green infrastructure, promoting renewable energy districts, and aligning with the 15-minute city concept to ensure that most services and needs are accessible within a short walk or bike ride from any part of the neighbourhood.

These efforts, combined with international support through the Mission 100 initiative and the Covenant of Mayors, position 2nd District of Bucharest, and specifically the Tei neighborhood, as key players in Bucharest's broader transition towards a climate-neutral and people-centered urban environment. This holistic approach ensures that both climate goals and social equity are addressed through smart urban planning and sustainable development strategies.

Policy & Regulatory Framework Analysis

The Policy & Regulatory Framework governing urban planning in the Tei neighbourhood of 2nd District of Bucharest, Bucharest, is shaped by a combination of national and local laws, regulations, and urban development programs. These frameworks address seismic risk, sustainability, and community involvement.

Specific Laws and Policies Affecting the Demo Area

Law 10/1995 on Quality in Construction: This Romanian law mandates that buildings, especially older structures, must comply with quality standards, including seismic resilience, which directly impacts interventions in neighborhoods like Tei.

Law 372/2005, with 2024 updates: This EU EPBD legislation, adopted at the national level, encourages the retrofitting of buildings to improve energy efficiency. It supports Bucharest's efforts to integrate renewable energy systems and reduce the environmental footprint of residential areas, including Tei.

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Romanian Seismic Risk Reduction Programs: Several national programs focus on reinforcing buildings against earthquakes. Since Tei contains many older buildings, this is a critical part of the planning process.

PUG of Bucharest: This provides the broader legal and regulatory context for all urban planning initiatives in Bucharest, including zoning and building regulations for neighborhoods like Tei. The PUG integrates sustainability goals, public transport policies, and green space development.

The Tei neighborhood in 2nd District of Bucharest, Bucharest, is part of a broader framework aimed at creating a sustainable, inclusive, and climate-resilient urban environment. In addition to the policies and instruments already mentioned, 2nd District of Bucharest has made significant strides in addressing climate and sustainability goals through various national and international programs such as the ones mentioned below.

Mission 100 Climate-Neutral and Smart Cities by 2030

2nd District of Bucharest is one of the cities selected as part of the European Commission's Mission 100 initiative, which seeks to support 100 cities across Europe in becoming climate-neutral and smart by 2030. This initiative aims to accelerate the transition to net-zero emissions by improving urban infrastructure, transportation, energy use and governance.

In 2024, 2nd District of Bucharest received the Climate City Contract label, a major recognition that commits the district to working with both local stakeholders and European partners to achieve its climate neutrality goals. This contract formalizes a roadmap for cutting carbon emissions, focusing on renewable energy integration, sustainable mobility, and green infrastructure development.

As part of 2nd District of Bucharest's inclusion in the Mission 100 Climate-Neutral and Smart Cities, it was selected through the NetZeroCities platform to become a pilot city in the Horizon Cohort 2 Urbanwise project, Bucharest's Pilot Activity: Urban Regeneration & Administrative Capacity Building for Sustainable Development & Emissions Reduction.

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Figure 26 - Poster of URBANWISE project in Bucharest, Tei neighbourhood

The project aims to foster sustainable urban development, engage the community, and promote decarbonisation in the 2nd District of Bucharest Municipality, with a strong focus on environmental awareness, capacity building, and long-term impact. The project proposes a series of activities aimed at enhancing the administrative capacity of the 2nd District of Bucharest Municipality to assess, reduce, and monitor emissions through tailored solutions. These solutions will be adapted for specific zones within the district, encompassing various types of urban structures, including residential buildings, public green areas, public transportation, schools, etc.

Covenant of Mayors

2nd District of Bucharest is also a signatory of the Covenant of Mayors (Figure 27), an international movement that brings together local governments committed to achieving the EU's climate and energy objectives. Under this commitment, the district has adopted comprehensive strategies to reduce greenhouse gas emissions, increase energy efficiency, and adapt to the impacts of climate change. This initiative complements the Climate City Contract, as it ensures that the district follows a structured and collaborative approach to urban planning, in line with both local and EU sustainability targets.

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Figure 27 - Logo of Covenant of Mayors for Climate & Energy

Other Local Development Strategies

The district's Program for Economic and Social Development, part of its territorial and urban planning program, includes the Local Integrated and Sustainable Development Strategy. This strategy outlines specific goals for improving the quality of life in 2nd District of Bucharest, which includes green urbanism, energy-efficient buildings, and the integration of public spaces.

Challenges and opportunities

2nd District of Bucharest faces a variety of challenges across four domains: Social and Economic, Environmental, Built Environment and Policy-related issues. The project aims to address these challenges through innovative and sustainable solutions, while taking advantage of the opportunities that exist in the area.

Social and Economic

The cultural aspects of public socializing and the concept of "the commons" in Tei Neighbourhood, Sector 2, Bucharest, reflect both traditional and evolving urban lifestyles. Historically, the neighbourhood has been a residential area, but its public spaces (parks, local markets, and communal gathering areas) play a crucial role in fostering social connections and community identity.

Public Interactions

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Tei Park, one of the district's most significant green spaces, is a central point for socializing and relaxation. Families, children, and the elderly gather here for leisure activities, and it serves as a venue for community events and festivals. The park offers opportunities for both planned and spontaneous social interactions, helping to strengthen community bonds. Local cafes and restaurants, playgrounds, and the university campus (University Campus Tei) also act as informal meeting points where residents engage with one another.

The Commons

In an urban context, "the commons" refers to shared resources accessible to all members of a community. In Tei, these include green spaces, public walkways, and even community gardens, which are increasingly becoming focal points for collective urban living.

Efforts to open up green spaces within the University Campus Tei to the local community represent a growing trend in Bucharest to integrate public, shared spaces into urban life. This helps to promote social inclusion and interaction, with these common areas seen not just as recreational spaces, but as hubs for cultural exchange and social cohesion.

Cultural and Social Shifts

As part of broader urban regeneration and sustainability efforts, there has been an increased focus on reclaiming public spaces in Tei to encourage more active participation from residents in "the commons." For example, through initiatives like the development of urban gardens or opening the university's green spaces to the wider public, Tei is promoting a more inclusive, people-centered urban design.

Public events such as neighbourhood festivals, market days, and cultural fairs, often organized by both local authorities and community groups, further nurture a sense of place and belonging in the neighbourhood. One of the key issues in 2nd District of Bucharest is the significant income contrast between neighbourhoods, with some areas being much wealthier than others. This inequality undermines social cohesion and limits equitable access to urban resources. Additionally, the lack of sufficient green spaces for socializing restricts community interaction and recreational activities. There is an opportunity to address these challenges by investing in urban infrastructure, particularly through the creation of public parks or community spaces, which could serve as social hubs for residents from different economic backgrounds.

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The Demo Site is a vibrant yet fragmented urban space where cultural diversity meets the challenges of limited cohesion. Residents, students, and local businesses contribute to a rich tapestry of identities and lifestyles, but the neighbourhood also reflects a lack of shared traditions and communal interaction. While diverse, the area struggles to fully capitalize on its cultural potential, partly due to the absence of established practices for using community spaces and fostering neighbourly connections.

At the heart of the Demo Site lies a diverse population. The residential areas, with a mix of apartment blocks and individual houses, host long-term Romanian residents alongside Roma families and Arab immigrants, each contributing their own cultural identity to the neighbourhood. While this variety adds to the area's dynamism, it also underscores the need for spaces and initiatives that encourage interaction and mutual understanding. Currently, there is little tradition of neighbours coming together or using shared spaces for communal activities, leaving the area socially segmented.

Education plays a significant role in shaping the area's dynamics. School No. 31 and the student dormitory of the Technical University of Civil Engineering Bucharest add an intergenerational layer to the cultural mix. Students bring energy and innovation, but their transient presence often limits their connection to the local community. At the same time, the school serves as a touchpoint for families in the area, though its influence is not yet extended into broader community engagement.

The local businesses—small shops, cafes, and bars—act as informal hubs for interaction, but they lack the capacity to foster deeper cultural connections. In a neighbourhood where people often operate within their own social groups, these establishments offer rare opportunities for cross-cultural exchange, but this potential remains largely untapped.

The physical layout of the site exacerbates these challenges. The streets are congested with informal parking, and the lack of pedestrian-friendly infrastructure discourages spontaneous interaction. Without dedicated public spaces, there are few places for people to connect across cultural and social divides. The current absence of shared traditions in using communal areas leaves the neighbourhood fragmented, with each group largely confined to its own spaces and routines.

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This context makes the planned WeGenerate actions particularly significant. Removing the fence around the old canteen and opening its courtyard to the public offers an opportunity to create a true community space—a place where people from all backgrounds can gather, interact, and build new traditions. Renovating the courtyard to host relaxation areas, cultural events, and community activities will provide a much-needed venue for fostering connections among neighbours.

The planned interventions are not only about physical improvements but also about addressing deeper social dynamics. By creating spaces that invite interaction and fostering a sense of shared purpose, the project has the potential to transform the Demo Site into a model of urban regeneration. It can bridge divides, build connections, and establish a tradition of community engagement where one does not currently exist.

Environmental Aspects

As discussed before, in the proximity of the demo site there is the Tei Park which is a really good source of green space for residents nearby. Also, in the demo site visually, there are green areas represented by trees, but not specifically green spaces created to socialise and engage. In terms of biodiversity there is a lack of data to quantify the demo area.
The area faces also environmental issues, such as poor air quality caused by heavy traffic and the lack of green spaces. Many local sources discuss the problem of overheating during summers in Bucharest and the air quality levels that is seven times higher than the legal limit especially around schools and hospitals.

Air quality sources like Airly and IQ Air classify the demo site area as having moderate air quality. However, there is no direct data collection within the demo site itself, so the reported values are based on measurements from the surrounding vicinity. Air quality is directly influence by the traffic in the area. Boulevard Tei, being a main artery, tends to have a more intense flow of vehicles, especially during peak hours when residents are commuting to work or school. Maica Domnului Street, although narrower, can experience congestion at certain times, particularly due to parking and access to residences. Teiul Doamnei, being a residential street, has lighter traffic but can be affected by the parking maneuvers of residents and visitors.

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The UHI was studied only at city level in the STAR project 92/2013 (Urban Heat Island Monitoring under Present and Future Climate). In the study UHI was analysed using satellite data from MODIS sensors aboard NASA's Terra and Aqua satellites, as well as SEVIRI sensors on the MSG geostationary platform, covering the period from 2000 to 2012. The UHI's intensity, defined as the temperature difference between urban areas and surrounding buffers, shows a more uniform and approximately 2–3°C cooler profile at night within a 7-km buffer, while during the day, it is more irregular with sharper temperature gradients. The study highlights strong links between land cover and urban surface temperatures, using satellite imagery to objectively quantify and map the UHI. The key factors that contribute to UHI are dense urbanization, lack of sufficient green spaces, traffic and air pollution and even building materials due to their quality and age.

Potential solutions to these issues include promoting sustainable transportation options, such as expanding bike lane networks, increasing green spaces, and enhancing tree coverage to improve air quality and overall urban life. Additionally, removing parking spaces, implementing slow streets, and introducing traffic calming measures or road diets on arterial roads could further contribute to safer, more liveable cities.

Built Environment

The built environment in 2nd District of Bucharest includes many older, poorly insulated buildings, which are not only energy inefficient but also pose serious earthquake risks, including problems related to energy poverty. Outdated heating systems further contribute to inefficiency, and there is low use of renewable energy. In addition, sidewalks are often blocked by parked cars, and there are no dedicated bike lanes, limiting safe mobility options for pedestrians and cyclists. Addressing these issues presents an opportunity to upgrade heating systems, incorporate renewable energy sources, and rehabilitate buildings to improve insulation. Improving the management of public spaces, particularly for pedestrian and cyclist use, would also enhance the overall quality of urban life.

Conclusions

Urban planning and development regulations in 2nd District of Bucharest are inconsistent, resulting in a fragmented landscape with varying architectural styles and building densities. Moreover, the concept of energy communities is not clearly defined in national legislation,

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which limits the potential for organizing collective energy solutions. To overcome these regulatory obstacles, there is a need for clearer legal frameworks that would enable more coherent and sustainable urban development, promoting not only energy efficiency but also a more organized and harmonious urban space.

2. Local Stakeholders Engagement Strategy

Mapping the stakeholders

Engaging local stakeholders is essential to the WeGenerate project, ensuring that urban regeneration efforts are socially inclusive and widely accepted by the local community. The key stakeholders involved include: elected officials, municipal staff, civil society organizations, educational institutions, and residents group contributes a distinct perspective. The engagement strategy is designed to promote interactions that ensure effective participation throughout the project's lifecycle.

- **Elected representatives**, such as local government officials and city council members, play an important role in aligning the project with local governance structures and ensuring policy alignment.
- **Municipal staff**, particularly those involved in urban planning, energy management and community services, will be deeply engaged in the technical aspects of the project and act as vital connectors between the project team and the broader municipal administration.
- **Civil society organizations**, including community groups and NGOs focused on social inclusion and environmental advocacy, are key partners, helping to ensure that the project addresses the needs of vulnerable populations.
- **Residents,** especially in economically disadvantaged areas, will be engaged to ensure that the regeneration efforts reflect the community's needs, such as improved energy savings and public space access.

Some of the NGOs and community groups present in the demo area and its proximity are:

- ClimatoSfera is an environmental organization dedicated to promoting sustainable urban development and community engagement. They established OPEN Garden, a

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2,382 m² green space near our demo area, featuring zones for recreation, urban gardening, composting, and recycling. This initiative serves as a model for urban sustainability and community involvement.

- ASCB is a student organization at UTCB which represents students' interests, organizes professional and social events, and fosters collaboration among students in the field of civil engineering.

- **Educational institutions**, particularly universities like UTCB and the Middle School no. 31, will also play an important role, engaging students in the co-creation and educational aspects of the project. To ensure comprehensive engagement, we will collaborate closely with teachers, professors, and academic staff to integrate the project's goals into some extracurricular activities. Workshops and interactive sessions will be organized to align with ongoing educational objectives and stimulate active participation in the WeGenerate project initiatives. For students, we plan to create hands-on learning opportunities such as project-based assignments and competitions that promote creativity and collaboration while addressing real-world challenges. For younger children, we will design age-appropriate activities such as educational and urban games to make complex concepts accessible and engaging. Parents will also be key collaborators in fostering a supportive environment. By fostering an inclusive dialogue among all stakeholders, we aim to build a vibrant, interconnected community where each participant feels empowered to contribute to and benefit from the project.

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- Another crucial stakeholder group comprises the **businesses and service providers** within the demo area. Our focal point here is 'La Ingineri Bistro,' a restaurant with a distinct student-oriented economic model. This includes offering student discounts and hosting diverse cultural events, such as concerts and sports game nights. 'La Ingineri Bistro' holds significant importance within the demo site area due to its role as a prominent social hub for students, fostering a vibrant urban space.

Figure 28 - 'La Ingineri Bistro' concert night and social gathering

Methods for stakeholder engagement

The engagement will employ a combination of in-person and online methods, ensuring accessibility. Workshops and focus groups will serve as central platforms for co-creation, where stakeholders can provide insights, voice concerns, and contribute to decision-making. Special attention will be given to vulnerable groups, ensuring that their specific needs are considered. Additionally, surveys and feedback mechanisms will be used to capture stakeholder input throughout the various phases of the project, enabling ongoing contributions from the community.

Community events, such as open houses, will offer opportunities for residents to see the energy solutions in action and provide feedback. Interactive decision-making workshops will also be used to engage stakeholders in understanding the potential impacts of different scenarios, supported by the project's digital twin technology.

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Engagement will occur throughout the project's different phases. Initially, the focus will be on mapping stakeholders and conducting consultations to gather baseline information and assess community expectations. During the co-creation phase, stakeholders will actively participate in the design and planning of solutions. As the project moves into the implementation phase, engagement will shift toward monitoring progress and gathering feedback. Finally, during the project's sustainability phase, stakeholders will help define the long-term governance of the energy-sharing platform and plan for the scaling of successful practices.

The decision-making process is designed to be inclusive and transparent. All significant decisions regarding the energy-sharing system, public space regeneration, and community-driven activities will be made in consultation with key stakeholders. The input collected from workshops, focus groups, and surveys will directly inform these decisions, ensuring that the voices of residents, including vulnerable groups, are incorporated. This engagement strategy ensures that all stakeholders are involved throughout the project, strengthening social cohesion within the local community. By maintaining continuous dialogue and transparency, the project ensures that urban regeneration efforts in Bucharest are inclusive, resilient, and sustainable.

Most of these activities will be organized in partnership with NBS EduWORLD, a Horizon Europe project that intersects nature-based solutions and education. This collaboration will focus on educating the community about the significance of nature-based solutions, particularly in urban areas, and their environmental impact. We believe this aligns closely with the ambitions and objectives of the WeGenerate project. Our collaboration will span nearly a year, during which we have planned a series of activities aimed at stakeholder mapping, community engagement, and education.

Planned Activities with NBSEduWorld:

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- December 2024: Informative booklet for residents, featuring NBS solutions for Bucharest's environmental issues. A QR code will link to a survey about the WeGenerate project, future plans, and ideas for the retrofitted area.
- January 2025: Design competition for students/universities, focusing on the urban space in the demo area. UrbanistAI will collaborate to facilitate an AI-powered digital design process.
- February-March 2025: Urban game for students in the impact area, tailored to the challenges of the demo site. SuperSerios and Institutul Jocului will collaborate to create this game.
- March 2025: Outdoor workshop at ClimatoSfera's urban garden, educating residents about NBS and circular economy. This event aims to raise awareness and engage the community.

3. Co-created Visions

In the demo site located in Bucharest, District 2, collective ambition setting and storytelling will be key to fostering meaningful community engagement. With a diverse population of approximately 6000 individuals, including residents, children from local schools, and students, the initiative will directly impact a vibrant community composed of mid- to lower-class families and romani people as well. By creating a shared vision and telling stories that reflect the unique experiences of these groups, we aim to strengthen ties, build trust, and promote a collaborative spirit that empowers everyone to contribute to the area's development.

Our action plan for the demo site includes a series of workshops and community activities designed to spread awareness about the project and emphasize the importance of community engagement in the urban regeneration process. These workshops will focus on educating residents about the goals and potential benefits of the regeneration project. We will organize interactive sessions and events to gather feedback, ensuring that the voices and opinions of the community are at the forefront of decision-making. By actively involving residents, children, and students, we aim to create a sense of ownership and collaboration, ensuring the project's success and long-term sustainability. In Figure 29 are shown some of the activities planned to engage co—created visions in the community within the demo area.

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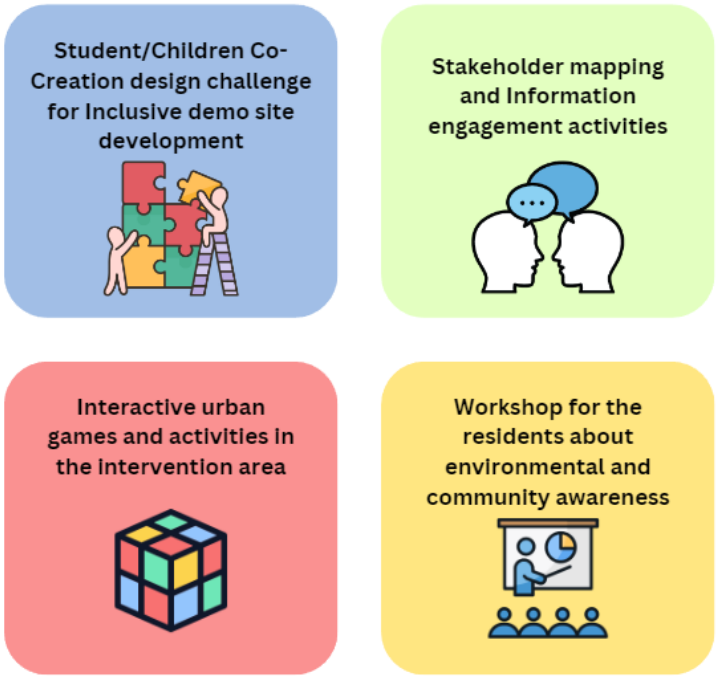

Figure 29 - Planned activities regarding community engagement and co-created visions

All the activities in this area for the community engagement and co-creative vision are based on 3 main objectives:

- **Create "third places" for children and residents**, offering safe, welcoming spaces where people of all ages can play, socialize, and engage with one another outside of their homes or workplaces. These spaces will encourage both children and adults, including students, to connect and foster a sense of community belonging, promoting social interaction and collaboration.
- **Renovating and reopening the canteen**, which has been closed for three years. The revamped canteen will offer discounted meals to support local students and families, while also including a dedicated area for student engagement, serving as a hub for social and academic activities.
- **Educating residents** about the importance of community sharing and the environmental value of green spaces in a densely urban area. By raising awareness about sustainable practices and fostering community stewardship, we hope to create a long-lasting, positive impact on the neighbourhood's social and environmental fabric.

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These activities will have both immediate and long-term impacts on the WeGenerate project. In the short term, the workshops, games, and design challenges will serve as crucial input for decision-making, providing real-time feedback from the community and ensuring that residents' voices are heard in the urban regeneration process. This direct engagement will guide the project's next steps and help tailor interventions to the community's needs. In the long term, these activities aim to educate residents, especially children and students, about environmental sustainability and community collaboration, fostering awareness and promoting best practices that will benefit the area for years to come. By instilling these values early, we aim to create a more connected, environmentally conscious, and resilient community.

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4. Pilot Transformation Activities

The following Actions and Tasks outline a comprehensive pilot transformation plan aimed at improving energy efficiency, enhancing sustainability and fostering community engagement within and around the university campus.

- **Action A1** addresses the **deep retrofit of the local student canteen** and explores how to adapt the current retrofit solutions from the RRP project to the WeGenerate objectives.
- **Action A2** focuses on the **regeneration of local community public spaces**, both on campus and in nearby neighbourhood, employing co-design methods with students, residents and other stakeholders to promote inclusivity, sustainability and well-being, along with specific activities from UrbanWise, NBS EduWorld and Campus Verde projects. The result, "**Open Campus for Neighbourhood and Climate"** pocket park will an inclusive and sustainable community space.
- **Action A3** centers on **developing a Shared Energy Center (SEC)** to better utilize and distribute the energy produced on campus, fostering a sense of shared responsibility and direct benefits for the local community.
- **Action A4** introduces a **Digital Twin (DT**) framework to accurately assess and predict the impact of energy retrofits, environmental conditions and potential greenhouse gas (GHG) reductions at both the building and neighbourhood levels.

Through a complementary approach—combining technical innovation, participatory design, and rigorous data collection—this pilot transformation program is promoting a positive change in the neighbourhood. Each Action and Task contributes a key piece of the overall vision: transitioning to a more sustainable and resilient campus while strengthening community ties and serving as a model for broader urban environments.

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4.1 Action A1 – Develop a Co-designed Deep Retrofit Solution for the Local Student Canteen and Energy Smart Building Environment through Urban Sharing Ecosystems

A1.1 Students engagement activities (October-December 2024)

Lead: UTCB; Input PS2

Period: October 2024-December 2024

Objectives

- Increase student awareness and participation in the canteen's retrofit process.
- Gather innovative ideas from students on sustainability and building efficiency.

Activities

A1.1.1 Organize workshops and brainstorming sessions with student groups (October-December 2024)

A1.1.2 Facilitate interactive polls to capture student feedback. (December 2024)

A1.1.3 Technical project input with the concept proposals incorporating student-generated ideas (December 2024)

Expected Outcomes

- A student-informed retrofit concept aligning with campus sustainability goals.
- Enhanced sense of ownership and responsibility among students toward energy-efficient buildings.

A1.2 Review of the Technical Project of the Canteen

Lead: UTCB; Input ENGIE, LNEG, CRES

Period: July 2024-December 2024

Objective:

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- Evaluate and improve the existing canteen retrofit project proposal with a focus on sustainability.

Activities:

A1.2.1 Technical review of the canteen's current retrofit design (July 2024 - December 2024)

A1.2.2 Cost-benefit analysis comparing solutions with gas boilers and heat pumps, compatibility between retrofit project and WeGenerate solution, considering installation feasibility, long-term savings and environmental impact (October 2024 -December 2024).

A1.2.3 Develop a proposal for the transition to heat pumps, including necessary changes to infrastructure, expected efficiency gains and integration requirements (November-December 2024).

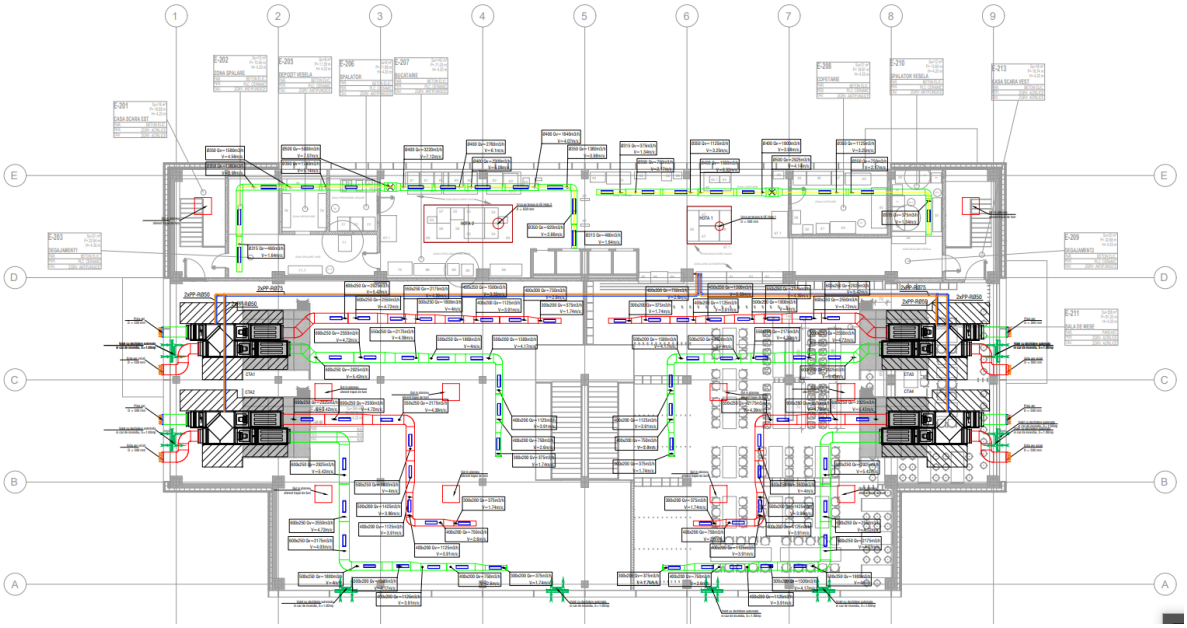

Figure 30 - HVAC systems from the Canteen project

Expected Outcomes:

- An updated canteen HVAC proposal ready for implementation, incorporating energy-efficient solutions aligned with project goals. To evaluate the heating system renovation proposal for the UTCB student canteen, an extensive review is conducted with the objective of replacing the existing gas boiler system with a heat pump solution.

Beyond the technical benefits, the project will contribute to UTCB's social and academic mission by providing a comfortable, sustainable environment for students. The canteen will

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serve students from diverse socioeconomic backgrounds, including many from rural or disadvantaged areas, as well as international students. The upgrade is expected to improve the canteen's accessibility and affordability, ensuring a higher quality of student life, while demonstrating UTCB's commitment to sustainability and social equity.

A1.3 Data Collection

Lead: UTCB; Input ENGIE, PS2

Period: January 2025-October 2027

Objectives

- Establish baseline energy consumption and building condition metrics.
- Monitor performance improvements post-retrofit.

Activities

A1.3.1 Assess the energy retrofit project of the Canteen, including equipment and operating schedules to establish the energy consumption baseline and possible improvements. Correlation with the School 31 retrofit planning (January 2025-June 2025)

A1.3.2 Analyse as-built info during the Canteen retrofit interventions (e.g. insulation levels, implemented HVAC system details) (June 2025—June 2026)

A1.3.3 Set up protocols and tools for ongoing performance tracking and comparison (April 2026-October 2027)

Expected Outcomes

- A data-driven baseline for measuring retrofit impact (e.g. energy and emission reductions).
- Ongoing monitoring framework for further input in the Digital Twin platform.

4.2 Action A2 – Smart and Sustainable Regeneration of Local Community Public Spaces within and Outside the University Campus

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A2.1 Co-design activities with UTCB students

Lead: UTCB

Period: October 2024-January 2025

Objectives

- Engage students in identifying needs and designing sustainable solutions for public spaces.
- Foster collaborative learning and hands-on experience in urban regeneration.

Activities

A2.1.1 Run interactive design sessions to explore landscaping, energy, waste management, and mobility solutions. Teams of 4-5 students will propose their own solutions, while students living in the campus will lead the teams. (October 2024 - November 2024)

A2.1.2 Collect student input on aesthetic, functional and environmental priorities. (November 2024 - December 2024)

A2.1.3 Develop preliminary design proposals reflecting student-driven insights. (December 2024 - January 2025)

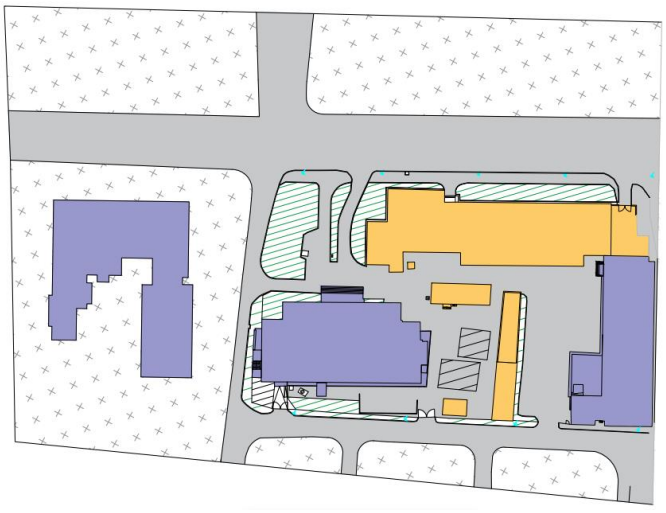

Figure 31 - Plan given to the students for their projects

Expected Outcomes

- A set of co-created design concepts specifically tailored to campus public spaces.

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- Increased student awareness of sustainable design principles, possibility to apply the sustainability theory into real projects.

A2.2. ENGAGEMENT ACTIVITIES WITH STUDENTS, RESIDENTS AND SCHOOL CHILDREN

*(Synergy with **NBS EduWorld, UrbanWise, Campus Verde projects**)*

Lead: UTCB; Input PS2, ICLEI, VTT

Period: January 2025-April 2026

Objectives

- Broaden community input in public space regeneration to include the main users of the campus site, while involving multiple vulnerable groups.
- Strengthen relationships between the university and local residents/school.

Activities

A2.2.1 Planning of the engagement activities for local residents and schools with the complementary projects' teams. (January 2025- June 2025)

A2.2.2 Co-creation and educational activities with NBS EduWORLD project: design competition for school children to stimulate creativity and learn about the importance choosing the right design and elements of the future to be regenerated area and urban game for students to stimulate engagement. (January 2025 - April 2025);

A2.2.3 Workshops and activities with the community from the demo area with support from the complementary projects. Select 2-3 students to serve as Canteen Ambassadors as well as 2-3 parents from local school to act as Park Ambassadors. (NBS EduWORLD, UrbanWise, Campus Verde). Within the Campus Verde project educational workshops for partner schools in the area will be organized. Within the Urban Wise project community engagement workshops will be organized, climate change adaptation awareness workshops and carbon footprint workshops for the local community in the pilot neighbourhood. Then the Carbon Neutral Fest, a street party on Dorin Pavel street, will be organized UrbanWise project ending

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in April 2026. (January 2025 - April 2026) This event is subject to approval from the Technical Traffic Commission.

A2.2.4 Collect feedback from the engagement activities, focusing on accessibility, inclusivity and environmental impact. (January 2025 - April 2026)

A2.2.5 Integrate findings into the final implementation designs from WeGenerate, UrbanWise and Campus Verde projects (January 2025 - April 2026)

Expected Outcomes

- Diverse perspectives reflected in the upgraded public spaces, ensuring usability for different community segments.
- Stronger local partnerships, paving the way for future joint initiatives and other local projects.
- Enhanced public awareness and support for sustainability objectives.

A2.3 WeGenerate Requirements for UrbanWise and Campus Verde Projects

*(Synergy with **UrbanWise and Campus Verde projects**)*

Lead: UTCB; Input PS2, ICLEI, VTT, Fraunhofer

Period: January 2025-June 2026

Objectives

- Align WeGenerate's sustainability and community-building goals with UrbanWise project demo-pilot in front of the canteen.
- Align WeGenerate's sustainability and community-building goals with Campus Verde project demo-pilot on the left side of the canteen (on the concrete platforms).

Activities

A2.3.1 Coordinate with UrbanWise and Campus Verde teams to clarify shared objectives and timelines. (January 2025-June 2025)

A2.3.2 Identify performance metrics (e.g., social, environmental, economic) for all the interventions within the demo-site. (January 2025-June 2025)

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A2.3.3 Document technical, logistical and policy requirements for synergy between the three projects. (January 2025-June 2026)

A2.3.4 Draft WeGenerate scope, roles, responsibilities, timeline, and deliverables to be complemented by UrbanWise and Campus Verde projects. (January 2025 - November 2025)

A2.3.5 Define evaluation WeGenerate criteria to be added for the acquisition procedure for UrbanWise project (terms of reference) and add specificities in the Campus Verde concept. Design specifications and requirements for the smart urban infrastructure to be purchased by the Municipality (smart lampposts with integrated PVs; smart urban furniture for the creation of an inclusive nature-based outdoor space to offer new opportunities for community sharing and socialising; and charging stations for EV) (January 2025 - November 2025)

A2.3.6 Manage the implementation process to be in line with WeGenerate timeline. (January 2025 - June 2026)

Expected Outcomes

- A clear plan detailing how WeGenerate's activities integrate into UrbanWise and Campus Verde.
- Harmonized project objectives to maximize community impact and resource efficiency.

A2.4 Co-supervision of implementation activities

*(Collaboration between **WeGenerate**, **UrbanWise**, and **Campus Verde** projects)*

Lead: UTCB; Input PS2, ICLEI, VTT, Fraunhofer

Period: January 2025 - October 2027

Objective:

- Supervise the planned interventions in the canteen courtyard to create a rehabilitated, sustainable public space accessible to the public.

Activities:

A2.4.1 Baseline data assessment (January 2025-March 2025)

A2.4.2 Fence removal between the canteen courtyard and Inginerilor Tei street (January 2025-June 2025)

A2.4.3 Walkability and safety access to the campus design and implementation: create friendly and safe walkable areas which connect Inginerilor Tei Street with Lacul Tei boulevard.

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Supplementary lighting poles will be installed in the area through UrbanWise project (details for the acquisition will be provided by the UTCB team to the Municipality). (June 2025-June 2026)

A2.4.4 Compliance with Safety and Accessibility Standards implementation for WeGenerate: Ensure that the design and installation meet safety, accessibility and environmental regulations, creating a welcoming space for all. (June 2025-June 2026)

A2.4.5 Coordination with additional works by the Municipality (ADPS2) - Activities such as pedestrianizing Dorin Pavel Street, eliminating informal parking and implementing bicycle lanes (June 2025-June 2026).

District 2 City Hall has requested the following actions to be carried out by ADPS2:

- **Redevelopment and regeneration of green spaces** in the vicinity of the Tei University Campus cafeteria, considering that the project partner, the Technical University of Civil Engineering Bucharest (UTCB), will eliminate the fence located on Dorin Pavel and Inginerilor Tei streets. This fence currently separates the canteen courtyard from the public space of Sector 2. This action will be implemented using ADP2's own budget.
- **Transformation of the Dorin Pavel street section** into a pedestrian zone, specifically between Bd. Lacul Tei and Str. Inginerilor Tei. This action is contingent on the opinion and approval of the Technical Traffic Commission and the Bucharest Road Brigade, which ADP is currently awaiting. Without this approval, the action cannot be implemented.
- **Implementation of one-way traffic** on Inginerilor Tei Street. Similarly, this action depends on the approval from the Technical Traffic Commission and the Bucharest Road Brigade, and without their favourable response, it cannot proceed.
- **Elimination of illegal parking** on Inginerilor Tei Street, on the side of the Tei University Campus canteen. This action can be implemented by ADP Sector 2 in collaboration with the Local Police Sector 2.

These actions are coordinated to align with the broader goals of improving mobility, safety, and sustainability in the area. The timing and execution of these activities will depend on obtaining the necessary approvals and collaboration with relevant authorities.

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A2.4.6 Coordination with Contractors: all the teams will work closely with selected contractors to ensure the courtyard rehabilitation aligns with sustainability goals and public accessibility. (August 2025-August 2026)

A2.4.7 Post-Installation WeGenerate Open Campus Evaluation: Conduct thorough assessments of the rehabilitated courtyard, focusing on durability, usability and visitor feedback to confirm it meets the desired standards of functionality and sustainability. Monitoring through specific KPIs (August 2026-October 2027)

Expected Outcomes:

- A rehabilitated canteen courtyard designed with eco-friendly materials and systems, providing an accessible, inviting, and sustainable public space for the community.
- Enhanced environmental quality, usability and safety in regenerated spaces (through verified KPIs).
- Seamless collaboration among WeGenerate, UrbanWise, and Campus Verde initiatives.

Figure 32 - Example of co-creation activities: design on site or with different digital tools

4.3 Action A3 – Develop a Sharing Platform (Shared Energy Center) for Sharing the Energy Produced in the Campus with the Neighbourhood

- **A3.1 SHARED ENERGY CENTER TECHNICAL SOLUTION DESIGN**

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Lead: UTCB; Input ENGIE, PS2, CRES, IREC, Fraunhofer

Period: September 2024 – July 2025

Objectives

- Create an efficient, reliable and scalable framework for an on-campus Shared Energy Center, including innovative energy production, storage and distribution models.
- Energy as a Service model design

Activities

A3.1.1 Form a multidisciplinary working group (researchers, engineers, students) to draft initial designs and to evaluate technology options (e.g. solar panels, heat pumps, battery storage). (September 2024 - January 2025)

A3.1.2 Energy simulations performed for the 3 focus buildings for baseline energy consumption assessment and future optimisation. (October 2024 - June 2025)

A3.1.3 Develop operational scenarios for peak load management and surplus energy sharing. (January 2025 - July 2025)

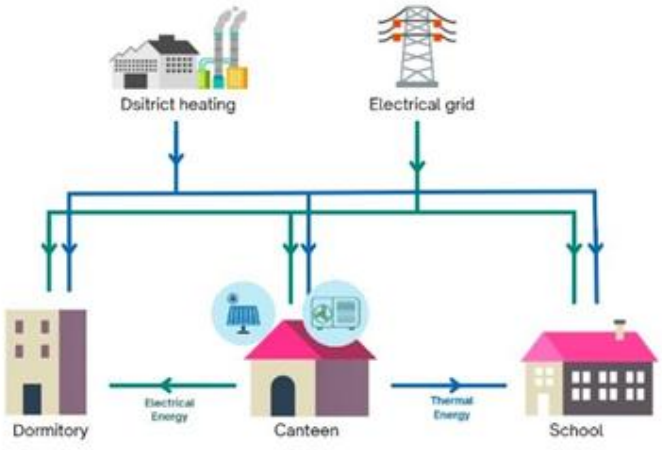

Figure 33 - General energy flow scheme in the Focus Area

Expected Outcomes

- A technically sound blueprint for the Shared Energy Center (SEC) that can adapt to growing community needs.
- Integration of state-of-the-art energy technologies aligned with university resources.

Enhanced knowledge-sharing among students, faculty, and industry experts.

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A3.2 Terms of Reference drafting and Bid preparation

Lead: UTCB; Input: ENGIE, Bucharest

Period: November 2024 – September 2025

Objective:

- Define clear project specifications and selection criteria for contractors for the WeGenerate ESC design and installation.
- Secure competitive proposals to ensure quality and cost-effectiveness.

Activities:

A3.2.1 Specify technical requirements, project phases and outcomes expected from contractors. (November 2024- March 2025)

A3.2.2 Develop an evaluation matrix for bids, emphasizing technical competence and experience with similar energy projects. Add requirements from the smart urban infrastructure to be purchased by the Municipality (January 2025- June 2025)

A3.2.3 Collaborate with ENGIE for technical validation and finalize the procurement documents. Prepare bid packages and manage the contractor selection process. (March 2025- September 2025)

Expected Outcomes:

- Finalized ToR that clearly articulates ESC requirements and evaluation criteria. Successful selection of the service provider.

A3.3 Implementation Activities and Installation of the SEC Systems

Lead: UTCB; Input ENGIE, PS2, Fraunhofer, IREC, CRES

Period: September 2025 – October 2027

Objective:

- Install the infrastructure needed to generate, store and distribute energy within the canteen and the school and student residence.

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- Operationalize the SEC to validate performance under real-world conditions.

Activities:

A3.3.1 Oversee the installation of ESC infrastructure and ensure adherence to the design plan. Data collected from the 3 buildings (energy used/produced) is transmitted to DT. (September 2025 – April 2026)

A3.3.2 The underground crossing of Dorin Pavel Street to transfer thermal energy from the heat pump located at the UTCB canteen to School No. 31 will be done by the Municipality. (September 2025 – April 2026)

A3.3.3 Smart infrastructure implementation by the Municipality (through UrbanWise and WeGenerate project) acquisition and implementation of smart lampposts with integrated PVs; smart urban furniture for the creation of an inclusive nature-based outdoor space to offer new opportunities for community sharing and socialising; and charging stations for EV. (September 2025 – October 2026)

A3.3.4 Coordinate testing phases to validate energy-sharing capabilities and system resilience. (May-2026 October 2026)

A3.3.5 Conduct initial pilot tests and adjust system parameters based on data. Continuous monitoring. Data will be provided to the Digital Twin as input (September 2026 - October 2027)

Expected Outcomes:

- A functional and tested SEC enabling energy sharing between the canteen and the school no. 31 and student residence C4.
- Documented performance metrics (energy savings, carbon footprint reductions).
- Foundations for expanding the shared energy model to additional buildings or communities.

4.4 Action A4 – Digital Twin Development and Testing for Assessing the Potential of GHG Emission Reduction and the Creation of an Energy Community in the Neighbourhood

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Data collected from campus sensors (incl. AQ, temperature, etc.) are transmitted to DT. 3D model (extruded model from the Bucharest District 2 GIS platform and 3 focus buildings laser scanning) of the demo-site to be transposed in the digital platform.

More details: WP5_Bucharest_DT & Energy Modelling

A4.1 STAKEHOLDERS ENGAGEMENT

*(Synergy with **UrbanWise project**)*

Lead: UTCB; Input PS2,

Period: September 2025 – August 2026

Objectives

- Involve key public, private and community stakeholders in defining the Digital Twin's scope and features.
- Gather user feedback early to shape a relevant and user-friendly DT solution for citizens.

Activities

A4.1.1 Identify stakeholder groups (local government, energy providers, neighborhood associations, etc.). (September 2024-April 2025)

A4.1.2 Conduct consultation sessions to define data needs, user interfaces and performance metrics. Collaboration with UrbanWise team from ClimatoSfera to link the DT with the carbon footprint calculator which will focus on sustainable behaviour changes and data-driven decision making. The platform encourages residents to be more aware of their carbon footprints and take steps to reduce their emissions. The platform can help track progress and ensure compliance with these goals. The WeGenerate DT will integrate the provided data. (April 2025-December 2025)

A4.1.3 Establish a communication plan for continuous engagement and feedback loops. (December 2025- August 2026)

Expected Outcomes

- A stakeholder-endorsed set of requirements guiding the DT design.

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A4.2 Neighbourhood 3D Model Design

Lead: UTCB; Input PS2, Fraunhofer, IREC

Period: December 2024 – August 2026

Objectives

- Develop an accurate digital replica of the demo area to serve as the DT's core visual and analytical component.

Activities

A4.2.1 Development of a CityGML model. The task aims to create a CityGML model of the impact area as a basis for the DT. UTCB and Bucharest will be responsible for providing the spatial data for the CityGML development. (December 2024- July 2025)

A4.2.2 CityGML to realistic 3D neighbourhood visualisation. Using the CityGML model as the basis, Fraunhofer will map the texture of the building façade to create a realistic visualisation of the Demo neighbourhood. (May 2025- October 2025)

A4.2.3 CityGML to input data for building energy and micro-climate simulations. IREC will support the conversion of the CityGML data to other formats needed for the building energy and micro-climate simulations led by UTCB. (June 2025- August 2026)

Expected Outcomes

- A high-fidelity 3D representation of the neighborhood (campus + surrounding area).
- A robust foundation for subsequent data inputs (e.g., sensor data, simulation outputs).

A4.3 Sensors' network design and installation

Lead: UTCB; Input PS2, ENGIE, VTT, Fraunhofer, IREC

Period: January 2025 – October 2027

Objectives

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- Enable real-time (or near real-time) data collection for energy use, environmental conditions (e.g., particulate matter, air temperature, humidity, noise) and other indicators like occupant behavior.
- Supply continuous input to the Digital Twin and other simulation environments for accurate modeling and monitoring, ensuring reliable data streams for decision-making on energy efficiency and environmental quality.

Activities

A4.3.1 Refine the set of Key Performance Indicators (KPIs) to ensure that data collected aligns with the project's sustainability and efficiency objectives. Define which parameters are critical (e.g., PM2.5, PM10, NOx, noise levels, temperature/humidity, power consumption) and match them to the relevant KPIs (e.g., air quality, comfort, energy usage). (January 2025- February 2025)

A4.3.2 Select and install appropriate hardware (sensors, data loggers, gateways). The system gathers and stores measurements from multiple sensor stations; equipped with LTE CAT1 modem, LoRa transceiver module, multi-band antenna and a 20W solar panel for continuous power, where no electric power supply is present. (February 2025- April 2025)

A4.3.3 Create terms of reference and develop the acquisition procedure. Draft comprehensive specifications for both hardware and software solutions (including the central station, measuring stations, and any accessories). Detail procurement steps, acceptance criteria, and service-level agreements (SLAs). Include requirements for mechanical installation, power supply (solar + battery), data connectivity, and security (physical locks, data encryption). (April 2025- August 2025)

A4.3.4 Analyse and integrate data streams into the DT system. Validate real-time (or near real-time) data flow from sensors to the platform, ensuring consistency, accuracy and minimal downtime. (September 2025 - October2027)

Expected Outcomes

- Operational sensor network covering the 3 buildings and neighborhood environment.
- Reliable data feeds that inform and update the Digital Twin.

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A4.4 Building Energy Simulations

Lead: UTCB; Input ENGIE, IREC, Fraunhofer, CRES

Period: November 2024– August 2026

Objectives

- Assess building-level energy efficiency measures using simulation tools (e.g., IES VE).
- Generate insights on the impact of potential interventions on energy demand and comfort.

Activities

A4.4.1 Model building envelopes, HVAC systems and occupant schedules for the 3 focus buildings. (November 2024 - August 2025)

A4.4.2 Run parametric studies to compare scenarios (e.g., improved insulation, high-efficiency lighting). (May 2025- December 2025)

A4.4.3 Evaluate potential RES (Renewable Energy Sources) solutions—including solar PV installations on roofs/terraces—to identify cost-effective and sustainable energy strategies for future scenarios to be integrated in the DT. (May 2025- December 2025)

A4.4.4 Fraunhofer will determine how these RES systems can be integrated into a larger Energy Sharing Community model across the three buildings. Integrate Fraunhofer simulations at the urban level to refine energy exchange strategies and gather critical data for the DT. (December 2025- August 2026)

Expected Outcomes

- Data-driven recommendations to optimize energy consumption at the building scale.
- Reliable modelling approach that ties building-level simulations to larger urban analyses.
- Output based on the specific KPIs: KPI1.1 Total Primary Energy, KPI 1.2 Renewable Energy Ratio, KPI 1.3 Net Energy/Net Power. The exact requirements of output data for the KPI calculations will be defined in the process.

A4.5 Simulation of energy systems in the intervention and impact areas

Lead: Fraunhofer; Input UTCB, ENGIE, PS2

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Period: August 2025 – May 2027

Objectives

- Identify cost-minimal combinations of supply technologies (electricity, heating, mobility) for both the intervention area (three retrofitted buildings) and the wider impact area.
- Determine what energy system changes are needed to achieve targeted greenhouse gas (GHG) reductions—specifically, exploring scenarios for 25% emissions decrease in the impact area.
- Integrate with Digital Twin: Provide inputs that enrich the Digital Twin framework, ensuring simulation outputs can inform real-time or future scenario planning.

Activities

A4.5.1 Collaboration between partners to gather relevant building, energy, and contextual data from Task A4.4's simulations and other sources. (August 2025 – March 2026)
A4.5.2 Define specific optimization goals, constraints, and potential configurations (e.g., high renewables scenario, cost-priority scenario) in consultation with project stakeholders. (February 2026 – November 2026)
A4.5.3 Run hourly-resolution simulations for the intervention area (the three buildings) and the wider impact area using Fraunhofer's KomMod tool, evaluating different supply technologies under various constraints. (November 2025 – August 2026)
A4.5.4 Assess system costs, optimal technology capacities, and operation schedules across the defined scenarios. Examine which setup yields the best balance between cost savings, emission reductions, and operational feasibility. Data to be sent as input for the DT if case. (April 2026 – August 2026)
A4.5.5 Discuss simulation outcomes with UTCB, refine scenarios if needed, and prepare guidance on building groupings for potential Energy Communities. (April 2026 – May 2027)

Expected Outputs

- Estimates on how different configurations contribute to achieving at least a 25% reduction in emissions.

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- Insights on how best to group buildings to form an Energy Community that maximizes shared benefits.
- Simulation results integrated into the Digital Twin, enhancing scenario-based planning and real-time decision-making.

A4.6 Urban Environment Simulations

Lead: UTCB; Input PS2, VTT, IREC

Period: February 2025 – November 2026

Objectives

- Evaluate environmental conditions (e.g., air quality, microclimate, urban heat island effect) at the neighborhood scale.
- Inform broader sustainability and resilience strategies through digital modeling.

Activities

A4.6.1 Use ENVI-met or similar software to simulate urban microclimates, vegetation effects, wind patterns etc. (February 2025 - December 2025)

A4.6.2 Compare different interventions (e.g., green roofs, urban shading devices). Evaluate scenarios on transforming nearby streets/areas in walkable zones with focus on environmental aspects (pedestrian comfort, air quality etc.). (August 2025 – April 2026)

A4.6.3 Feed results into the DT for integrated scenario evaluations. (January 2026 – November 2026)

Expected Outcomes

- Detailed environmental impact assessments guiding neighborhood-scale improvements.
- Output based on the specific KPIs: KPI 2.1 GHG Emission Performance and KPI 6.3 Urban Heat Island. The exact requirements of output data for the KPI calculations will be defined in the process.

A4.7 Development of DT Platform

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Lead: UTCB; Input IREC, Fraunhofer, PS2

Period: June 2025 – December 2026

Objectives

- Create a fully operational Digital Twin platform that consolidates all relevant data streams and simulation results.
- Formalize procurement requirements for advanced system components or services.

Activities

Provision of the technical details and workflow of the DT concept:

A4.7.1 Integration of GHG emission calculations in the DT backend (Lead Partner: IREC) Based on data and results generated through Tasks A4.1-A4.5, the GHG emissions of both the intervention and impact areas will be estimated following the KPI 2.1 calculation method set out in the WeGenerate Impact Model (D7.1). IREC will integrate the GHG calculation formulars in the DT backend, so that the GHG emissions of selected scenarios can be instantly calculated in the DT. IREC will discuss with UTCB and Fraunhofer concerning the scenarios that will be included in the GHG emission calculation in the DT. (October 2025 - November2026)

A4.7.2 Integration of building and district level simulation results in the DT backend (Lead Partner: IREC, Inputs: UTCB and Fraunhofer) The building and district level simulation results generated in Task A4.4 and A4.6 will be integrated in the DT for visualisation. IREC will work with UTCB and Fraunhofer to identify the output data that should be displayed and the way the selected data should be visualised in the DT. (November 2025 - November 2026)

A4.7.3 Preparation of real-time sensor data for visualisation in the DT (Lead Partner: UTCB) Various sensors are planned to be installed in the intervention and impact areas to monitor the following conditions: urban temperature, air quality, noise, etc. UTCB will in charge of the sensor installation and maintenance as well as the real-time data collection and preparation for visualisation in the DT. UTCB will work with Fraunhofer and IREC to identify the data structure and format needed for the DT visualisation, particularly concerning the handling of the real-time data. (January 2026 - December 2026)

A4.7.4 Development of static and live data visualisation and dashboard for the DT frontend (Lead Partner: Fraunhofer and IREC, Inputs: UTCB and Bucharest) Fraunhofer and IREC will

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develop the static and live data visualisation and dashboard for the DT frontend. Ideas about the visualisation will be further explored between all partners involved in this task and experiences in past projects will be exploited to find feasible solutions. (March 2026 – December 2026)

A4.7.5 Draft the Terms of Reference (ToR) and prepare tender documents for vendors/solution providers, based on the input from A4.4, A4.5 and A4.6. (Lead Partner: UTCB) (June 2025 - April 2026)

A4.7.6 Coordinate with internal teams and service providers to ensure seamless integration of hardware, software and data pipelines. (Lead Partner: UTCB) (February 2026 – December 2026)

Expected Outcomes

- A robust, interoperable DT platform architecture.
- Clear procurement guidelines that address both current needs and future scalability.
- Potential vendor contracts securing advanced DT functionalities.

A4.8 Monitoring Activities with DT

Lead: UTCB; Input PS2, IREC, Fraunhofer, CRES

Period: April 2026 – October 2027

Objectives

- Continuously track performance metrics (e.g., GHG emissions, energy consumption, environmental quality or comfort levels).
- Refine the DT model with real-world data to improve simulation accuracy and decision support.

Activities

A4.8.1 Collect, store and analyse data on a regular basis. (April 2026 - October 2027)

A4.8.2 Compare measured values against simulated outcomes to validate models for continuous improvement. (September 2026 - October 2027)

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A4.8.3 Adjust operational strategies (e.g., energy distribution, climate control) based on DT insights. (January 2027 - October 2027)

Expected Outcomes

- Up-to-date, high-resolution data for ongoing performance optimization.
- Verified Digital Twin model that stakeholders can trust for scenario planning.
- Evidence-based recommendations for scaling up or replicating the energy community model.

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4.5 Summary of the Pilot Transformation Activities

Transformation Action	Description of Tasks	Responsible Partners	Month (Start-End)	Innovation Hub Interaction[1]				Related KPIs
				2.1	2.2	2.3	2.4	
A1 Develop a co-designed deep retrofit solution for the local student canteen and energy smart building environment through urban sharing ecosystems.	Task A1.1 Student Engagement for Canteen Retrofit Concept: Organize workshops and interactive sessions to involve students in shaping the canteen's retrofit design.	UTCB (lead); PS2 (input)	10.2024 - 12.2024		X			KPI 1.1, KPI 1.2, KPI 2.3, KPI 2.4, KPI 2.5, KPI 3.6, KPI 6.2,
	Task A1.2 Review of the Technical Project of the Canteen: Examine existing technical plans to ensure alignment with deep retrofit requirements, including energy efficiency and sustainability goals.	UTCB (lead); ENGIE, LNEG, CRES (input)	07.2024 - 12.2024	X		X		
	Task A1.3 Data Collection: Gather relevant data (e.g., baseline energy use, building conditions) to inform the retrofit design and monitor subsequent performance.	UTCB (lead); ENGIE, PS2 (input)	01.2025 – 10.2027	X		X		
A2 Smart and sustainable regeneration of local community public spaces within and outside the university campus.	Task A2.1 Co-Design Activities with UTCB Students: Collaborate with student groups to identify improvements and sustainable design ideas for public spaces on campus.	UTCB (lead)	10.2024 – 01.2025		X			KPI 2.2, KPI 3.1, KPI 3.2, KPI 3.3, KPI 3.4, KPI 3.5, KPI 3.6, KPI 4.1, KPI 4.2, KPI 5.1, KPI 5.2, KPI 5.3, KPI 5.4, KPI 5.5, KPI 5.6, KPI 6.1, KPI 6.2, KPI 6.3, KPI 6.4,
	Task A2.2 Engagement Activities with Students, Residents and School Children: Conduct outreach and community sessions and activities, incorporating diverse perspectives into the regeneration plans. Synergy with **NBS EduWorld** project	UTCB (lead); PS2, ICLEI, VTT (input)	01.2025 – 04.2026		X			

[1] Innovation Hub Solution Clusters: 2.1 Integrated Planning and Digital Application, 2.2 Social Innovation and Participatory Action, 2.3 Energy in Built Environment, 2.4 Sustainable Mobility.

Transformation Action	Description of Tasks	Responsible Partners	Month (Start-End)	Innovation Hub Interaction[1]				Related KPIs
				2.1	2.2	2.3	2.4	
	Task A2.3 WeGenerate Requirements for **UrbanWise** Project: Define and document the specific needs for WeGenerate's impact area, ensuring synergy with UrbanWise project objectives.	UTCB (lead); PS2, ICLEI, VTT, Fraunhofer (input)	01.2025 – 06.2026		X			
	Task A2.4 Co-supervision (WeGenerate, **UrbanWise** and **Campus Verde** projects) of implementation activities: Oversee the physical transformation of selected public spaces, ensuring fidelity to the co-designed plans and sustainability criteria.	UTCB (lead); PS2, ICLEI, VTT, Fraunhofer (input)	01.2025 – 10.2027				X	
A3 Develop a sharing platform (Shared Energy Center) for sharing the energy produced in the campus with the neighbourhood.	Task A3.1 Shared Energy Center Technical Solution Design: Involve technical and research teams in designing the Shared Energy Center's technical framework and operation model.	UTCB (lead); ENGIE, PS2, CRES, IREC, Fraunhofer (input)	09.2024 – 07.2025	X				KPI 1.1, KPI 1.2, KPI 1.3, KPI 1.4, KPI 4.3,
	Task A3.2 Terms of Reference (ToR) Drafting and Bid Preparation: Prepare the functional and technical specifications, followed by bid documentation for potential contractors.	UTCB (lead); ENGIE, Bucharest (input)	11.2024 – 09.2025	X				
	Task A3.3 Implementation Activities and Installation of the ESC Systems: Install and integrate the necessary infrastructure for energy generation, storage and distribution in the intervention area.	UTCB (lead); ENGIE, PS2, Fraunhofer, IREC, CRES (input)	09.2025 – 10.2027		X			
A4 Digital Twin Development and Testing for Assessing the Potential of GHG Emission Reduction and the Creation of	Task A4.1 Stakeholder Engagement: Identify and involve private and public entities and community members to define requirements and gather user feedback for the DT design.	UTCB (lead); PS2 (input)	09.2025 – 08.2026	X	X			KPI 1.3, KPI 1.4, KPI 2.1, KPI 4.5, KPI 6.3, KPI 6.5, KPI 6.6

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Transformation Action	Description of Tasks	Responsible Partners	Month (Start-End)	Innovation Hub Interaction[1]				Related KPIs
				2.1	2.2	2.3	2.4	
an Energy Community in the Neighbourhood	Task A4.2 Neighbourhood 3D Model Design: Create a digital 3D model covering key buildings and urban features to serve as the foundation for the Digital Twin.	UTCB (lead); PS2, Fraunhofer, IREC (input)	12.2024 – 08.2026	X				
	Task A4.3 Sensors Network Design and Installation: Plan and deploy sensors for real-time data collection (e.g., energy use, environmental conditions) feeding into the Digital Twin.	UTCB (lead); PS2, ENGIE, VTT, Fraunhofer, IREC (input)	01.2025 – 10.2027	X				
	Task A4.4 Building Energy Simulations: Use simulation tools (e.g., IES VE) to explore different building-level efficiency scenarios, integrating Fraunhofer data for larger-scale analyses.	UTCB (lead); ENGIE, IREC, Fraunhofer, CRES (input)	11.2024 – 08.2026	X				
	Task A4.5 Simulation of energy systems in the intervention and impact areas	Fraunhofer (lead); UTCB, ENGIE, PS2 (input)	08.2025 – 05.2027	X				
	Task A4.6 Urban Environment Simulations: Employ environmental modeling (e.g., ENVI-met) to assess neighborhood-level conditions and incorporate findings into the Digital Twin.	UTCB (lead); PS2, VTT, IREC (input)	02.2025 – 11.2026	X				
	Task A4.7 Development of DT platform, ToR and Tender: Finalize the platform's technical specifications, draft the Terms of Reference and launch the procurement process for advanced system components.	UTCB (lead); IREC, Fraunhofer, PS2 (input)	06.2025 – 12.2026	X				

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Transformation Action	Description of Tasks	Responsible Partners	Month (Start-End)	Innovation Hub Interaction[1]				Related KPIs
				2.1	2.2	2.3	2.4	
	Task A4.8 Monitoring Activities with DT: Continuously collect and analyze sensor data to refine performance, track GHG reduction potential and other indicators.	UTCB (lead); PS2, IREC, Fraunhofer, CRES (input)	04.2026 – 10.2027	X				

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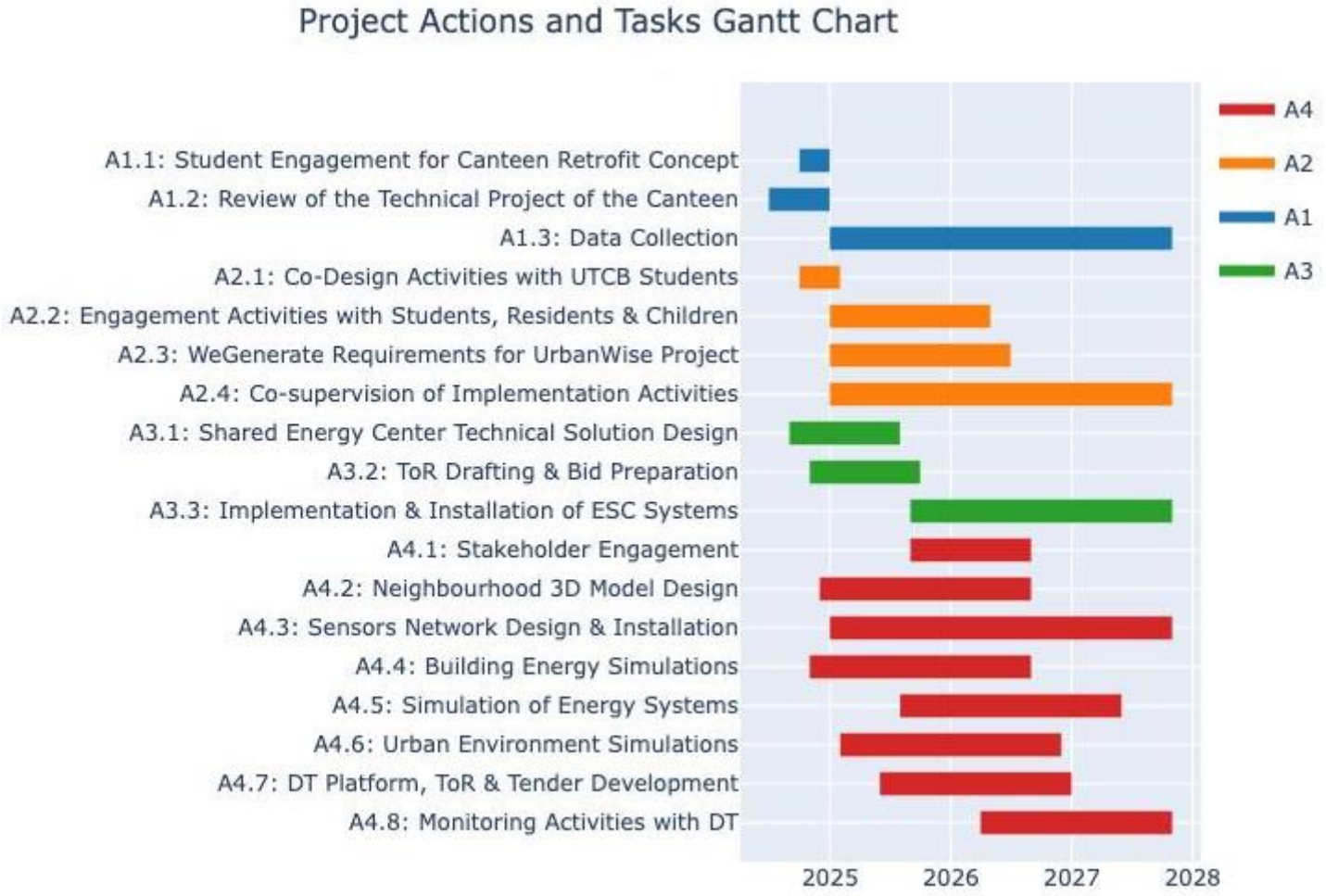

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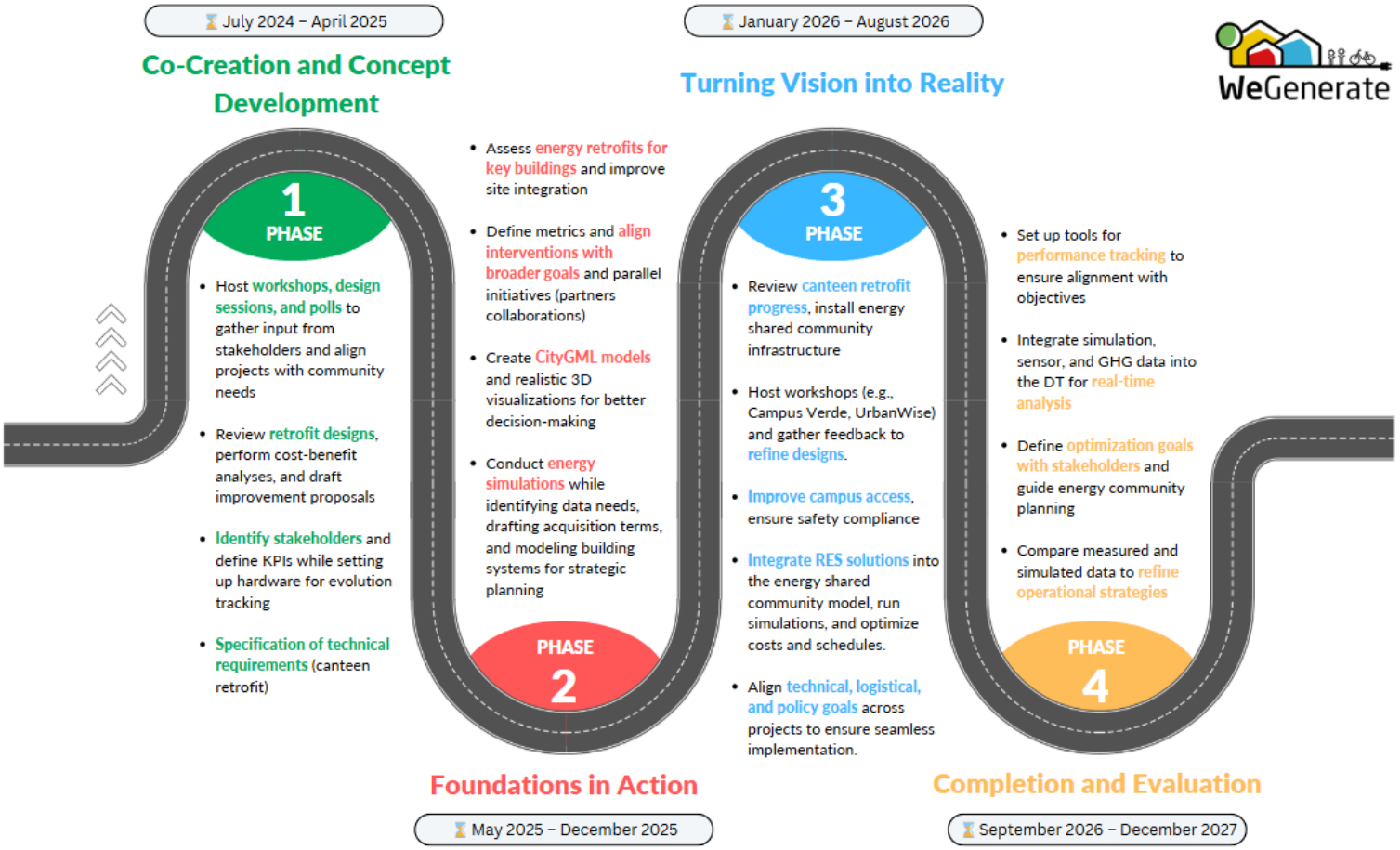
5. IMPLEMENTATION ROADMAP



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CONCLUSIONS

The Urban WeGeneration Action Plan and Implementation Roadmap for Bucharest demonstrates a comprehensive and innovative approach to urban regeneration, particularly within the Tei neighborhood of District 2. By addressing environmental, social, and infrastructural challenges through advanced technologies and inclusive design, the project establishes a pathway toward a more sustainable, resilient, and equitable urban future. The roadmap reflects a multi-dimensional strategy that combines energy efficiency, urban mobility improvements, and community engagement to create a dynamic and sustainable living environment.

The roadmap achieves a significant milestone by blending environmental sustainability with urban development. Key achievements include the integration of renewable energy systems, such as solar photovoltaic panels and heat pumps, which drastically reduce dependence on fossil fuels. These energy solutions are complemented by the introduction of a shared energy platform, transforming the Tei neighborhood into a localized energy microgrid. The retrofitting of key buildings like the canteen, school, and student dormitory aligns them with nearly zero-energy building (nZEB) standards, exemplifying the project's commitment to energy efficiency. Furthermore, the roadmap reimagines public spaces by enhancing their accessibility and functionality, prioritizing pedestrian and cycling-friendly infrastructure.

The project's impact spans multiple domains, beginning with environmental sustainability. The integration of renewable energy systems, coupled with energy-efficient retrofits, not only reduces greenhouse gas emissions but also sets a benchmark for future urban projects in Bucharest and beyond. The implementation of smart energy management systems, supported by digital twin technology, facilitates real-time monitoring and optimization of energy use, ensuring that resources are used efficiently.

On a social level, the project fosters stronger community ties by creating open, shared spaces that encourage interaction and inclusivity. The transformation of the university canteen and its surrounding courtyard into public spaces accessible to both students and local residents exemplifies the project's community-first approach. These spaces are designed to host

cultural, recreational, and educational activities, bridging the gap between academic institutions and the surrounding neighborhoods.

The project also addresses urban mobility challenges through the introduction of pedestrian-friendly zones, dedicated bike lanes, and electric vehicle infrastructure. These changes are expected to alleviate traffic congestion, reduce pollution, and promote sustainable modes of transportation, contributing to a healthier and more livable urban environment.

While the roadmap outlines ambitious goals, it has faced challenges that require innovative solutions. For example, potential resistance from residents regarding the reduction of parking spaces highlights the importance of community engagement. The roadmap emphasizes involving local stakeholders in the decision-making process through consultations and educational initiatives. This participatory approach ensures that the community not only accepts but also actively supports the proposed changes.

Another challenge lies in addressing gaps in data and stakeholder input. To overcome this, the project incorporates activities focused on gathering detailed data on local needs and preferences before implementing significant changes. This data-driven approach ensures that interventions are well-informed and tailored to the unique characteristics of the Tei neighborhood.

The Tei pilot project serves as a pioneering model for urban regeneration, showcasing the potential of integrating renewable energy systems and participatory design into urban planning. By demonstrating the feasibility and benefits of creating a localized energy microgrid, the project aligns with the European Union's climate-neutral and smart cities initiative. The lessons learned from this initiative can be adapted and applied to other districts in Bucharest and cities across Europe, contributing to the broader goals of the EU Green Deal and climate neutrality by 2050.

Moreover, the roadmap highlights the critical role of collaboration among public institutions, private entities, and local communities. This collective effort not only accelerates the adoption of sustainable practices but also fosters a sense of ownership and responsibility among stakeholders.

Looking ahead, the roadmap establishes a solid foundation for ongoing urban transformation in Bucharest. It envisions a future where sustainability, innovation, and inclusivity are at the

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core of urban planning and development. By fostering partnerships between governmental bodies, academic institutions, and the community, the project sets a precedent for future initiatives. The transformation of the Tei neighborhood into a model of sustainability and resilience serves as a testament to what can be achieved through collaborative, forward-thinking planning.

The Urban WeGeneration Action Plan is more than a roadmap—it is a vision for a better future of the neighbourhood development. It demonstrates that with the right blend of technology, community engagement and policy support, cities can transition into climate-neutral, inclusive and vibrant spaces where both people and the environment thrive.

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PARTNERS LOGOS

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