



IRIS

Integrated and Replicable Solutions
for Co-Creation in Sustainable Cities

Project Acronym:	IRIS
Project Full Name:	Integrated and Replicable Solutions for Co-Creation in Sustainable Cities
Grant Agreement:	No 774199
Project Duration:	5 years (starting 1 October 2017)

Deliverable 8.10

Focsani replication plan

Work Package:	8
Task:	8.6
Lead Beneficiary:	FOCS
Due Date:	30 September 2020 (M36)
Submission Date:	31 March 2021 (M42)
Deliverable Status:	Final
Deliverable Style:	R
Dissemination Level:	PU
File Name:	D8.10 Focsani replication plan



This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No 774199



Authors

Surname	First Name	Beneficiary
Minciuc	Eduard	UPB
Patrascu	Roxana	UPB
Darie	George	UPB
Ban	Diana	UPB
Vasile	Elena	UPB
Nicola	Nicoleta	UPB
Cazaciuc	Dan	Focsani
Imireanu	Adrian	Focsani
Purece	Cristian	ICEM
Adam	Adrian Andrei	ICEM
Corlan	Lilica	ICEM
Ligda	Silvia	ICEM
Mandrean	Cristian	ICEM

In case you want any additional information or you want to consult with the authors of this document, please send your inquiries to: irissmartcities@gmail.com.

Reviewers

Surname	First Name	Beneficiary
Tsarchopoulos	Panagiotis	Centre for Research and Technology Hellas
Knuts	Mauritz	VAASA/VASEK
Massink	Roel	UTR

Version History

Version	Date	Modifications made by
0.1	27/05/2020	Created the first structure of the deliverable
0.2	29/06/2020	Chapter contribution added
0.3		
1.0	19/03/2021	Final version to be released to the EC

Disclaimer

This document reflects only the author's view. Responsibility for the information and views expressed therein lies entirely with the authors. The Innovation and Networks Executive Agency (INEA) and the European Commission are not responsible for any use that may be made of the information it contains.

Executive Summary

The Municipality of Focsani is partner as a Fellow city in the IRIS project. The main reason that the city of Focsani is involved into this project is that its main long-term objective is a sustainable development of the city. Being part of the IRIS project can also lead to connecting to other EU smart city, increasing experience and capacity building for implementation of different projects that can to sustainable development.

The Focsani Replication Plan aims at identifying different projects that can be implemented replicated using IRIS experience, especially experience of the Lighthouse cities. Besides this main objective, the present document sets several secondary objectives:

- To select the integrated solutions for replication.
- To describe from technical, economic, environmental and social points of view replication solutions.
- To analyze the stakeholders for different replication solutions.
- To analyze different barriers and drivers for replication solutions.
- To identify knowledge gaps and use capacity building and knowledge transfer for replication solutions.

The document mainly focusses on the 5 Transition Tracks analyzing each project proposed for implementation within selected Integrated Solution. The analysis of each project proposal consists mainly of:

- Stakeholder analysis.
- Capacity building and knowledge transfer.
- Detailed project presentation, including technical description of the project, specific objectives, technical, economic and environmental advantages of the project, project implementation plan, financing issue, barriers and drivers.

The Municipality of Focsani has chosen to replicate the following integrated solutions:

- Transition Track 1. Smart renewables and closed-loop energy positive districts:
 - Integrated Solution 1.2. Near zero retrofit district. The project refers to retrofitting of 9 residential and 7 public buildings, including utilization of renewable energy sources.
- Transition Track 2. Smart energy management and storage for grid flexibility:
 - Integrated Solution 2.2. Smart multi-sourced low temperature district heating (DH) with innovative storage solutions. The project has several components: rehabilitation of the district heating network, installation of a heat storage tank at the district heating generation facility and implementation of the trigeneration concept at the energy generating facility.
- Transition Track 3. Smart e-mobility sector:
 - Integrated Solution 3.1. Smart Solar V2G EV's charging. The project includes slow and fast EV charging stations for cars and electric busses.
 - Integrated Solution 3.2. Innovative Mobility Services for the Citizens. This project includes the following components: modernization and re-systematization of the public

transportation infrastructure, acquisition of electric busses and implementation of bike-sharing concept.

- Transition Track 4. City innovation platform:
 - Integrated Solution 4.1. Services for Urban Monitoring. The project aims at rehabilitation, modernization and extension of the public lighting system. There are also two projects that are in initial development stage: Safe School & Safe City.
 - Integrated Solution 4.2. Services for City Management and Planning. The project is linked with the project from Transition Track 2 and aims at installation of automation and monitoring equipment within the district heating network. There are also three projects that are in initial development stage: Center for Integrated Management of public services, Digital Municipality, Geospatial management of Focsani Municipality area.
 - Integrated Solution 4.3. Services for Mobility. The project aims at implementation of a traffic management system. There is also one project that is in initial development stage: Citizen Innovation Platform.
- Transition Track 5. Citizen engagement:
 - Integrated Solution 5.1. Co-creating the energy transition in your everyday environment.
 - Integrated Solution 5.4. Apps and interfaces for energy efficient behavior.

The projects within this Transition Track have been heavily influenced by the COVID-19 pandemic. However, the Municipality has tried to engage citizens into project development and implementation.

The expected impact of this deliverable is that all replication projects/activities are better prepared and the Municipality of Focsani has a well-structured and defined plan for their implementation. Another major impact that can be achieved is that the Municipality of Focsani can take advantage and use all information and experience of Lighthouse cities for projects replication and avoid some barriers and use some drivers.

The main conclusion of this Focsani Replication Plan is that all projects proposed for replication/implementation are developing very well and the IRIS experience has proven and shall prove in the future as very beneficial for the Municipality of Focsani.

Table of Contents

Executive Summary.....	4
Table of Contents.....	6
List of Figures	9
List of Tables	9
List of Abbreviations and Acronyms	10
1 Introduction	11
1.1 Scope, objectives and expected impact.....	11
1.2 Contributions of partners	12
1.3 Relation to other activities.....	12
1.4 Structure of the deliverable	12
2 Methodology.....	14
2.1. Introduction	14
2.2. Replication methodology	14
2.3. Creation process for replication plan.....	14
2.4. Solutions chosen for replication	15
3 City needs, challenges and prioritization.....	18
4 Transition Track #1: Smart renewables and closed-loop energy positive districts	23
4.1. TT#1 Replication in a nutshell.....	23
4.2. Selection process	24
4.3. Mapping of stakeholders	24
4.4. Identified knowledge gaps.....	24
4.5. Capacity building and knowledge transfer	25
4.6. IS-1.2: Near zero energy retrofit district.....	25
4.7. Conclusions on ambitions and planning of activities for TT#1 1 Smart renewables and closed-loop energy positive districts.....	40
5 Transition track #2: Smart energy management and storage for grid flexibility.....	42
5.1. TT#2 Replication in a nutshell.....	42
5.2. Selection process	43
5.3. Mapping of stakeholders	43
5.4. Identified knowledge gaps.....	43
5.5. Capacity building and knowledge transfer	43



5.6.	IS-2.2: Smart multi-sourced low temperature district heating (DH) with innovative storage solutions.....	44
5.7.	Conclusions on ambitions and planning of activities for TT#2 Smart Energy Management and Storage for Energy Grid Flexibility	49
6	Transition track #3: Smart e-mobility sector	50
6.1	TT#3 Replication in a nutshell.....	50
6.2	Selection process	51
6.3	Mapping of stakeholders	51
6.4	Identified knowledge gaps.....	52
6.5	Capacity building and knowledge transfer	52
6.6	IS-3.1: Smart Solar V2G EVs charging.....	52
6.7	IS-3.2: Innovative Mobility Services for the Citizens.....	55
6.8	Conclusions on ambitions and planning of activities for TT #3 Smart e-Mobility Sector	64
7	Transition track #4: City innovation platform.....	65
7.1	TT#4 Replication in a nutshell.....	65
7.2	Selection process	66
7.3	Mapping of stakeholders	66
7.4	Identified knowledge gaps.....	66
7.5	Capacity building and knowledge transfer	67
7.6	IS-4.1: Services for Urban Monitoring.....	67
7.7	IS-4.2: Services for City Management and Planning.....	72
7.8	IS-4.3: Services for Mobility	73
7.9	Conclusions on ambitions and planning of activities for TT #4 City Innovation Platform (CIP) .	79
8	Transition track #5: Citizen engagement	80
8.1	TT#5 Replication in a nutshell.....	80
8.2	Selection process	81
8.3	Mapping of stakeholders	81
8.4	Identified knowledge gaps.....	81
8.5	Capacity building and knowledge transfer	81
8.6	IS-5.1: Co-creating the energy transition in your everyday environment	82
8.7	IS-5.4: Apps and interfaces for energy efficient behavior	82
8.8	Conclusions on ambitions and planning of activities for TT #5 Citizen Engagement and Co-creation.....	83
9	Summary of Follower City use cases and measures	85



9.1	Integration of use cases and measures.....	86
10	Output to other work packages.....	87
11	Conclusions	88
12	References	92
Annex 1	99



List of Figures

Figure 1. Rehabilitated building in Focsani	38
Figure 2. Rehabilitated the Technical College "Gheorghe Asachi" Focşani	39
Figure 3. Rehabilitated the Gymnasium School "Ion Basgan" Focşan	39
Figure 4. Rehabilitated the Gymnasium School "Duliu Zamfirescu" Focşani	40
Figure 5. Location of 5 fast charging stations for electric busses.	54
Figure 6. Public transportation system of Focsani city.	56
Figure 7. Re-systematization of public transportation infrastructure in Focsani city.	58
Figure 8. Bicycle tracks in Focsani city.	60
Figure 9. Location of bicycle tracks in Focsani.	61

List of Tables

Table 1 Status of the solutions to be replicated	16
Table 2 Solutions chosen for replication, and those demonstration project	17
Table 3 Proposed sources of funding	21
Table 4. Summary of the energy, economic and environmental analysis for the residential buildings in Focsani city.....	27
Table 5 The main economic results for the residential buildings.	29
Table 6. Gantt diagram for the B+GF+4F residential buildings.....	29
Table 7. Gantt diagram for the Bl. Independentei nr.6 / B+GF+8F and Bl. Independentei nr.8 / B+GF+8F residential buildings.	30
Table 8. Gantt diagram for the Bl . Unirii nr.54 /B+GF+8F residential building.....	30
Table 9. Gantt diagram for the Bl . Unirii nr.28 /B+GF+8F residential building.....	31
Table 10. Gantt diagram for the Bl.Poienitei nr.12 / B+GF+3F residential building.	31
Table 11. Summary of the energy, economic and environmental analysis for the public buildings in Focsani city.....	33
Table 12. The main economic results for the public buildings.	35
Table 13. Gantt diagram for the above-mentioned public building.	35
Table 14. Gantt diagram for the above-mentioned public building.	37
Table 15. Gantt diagram for rehabilitation of district heating network.	46
Table 16. Main results of the economic analysis for the implementation of heat storage tank and absorption chilling machine for 3 scenarios.	48
Table 17. Gantt diagram for the modernization of public transportation.	57
Table 18. Gantt diagram for the modernization and re-systematization of public transportation infrastructure.	59
Table 19. Gantt diagram for the bike-sharing system.	62
Table 20. Gantt diagram for the public lighting system.....	70
Table 21. Revenues for both analyzed scenario only from public transportations.....	75
Table 22. Gantt diagram for the implementation of the traffic management and monitoring system.....	77
Table 23. Replication projects and their status of implementation..	85

List of Abbreviations and Acronyms

Abbreviation	Definition
EU	European Union
WP	Work Package
TT	Transition Track
EM	Energy mark of the building
EC	Energy class of the building
PER	Primary energy reduction
FER	Final energy reduction
HER	Heating energy reduction.
DHS	District Heating System
DHN	District Heating Network
CHP	Combined heat and power
ITC	Information Technology and Communication
RES	Renewable energy sources
SME	Small and medium enterprises
SPBP	Simple Pay Back Period
CIP	City Innovation Platform
GHG	Green House Gasses
EU	European Union
MDRAP	Ministry of Regional Development and Public Administration
POCA	Operational Program Administrative Capacity
POIM	Large Infrastructure Operational Program
POR	Regional Operational Program
EEA	European Economic Area
EEIP	Energy Efficiency Improvement Plan
SUMP	Sustainable Urban Mobility Plan
SDS	Sustainable Development Strategy

1 Introduction

The Municipality of Focsani is a Fellow City partner in IRIS project. One of the main reasons of being part of this project is that the Municipality of Focsani is willing to put the city on the track of sustainable development, and IRIS project can surely boost/help/support the Municipality's efforts in this direction.

The sustainable development concept of Focsani city has been proposed, developed and analyzed in different official documents elaborated by the Municipality. The concept of sustainable development includes different city areas/domains, like buildings/districts sustainable development, efficient utilities networks, smart and sustainable mobility sector, digitalization, citizen involvement and co-creation and many others.

The IRIS project, with its main objectives and goals, has many parallels with Focsani sustainable strategy, and, therefore, can greatly contribute to city sustainable development. The Municipality of Focsani can take numerous and great advantages of being part of IRIS project, like the most important ones presented below:

- Connection with other EU cities that implement sustainable development concept.
- Replication of already implemented projects in different cities, partners within IRIS.
- Knowledge exchange, including new ideas and project ideas.
- Capacity building at Municipality of Focsani, including with help and experience from Lighthouse cities.

One of the main objectives of the Municipality of Focsani within IRIS project is to take advantage and prepare a replication plan for projects in different city areas to be implemented in Focsani. This objective is achieved through elaboration of the Focsani replication plan.

1.1 Scope, objectives and expected impact

The main objective of this deliverable is to provide a replication plan that can be used by the Municipality of Focsani for developing of different projects in the city for implementation of the sustainable concept.

There are also several secondary objectives of this deliverable:

- To select the integrated solutions for replication.
- To describe from technical, economic, environmental and social points of view replication solutions.
- To analyze the stakeholders for different replication solutions.
- To analyze different barriers and drivers for replication solutions.
- To identify knowledge gaps and use capacity building and knowledge transfer for replication solutions.

The expected impact of this deliverable is that all replication projects/activities are better prepared and the Municipality of Focsani has a well-structured and defined plan for their implementation. Another major impact that can be achieved is that the Municipality of Focsani can take advantage and use all

information and experience of Lighthouse cities for projects replication and avoid some barriers and use some drivers.

1.2 Contributions of partners

All Romanian partners involved in IRIS project have contributed to elaboration of the replication plan. The Municipality of Focsani has elaborated different technical documents that have been used for elaborating this replication plan. All three partners, the Municipality of Focsani, University Politehnica of Bucharest (UPB) and ICEMENERG, have actively participated in elaboration of this deliverable and all shall contribute to reviewing and up-dating process when needed.

1.3 Relation to other activities

The main relation to other activities performed within IRIS project with present deliverable are presented below:

- Very strong relation to all deliverables elaborated within Work packages 5, 6 and 7, since those deliverables refer mainly to demonstration/pilot/replication projects implemented in Lighthouse cities.
- Relation to Work package 3 for using bankable business models for replication process.
- Relation to Work package 4 for using information regarding City innovation platform.
- Relation to Work package 9 for monitoring and evaluation of replication projects.

1.4 Structure of the deliverable

The main focus of the deliverable is to clearly present integrated solutions chosen for replication in Focsani city within each Transition Track. At the beginning of the deliverable there are some chapters presenting general information. Chapter one presents the objectives of the deliverable, contribution of partners and relation to other activities within IRIS project. Chapter two presents the methodology used for creating this replication plan. Chapter three summarizes city needs, challenges and prioritization. Chapters 4-8 present replication solutions chosen for implementation within each 5 transition tracks. These chapters present for each integrated solutions the following main steps:

- Mapping of stakeholders that can be involved in replication activities.
- Identifying knowledge gaps.
- Capacity building and knowledge transfer.
- Presentation of the integrated solution:
 - Situation before implementation of integrated solution.
 - Objectives and goals of replication project.
 - Description of replication project.
 - Technical, economic, environmental and social criteria.
 - Planning of replication activities.
 - Barriers and drivers.

For different replication projects the above-presented steps might be presented in more or less details depending on the project and available information.

There should be also mentioned that for the Transition Track 5 Citizen Engagement there have not been implemented many projects that involve citizens, and this is due to the COVID-19 pandemic situation. However, there have been different public consultations that the Municipality of Focsani undertook when elaborating strategic documents for the Municipality of Focsani.

Chapter nine presents the summary of Focsani replicated solutions and their interconnection with each other. At the end of the deliverable there is a chapter dedicated to conclusions.

2 Methodology

2.1 Introduction

This deliverable is part of IRIS **WP 8: Replication by Lighthouse regions, Follower cities, European market uptake**, and it is related to **T8.6 Focsani Follower City replication activities**. Deliverable **D8.10 Focsani replication plan** provides a detailed plan for all replication projects chosen to be implemented by the Municipality of Focsani.

The Focsani replication plan is based on the following main ideas/pillars:

- Replication projects to be developed and implemented in Focsani shall be based on demonstration, pilot and replication projects already implemented in Lighthouse cities.
- The Municipality of Focsani has established several action directions/fields/areas for replication activities.
- The replication activity/process is based on local needs and priorities, but also uses all available information from all partners involved in the IRIS project.

The Focsani replication plan shall be used as a guide for all replication activities performed by the Municipality of Focsani.

2.2 Replication methodology

The replication methodology used by the Municipality of Focsani is based on the following main steps/documents:

- Focsani strategy for sustainable development.
- Focsani needs, challenges and opportunities.
- Choosing integrated solutions for replication.
- Implementation of integrated solutions.
- Monitoring of integrated solutions.
- Dissemination.

2.3 Creation process for replication plan

The creation process of this deliverable includes the following main steps that have been performed during replication plan elaboration.

- Elaboration of Replication plan template, including the table of contents. In this step, there have been involved all Romanian IRIS partners together with partners from all other Follower cities and IRIS management representatives.
- Face to face, on-line meetings, e-mail and telephone discussions between all Romanian partners.
- Elaboration of replication plan with active participation of all Romanian partners.
- Review of replication plan with active participation of all Romanian partners.

- Up-date, if necessary, of replication plant with active participation of all Romanian partners.

2.4 Solutions chosen for replication






















The Municipality of Focsani has chosen to replicate the following integrated solutions:

- Transition Track 1. Smart renewables and closed-loop energy positive districts:
 - Integrated Solution 1.2. Near zero retrofit district.
- Transition Track 2. Smart energy management and storage for grid flexibility:
 - Integrated Solution 2.2. Smart multi-sourced low temperature district heating (DH) with innovative storage solutions.
- Transition Track 3. Smart e-mobility sector:
 - Integrated Solution 3.1. Smart Solar V2G EV's charging.
 - Integrated Solution 3.2. Innovative Mobility Services for the Citizens.
- Transition Track 4. City innovation platform:
 - Integrated Solution 4.1. Services for Urban Monitoring.
 - Integrated Solution 4.2. Services for City Management and Planning.
 - Integrated Solution 4.3. Services for Mobility.
- Transition Track 5. Citizen engagement:
 - Integrated Solution 5.1. Co-creating the energy transition in your everyday environment.
 - Integrated Solution 5.4. Apps and interfaces for energy efficient behavior.

During the application process, the Municipality of Focsani, through targets chosen regarding energy and climate related issues, expressed its keen interest to replicate several solutions. Table 1 shows the status for each project that is being analyzed for implementation for each Integrated Solution, respectively for each Transition Track.



Table 1 Status of the solutions to be replicated

Transition Tracks	Integrated Solutions		Follower City	
			Focsani	Status
 TT # 1 Renewables and energy positive districts		IS-1.1: Positive energy buildings	-	
		IS-1.2: Near zero energy districts	R	
		IS-1.3: Symbiotic waste heat	-	
 TT # 2 Flexible energy management and storage		IS-2.1: Flexible electricity grids	-	
		IS-2.2: Multi-sourced district heating	R	
		IS-2.3: 2 nd life batteries	-	
 TT # 3 Intelligent mobility solutions		IS-3.1: Vehicle-to-grid and smart solar charging	R	
		IS-3.2: Innovative mobility services	R	
 TT # 4 Digital transformation and services		IS-4.1: Urban monitoring	R	
		IS-4.2: City management and planning	R	
		IS-4.3: Mobility services	R	
		IS-4.4: Energy management	-	
 TT # 5 Citizen engagement & co-creation		IS-5.1: Changing everyday energy use	R	
		IS-5.2: Participatory city modeling	-	
		IS-5.3: Living labs	-	
		IS-5.4: Behaviour changing information	R	

Colour	Description
	Implementation
	Design
	Under study



Table 2 illustrates a summary of the replicable solutions. It indicates the chosen solution and the LH city demonstration acting as basis of each replication project/solution.

Table 2 Solutions chosen for replication, and those demonstration project

FOCSANI			
TT#1: Smart renewables and closed-loop energy positive districts			
Integrated Solution	City, Demonstration Project and/or Organization	Replication Project	Suggested time
IS-1.1: Positive Energy Buildings			
IS-1.2: Near zero energy retrofit district	Utrecht & Gothenburg	Retrofitting of residential and public buildings	TBA
IS-1.3: Symbiotic waste heat networks			
TT#2: Smart Energy Management and Storage for Grid Flexibility			
Integrated Solution	City, Demonstration Project and/or Organization	Replication Project	Suggested time
IS-2.1: Flexible electricity grid networks			
IS-2.2: Smart multi-source low temperature district heating with innovative storage solutions	Nice & Gothenburg	Smart district heating	TBA
IS-2.3: Utilizing 2nd life batteries for smart large scale storage schemes			
TT#3: Smart e-Mobility Sector			
Integrated Solution	City, Demonstration Project and/or Organization	Replication Project	Suggested time
IS-3.1: Smart solar V2G EVs charging	Utrecht	V2G EV charging	TBA
IS-3.2: Innovative Mobility services for the Citizens	Utrecht & Gothenburg	Bike sharing	TBA
TT#4: City Innovation Platform (CIP)			
Integrated Solution	City, Demonstration Project and/or Organization	Replication Project	Suggested time
IS-4.1: Services for Urban Monitoring	Nice	Street lighting	TBA
IS-4.2: Services for City Management and Planning	Nice & Gothenburg	District heating system automation, monitoring & control	TBA
IS-4.3: Services for Mobility	Gothenburg	Traffic lights management	TBA
IS-4.4: Services for Grid Flexibility			
TT#5: Citizen engagement			
Integrated Solution	City, Demonstration Project and/or Organization	Replication Project	Suggested time
IS-5.1: Changing everyday energy use	Nice & Utrecht	Citizen engagement	TBA
IS-5.2: Participatory city modelling			
IS-5.3: Living labs			
IS-5.4: Behaviour changing Information	Nice & Gothenburg	Apps for energy efficient behavior	TBA

3 City needs, challenges and prioritization

Focșani is a medium sized city - the capital of Vrancea County. Focsani city is situated at the border between Moldova and Muntenia historical regions of Romania. The city is crossed by the railway corridor no.9 (Helsinki - Moscow – Chișinău-Bucharest-Plovdiv and, in the future, by road corridor no.1 (Tallinn - Warsaw - Bucharest – Cernăuți. Citizens from Focșani like to say that “we are welcoming our guests in the legendary Land of Vrancea and the Union City”. Focșani city needs to react both to its local internal cross-sectorial challenges and to the external pressure related to the economic disparities between western and eastern European countries, recently more influenced by the geopolitical context with our neighbour Moldova and Ukraine. Focșani is committed to become a smart and sustainable urban centre, starting from efficiently tackling all local issues (economic, social, administrative, environmental etc.) through an integrated innovative approach. Together with its citizens, the key stakeholders and urban utilities’ providers, the municipality is focused on: increasing buildings’ energy efficiency and the living standards; mitigating CO₂ footprint by reducing primary energy resources consumption and implementing adequate RES, in areas of interest with no DHS; developing an eco-smart public transport, efficiently managed and monitored; implementing an ITC decision-based management tool in order to develop a transparent and efficient public administration process; securing its citizens’ safety and enhancing their level of knowledge, awareness and engagement; maintaining a low unemployment rate by increasing the economic potential of the city (SME development; attracting foreign investment; tourism).The Municipality gained experience in running several investment project financed by Pre-accession and Structural Funds, being prepared to submit new project proposals for the next period.

Considering the new legal and regulatory framework regarding the energy efficiency in buildings - National Law no.121/2014 transposing the Directive 2009/27/UE, buildings constructed before 2005 are not thermally insulated, building constructed between 2005 and 2014 are poorly thermally insulated and starting with 2014 buildings are adequately thermally insulated. It has to be mentioned that after implementing the new national regulation on buildings’ energy performance, all new buildings have to be properly thermally insulated according to the relevant European Directive. Recently Municipality of Focsani refurbished and upgraded two public buildings (two schools) in order to increase the energy efficiency performance, and has signed nine more financing contracts for increasing the energy efficiency of some public buildings and two financing contracts for residential buildings.

Transition Track # 1 and # 2 - Focșani Municipality good practices in the smart and sustainable urban development field is related to retrofitting both residential and public buildings, but and to “low carbon districts” mainly an upgraded district heating system, including a high efficient cogeneration plant and a DHN, supplying about 40% of Focșani city, the rest of the population having implemented individual sources. The owner of the heating supply network is ENET - a public company subordinated to Focșani Municipality. The high efficient centralized heating system includes:

- a cogeneration source for heat and power, operating on natural gas [2 x high-efficiency CHPPs - internal combustion engines (2 x 6.8MWe); 2 x hot water boilers (2 x 50 Gcal / h); a hot water boiler (1 x 25Gcal / h)];

- transport network with a length of 23.21 km;
- 57 thermal substations connected to the transport network and supplying homeowners' association (single-family homes, condominiums), private companies, public institutions and social-cultural entities;
- distribution network in length of 59.08 km;
- heat meters installed for condominiums (apartment buildings), inside the staircases of the block of flats, on the heating and hot water distribution networks.

All this technological improvements are possible through a major retrofitting and upgrading project managed by Focșani Municipality, aiming the compliance with environmental standards on air pollution and energy efficiency for heat supplying systems. Also, a new project visiting the rehabilitation of the district heating system at the level of Focșani Municipality was submitted.

Transition Track #3 - Current Status Municipality of Focșani has many road links at the national and Vrancea County level, being an important road junction in the south-east part of Romania. Municipality road's network has a linear arrangement, with the major roadways 70% oriented from North to South. According to data from the National Institute of Statistics, the total road length of the city is about 123 km, of which about 84% already modernized (103 km). Related to the public transport according to the scheduled traffic, nine routes were approved, with a total length of 160 km roundtrip, but still there are areas with no such services for the citizens.

Several projects were implemented, including the approved SUMP, for upgrading and extending the green areas; repairing streets network, sidewalk, access alleys, parking areas, bus stations; construction of new parking areas and bikes tracks; intermodal knots; EV charging infrastructure both for e-cars and e-buses of medium and small capacity, etc.

Transition Track # 4 - Current Status The municipality has "ITC system", based on a GeoMedia platform, for an Integrated Accounting and Financial Management - for all local subordinated public institutions and services (buildings; services such as social, population register, street sanitation , green public spaces, street lighting, parking, markings / road signs, local police, culture, etc.). This ITC system is gathering data from purchased or internally developed applications in Visual Basic, Access, Php, Macromedia or from files built with AutoCad, Microsoft Office, CorelDraw, Adobe. All Software are licensed and enables specialists to develop new projects in various fields. Main IT software used, at this moment, are based on this GeoMedia platform, with access rights for the subordinated companies / utilities providers already connected to this communication network: tax collectors, agricultural evidence, urban planning, human resources and Public Domain Inventory. The main challenge and step forward will be to interconnect data from all software used by the city and the other public services transport, public lighting and utilities providers not yet integrated - heating, water, sewerage, natural gas, communication, electricity, etc. Additionally the municipality implemented a surveillance and crime prevention system in the following districts: Sud, Laminorul and Mandresti. The Municipality of Focșani is implementing a project (WIFI4EU) aimed at promoting the internet connectivity of the local community.

Transition Track #5 - Current Status Focșani has always been a city orientated to the future in relation with the efficiency and transparency of the municipal management process, keeping close connections with the civil society representatives. Based on citizens involvement in the decision making process, Focșani has drawn out the city Development Strategy, being one of the first document of this type performed in

Romania. Focsani developed several analyses and implemented, together with a European consultant in the field, a management system for a dynamic and transparent public administration, which became a model for other local municipalities. In 2002, Focsani was one of the first cities that implemented the “Communication Centre for Citizens” concept, long before the Romanian legislative framework was in force.

Municipality of Focșani is a signatory member of the Covenant of Mayors, with Energy Efficiency Improvement Plan (EEIP) [1] under Local Council approval. In 2015 the City Local Council approved Municipality of Focșani Sustainable Development Strategy for 2014–2023 (SDS) [2], in July 2020 the strategy was updated, and in 2016 has been approved the Sustainable Urban Mobility Plans (SUMP) [3]. In 2020, a project request was submitted regarding the development of a coherent strategic plan, designed to ensure a sustainable vision for the development of sustainable urban mobility in Focșani, by elaborating the new Sustainable Urban Mobility Plan (SUMP). New SUMP will have to meet the financing needs and requirements for the programming period of European funds 2021-2027. Relevant approved plans (part of its EEIP) and already allocated available budget The strategic objectives of Focsani SDS will be reached through concrete measures and actions in the following fields of Energy with a) district heating system upgrading and retrofitting ongoing program, b) an Eco-efficient public lighting, including a telemanagement system and c) energy efficient buildings (public buildings, residential - single-family homes, condominiums). All the above will be connected with smart metering and a dispatching centre for field data collecting; electricity, heat, natural gas and water consumption, water – air – soil pollution. In transport sector a) a Multi-modal transport infrastructure at metropolitan level, b) an intelligent traffic management, including video surveillance, c) an Eco-smart public transport, including the acquisition of 20 electric busses (small and medium capacity) and the development of the charging infrastructure (20 stations) and d) Green parking areas will be designed and constructed. In addition, a Smart ITC decision-based management tool will be implemented in order to develop a transparent and efficient public administration process, including non-bureaucratic proficient public services. The tool is designed, a) to gather data collected in field, process them and draw reports / assess KPIs, while ensuring a user interface at the general public level and b) to ensure open access to different type of information, thus enhancing the level of citizens’ trust and understanding, challenging them to action and rational use of resources.

The financial means to be used by the Municipality of Focșani in achieving the objectives of the Energy Efficiency Increase Program are both from its own budget (own revenues from local taxes, business activities, privatization of municipal properties, subsidies from the state budget) , as well as those attracted from external sources.

In order to use the external financing opportunities for energy efficiency programs, the local administration has made efforts to know the procedures of the financial instruments and of the innovative financial schemes used at international level.

The capacity to ensure the implementation of the measures proposed by PIEE will be achieved through an activity of attracting funds from various financial sources and through various financial mechanisms/instruments (Table 3).



Table 3 Proposed sources of funding

Sources - tools / Areas of intervention	BUILDINGS / EQUIPMENTS / INSTALLATIONS FOR PUBLIC LIGHTING	ROAD TRANSPORT	LOCAL ENERGY PRODUCTION	OTHER FIELDS
Structural and Investment European Funds	POR, POCA	POR, POCA	POIM	POIM
European Territorial Cooperation Programs	Danube Transnational Program / INTERREG V / URBACT III / ESPON / Innovative actions in sustainable urban development			
European research programs	HORIZON 2020, LIFE			
Bilateral Programs	USTDA, Switzerland, Norway, EEA			-
Technical assistance and trade credits	ESCO; EIB – Elena; Jessica; The European Energy Efficiency Fund (EEEF); UE/BERD			
Local tax instruments	Bonuses / Penalties with reference to: - local taxes (tax on buildings or means of transport); - CO ₂ emissions when using thermal installations on fossil fuels	-		Taxation by local urban regulation (eg new construction vs. equivalent green space)
Local budget	Possible contributions for any of the areas, depending on budget planning			
State budget	Green House Classic and Green House Plus Program Classic Scrap and Scrap Plus Program; Green Power Infrastructure Program Programul Rabla Clasic și Rabla Plus;	Central institutions involved (MDRAP etc.)		Green Power Infrastructure Program, etc.
Private sources	Welcome contributions for any of the areas of intervention			

Ambition

Focsani is willing to become a smart and sustainable urban centre, focused on an integrated innovative approach of all local problems. Together with the key municipal stakeholders and urban utilities' providers, the municipality is committed to increase the buildings' energy efficiency and the living Transition track #1: standards, reducing CO₂ emissions and securing its citizens' safety.

The Municipality of Focsani has a strong ambition to transform the city based on sustainable development. For achieving this major goal, the Municipality has elaborated a long-term strategy for sustainable development of Focsani city. The strategy analysed all city needs in different areas/domains and identified major priorities for the city. Based on these priorities and on the sustainable development concept, there have been identified/analysed/prepared for implementation projects in different areas, such as:

- Sustainable development of buildings/districts in the city of Focsani - Transition track1.
- Modernization of utilities networks and services Transition track 2.



- Transformation into smart and sustainable, and based on renewable energy, of the mobility sector - Transition track 3.
- Digitalization of Municipality services and creation on new digital services - Transition track 4.
- Involve citizens into city development - Transition track 5.

In the next 5 chapters all integrated solutions chosen for replication are presented and explained in a manner so they can be easier to implement and monitor.

4 Transition Track #1: Smart renewables and closed-loop energy positive districts

4.1 TT#1 Replication in a nutshell

The Municipality of Focsani is set to develop smart, based on renewable energy sources, city districts. In this context, buildings can represent a specific target for decreasing energy consumption, thus increasing energy efficiency. The integrated solution chosen by the Municipality of Focsani from this transition track to be replicated relates to retrofitting residential and administrative buildings in Focsani city. The process has already started with elaborating a set of technical documentation for different residential and administrative buildings. For each analyzed building there have been elaborated the following set of documents:

- Energy audit of the building assessing all energy demands and proposing energy efficiency measures for reducing energy consumption.
- Technical documentation for proposed energy efficiency measures.

Next major steps of the replication process include the following:

- Public procurement procedure for selection of construction works providers.
- Implementation on-site at each analyzed building of every energy efficiency measure proposed in technical documentation.
- Reception of works.

The buildings shall be rehabilitated based on a well-planned schedule, one by one and not all of them at a time. However, there might be two-three buildings (residential or/and public) that undergo the rehabilitation process at the same time.

The implementation of this integrated solution shall lead to different energy, financial, environmental, social, etc., benefits at the level the Municipality of Focsani, i.e.:

- Energy benefit – reducing energy consumption in buildings.
- Financial benefit – reducing financial resources allocated for energy bill for citizens and for Focsani Municipality itself.
- Environmental - reducing environmental pollution through reducing Green House Gasses (GHG) emissions.
- Social – increasing citizen comfort and their affordability to pay energy bills.

4.2 Selection process

The Municipality of Focsani has targeted for retrofitting both residential and public buildings. There have been chosen 9 residential buildings with different characteristics (height, number of apartments, etc.) and 7 public buildings, all of them being schools, colleges, etc.

4.3 Mapping of stakeholders

The main stakeholders that can be involved in the replication process of this integrated solution can be divided based on the type of buildings. So, for the residential buildings the main stakeholders are:

- Municipality of Focsani.
- Apartments owners through building owners' association.
- Energy service companies that provide services for elaboration of all technical documentation.
- Equipment/materials suppliers that supply different equipment/ materials, e.g. insulation materials, new windows, etc.
- Construction companies that implement this integrated solution on-site at each building.
- Utility companies, e.g. district heating company, since it is directly influenced through reduction of heat consumption.

For the public buildings the main stakeholders are:

- Municipality of Focsani.
- Management of the public buildings, in this case the management of schools, colleges, etc.
- Energy service companies that provide services for elaboration of all technical documentation.
- Equipment/materials suppliers that supply different equipment/ materials, e.g. insulation materials, new windows, etc.
- Construction companies that implement this integrated solution on-site at each building.
- Utility companies, e.g. district heating company, since it is directly influenced through reduction of heat consumption.

4.4 Identified knowledge gaps

The retrofitting/rehabilitation of buildings in Romania and Focsani city has been implemented and it is a quite known area for some years already. Different types of companies, i.e. energy service providers, equipment materials suppliers, construction companies, etc. have been involved in this type of project for some years now and have gained great experience in the field. So, it can be said that there are no major knowledge gaps regarding this issue of retrofitting buildings. However, there might be some small knowledge gaps regarding new materials available on the EU market that can be used for thermal insulation. So, this knowledge gap can be tackled in the future knowledge transfer and capacity building.

Another knowledge gap is referred to utilization/integration of renewable energy sources at the level of buildings.

4.5 Capacity building and knowledge transfer

The only knowledge gap identified for this transition track regarding building retrofitting refers to the availability of new thermal insulating materials on the EU market. The second knowledge gap refers to utilization/integration of renewable energy sources at the building level. So, in order to transfer knowledge and implement capacity building there can be organized some internet-based meetings, or some dedicated written materials, e.g. leaflets, booklets, etc. The knowledge transfer and capacity building can be also improved through site visits where such new materials have been used within a project.

4.6 IS-1.2: Near zero energy retrofit district

The Municipality of Focsani intends to replicate IRIS Integrated Solution regarding to retrofitting several buildings, including utilization of renewable energy sources. This project can lead to developing in Focsani city a near zero energy district. The Municipality targets through this project two types of buildings: residential and public buildings. There have been chosen for retrofitting 9 residential and 6 public buildings [4-10].

The residential buildings can be divided into three categories depending on the number of floors as follows:

- Basement + ground floor + 4 floors, B+GF+4F.
- Basement + ground floor + 8 floors, B+GF+8F.
- Basement + ground floor + 3 floors, B+GF+3F.

The analysis of each building has been performed based on the following energy, economic and environmental criteria:

- Energy performance certificate of the building.
- Energy class of the building.
- Total specific annual primary energy consumption.
- Total specific annual final energy consumption.
- Total specific annual final energy consumption for heating.
- Total specific annual final energy consumption for warm water preparation.
- Total specific annual final energy consumption for heating for lighting.
- Equivalent CO₂ emissions factor.

All these criteria have been calculated for all residential buildings before and after implementation of specific energy efficiency measures.

There have also been calculated for each building the following criteria:

- Annual energy savings.
- Annual financial savings.
- Estimated investment for the energy efficiency measures.
- Simple Pay Back Period for the proposed energy efficiency measures.

The main energy efficiency measures proposed for residential buildings include the following:



- Thermal insulation of the exterior walls.
- Changing the windows with new more energy efficient ones.
- Insulating/closing the balconies.
- Thermal and hydro insulation of the building terrace.
- Thermal insulation of the ground floor.
- Retrofitting of the warm water system.
- Retrofitting of the lighting system.

Table 4 shows a summary of the energy, economic and environmental analysis including the main energy and environmental criteria.

Table 4 shows the main economic results for the residential buildings.

Table 4. Summary of the energy, economic and environmental analysis for the residential buildings in Focsani city.

Building	Actual situation, EM/EC	Proposed solutions	Estimated results				
			EM/EC	PER, %	FER, %	HER, %	CO ₂ R, %
Bl. Brailei nr.7 /B+GF+4F	74/D	- Thermal insulation of the exterior walls with 15 cm insulation.	98.5/B	53.49	43.54	73.41	55.33
Bl. Brailei nr.10 /B+GF+4F	77.3/D	- Changing the windows and exterior access doors. - Insulating / closing the balconies.	98.10/B	46.4	49.70	68.78	48.79
Bl. Bucuresti A4 /B+GF+4F	76.1/D	- Thermal and hydro insulation of the building terrace with 20 cm insulation.	99.6/B	53.68	43.21	71.83	55.61
Bl. Cantemir A /B+GF+4F	76.8/C	- Thermal insulation of the ground floor with 10 cm insulation.	98/B	47.95	49.26	69.17	49.67
Average B+GF+4F				50.38	46.43	70.80	52.35
Bl. Independentei nr.6 / B+GF+8F	77.3/C	- Thermal insulation of the exterior walls with 15 cm insulation.	98.5/B	48.50	48.48	68.38	50.34
Bl. Independentei nr.8 / B+GF+8F	76.9/C	- Changing the windows and exterior access doors. - Insulating / closing the balconies. - Thermal and hydro insulation of the building terrace with 20 cm insulation. - Thermal insulation of the ground floor with 10 cm insulation.	99.10/B	50.92	45.93	70.18	52.86
Bl . Unirii nr.54 /B+GF+8F	79.9/C	- Thermal insulation of the exterior walls with 15 cm insulation. - Changing the windows and exterior access doors. - Insulating / closing the balconies. - Thermal and hydro insulation of the building terrace with 20 cm insulation. - Retrofitting of the warm water distribution network. - Retrofitting of the heating distribution network.	99.7/B	48.09	48.69	66.74	50.06
Bl . Unirii nr.28 / B+GF+8F	79/C	Thermal insulation of the exterior walls with 15 cm insulation. - Changing the windows and exterior access doors. - Insulating / closing the balconies.	99.7/B	50.08	47.02	67.83	51.86

Building	Actual situation, EM/EC	Proposed solutions	Estimated results				
			EM/EC	PER, %	FER, %	HER, %	CO ₂ R, %
		<ul style="list-style-type: none"> - Thermal and hydro insulation of the building terrace with 20 cm insulation. - Retrofitting of the lighting system. 					
Average B+GF+8F				49.40	47.53	68.28	51.28
Bl.Poienitei nr.12 / B+GF+3F	70.2/D	<ul style="list-style-type: none"> - Thermal insulation of the exterior walls with 15 cm insulation. - Changing the windows and exterior access doors. - Insulating / closing the balconies. - Thermal and hydro insulation of the building terrace with 20 cm insulation. - Thermal insulation of the ground floor with 10 cm insulation. - Retrofitting of the lighting system. 	98.5/B	58.23	38.96	76.57	59.97

Note:

EM – energy mark of the building.

EC – energy class of the building.

PER – primary energy reduction.

FER – final energy reduction.

HER – heating energy reduction.

CO₂R – carbon dioxide reduction.

Table 5 The main economic results for the residential buildings.

Building	Estimated investment, RON	SPBP, years
Bl. Brailei nr.7 /B+GF+4F	435160.39	10.3
Bl. Brailei nr.10 /B+GF+4F	364463.82	11.7
Bl. Bucuresti A4 /B+GF+4F	435160.39	12.1
Bl. Cantemir A /B+GF+4F	498978.37	16.1
Bl. Independentei nr.6 /B+GF+8F	809962.79	13.3
Bl. Independentei nr.8 /B+GF+8F	670382.93	10.7
Bl . Unirii nr.54 /B+GF+8F	896093.59	16.7
Bl . Unirii nr.28 /B+GF+8F	695944.13	12.1
Bl.Poienitei nr.12 /B+GF+3F	480405.38	12.7

Note:

RON – Romanian Leu (Romanian national currency).

SPBP – Simple Pay Back Period.

Table 6 shows the Gantt diagram including the planning of replication activities and work breakdown structure for the following residential buildings:

- Bl. Brailei nr.7 /B+GF+4F.
- Bl. Brailei nr.10 /B+GF+4F.
- Bl. Bucuresti A4 /B+GF+4F.
- Bl. Cantemir A /B+GF+4F.

Table 6. Gantt diagram for the B+GF+4F residential buildings.

Stage / Activity	Month							
	1	2	3	4	5	6	7	8
Energy efficiency measures implementation								
1. Environmental protection works								
1.1. Green spaces and pavements redo works								
2. Common energy efficiency measures works								
2.1. Common windows change								
2.2 External walls insulation								
2.3. Thermal and hydro insulation of the building terrace								
2.4. Thermal insulation of the ground floor								
3. Individual energy efficiency measures works								
3.1. Individual windows change								
4. Other works								
4.1. Other common works								
4.2. Other individual works								
5. Organization of works								

Table 7 shows the Gantt diagram including the planning of replication activities and work breakdown structure for the following residential buildings:

- Bl. Independentei nr.6 / B+GF+8F.



- Bl. Independentei nr.8 / B+GF+8F.

Table 7. Gantt diagram for the Bl. Independentei nr.6 / B+GF+8F and Bl. Independentei nr.8 / B+GF+8F residential buildings.

Stage / Activity	Month							
	1	2	3	4	5	6	7	8
Energy efficiency measures implementation								
1. Environmental protection works								
1.1. Green spaces and pavements redo works								
2. Common energy efficiency measures works								
2.1. Common windows change								
2.2 External walls insulation								
2.3. Thermal and hydro insulation of the building terrace								
3. Individual energy efficiency measures works								
3.1. Individual windows change								
4. Other works								
4.1. Other common works								
4.2. Retrofitting of the drainage system								
4.3. Other individual works								
5. Organization of works								

Table 8. Shows the Gantt diagram including the planning of replication activities and work breakdown structure for the Bl . Unirii nr.54 /B+GF+8F residential building.

Table 8. Gantt diagram for the Bl . Unirii nr.54 /B+GF+8F residential building.

Stage / Activity	Month							
	1	2	3	4	5	6	7	8
Energy efficiency measures implementation								
1. Environmental protection works								
1.1. Green spaces and pavements redo works								
2. Common energy efficiency measures works								
2.1. Common windows change								
2.2 External walls insulation								
2.3. Thermal and hydro insulation of the building terrace								
2.4. Thermal insulation of the ground floor								
2.5. Retrofitting of the warm water network								
3. Individual energy efficiency measures works								
3.1. Individual windows change								
4. Other works								

Table 9 shows the Gantt diagram including the planning of replication activities and work breakdown structure for the Bl . Unirii nr.28 /B+GF+8F residential building.



Table 9. Gantt diagram for the Bl. Unirii nr.28 /B+GF+8F residential building.

Stage / Activity	Month							
	1	2	3	4	5	6	7	8
Energy efficiency measures implementation								
1. Environmental protection works								
1.1. Green spaces and pavements redo works								
2. Common energy efficiency measures works								
2.1. Common windows change								
2.2 External walls insulation								
2.3. Thermal and hydro insulation of the building terrace								
2.4. Retrofitting of the lighting system								
3. Individual energy efficiency measures works								
3.1. Individual windows change								
4. Other works								
4.1. Other common works								
4.2. Electrical equipment common spaces								
4.3. Retrofitting of warm water system								
4.4. Other individual works								
5. Organization of works								

Table 10 shows the Gantt diagram including the planning of replication activities and work breakdown structure for the Bl.Poienitei nr.12 / B+GF+3F residential building.

Table 10. Gantt diagram for the Bl.Poienitei nr.12 / B+GF+3F residential building.

Stage / Activity	Month							
	1	2	3	4	5	6	7	8
Energy efficiency measures implementation								
1. Environmental protection works								
Green spaces and pavements redo works								
2. Common energy efficiency measures works								
2.1. Common windows change								
2.2 External walls insulation								
2.3. Thermal and hydro insulation of the building terrace								
2.4. Thermal insulation of the ground floor								
3. Individual energy efficiency measures works								
3.1. Individual windows change								
4. Other works								
4.1. Other common works								
4.2. Other individual works								
5. Organization of works								

The 11 public buildings chosen for retrofitting are all from the education sector, and include schools, colleges, etc. These public buildings can be divided into two categories depending on the energy efficiency measures proposed:

- Public buildings analyzed for retrofitting including only energy efficiency measures.
- Public buildings analyzed for retrofitting including energy efficiency measures and utilization of renewable energy sources.

The analysis of each building has been performed based on the following energy, economic and environmental criteria {11-21}:

- Energy performance certificate of the building.
- Energy class of the building.
- Total specific annual primary energy consumption.
- Total specific annual final energy consumption.
- Total specific annual final energy consumption for heating.
- Total specific annual final energy consumption for warm water preparation.
- Total specific annual final energy consumption for heating for lighting.
- Equivalent CO₂ emissions factor.

All these criteria have been calculated for all public buildings before and after implementation of specific energy efficiency measures and solutions for utilization of renewable energy sources.

There have also been calculated for each building the following criteria:

- Annual energy savings.
- Annual financial savings.
- Estimated investment for the energy efficiency measures.
- Simple Pay Back Period for the proposed energy efficiency measures.

The main energy efficiency measures proposed for public buildings include the following:

- Thermal insulation of the exterior walls.
- Changing the windows with new more energy efficient ones.
- Insulating/closing the balconies.
- Thermal and hydro insulation of the building terrace.
- Thermal insulation of the ground floor.
- Retrofitting of the warm water system.
- Retrofitting of the lighting system.
- Utilization of renewable energy sources for heat generation.

Table 11 shows a summary of the energy, economic and environmental analysis including the main energy and environmental criteria.

Table 12 shows the main economic results for the residential buildings.

Table 11. Summary of the energy, economic and environmental analysis for the public buildings in Focsani city.

Building	Actual situation, EM/EC	Proposed solutions	Estimated results				
			EM/EC	PER, %	FER, %	HER, %	CO ₂ R, %
Colegiul tehnic Gh. Asachi GF+3F a) Internat b) Cantina	a) 80,6/B b) 61.9/D	- Thermal insulation of the exterior walls. - Changing the windows and exterior access doors. - Thermal and hydro insulation of the building terrace. - Thermal insulation of the ground floor.	a) 100/A b) 94.6/B	a) 39.63 b) 37.26	a) 39.61 b) 43.39	a) 57.88 b) 66.39	a) 38 b) 32
Scoala Gimnaziala Ion BASGAN B+GF+3F	91.5/B	- Retrofitting of the sanitary warm water system, including equipping with automation devices for reducing water consumption.	100/A	48.56	48.58	58.13	46.87
Scoala gimnaziala- Duiliu Zamfirescu GF+2F	90/B	- Retrofitting of the heating system. - Retrofitting of the lighting systems, including LED bulbs and different automation sensors for reducing energy consumption.	100/A	34.46	34.58	51	32.88
Average				39.23	41.54	58.35	37.44
Liceul Gheorghe Tatarescu GF+2F	93.9/B	- Thermal insulation of the exterior walls. - Changing the windows and exterior access doors. - Thermal and hydro insulation of the building terrace.	100/A	41.17	41.71	54.60	35.18
Colegiul economic M. Kogalniceanu B+GF+2F	69.32/D	- Thermal insulation of the ground floor. - Retrofitting of the lighting systems, including LED bulbs.	99.55/A	70	71.57	77.50	72.32
Scoala Gimnaziala Aghel Saligny B+GF+2F	71.17/D	- Integration of a heat pump for heat generation. - Integration of solar thermal panels for warm water preparation. Integration of photovoltaic panels for power generation.	100/A	68.66	71.75	77	73.22
Average				59.94	61.68	69.7	60.24

Note:

EM – energy mark of the building.

EC – energy class of the building.

PER – primary energy reduction.

FER – final energy reduction.

HER – heating energy reduction.

CO₂R – carbon dioxide reduction.

Table 12. The main economic results for the public buildings.

Building	Estimated investment, RON	SPBP, years
Colegiul tehnic Gh. Asachi GF+3F a) Internat	788057.32	9
Colegiul tehnic Gh. Asachi GF+3F b) Cantina	278548.85	6.6
Scoala Gimnaziala Ion BASGAN B+GF+3F	788057.32	9
Scoala gimnaziala- Duiliu Zamfirescu GF+2F	701807.07	12.2
Liceul Gheorghe Tatarescu GF+2F	501943.56	8.36
Colegiul economic M. Kogalniceanu B+GF+2F	652813	3.49
Scoala Gimnaziala Aghel Saligny B+GF+2F	1179853	3.8

Note:

RON – Romanian Leu (Romanian national currency).

SPBP – Simple Pay Back Period.

Table 13 shows the Gantt diagram including the planning of replication activities and work breakdown structure for the following public buildings:

- Colegiul tehnic Gh. Asachi GF+3F Internat + Cantina.
- Scoala Gimnaziala Ion BASGAN B+GF+3F.
- Scoala gimnaziala- Duiliu Zamfirescu GF+2F.
- Liceul Gheorghe Tatarescu GF+2F.

Table 13. Gantt diagram for the above-mentioned public building.

Stage / Activity	Month											
	1	2	3	4	5	6	7	8	9	10	11	12
Energy efficiency measures implementation												
1. Land study												
2. Documentation for authorizations												
3. Technical expertise												
4 Energy performance analysis of buildings												
5. Design												
6. Public procurement												
7. Consulting												
8. Technical assistance												
9. Construction and installation												
10. Installation of technological equipment												
11. Other works												
12. Tests and putting into operation												



Table 14 shows the Gantt diagram including the planning of replication activities and work breakdown structure for the following public buildings:

- Colegiul economic M. Kogalniceanu B+GF+2F.
- Scoala Gimnaziala Aghel Saligny B+GF+2F.

Table 14. Gantt diagram for the above-mentioned public building.

Stage / Activity	Year I												Year II											
	Trim 1			Trim2			Trim3			Trim4			Trim1			Trim2			Trim3			Trim4		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
1. Design procurement																								
2. Design																								
3. Land study																								
4. Authorizations																								
5. Public procurement																								
6. Technical assistance																								
7. Constructio + equipment installation																								
8. Other works																								
9. Tests and putting into operation																								

The implementation of this specific Integrated solution can face several barriers and drivers, as presented below.

1. Technical Bounds & Drivers: One bound can be due to different specific issues for any analyzed case/building the utilization of a certain technology cannot be possible. A driver in this case can be the fact that in Romania these solutions have not been implemented before on a large scale, so today there can be used the best available technologies on the market.
2. Legal: There are still Bounds regarding legal framework, especially with lack of some secondary legislation. On the other hand, Romanian legal framework should completely align to EU legislation, which can be considered as a Driver for the future project development.
3. Social: There is still a need for increasing the awareness of population regarding the energy efficiency concept and utilization of renewable energy sources.
4. Financial: On the local/national level there is a bound regarding the available financing from the Government. On the other hand, there is available financing through different EU funded programs.
5. Environmental: All energy efficiency measures, and utilization of renewable energy sources can surely lead to reducing pollutant emissions and thus reducing environmental impact.

There should be mentioned that this project regarding the rehabilitation of buildings in Focsani city started already in 2020.

Figure 1 shows the example of the retrofitting building in Focsani city before and after the rehabilitation.



Figure 1. Rehabilitated building in Focsani

Regarding the financing schemes and financial sources for this project there can be mentioned the following aspects:

- There has been signed the financing contract for first 6 blocks of buildings (1 phase) – 1012800.45 euro. The financing is ensured through Regional Development Agency that uses EU funds with Municipality of Focsani participating with 2%.
- There has been signed the financing contract for next 9 blocks of buildings (2 phase) – 1292872.89 euro. The financing is ensured through Regional Development Agency that uses EU funds with Municipality of Focsani participating with 2%.
- There have been signed the financing contracts for 8 public buildings (mainly schools and kindergartens) – 6723200.64 euro. The financing is ensured through Regional Development Agency that uses EU funds with Municipality of Focsani participating with 2%.



Figure 2. Rehabilitated the Technical College "Gheorghe Asachi" Focșani



Figure 3. Rehabilitated the Gymnasium School "Ion Basgan" Focșan



Figure 4. Rehabilitated the Gymnasium School "Duiliu Zamfirescu" Focșani

4.7 Conclusions on ambitions and planning of activities for TT#1 1 Smart renewables and closed-loop energy positive districts

The conclusions on ambitions and planning of integrated solution related to retrofitting residential and public buildings [22-35] are the following:

- The integrated solution is in an advanced stage of implementation.
- There have been elaborated all technical documentation.
- The Municipality of Focșani has prepared all public procurement documentation.
- There have identified and secured financing instruments.
- All activities are well-planned.
- The implementation of this replication project shall start in 2020.

There are also planned next steps regarding rehabilitation and modernization of public buildings in Focșani city [36-48]. At this moment there 9 financing applications that have submitted to the Regional Development Agency. The total amount for this financing is 19344731.3 euro.

There are also projects in early development stages (elaboration of feasibility studies) for which the financing application have not been submitted yet but are in preparation stage. The financing documentation is prepared for 4 public buildings (kindergartens) and 2 residential buildings. And shall be submitted for financing to Regional Development Agency. The total amount for this financing is 6544819.82 euro.

The Municipality of Focșani is also planning to apply for financing for rehabilitation and modernization of public and residential buildings from EU funds 2021-2027 financing program. The Municipality is planning to apply for financing for rehabilitation of about 900 apartments (in blocks of buildings) and the project is

estimated at 7500000 euro. There are three projects for rehabilitation and modernization of 3 public buildings with the total value estimated at 1800000 euro.

5 Transition track #2: Smart energy management and storage for grid flexibility

5.1 TT#2 Replication in a nutshell

The Municipality of Focsani is the legal owner of the district heating company SC ENET SA, which operates the entire district heating system of the city. The district heating system has been developed in the 1970's and since then undergone through several major modernization phases. Initially, the cogeneration plant has been designed to supply heat to industrial and residential consumers. Over the years, the industrial consumption of heat went down, thus having a major negative impact on cogeneration plant. Today, the cogeneration plant supplies heat to residential consumers only. The integrated solution chosen by the Municipality of Focsani from this transition track to be replicated refers to modernization of the entire system, including energy generating facility and district heating network. The modernization of the district heating system is a continuous process. The Municipality of Focsani has already implemented several measures for increasing energy and economic efficiencies. To continue with modernization of the district heating system there have been elaborated following technical documents:

- District heating business strategy for the city of Focsani [49].
- Feasibility study for modernization of Focsani district heating system [50].

There should be also mentioned that SC ENET SA district heating company has been involved in a research project together with University Politehnica of Bucharest. The project analyzed the operation of the energy generating facility and included several proposals for increasing its efficiency. These proposals can also be taken into consideration within this replication activity.

Next major steps of the replication process should include the following:

- Find and secure financing sources.
- Rehabilitation/modernization of district heating system. This shall be done in steps, gradually rehabilitating/modernizing different parts of the system.

The implementation of this integrated solution shall lead to achieving different benefits at the level of Focsani city, i.e.:

- Energy benefit – reducing primary energy consumption (mainly fossil fuel – natural gas) at the energy generating facility.
- Financial benefit – reducing financial resources allocated to district heating company, and the long-term goal is to generate profits from this activity.
- Environmental benefit – reducing environmental pollution through reduction of GHG emissions at the energy generating facility.
- Social – increasing citizen comfort and their affordability to pay energy bills.

5.2 Selection process

The Municipality of Focsani aims at rehabilitating the following parts of the district heating system:

- Transportation network.
- Thermal substations.
- Distribution network.

There can be also implemented several energy efficiency measures at the energy generating facility, including:

- Installation of a heat storage tank.
- Trigeneration - combined production of power, heat and cold.

5.3 Mapping of stakeholders

The main stakeholders that can be involved in the replication process of this integrated solution are:

- Municipality of Focsani.
- SC ENET SA Focsani district heating company.
- Apartments owners through building owners' association.
- Energy service companies that provide services for elaboration of all technical documentation.
- Equipment/materials suppliers that supply different equipment/ materials, e.g. pipes, insulation materials, automation, etc.
- Construction companies that implement this integrated solution on-site.

5.4 Identified knowledge gaps

The Municipality of Focsani through SC ENET SA has great experience in operating a district heating system, since the system has been set up and put into operation about 50 years ago. So, it can be said that there are no major knowledge gaps regarding rehabilitation/modernization of district heating system. However, there might be some small knowledge gaps regarding new automation technologies and intelligent process operation using IT&C technologies. So, this knowledge gap can be tackled in the future knowledge transfer and capacity building. Another knowledge gap is about heat metering at the consumers' site.

5.5 Capacity building and knowledge transfer

The identified knowledge gap for this transition track refers to new automation technologies and intelligent process operation using IT&C technologies and heat metering. These gaps can be overcome through site visits of similar solution developed and implemented in Lighthouse or/and Follower cities. The capacity building on this issue can also be done through internet-based meetings or distributing different technical materials regarding this issue.

5.6 IS-2.2: Smart multi-sourced low temperature district heating (DH) with innovative storage solutions

The replication project, matching this integrated solution, that Municipality of Focsani intends to implement refers to increasing energy efficiency of the district heating system through implementation of different measures at energy generation facility and within the district heating network.

The district heating system (DHS) of Focsani city has been developed and put into operation in 1970's. Back then the system has been primarily designed to generate energy for industrial purposes for covering energy demand of the wood processing factory and at the same time to cover city heat needs for domestic warm water and heating. Initially, the energy generating facility was set up as a boiler house generating only heat for industrial and urban needs. However, shortly after been put into operation the energy generating facility has been transformed into a combined heat and power (CHP) plant. Back then the cogeneration plant was equipped with a steam turbine technology, mainly using natural gas, but sometimes, especially during wintertime, also using fuel oil, as primary energy source.

In 2001 SC ENET SA incorporates both energy generation and transportation/distribution/supply to become a horizontally integrated company for heat supply in Focsani city.

In 2013 the CHP plant underwent a major rehabilitation process allowing to increase its energy and financial efficiency and, at the same time, to reduce its environmental impact. The old, steam turbine-based technology, has been replaced with internal combustion engines. So, today, the cogeneration plant of SC ENET SA of Focsani city includes the following main equipment:

- 2 internal combustion engines of 6.8 MWe of electric power and about 7 MWth of heat installed each.
- 1 10 t/h steam boiler used especially for internal purposes (degassing of the makeup water).
- 2 50 Gcal/h hot water boiler each used for covering heat peak demand, especially during wintertime for covering heating demand.

The internal combustion engines operate for covering base load demand, which usually consists of domestic warm water preparation. During the wintertime engines can also be used for covering parts of heating demand. Hot water boilers are usually used during wintertime for covering heating demand.

The district heating system of Focsani city includes the following parts:

- Primary/transportation district heating network linking heat generating facility and thermal substations.
- Thermal substations used for changing parameters of the district heating working fluid.
- Secondary/distribution district heating network linking thermal substations and final consumers.

SC ENET SA confronts with several problems/issues in operation of the district heating system. Some of them are presented below:

- High disconnection rate of domestic consumers, which leads to different technical and economic operational issues.
- High rates of heat losses (about 37 %, of which about 17 % in the primary/transmission network and about 20 % in the secondary/distribution network) in the district heating network.

- Low operation time of cogeneration equipment, especially during summertime it is operated only one internal combustion engine.
- Operation of cogeneration equipment in periods when electricity tariffs are low, resulting in low revenues, and sometimes even financial losses.
- High variation of heat demand leading equipment operation at partial loads with low efficiency.

All these issues lead poor technical and economic efficiency of the entire district heating system, and at the same time increase the environmental impact compared to an efficient operation.

To tackle all the above-mentioned problems SC ENET SA together with Municipality of Focsani have come up with plan/strategy that includes two main directions:

- Rehabilitation of the district heating network.
- Optimization/improvements/modernization of the cogeneration plant.

There should be mentioned that SC ENET SA together with Municipality of Focsani city are rehabilitating and modernizing the district heating system on a constant basis. There can be mentioned that about 2.8 km of the primary/transportation network, 9 thermal substations and about 11 km of secondary/distribution network have been already rehabilitated and modernized.

The rehabilitation of the district heating network includes the following activities:

- Rehabilitation of 3.635 km of the primary/transportation network.
- Rehabilitation of 7.170 km of the secondary/distribution network.
- Rehabilitation and modernization, including automation and monitoring equipment of 6 thermal substations (PT19, PT29, PT45, PT47, PT48 and PT57).
- Connection of social housing buildings to the district heating system (ANL buildings located in the districts Sud and Democratiei). This activity includes a new district heating network of about 3 km and individual thermal substations at each building. There should be mentioned that this activity shall increase heat demand, and, therefore, equipment time operation, technical and economic efficiency of the district heating system.

The proposed energy efficiency measures to be implemented within the district heating network shall lead to the following technical, economic and environmental advantages:

- Reduction of heat losses in the district heating system with 22.11 TJ/year, leading to fuel savings of 691512 Nm³ of natural gas.
- Connection of the ANL social housing buildings to the district heating system shall lead to improving overall efficiency of the cogeneration plant with about 3 %, and to increasing the operational load, operational time and economic efficiency of the SC ENET SA Focsani.
- Increasing the overall energy efficiency of the entire district heating system shall lead to total fuel (natural gas) savings of about 58 TJ/year.
- The fossil fuel (natural gas) savings shall lead to decreasing of the pollutant emissions, such as:
 - CO₂ emissions decrease – 3265 t/year.
 - NO_x emissions decrease – 2.473 t/year.
 - SO₂ emissions decrease – 0.573 t/year.
 - Dust particles decrease – 0.081 t/year.

The planning of the activities for the rehabilitation of the district heating network is divided into two parts:

- Activities for rehabilitation of the district heating network.
- Activities for connection to the district heating system of ANL social housing buildings.

The activities for rehabilitation of the district heating network include the following:

- Acquisition and installation of the new pre-insulated pipes for the primary and secondary district heating networks, including special automation/early fault detection wires along all pipes (heating, domestic warm water and recirculation of domestic warm water).
- Acquisition and installation at the consumers' limit of property of monitoring equipment.
- Acquisition and installation at the consumers' limit of property of hydraulic equilibration equipment for good operation of the entire district heating system and for ensuring high quality of the district heating service provided to costumers.
- Acquisition and installation of automation and monitoring equipment for the district heating network.
- Acquisition and installation of valves and other fitting equipment needed for primary and secondary district heating networks.
- Acquisition and installation of valves and other fitting equipment needed for all rehabilitated thermal substations and new individual thermal substations.

The activities for connection to the district heating system of ANL social housing buildings include the following:

- Acquisition and installation of the new pre-insulated pipes for the primary and secondary district heating networks, including special automation/early fault detection wires along all pipes (heating, domestic warm water and recirculation of domestic warm water).
- Acquisition and installation of 37 individual thermal substations fully automated. Each individual thermal substation shall include 2 heat exchangers for covering heating demand and 2 heat exchangers for covering domestic warm water demand.

The investment for rehabilitation of the district heating network has been estimated at about 26 million Euro. The payback period for this investment has been calculated at about 8 years.

Table 15 shows the Gantt diagram including the planning of replication activities and work breakdown structure for rehabilitation of the district heating network.

Table 15. Gantt diagram for rehabilitation of district heating network.

Implementation plant																								
Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Consultancy																								
Procurement, acquisition																								
Execution																								
Technical assistance																								
Procurement, acquisition																								
Execution																								
Audit																								

the financial revenues of district heating companies. The main advantages of heat storage implementation at a cogeneration plant within a district heating system are the following:

- A higher global energy efficiency of fossil fuel utilization.
- Optimal, close to full load, operation of cogeneration equipment.
- Reduced environmental impact.
- Electricity generation during the high tariff's periods.
- More stable operation of district heating networks.

The implementation of absorption chilling machine can lead to utilization of both cogeneration units almost all year long. This fact can lead to some advantages, like:

- Diversifying the portfolio of the district heating company (another costumer and sales of heat, electricity and cold).
- Improving the cash flow during summertime.
- Increasing the annual turnover of the district heating company.
- Improving the financial efficiency of the district heating company.

The technical and economic analysis has been performed for three scenarios:

- Scenario 1 – implementation of only heat storage tank.
- Scenario 2 – implementation of only absorption chilling machine.
- Scenario 3 – implementation of both heat storage tank and absorption chilling machine.

The results of the economic analysis of the three above-mentioned scenarios are presented in table 16.

Table 16. Main results of the economic analysis for the implementation of heat storage tank and absorption chilling machine for 3 scenarios.

	Scenario 1	Scenario 2	Scenario 3
Investment costs, Euro	94000	531000	625000
Annual profit, Euro	95000	109000	204000
SPP, years	1	4.9	3.1
NPV, Euro	650000	361000	1000000
IRR, %	101	20	33

The implementation of this specific Integrated solution can face several barriers and drivers, as presented below.

1. Technical Bounds & Drivers: There can be said that there are no major technical barriers for implementation of this integrated solution. However, there might some technical issues regarding absorption chilling machine since SC ENET SA has no experience with this type of equipment. A driver in this case can be the fact that SC ENET SA together Municipality of Focsani have already started rehabilitation and modernization of district heating system.
2. Legal: There can be some legal barriers, especially with lack of some secondary legislation, that put some difficulties with project implementation, e.g. equipment installation at consumers' property limit. However, this barrier can be overcome through Local Council implication and creation of local legal framework.

3. Social: There is a great need for increasing the awareness of population regarding all benefits of a district heating system. Of course, such a system should be modernized, well-operated and efficient from all points of view.
4. Financial: On the local/national level there is a bound regarding the available financing from the Government. On the other hand, there is available financing through different EU funded programs.
5. Environmental: All measures proposed within this transition track can surely lead to reducing pollutant emissions and thus reducing environmental impact.

Regarding the financing schemes and financial opportunities for this project there should be mentioned the following:

- There has been signed the financing contract for rehabilitation and modernization of the district heating system with a total value of 14379936.98 euro. The financing shall be ensured through the Regional Development Agency with 2% participation of the Municipality.

5.7 Conclusions on ambitions and planning of activities for TT#2 Smart Energy Management and Storage for Energy Grid Flexibility

The conclusions on ambitions and planning of integrated solution related to smart multi-sourced low temperature district heating (DH) with innovative storage solutions are the following:

- The integrated solution is still in an early stage of implementation.
- There have only been elaborated initial technical documentation, i.e. feasibility studies.
- There have been identified financing sources for implementation of this solution.
- There should be elaborated an implementation plan, including work breakdown structure.
- The implementation of this integrated solution needs more involvement both from local district heating company SC ENET SA and the Municipality of Focsani.

The Municipality of Focsani has also prepared the financial application for the next phase of rehabilitation and modernization of the district heating system of the city. The Municipality applied for financing from Regional Development Agency for 12892738.44 euro.

The Municipality of Focsani is also planning to apply for financing from EU funds 2021-2027 program for rehabilitation and modernization of district heating system. The estimated value for financial application from EU funds is 20000000 euro.

The modernization of district heating system of Focsani city is part of the Municipality's Master Plan regarding centralized heat supply.

6 Transition track #3: Smart e-mobility sector

6.1 TT#3 Replication in a nutshell

The Municipality of Focsani has been analyzing the issues regarding to mobility in the city for quite a long time. This high interest is due to its strong determination to develop the city in a sustainable manner, and mobility sector is one of the major components of its sustainable development plan. The Municipality of Focsani is interested in replication of both integrated solutions within this transition track. These integrated solutions relate to electric vehicle/bus use and charge and different innovative mobility services for citizens. There are several major projects that are already under analysis. For each of this major project there has been elaborated different technical documentation, as presented below:

- Opportunity study, including traffic management study for modernization of the public transportation in the city of Focsani [51-53].
- Feasibility study for development of bicycle tracks and implementation of a bike-sharing system in the city [54-55].
- Technical documentation for re-systematization of the public transportation infrastructure for increasing its attractiveness [56-57].

Next major steps of the replication process include the following:

- Public procurement procedure for selection of equipment/works/services providers.
- Implementation on-site of each major mobility project.
- Reception of works.

The implementation of all major projects in the mobility sector of Focsani city has the following goals/objectives/aims:

- Development of the public transportation infrastructure, including special lanes for busses.
- Stimulation of utilization of public transportation by citizens through limitation of vehicles access into downtown city.
- Utilization of electric busses, including implementation of electric busses charging stations using photovoltaic solar panels.
- Development of bicycle tracks and implementation of a bike-sharing system in the city.
- Extension of the parking areas within the city.

The implementation of the smart mobility integrated solutions in Focsani city shall lead to different benefits, such as:

- Environmental - reducing environmental pollution through reducing Green House Gasses (GHG) emissions.
- Social – increasing citizen comfort and satisfaction.

6.2 Selection process

For transition track 3 the Municipality of Focsani intends to implement 4 major projects, each of them including several components:

- Electric vehicle/bus charging stations, including:
 - Slow charging stations for electric busses.
 - Fast charging stations for electric busses.
 - Fast charging stations for electric vehicles.
- Modernization of the public transportation and acquisition of electric busses, including:
 - Acquisition of 9 electric busses with 70 places and 7 electric busses with 25 places.
 - Implementation of an e-ticketing system for entire public transportation fleet.
 - Implementation of an information system for citizens in major bus stations.
 - Development of a software applications for urban mobility for facilitating access to public transportation (citizens and tourists), including ticketing. The application shall also be as a travel system for routes optimization.
 - Monitoring and management system for busses' fleet.
 - Passengers' safety and security system in busses.
- Modernization and re-systematization of the public transportation infrastructure:
 - Rehabilitation of road infrastructure.
 - Special lanes for public transportation.
 - Rehabilitation of sidewalks.
 - Bicycle tracks.
 - Smart bus stations.
 - Preparing infrastructure for smart mobility management system.
- Implementation of a bike-sharing system, including:
 - Smart bicycles fleet with on-board computer and smart access.
 - Smart docking stations for bicycles.
 - Bike renting terminal.
 - Bike repairing stations.
 - Common ticketing system with public transportation.

6.3 Mapping of stakeholders

The main stakeholders that can be involved in the replication process of integrated solutions within this transition track are:

- Municipality of Focsani.
- Public transportation company.
- Citizens.
- Equipment/materials/services suppliers.
- Construction companies that implement integrated solutions/projects on-site.

6.4 Identified knowledge gaps

The knowledge gaps identified for this transition track refer to:

- Types of electric busses that can be used.
- Different types of electric charging stations.
- E-ticketing system.
- Monitoring and management system for busses' fleet.
- Bike-sharing system.

All these knowledge gaps can be, and some of them have already been, addressed within IRIS project through different capacity building and knowledge transfer activities.

6.5 Capacity building and knowledge transfer

Some of the identified knowledge gaps have already been addressed through different activities within IRIS project, e.g. webinars for electric busses, on-site visits in different Lighthouse cities, etc. Capacity building and knowledge transfer within this transition track shall continue, at least for the project duration. However, there should be mentioned that Focsani Municipality representatives have already established contacts with different project partners to tackle the issues of capacity building and knowledge transfer regarding smart mobility issues.

6.6 IS-3.1: Smart Solar V2G EVs charging

The Municipality of Focsani is in the process of implementation of an infrastructure for electric vehicles/busses charging stations. This infrastructure shall include 20 charging stations placed throughout the city. The electric charging stations shall be of two types: slow charging station and fast charging station. The strategy for bus charging shall be developed based on technical specifications of electric busses and specificity of public transportation routes/lines. This replication integrated solution includes 3 types of charging station:

- Slow charging stations for electric busses.
- Fast charging stations for electric busses.
- Fast charging stations for electric vehicles.

There should be mentioned that slow charging stations shall allow full charge up to 100 %, fast charging stations shall take about 2 to 10 minutes.

Slow charging stations for electric busses

The slow charging stations for electric busses will be designed in such a way so they can ensure at least 40 kW per bus. The slow charging is designed to take place during the night by coupling the electric bus to the low voltage network (400 V). Depending on the battery stack capacity the full charging shall take up to 6 hours. The charging stations shall be equipped with a standardized coupling equipment and with a friendly user interface allowing bus drivers to take all necessary individual steps for bus charging. The

process of slow charging shall lead to 100 % of battery stack. The main characteristics of a slow charging station shall include:

- Possibility for charging 24 hours 7days a week.
- Possibility for decoupling in emergency cases.
- Electric equipment protection level at least IP 44.
- Charging tension 400 V.
- Charging power 40 kW/bus at minimum 100 A.
- User friendly interface.
- Energy monitoring system.
- High energy efficiency class.
- Power factor at least 0.98.

Fast charging stations for electric busses

The fast charging stations for electric busses shall be able to deliver at least 300 kW for battery charging within a time of 2 to 10 minutes. The main characteristics of a slow charging station shall include:

- Possibility for charging 24 hours 7days a week.
- Possibility for decoupling in emergency cases.
- Electric equipment protection level at least IP 44.
- Charging tension 400 V.
- Charging power 300 kW/bus at minimum 750 A.
- User friendly interface.
- Energy monitoring system.
- High energy efficiency class.
- Power factor at least 0.98.

The fast charging process should be simple allowing bus driver to operate it easy and fast. Figure 5 shows the location of 5 fast charging stations for electric busses.



Figure 5. Location of 5 fast charging stations for electric busses.

Taking into consideration all specific characteristics of bus lines in Focsani city, there can be said that one bus line has a length between 135 and 276 km. This leads to conclusion that there shall be enough 2 fast charging per day per bus.

Fast charging stations for electric vehicles

The Municipality of Focsani intends to install 4 fast charging stations for electric vehicles. This measure aims at stimulating the utilization of electric vehicles. The fast charging stations shall be located along the main following routes: Bd. Cuza Voda, Bd. Unirii, Bd. Bucuresti and Bd. Independentei. The locations for fast charging stations have been chosen in such a way so they can be easily accessible with minimum supplementary movement for potential users.

This specific project shall lead to increasing the number of electric vehicles in Focsani city, reducing environmental pollution and traffic agglomeration, especially in the downtown city, and improving social satisfaction of citizens.

The implementation of this specific Integrated solution can face several barriers and drivers, as presented below.

1. Technical Bounds & Drivers: There can be different technical barriers/issues along project implementation. The main identified technical barriers are regarding to power infrastructure needed to be in place for electric charging stations, compatibility of electric charging stations with

local power network, availability of power in the local network. All these technical barriers can be overcome with a good planning and analysis of the project.

2. Legal: There can be some legal barriers regarding electric charging stations location and operation. However, these barriers can be overcome through Local Council implication and creation of local legal framework.
3. Social: There is a great need for increasing the awareness of population regarding all benefits of an innovative mobility system in Focsani city. This can be done through information and through citizens' involvement.
4. Financial: On the local/national level there is a bound regarding the available financing from the Government. On the other hand, there is available financing through different EU funded programs.
5. Environmental: All measures proposed within this integrated solution can surely lead to reducing pollutant emissions and thus reducing environmental impact.

6.7 IS-3.2: Innovative Mobility Services for the Citizens

Today the Municipality of Focsani operates a public transportation system including 9 lines with a total length of 143 km. In the near future the Municipality of Focsani intends to modernize its public transportation system, including 2 new lines and tracks for bicycles. Also, for some public transportation lines there shall be introduced electric busses. Another project within this integrated solution relates to bike-sharing. The main components of this integrated solution are as follows:

- Modernization of public transportation, including acquisition of electric busses.
- Modernization and re-systematization of public transportation infrastructure.
- Implementation of bike-sharing concept.

The main goals/objectives of this integrated solution are as follows:

- Increasing the attractiveness utilization of public transportation system.
- Increasing the efficiency of public transportation system and at the same time decreasing fossil fuel consumption.
- Implementation of special lanes for public transportation.
- Improving transportation in the city of Focsani.
- Increasing safety of all traffic participants.
- Increasing the attractiveness of bicycle utilization through development of specific infrastructure.
- Reduction of pollutant emissions.
- Promotion of urban public transportation as a viable solution for citizens.
- Reduction of number of accidents and increasing traffic safety for all traffic participants.

Modernization of public transportation, including acquisition of electric busses

Today the public transportation of Focsani city consists of 9 lines having a total length of 143 km. The modernization of public transportation system includes creation of 2 new lines. Another innovative

solution refers to acquisition of electric busses. Figure 6 presents the public transportation system of Focsani city.

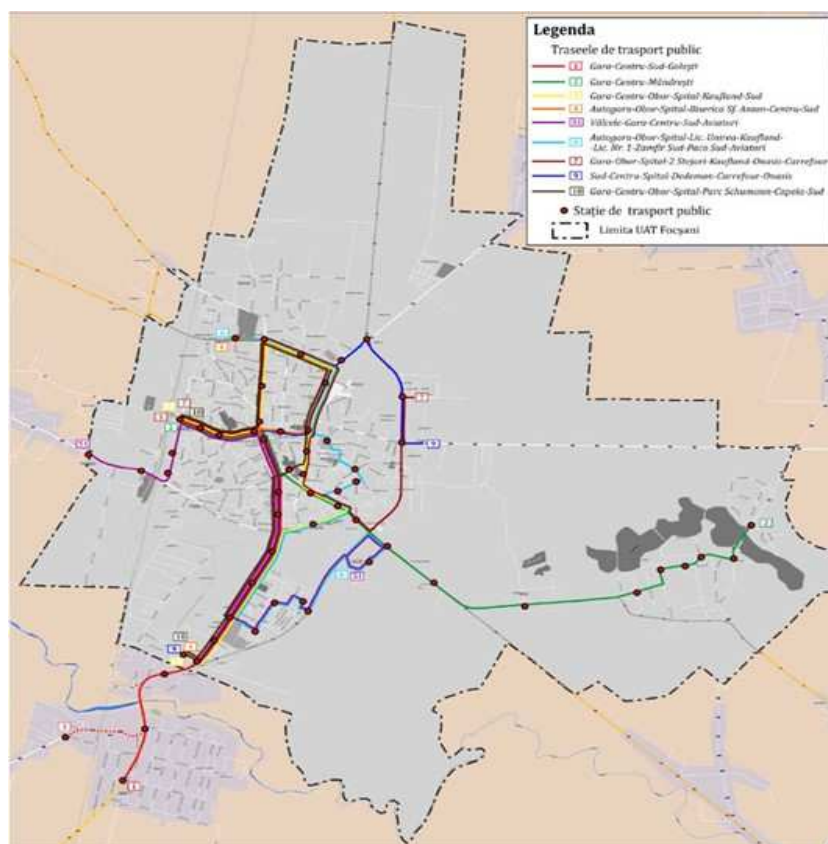


Figure 6. Public transportation system of Focsani city.

The technical study has included a detailed calculation of number of busses need for each line, time between two busses, bus passenger capacity, maximum number pf passengers, time duration for a complete round-up, resulting the exact number of needed buses for a specific transportation line. Analyzing the performed technical study there can be drawn the following conclusions:

- The average operation load of public transportation system is 76 %, which can be considered efficient and at the same time comfortable for citizens.
- For some bus lines there can crowding times at the end of the line; in this case there should be increased the number of busses, and this can be done through a bus fleet management.
- In the downtown area, for 5 different bus lines, there can be times with low passengers' flow, which shall lead to decreasing the number of busses, and this can also be done through a bus fleet management, including changing the bus with 70 passenger capacity with one with 25 passenger capacity.

The implementation of this project within this integrated solution can lead to the following results:

- Ensuring transportation capacity with 30 % greater than for 2018.
- Ensuring public transportation in areas where there is no such option today through introduction of 2 new lines.

- Increasing the frequency of busses with at least 20 % on lines 1, 2, 3, and 6, considered as being priority for Focsani city, the first 3 ones are the most crowded ones.
- Increasing the quality and attractiveness of public transportation.
- Improving the connectiveness of public transportation system due to introduction of two new lines.

So, in order to achieve all modernization purposes of public transportation system, the Municipality of Focsani decided to acquire electric busses. There shall be acquired 9 electric busses with 70 passenger places and 7 electric busses with 25 passenger places capacity.

Table 17 shows the Gantt diagram including the planning of replication activities and work breakdown structure for the modernization of public transportation.

Table 17. Gantt diagram for the modernization of public transportation.

No	Activity	Previous activity	Months																							
			Month 1-6						Months 7-12						Months 13-18						Months 19-24					
1	Elaboration of Sustainable Urban Mobility Plan																									
2	Elaboration of opportunity study and financing application																									
3	Signing of financial contracts																									
4	Design and engineering																									
5	Public acquisition																									
6	Organization and logistics																									
7	Delivery and installation																									
7.1	Electric busses and charging infrastructure delivery																									
7.2	Delivery and installation of electric equipment																									
7.3	Delivery and installation of communication system																									
8	Putting into operation and tests																									
9	Works reception																									
10	Other activities																									
10.1	Project management																									
10.2	Technical assistance																									
10.3	Audit																									
10.4	Information, communication and advertising																									

Modernization and re-systematization of public transportation infrastructure

On component of this integrated solution that Municipality of Focsani intends to implement is related to modernization and re-systematization of public transportation infrastructure. The main goal of this project is to increase the attractiveness and accessibility of citizens to public transportation. Figure 7 shows the re-systematization of the public transportation infrastructure in Focsani city.



Figure 7. Re-systematization of public transportation infrastructure in Focsani city.

Modernization and re-systematization of public transportation infrastructure in Focsani city includes the following main components:

- Modernization and re-systematization of about 19 km of road/routes.
- Arranging of about 33,000 m² of green areas.
- Secondary works on modernized roads.
- Installation of 61 smart public transportation stations.

- Installation of anti-parking bollards, including retractable bollards for some areas with weekend access.
- Preparation works for all communication infrastructure used throughout the city.

Table 18 shows the Gantt diagram including the planning of replication activities and work breakdown structure for the modernization and re-systematization of public transportation infrastructure.

Table 18. Gantt diagram for the modernization and re-systematization of public transportation infrastructure.

No	Activity	Previous activity	Months																							
			Month 1-6						Month 7-12						Month 13-18						Month 19-24					
1	Elaboration of Sustainable Mobility Plan																									
2	Elaboration of opportunity study and financial application																									
3	Financing contract signing																									
4	Design and engineering																									
5	Public procurement																									
6	Organization and logistics																									
7	Construction and installation works																									
8	Putting into operation and tests																									
9	Works reception																									
10	Other activities																									
10.1	Project management																									
10.2	Technical assistance																									
10.3	On-site supervision																									
10.4	Audit																									
10.5	Information, communication and advertising																									

Implementation of bike-sharing concept

The Municipality of Focsani has already started to implement projects for creating an infrastructure dedicated to bicycles. Today, there are two bicycle tracks that can be used in Focsani city, see Figure 8.

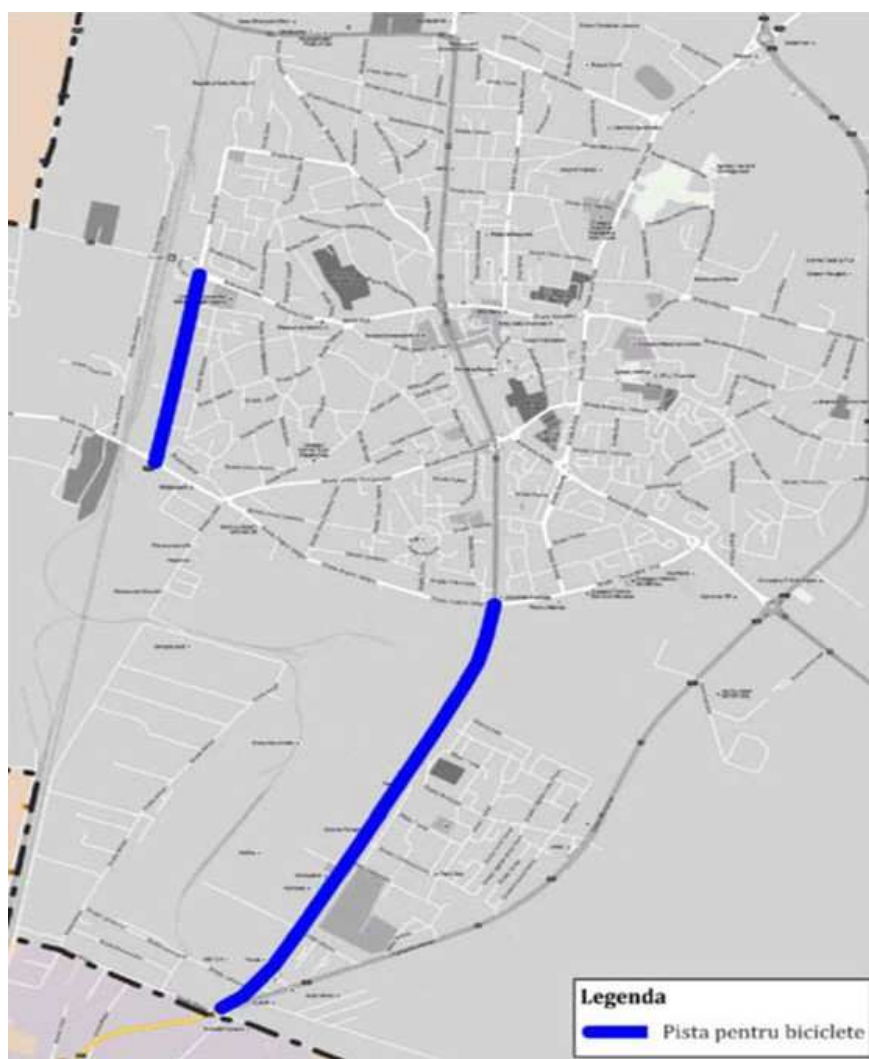


Figure 8. Bicycle tracks in Focsani city.

However, these existing bicycle tracks are singular, not connected into a network that would allow access on bicycle into different parts of the city. There is neither a bike renting system implemented in Focsani city. So, taking all above into consideration the Municipality of Focsani intends to implement an intelligent bicycle transportation system that would very well integrate into the concept of Smart City / Smart Mobility and Sustainable Development.

The Municipality of Focsani has elaborated a feasibility study regarding development and implementation of bicycle tracks and bike-sharing system. The main problems revealed regarding these issues are the following:

- Reduced safety of bicycle riding, especially due to fact that today bicycle riding is done on the sidewalk and there are cars parked there and the lack of special signs for bicycle.
- There is no bicycle network in Focsani city.
- There is no bike-sharing system in the city that can stimulate and attract bicycle riding.

Taking into consideration all mentioned above, the Municipality of Focsani intends to further develop the bicycle-based transportation system. In this regard there are two distinctive projects:

- Development of bicycle infrastructure, including bicycle tracks.
- Implementation of a bike-sharing system.

The development of the bicycle infrastructure in the city of Focsani is planned to be done in different parts of the city, and shall include the following areas with bicycle tracks:

- Str. Republicii between Str. Cuza Voda and Bd. Garii.
- Bd. Garii between Str. Republicii and Str. Prof. Gheorghe Longinescu.
- Str. Aurora between Bd. Independentei and Str. Mare a Unirii.
- Str. Ana Ipatescu between Str. Mare a Unirii and Str. Cuza Voda.
- Str. Mare a Unirii between Str. Aurora and Str. Marasesti.
- Str. Maior Gheorghe Pastia between Bd. Unirii and Str. Cuza Voda.
- Bd. Brailei between Str. Maior Gheorghe Pastia and Str. 1 Decembrie 1918.

Figure 9. Shows the city areas where the bicycle tracks shall be implemented.

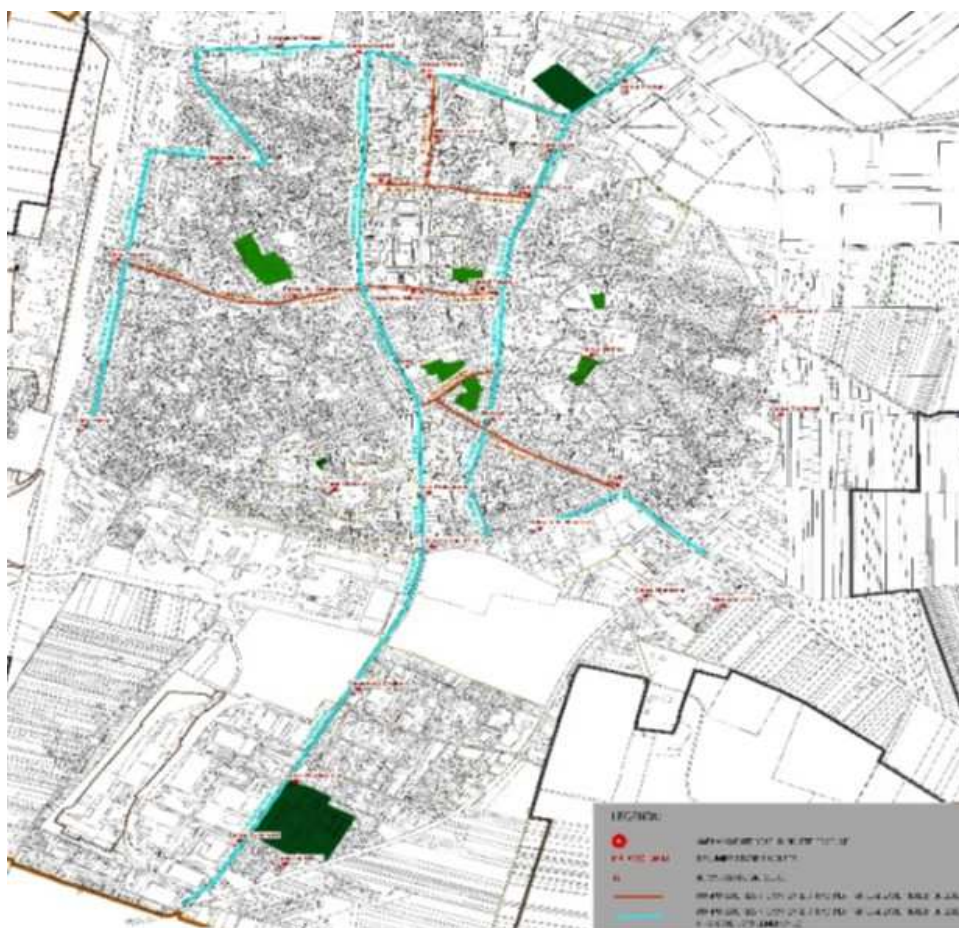


Figure 9. Location of bicycle tracks in Focsani.

The bike-sharing system shall include the following components:

- Intelligent terminals for bike renting.
- Intelligent bike returning stations.
- Intelligent bicycles with on-board computer.
- Intelligent tricycles with on-board computer.
- Communication and operation center.
- Software application with multi-language support.
- Bicycle repair stations.
- Repair kits.

The bike-sharing system shall include an integrated ticketing system, which shall allow utilization in parallel of the bike-sharing system and public transportation system.

Table 19 shows the Gantt diagram including the planning of replication activities and work breakdown structure for the implementation of the bike-sharing system.

Table 19. Gantt diagram for the bike-sharing system.

No	Activity	Previous activity	Months																							
			Month 1-6						Month 7-12						Month 13-18						Month 19-24					
1	Project preparation																									
1.1	Elaboration of land studies																									
1.2	Elaboration of feasibility study																									
1.3	Elaboration of financing application																									
1.4	Approval of financing application																									
2	Signing of financing contract																									
3	Public procurement																									
4	Design and engineering																									
4.1	Technical project																									
4.2	Authorizations																									
4.3	Project verification																									
5	Acquisition and installation																									
5.1	Organization and logistics																									
5.2	System supply and installation																									
6	Putting into operation and tests																									
7	Reception of system																									
8	Other activities																									
8.1	Project management																									
8.2	Technical assistance																									
8.3	Works supervision																									
8.4	Audit																									

8.5

communication and advertising

The implementation of all innovative mobility projects in the city of Focsani shall lead to achieving the following mobility, social and environmental results:

- Increase of number of passengers using public transportation.
 - 20250 passengers/day in 2021, which is with 2539 passengers more than before project implementation, representing an increase of 14.3%.
 - 23003 passengers/day in 2026, which is with 5866 passengers more than before project implementation, representing an increase of 34.2%.
- Increase of number of people using bicycles.
 - 4459 people/day in 2026, which is with 1480 people more than before project implementation, representing an increase of 24.1 %.
- Reduction of CO₂ emissions due to transportation.
 - Reduction with 2629 tons of CO₂ in 2021, which is a decrease with 5.3 % compared to period before project implementation.
 - Reduction with 6513 tons of CO₂ in 2026, which is a decrease with 12.1 % compared to period before project implementation.

The implementation of this specific Integrated solution can face several barriers and drivers, as presented below.

1. **Technical Bounds & Drivers:** There can be different technical barriers/issues along project implementation. The main identified technical barriers are regarding to electric busses choosing, bike-sharing system, software application for innovative mobility. All these technical barriers can be overcome with a knowledge exchange and capacity building, which has already started on some issues.
2. **Legal:** There can be some legal barriers regarding electric busses and bike-sharing. However, these barriers can be overcome through Local Council implication and creation of local legal framework.
3. **Social:** There is a great need for increasing the awareness of population regarding all benefits of an innovative mobility system in Focsani city. This can be done through information and through citizens' involvement. There should be also mentioned that through implementation of bike-sharing system there can be created some additional jobs in Focsani city
4. **Financial:** On the local/national level there is a bound regarding the available financing from the Government. On the other hand, there is available financing through different EU funded programs.
5. **Environmental:** All measures proposed within this integrated solution can surely lead to reducing pollutant emissions and thus reducing environmental impact.

The Municipality of Focsani has signed the financing contracts for the following parts of this complex project:

- Re-Systematization of public transportation infrastructure – 15121508.51 euro.
- Modernization of public transportation – 7889423.10 euro.
- Bike-sharing project – 22483700.74 euro.
- 20 electric busses – 11160551.13 euro.

These signed financing contracts shall be financed through the Regional Development Agency. The electric busses project shall be implemented in partnership with Ministry of Regional Development.

6.8 Conclusions on ambitions and planning of activities for TT #3 Smart e-Mobility Sector

The conclusions on ambitions and planning of integrated solutions related to smart e-mobility sector are the following:

- The integrated solutions are in an advanced stage of implementation.
- There have been elaborated all technical documentation.
- The Municipality of Focsani has prepared all public procurement documentation.
- There have identified and secured financing instruments for some projects, parts of this transition track; for other projects there is still needed to identify financing sources.
- All activities are well-planned.

The Municipality of Focsani intends to apply for EU funds through 2021-2027 financing program for development of the public transportation infrastructure including increasing the attractiveness of public transportation. The value of financing is 13000000 euro.

7 Transition track #4: City innovation platform

7.1 TT#4 Replication in a nutshell

The issue of digitalization is a very important matter for the Municipality of Focsani since it can support and contribute to the implementation of the sustainable development concept. The Municipality of Focsani aims at replicating 3 of 4 integrated solutions. The integrated solutions that Municipality of Focsani is interested in are related to:

- Services for urban monitoring.
- Services for city management and planning.
- Services for mobility.

For each integrated solution there is a project that is being developed by the Municipality of Focsani. The first steps taken for projects implementation refer to technical documentation elaboration, and there has been elaborated different documentation, as presented below:

- Feasibility study for rehabilitation, modernization, and extension of the public lighting system in Focsani city [58].
- District heating business strategy for the city of Focsani.
- Feasibility study for modernization of Focsani district heating system.
- Feasibility study for implementation of traffic management and monitoring system [59-60].

The projects that are being developed under this transition track are at different stages of implementation. Two of them, rehabilitation of lighting system and traffic management and monitoring system have already financing contracts signed and are ready to be implemented. Other projects are still in the technical documentation preparation phase and search for financing sources.

The implementation of projects within this transition track shall lead to different benefits for Focsani city and its citizens, i.e.:

- Energy benefit – reducing primary energy consumption due to more efficient street lighting, traffic management system and more efficient operation of district heating system.
- Financial benefit – reducing financial resources allocated to street lighting and district heating company.
- Environmental benefit – reducing environmental pollution through reduction of GHG emissions throughout the city due to lower traffic.
- Social – increasing citizen comfort and safety.

There should be mentioned that there are also project proposals that are being developed and implemented under this Transition Track. These project proposals are intended to be financed through EU funds, 2021-2027 financing program.

7.2 Selection process

The Municipality of Focsani is developing and implementing the following projects within this transition track:

- Rehabilitation, modernization, and extension of the public lighting system in Focsani city.
- Installation of local and centralized monitoring and management system for district heating system of Focsani city.
- Implementation of traffic management and monitoring system.

The project proposals that are considered for implementation are the following:

- Safe School - Pro-active system for access control to schools.
- Safe City – video surveillance monitoring system including intelligent App for citizens.
- Center for Integrated Management of public services.
- Digital Municipality – an integrated e-platform for Municipality.
- Geospatial management of Focsani Municipality area.
- Citizen Innovation Platform.

Some of these project proposals have been inspired from IRIS experience.

7.3 Mapping of stakeholders

The main stakeholders that can be involved in the replication process of all integrated solutions within this transition track are:

- Municipality of Focsani.
- SC ENET SA Focsani district heating company.
- Company that operates public lighting system in Focsani city.
- Local police and/or local company operating traffic lights system.
- Public transportation company.
- Citizens.
- Equipment/materials/services suppliers.
- Construction companies that implement integrated solutions/projects on-site.

7.4 Identified knowledge gaps

The main knowledge gaps identified within this transition track refer to:

- Development and implementation of digital platform at city level including data from different city sectors (e.g. transportation, energy, services). The problem identified by Municipality of Focsani representatives refers to availability of data from different stakeholders; sometimes there are private stakeholders (e.g. local telecom company, which is a private company) and they are not quite willing to share different data. So, in this respect a knowledge exchange with other IRIS partners can be useful.

- SCADA system implementation for district heating system. It has not been done before and, thus, can lead to some technical issues during implementation.

All these knowledge gaps can be, and some of them have already been, addressed within IRIS project through different capacity building and knowledge transfer activities.

7.5 Capacity building and knowledge transfer

Some of the identified knowledge gaps have already been addressed through different activities within IRIS project, e.g. city innovation platform implementation has been discussed at the 5th on-line consortium meeting through pitch meetings of IRIS partners from different cities. Capacity building and knowledge transfer within this transition track shall continue, at least for the project duration. However, there should be mentioned that Focsani Municipality representatives have already established contacts with different project partners to tackle the issues of capacity building and knowledge transfer regarding city innovation platform.

7.6 IS-4.1: Services for Urban Monitoring

The Municipality of Focsani has analyzed the operation of the lighting system of the city and the analysis has shown the following deficiencies:

- Poor quality of street lighting.
- Reduced lighting efficiency in some areas.
- Reduced energy efficiency of the system.
- Increased maintenance costs of the system.
- Old technology.

There are also other factors that can support the rehabilitation and modernization of the lighting system of the city:

- Urban development of the city, including appearance of new neighborhoods.
- Traffic changes.
- Increasing number of tourists.

All the above-mentioned deficiencies and factors led to decision of Focsani Municipality to develop and implement a project for rehabilitation, modernization, and extension of the public lighting system. The main goals of the project are listed below:

- Modernization of the lighting system according to the highest national and EU standards.
- Centralized real-time management of the lighting system that can lead to reducing operation and maintenance costs.
- Implementation of the dynamic lighting based on city needs that can lead to electricity and, thus, financial savings.
- Reducing power consumption and thus achieving financial savings through utilization of new lighting technologies.
- Reducing pollutant emissions associated with energy savings.

The project for rehabilitation, modernization and extension of the lighting system of Focsani city includes several components:

- Rehabilitation and modernization of the lighting system, including changing the aerial cables with underground ones and installing LED-based lighting devices.
- Installing of a centralized monitoring and management system for the lighting system of Focsani city.
- Extension of the lighting system to new developed areas.
- Installing lighting poles for pedestrian crossings.
- Utilization of renewable-generated electricity for powering lighting system.

There has been analyzed two solutions for implementation of this project:

- Solution 1: rehabilitation, modernization and extension of the public lighting system and implementation of an intelligent monitoring and management system.
- Solution 2: rehabilitation, modernization and extension of the public lighting system and implementation of an intelligent monitoring and management system, and, in addition to the first solution, utilization of renewable-generated electricity for powering lighting system and installing lighting poles for pedestrian crossings.

Solution 1, rehabilitation, modernization and extension of the public lighting system and implementation of an intelligent monitoring and management system includes the following steps:

- Modernization/extension of the power network for the public lighting system.
- Installation of new lighting poles, including all needed equipment.
- Installation of new LED-based lighting bulbs.
- Installation of an intelligent monitoring and management system.

Solution 2, rehabilitation, modernization and extension of the public lighting system and implementation of an intelligent monitoring and management system, and, in addition to the first solution, utilization of renewable-generated electricity for powering lighting system and installing lighting poles for pedestrian crossings includes the following steps:

- Modernization/extension of the power network for the public lighting system.
- Installation of new lighting poles, including all needed equipment.
- Installation of new LED-based lighting bulbs.
- Installation of an intelligent monitoring and management system.
- Installation of new lighting poles for pedestrian crossings equipped with photovoltaic panels for power generation and batteries for electricity storage.

The specific technical indicators for the project are presented below:

- Increasing the public lighting system from about 26 km today to about 36 km after project implementation.
- Increasing the light level.
- Installation of 1056 new lighting poles.
- Installation of 1123 new lighting bulbs.
- Installation of 66 photovoltaic panels and power storage batteries.

The estimated investment costs are presented below for both solutions:

- Solution 1 investment cost: about 4.013 million Euro.
- Solution 2 investment cost: about 4.243 million Euro.

The project implementation shall lead to the following technical, energy and environmental criteria:

- Increasing the number of lighting devices with about 23 %.
- Reducing the power installed capacity with 44 %.
- Reducing electricity consumption from about 586 MWh/year today to about 327 MWh/year after project implementation, thus leading to energy savings of about 259 MWh/year, corresponding to a reduction of electricity consumption of about 44 %.
- Reducing CO₂ emissions due energy savings from about 36 tons/year of CO₂ equivalent to about 20 tons/year of CO₂ equivalent, corresponding to a reduction of CO₂ emissions of about 44 %.

Table 20 shows the Gantt diagram including the planning of replication activities and work breakdown structure for the implementation of the public lighting system. The Gantt diagram is similar for both analyzed solutions.

Table 20. Gantt diagram for the public lighting system.

Activity	Month																															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
1.Obtaining financing																																
2. Technical project																																
3. Acquisition																																
4. Installation and construction works																																
5. Project reception																																

The implementation of this specific Integrated solution can face several barriers and drivers, as presented below.

1. Technical Bounds & Drivers: There can be different technical barriers/issues along project implementation. The main identified technical barriers are regarding to photovoltaic panels utilization for power generation and monitoring and management system for public lighting. All these technical barriers can be overcome with a knowledge exchange and capacity building, which has already started on some issues.
2. Legal: There can be some legal barriers regarding photovoltaic panels utilization. However, these barriers can be overcome through Local Council implication and creation of local legal framework.
3. Social: From the social point of view there were not identified any barriers. The social advantages of implementation of this project constitute in improving the life standards of citizens of Focsani. There should be also mentioned that through this project implementation there can be created some additional jobs in Focsani city.
4. Financial: On the local/national level there is a bound regarding the available financing from the Government. On the other hand, there is available financing through different EU funded programs.
5. Environmental: All measures proposed within this integrated solution can surely lead to reducing pollutant emissions and thus reducing environmental impact.

The Municipality of Focsani has signed the financing contract for implementation of this project. The financing contract has the value of 4053576.40 euro. The financing shall be ensured by Regional Development Agency with 2% participation of the Municipality.

The Municipality of Focsani is developing the following project proposals that can be implemented within this Integrated Solution:

- Safe School - Pro-active system for access control to schools.
- Safe City – video surveillance monitoring system including intelligent App for citizens.

The Safe School project has the following components:

- Integrated control system for access to schools.
- Real time monitoring of body temperature.
- Real time warning and alarm system in schools.
- Disinfection tunnel.
- App for parents.

The estimated value of the project is 3000000 euro and the financing source shall be EU funds, 2021-2027 financing program.

The Safe City project includes the following objectives:

- Intelligent systems for early public safety dangers detection.
- Analytics type video surveillance.
- Integration with public transportation management system.

- Integration with traffic management system.
- Integration with public lighting system.
- App for citizens (front office).
- App for Municipality (back office).

The estimated value of the project is 3000000 euro and the financing source shall be EU funds, 2021-2027 financing program.

7.7 IS-4.2: Services for City Management and Planning

The installation of local and centralized monitoring and management system for Focsani district heating system is a part of a complex project for implementation of a smart multi-sourced low temperature district heating with innovative storage solutions, which is part of transition track 2. The components of the complex project aiming at modernization of the district heating system that are related to this integrated solution include the following activities:

- Installation of a system for primary/transportation network for monitoring the state of pipes' insulation.
- Installation of special automation/early fault detection wires along all pipes (heating, domestic warm water and recirculation of domestic warm water) for transportation and distribution networks.
- At thermal substations there shall installed:
 - Pressure regulators and variable speed pumps for optimizing the operation of the system and increasing the comfort for heat consumers.
 - Changing the monitoring system and installing an equilibration system.
- Installation at the consumers' limit of property of:
 - Monitoring equipment for each specific consumer for heat consumption for heating and domestic warm water preparation.
 - Hydraulic equilibration system for each specific consumer.
 - Fault detection and monitoring system for each specific consumer.

The implementation of the above-mentioned solutions are very strong linked with the complex project of modernization of the entire district heating system and, thus, they shall be implemented together with the integrated solution 2.2.

Apart from installation of monitoring system at different parts of the district heating systems the Municipality of Focsani together with SC ENET SA, local district heating company, are willing to implement SCADA system for the entire district heating system including energy generating facility. However, the implementation of SCADA system is yet in a very early/conceptual stage and needs to be analyzed within a feasibility study and then to take further steps for its implementation.

The financing of this project is included in financial schemes presented for Transition Track 2.

The Municipality of Focsani is developing the following project proposals that can be implemented within this Integrated Solution:

- Center for Integrated Management of public services.

- Digital Municipality – an integrated e-platform for Municipality.
- Geospatial management of Focsani Municipality area.

Center for Integrated Management of public services includes the following objectives:

- Management of public safety, energy monitoring, traffic and transportation, public lighting, environmental protection.
- Citizens information system.
- Parking systems management.
- Ticketing in public transportation.
- Management of bike sharing system.
- Smart mobility apps.
- Waste management system.

The estimated value of the project is 8000000 euro and the financing source shall be EU funds, 2021-2027 financing program.

Digital Municipality – an integrated e-platform for Municipality project includes the following components:

- Digitalization of all processes within the Municipality.
- Encoded communication system within the Municipality.
- A unique integrated management platform.
- A unique digital counter for citizens.
- App E-Citizen.

The estimated value of the project is 10000000 euro and the financing source shall be EU funds, 2021-2027 financing program.

Geospatial management of Focsani Municipality area project includes the following components:

- Standardization of urban and cadastral data.
- Integration of all urban and cadastral data for Municipality of Focsani.
- A unique informational system for all urban and cadastral data.
- Procedures for data acquisition and actualization in real time.

The estimated value of the project is 3000000 euro and the financing source shall be EU funds, 2021-2027 financing program.

7.8 IS-4.3: Services for Mobility

The Municipality of Focsani has analyzed and evaluated the traffic in the city and there resulted the following conclusions from the analysis:

- There is no traffic management and monitoring system in the city of Focsani, which can contribute to reducing traffic congestions and ensuring priority for public transportation for promoting it.
- Due to inexistence of the traffic management and monitoring system there have been identified some dysfunctionalities:

- Overlapping of intranational, national and local roads leading to high traffic.
- Lack of city bypass belt.
- Overlapping of urban, local and national public transportation lines.
- Safety issues for pedestrians due to illegally parked vehicles on the walk sides.
- Insufficient number of parking space.
- Inexistence of bike lanes.
- Inexistence of traffic management system.

The analysis of the situation led to conclusion to implementing a traffic management and monitoring system in the city of Focsani. The main objective of the project is to promote sustainable urban mobility, based on innovative and efficient solutions, and to reduce pollution in the city of Focsani. The goals of the projects are the following:

- Reduce traffic congestion.
- Reduce pollution in downtown city.
- Increase citizens safety.

For analyzing the implementation of the project there has been performed a feasibility study for implementation of traffic management and monitoring system. In the study there have been analyzed two scenarios (scenario 1 and scenario 2), scenario 0 representing the actual situation.

Both proposed scenarios have the following common components:

- Implementation of a traffic management system for adaptation of traffic lights in real time according to traffic data.
- Implementation of a prioritization system for public transportation for adaptation and reducing times for public busses.
- Implementation of a monitoring system for video monitoring of crossroads for increasing safety of all traffic participants.
- Implementation of an information system for allowing transit transport to choose alternative routes, leading to reducing traffic in downtown city.
- Implementation of automatic identification of vehicle plates system in six locations for increasing traffic safety and for decision making process regarding traffic management.

The difference between the two scenarios, scenario 1 and scenario 2, is different re-systematization of road infrastructure and reorganization of traffic in the city of Focsani. The re-systematization of road infrastructure and reorganization of traffic in the city of Focsani for both scenarios is presented below:

- Scenario 1 – installing traffic lights at all crossroads and pedestrian crossings on the following main roads: Unirii – Independentei – Cuza Voda – Bucegi. At the same time, it is proposed to abolish all existing roundabouts.
- Scenario 2 - installing traffic lights at all crossroads and pedestrian crossings on the following main roads: Unirii – Independentei – Cuza Voda – Bucegi. At the same time, it is proposed to abolish all existing roundabouts with exception of the one at the crossroad Independentei - Marasesti, and introducing one-way roads in the city, as follows:
 - Unirii - Independentei one-way from South to North.
 - Cuza Voda – Bucegi one-way from Nord to South.

There shall be also implemented special lanes for public transportation in counter sense of general traffic presented above.

There should be mentioned that present project for installation of a traffic management and monitoring system is a part of a more complex project that include re-systematization of entire traffic system and modernization of public transportation of the city of Focsani. The other components of the complex mobility project have been presented in chapter related to Transition Track 4.

The traffic management and monitoring system shall have the following components:

- Traffic management system.
- Video monitoring system.
- Public transportation prioritization system.
- Automatic identification of vehicle plates system.
- Information system.
- Integrated control center.
- Communication network.

There has been performed a technical, economic and environmental analysis of both scenarios. The main criteria are presented below.

The investment costs for both scenarios have been estimated as presented below:

- Scenario 1 – investment cost – 4.16 million Euros.
- Scenario 2 – investment cost – 4.43 million Euros.

The annual operation costs, including utilities costs, repair and maintenance costs and salary costs, are presented below for bot scenarios:

- Scenario 1 – annual operation costs – 229,000 Euros.
- Scenario 2 – annual operation costs – 263,000 Euros.

The revenues from public transportation for both scenarios are presented in Table 21.

Table 21. Revenues for both analyzed scenario only from public transportations.

Scenario	2021	2026	2032
	Revenues from public transportation, Euro		
S1	33,300	139,900	182,500
S2	79,900	319,900	347,400

There should be also mentioned that the implementation of this project shall also lead to the following advantages:

- Time savings for all traffic participants.
- Operation costs savings.
- Increasing the safety of all traffic participants.
- Improving air quality.

- Reducing environmental impact.

Table 22 shows the Gantt diagram including the planning of replication activities and work breakdown structure for the implementation of the traffic management and monitoring system.

Table 22. Gantt diagram for the implementation of the traffic management and monitoring system.

NO.	Activity	Before contract signing	Month															
			Month 1-6				Month 7-12				Month 13-18				Month 19-24			
1	Project preparation																	
1.1	Elaboration of terrain studies																	
1.2	Elaboration of feasibility study																	
1.3	Elaboration of financing application																	
1.4	Approval of financing application																	
2	Signing of financing contract																	
3	Public acquisition																	
4	Design and engineering																	
4.1	Technical design																	
4.2	Authorizations																	
4.3	Technical project verification																	
5	Acquisition and installation																	
5.1	Organization and logistics																	
5.2	Acquisition and installation																	
6	Putting into operation																	
7	Works reception																	
8	Other activities																	
8.1	Project management																	
8.2	Technical assistance																	
8.3	Works supervision																	
8.4	Audit																	
8.5	Information, communication, dissemination and advertising																	

The implementation of this specific Integrated solution can face several barriers and drivers, as presented below.

1. Technical Bounds & Drivers: There can be different technical barriers/issues along project implementation. The main identified technical barriers are regarding to traffic management system and integrated control center. All these technical barriers can be overcome with a knowledge exchange and capacity building, which has already started on some issues.
2. Legal: There can be some legal barriers regarding video monitoring system utilization and automatic identification of vehicle plates system. However, these barriers can be overcome through Local Council implication and creation of local legal framework.
3. Social: From the social point of view there were not identified any barriers. The social advantages of implementation of this project constitute in improving the life standards of citizens of Focsani. There should be also mentioned that through this project implementation there can be created some additional jobs in Focsani city.
4. Financial: On the local/national level there is a bound regarding the available financing from the Government. On the other hand, there is available financing through different EU funded programs.
5. Environmental: All measures proposed within this integrated solution can surely lead to reducing pollutant emissions and thus reducing environmental impact.

The Municipality of Focsani has signed the financing contract for this project with a value of 4590109.61 euro. The financing shall be ensured through the Regional Development Agency with 2% participation of the Municipality.

The Municipality of Focsani is developing the following project proposal that can be implemented within this Integrated Solution:

- Citizen Innovation Platform.

The Citizen Innovation Platform include the following objectives:

- Improvement of urban mobility.
- Integration with traffic management system.
- Monitoring of parking lots.
- Monitoring of bikes parking lots.
- Implementation of a waste management system.
- Creation of a Smart City Focsani platform.

The estimated value of the project is 2500000 euro and the financing source shall be EU funds, 2021-2027 financing program.

7.9 Conclusions on ambitions and planning of activities for TT #4 City Innovation Platform (CIP)

The conclusions on ambitions and planning of integrated solutions related to city innovation platform are the following:

- The integrated solutions related to traffic management and monitoring system and lighting system are in an advanced stage of implementation. The integrated solution regarding monitoring and management system for district heating is still in an early stage of development. It is closely linked with the implementation of integrated solution regarding the modernization of entire district heating system.
- There have been elaborated all technical documentation for traffic management and monitoring system and lighting system. For integrated solution regarding monitoring and management system for district heating there still needs to be elaborated all technical documents.
- All public procurement documents have been elaborated for integrated solutions for traffic management and monitoring system and lighting system.
- There is secured financing for implementation of the lighting system. There is still a need to secure financing for the traffic monitoring and management system.
- All activities are well-planned for integrated solutions for traffic management and monitoring system and lighting system.
- The implementation of rehabilitation, modernization and extension of the public lighting system integrated solution shall start in 2020.

The Municipality of Focsani is preparing to extend the project for rehabilitation of public lighting system. There is being developed a project for rehabilitation of public lighting system for 6 streets in the city with a total value of 519507.19 euro. The funding shall be ensured through the Regional Development Agency.

8 Transition track #5: Citizen engagement

8.1 TT#5 Replication in a nutshell

The Municipality of Focsani has always tried to involve citizens into city development and decision making process. The Municipality has already good example of information campaigns and citizens involvement in city projects.

For several years now, The Municipality of Focsani, through its Mayor organizes yearly meetings with citizens entitled “Tell what you want for your city”. The aims of these meetings are the following:

- To involve citizens in debates regarding city budget.
- To allow citizens to explain their problems, which can be related to neighborhood or to city.
- To allow citizens to come up with new ideas and project proposals for city development.

The Municipality of Focsani has also tried to develop new and improve already existing communication channels between Municipality and citizens. There have been developed and used the following communication channels:

- Municipality’s web site.
- Annual Mayor’s letter and report available on Municipality’s web site.
- Municipality’s e-mail.
- Citizen telephone line.
- Focsani magazine dedicated to issue of Focsani city.
- Leaflets, flyers, etc.

There has also been established a communication center within the Municipality. The objectives of this communication center are the following:

- To facilitate flow of information.
- To allow citizens access to different database.
- To shorten document trials.
- To reduce redundant activities.
- To create a friendly environment for citizens of Focsani.

All these activities allowed citizens engagement in city life and decision making and showed that citizens are willing to get involved in this activity, can point out different problems/issues in different city areas and can come up with interesting and creative ideas/projects.

For this transition track the Municipality of Focsani is willing to replicate two integrated solutions regarding to citizens co-creation and development of different applications for encouraging energy efficiency behavior.

There should be mentioned that till now there has not been elaborated any study regarding citizen engagement and co-creation. However, it is also true that the Municipality of Focsani and Mayor of

Focsani city are fully understanding the importance of this issue for a sustainable development of the city, and are willing to take further steps and engage citizens and allow their co-creation to take part in city development.

There should be mentioned that due to the COVID-19 pandemic situation citizens engagement into the Municipality's project development and implementation have been very low. Nevertheless, there are some examples of citizen engagement that have been implemented in Focsani.

8.2 Selection process

The Municipality of Focsani is willing to replicate the following integrated solutions within this transition track:

- Co-creating the energy transition in your everyday environment.
- Apps and interfaces for energy efficiency behavior.

8.3 Mapping of stakeholders

The main stakeholders that can be involved in the replication process of all integrated solutions within this transition track are:

- Municipality of Focsani.
- Local Council.
- Citizens of Focsani city.
- Energy utility companies.
- Software developing companies.

8.4 Identified knowledge gaps

The main knowledge gaps identified for replication of integrated solutions within this transition tracks refer to:

- Establishing new and efficient ways to involve citizens in city life.

8.5 Capacity building and knowledge transfer

The capacity building and knowledge transfer within this transition track has already started and some issues have been discussed at the 5th on-line consortium meeting through pitch meetings of IRIS partners from different cities. However, the Municipality of Focsani still feels the great need for capacity building and knowledge transfer for replicating these integrated solutions.

8.6 IS-5.1: Co-creating the energy transition in your everyday environment

The COVID-19 pandemic situation has had a great negative influence on citizen engagement for consultation and active participation of citizens of Focsani into the project development and implementation in Focsani area. However, even in this today's context the Municipality of Focsani has tried to involve citizens as much as possible into the process making and decisions regarding sustainable development of Focsani city.

Today the Municipality of Focsani is in the process of elaborating two main strategic documents:

- Strategy for development of Focsani city for 2021-2027.
- Sustainable urban mobility plan for Focsani city.

For the elaboration of both documents the Municipality has tried as much as possible to involve citizens into the elaboration process of this documents and take into consideration all proposals/comments that come from citizens. Almost all activities for citizens consultation took part using on-line resources.

The Municipality has prepared and addressed to citizens on-line questionnaire for collecting proposals and comments regarding the above-mentioned documents. There have been also organized on-line presentations regarding the steps of elaboration of these documents and citizens have had possibilities to comment, address questions, come with proposals on-line using available chat or via e-mail. For the sustainable urban mobility plan there has also been prepared and sent via e-mail for consultation a questionnaire regarding the mobility preferences of citizens in Focsani. At the same time, for increasing citizens awareness and their implication and engagement into city life and development there have prepared and distributed throughout the city posters, flyers, leaflets, video clips in local media channels.

All these actions are directed towards citizens and have as main objective to try to engage more citizens into city life, development and decision-making process.

There should be mentioned that for this Transition Track and Integrated Solution there are still some gaps and difficulties that need to be challenged and overtaken. Hopefully, in the near future, once the pandemic shall decrease in intensity and knowledge transfer within IRIS project shall increase, regarding this matter, the Municipality of Focsani shall be able to engage and involve more citizens into public life.

8.7 IS-5.4: Apps and interfaces for energy efficient behavior

The development and implementation of different apps and interfaces in Focsani city depends very on implementation of different projects, i.e. bike-sharing concept, sustainable mobility project, city innovation platform, etc. Some of these projects are already in very advanced phase, i.e. looking for financing or already having ensured financing, and some of them are still in an early development stage. But these projects have also components regarding the development and implementation of different apps and interfaces for energy efficient behavior and for other specific issues.

The Municipality of Focsani has prepared a list of projects to be implemented in the next EU financing period 2021-2027. Among those projects there are also proposed apps and interfaces to be developed

and implemented. Below there is presented the list of proposed projects and apps and interfaces within each project.

- Integrated management and operational center.
 - Interfaces for all public and local authority institutions.
 - Interface for traffic management.
 - Interface for smart lighting system.
 - Interface for EV charging stations.
 - Interface for waste management
- Citizen innovation platform:
 - Interface and app for parking lots.
 - Interface and app for public transportation ticketing and passenger information.
 - Interface and app for bike-sharing concept, including bike parking lots.
 - Smart City Focsani platform.
- Digital Municipality.
 - Digitalization of Municipality's internal procedures/processes.
 - Encoded communication system.
 - Unique integrated management platform.
 - A unique digital counter.
 - E-Citizen app.
- Safe School.
 - Front office app for parents.
 - Back office app for internal school management.
- Safe City.
 - Analytics type video surveillance interface.
 - Public transportation management interface.
 - Front office app for citizens.
 - Back office app for operational management.

All these projects shall be developed and implemented in coming years using EU funds from 2021-2027 budget.

8.8 Conclusions on ambitions and planning of activities for TT #5 Citizen Engagement and Co-creation

The conclusions on ambitions and planning of activities for Transition Track 5 are the following:

- The COVID-19 pandemic has had a great negative impact on citizen engagement into city life and development.
- However, the Municipality of Focsani has still tried to involve citizens in commenting and analyzing different main document elaborated by the Municipality. The main involvement of citizens was carried out through on-line media and means.
- The Municipality of Focsani has prepared a list of projects to be developed and implemented next years using EU funding. These projects include many apps and interfaces for citizens and Municipality for energy efficient behavior and not only.

- The end of the pandemic and experience from IRIS project should help the Municipality of Focsani to boosting citizen engagement in city life and its sustainable development.

9 Summary of Follower City use cases and measures

The Municipality of Focsani has chosen to replicate integrated solutions from all five transition tracks. However, there are not all integrated solutions from each transition track that shall be replicated in Focsani. In chapter 2.4 there are presented all specific integrated solutions for each transition track that have been chosen for replication in Focsani city. The development and implementation of each integrated solutions are in different stages and differ from each other. All integrated solutions developed for implementation in Focsani city can be divided into four specific categories:

- Category 1 – solutions that shall start being implemented in 2020. These are integrated solutions regarding building retrofit and modernization of the lighting system.
- Category 2 – solutions that are ready to be implemented, but lack different components, e.g. financing. These are integrated solutions regarding smart e-mobility and traffic monitoring and management system.
- Category 3 – solutions that are still in an early stage of development with only some of technical documentation being elaborated. These are solutions related to modernization of district heating system and implementation of monitoring and management system for entire district heating.
- Category 4 – solutions that still need to be developed. These are solutions related to citizen engagement. For these solutions, the Municipality of Focsani still need to identify a specific project linked with an integrated solution and develop it for implementation.

Table 23 presents the replication projects and their links to Transitions Tracks and Integrated Solutions and their status of implementation.

Table 23. Replication projects and their status of implementation..

Category	Solution level	Solution description	TT/IS	Replication Project
Category 1	solutions that shall start being implemented in 2020	integrated solutions regarding building retrofit and modernization of the lighting system.	TT1/IS1.2	Retrofitting of residential and public buildings (Utrecht & Gothenburg)
			TT4/IS4.3	Traffic lights management (Gothenburg),
Category 2	solutions that are ready to be implemented, but lack different components, (e.g. financing)	integrated solutions regarding smart e-mobility and traffic monitoring and management system	TT3/IS3.1, IS3.2,	V2G EV charging (Utrecht), Bike sharing, (Utrecht & Gothenburg)
			TT4/IS4.1	Street lighting (Nice)
Category 3	solutions that are still in an early stage of development	solutions related to modernization of district heating system and implementation of monitoring and management system for entire district heating	TT2/IS2.2	Smart district heating (Nice & Gothenburg)
			TT4/IS4.2	District heating system automation,

				monitoring & control (Nice & Gothenburg)
Category 4	solutions that still need to be developed	solutions related to citizen engagement, solutions for which the Municipality of Focsani still need to identify a specific project linked with an integrated solution and develop it for implementation,	TT5/IS5.1, IS5.4	Citizen engagement (Nice & Utrecht) Apps for energy efficient behavior (Nice & Gothenburg)

As a conclusion, it can be said that the development and implementation of replication solutions in Focsani city is going very well for the first two categories. However, for the last two categories there is still a need of more implication from the Municipality of Focsani.

9.1 Integration of use cases and measures

The Municipality of Focsani is developing and implementing different projects related to integrated solutions from the five transition tracks. Some of the projects interconnect integrated solutions from different transition tracks. The projects that interconnect integrated solutions from different transition tracks are presented below.

- Rehabilitation and modernization of the entire district heating system includes two integrated solutions from different transition tracks:
 - Integrated Solution 2.2. Smart multi-sourced low temperature district heating (DH) with innovative storage solutions.
 - Integrated Solution 4.2. Services for City Management and Planning.
 The implementation of both integrated solutions will probably be done within a single project.
- The modernization, re-systematization and extension of the public transportation system is a single project developed by the Municipality of Focsani. This complex project includes the following integrated solutions, that shall be all implemented, gradually, step by step:
 - Integrated Solution 3.1. Smart Solar V2G EV's charging.
 - Integrated Solution 3.2. Innovative Mobility Services for the Citizens.
 - Integrated Solution 4.3. Services for Mobility.

The other integrated solutions are individual projects and shall be implemented separately.

10 Output to other work packages

This deliverable is a very specific document that relates mostly to the city of Focsani and, thus, is greatly related to WP 8. However, some information from this deliverable can be used as output to other work packages:

- WP 2 EU wide cooperation with ongoing projects, initiatives and communities – the present deliverable can represent an example of replication plan that can be used by other cities around Europe for replication activities.
- WP 3 Development of bankable business models and exploitation activities – some of the integrated solutions presented in this deliverable can be used as business model for replication by other cities.
- WP 10 Communication and dissemination – the deliverable shall be used for communication and dissemination of replication activities in the IRIS project.

The deliverable is also of great interest to all IRIS partners for knowledge exchange and capacity building on different issues.

11 Conclusions

The Municipality of Focsani is a Fellow City partner in IRIS project. One of the main objectives of the Municipality of Focsani within IRIS project is to take advantage and prepare a replication plan for projects in different city areas to be implemented in Focsani. This objective is achieved through elaboration of the Focsani replication plan.

The Focsani replication plan is based on the following main ideas/pillars:

- Replication projects to be developed and implemented in Focsani shall be based on demonstration, pilot and replication projects already implemented in Lighthouse cities.
- The Municipality of Focsani has established several action directions/fields/areas for replication activities.
- The replication activity/process is based on local needs and priorities, but also uses all available information from all partners involved in the IRIS project.

The Focsani replication plan shall be used as a guide for all replication activities performed by the Municipality of Focsani.

The main objective of this deliverable is to provide a replication plan that can be used by the Municipality of Focsani for developing of different projects in the city for implementation of the sustainable concept.

There are also several secondary objectives of this deliverable:

- To select the integrated solutions for replication.
- To describe from technical, economic, environmental and social points of view replication solutions.
- To analyze the stakeholders for different replication solutions.
- To analyze different barriers and drivers for replication solutions.
- To identify knowledge gaps and use capacity building and knowledge transfer for replication solutions.

The expected impact of this deliverable is that all replication projects/activities are better prepared and the Municipality of Focsani has a well-structured and defined plan for their implementation. Another major impact that can be achieved is that the Municipality of Focsani can take advantage and use all information and experience of Lighthouse cities for projects replication and avoid some barriers and use some drivers.

The replication methodology used by the Municipality of Focsani is based on the following main steps/documents:

- Focsani strategy for sustainable development.
- Focsani needs, challenges and opportunities.
- Choosing integrated solutions for replication.
- Implementation of integrated solutions.
- Monitoring of integrated solutions.
- Dissemination.

The Municipality of Focsani has chosen to replicate the following integrated solutions:

- Transition Track 1. Smart renewables and closed-loop energy positive districts:
 - Integrated Solution 1.2. Near zero retrofit district.
- Transition Track 2. Smart energy management and storage for grid flexibility:
 - Integrated Solution 2.2. Smart multi-sourced low temperature district heating (DH) with innovative storage solutions.
- Transition Track 3. Smart e-mobility sector:
 - Integrated Solution 3.1. Smart Solar V2G EV's charging.
 - Integrated Solution 3.2. Innovative Mobility Services for the Citizens.
- Transition Track 4. City innovation platform:
 - Integrated Solution 4.1. Services for Urban Monitoring.
 - Integrated Solution 4.2. Services for City Management and Planning.
 - Integrated Solution 4.3. Services for Mobility.
- Transition Track 5. Citizen engagement:
 - Integrated Solution 5.1. Co-creating the energy transition in your everyday environment.
 - Integrated Solution 5.4. Apps and interfaces for energy efficient behavior.

The conclusions on ambitions and planning of integrated solution related to retrofitting residential and public buildings are the following:

- The integrated solution is in an advanced stage of implementation.
- There have been elaborated all technical documentation.
- The Municipality of Focsani has prepared all public procurement documentation.
- There have identified and secured financing instruments.
- All activities are well-planned.
- The implementation of this replication project shall start in 2020.

The conclusions on ambitions and planning of integrated solution related to smart multi-sourced low temperature district heating (DH) with innovative storage solutions are the following:

- The integrated solution is still in an early stage of implementation.
- There have only been elaborated initial technical documentation, i.e. feasibility studies.
- There should be identified financing sources for implementation of this solution.
- There should be elaborated an implementation plan, including work breakdown structure.
- The implementation of this integrated solution needs more involvement both from local district heating company SC ENET SA and the Municipality of Focsani.

The conclusions on ambitions and planning of integrated solutions related to smart e-mobility sector are the following:

- The integrated solutions are in an advanced stage of implementation.
- There have been elaborated all technical documentation.
- The Municipality of Focsani has prepared all public procurement documentation.
- There have identified and secured financing instruments for some projects, parts of this transition track; for other projects there is still needed to identify financing sources.
- All activities are well-planned.

The conclusions on ambitions and planning of integrated solutions related to city innovation platform are the following:

- The integrated solutions related to traffic management and monitoring system and lighting system are in an advanced stage of implementation. The integrated solution regarding monitoring and management system for district heating is still in an early stage of development. It is closely linked with the implementation of integrated solution regarding the modernization of entire district heating system.
- There have been elaborated all technical documentation for traffic management and monitoring system and lighting system. For integrated solution regarding monitoring and management system for district heating there still needs to be elaborated all technical documents.
- All public procurement documents have been elaborated for integrated solutions for traffic management and monitoring system and lighting system.
- There is secured financing for implementation of the lighting system. There is still a need to secure financing for the traffic monitoring and management system.
- All activities are well-planned for integrated solutions for traffic management and monitoring system and lighting system.
- The implementation of rehabilitation, modernization and extension of the public lighting system integrated solution shall start in 2020.

The conclusions on ambitions and planning of activities for Transition Track 5 are the following:

- The COVID-19 pandemic has had a great negative impact on citizen engagement into city life and development.
- However, the Municipality of Focsani has still tried to involve citizens in commenting and analyzing different main document elaborated by the Municipality. The main involvement of citizens was carried out through on-line media and means.
- The Municipality of Focsani has prepared a list of projects to be developed and implemented next years using EU funding. These projects include many apps and interfaces for citizens and Municipality for energy efficient behavior and not only.
- The end of the pandemic and experience from IRIS project should help the Municipality of Focsani to boosting citizen engagement in city life and its sustainable development.

The development and implementation of each integrated solutions are in different stages and differ from each other. All integrated solutions developed for implementation in Focsani city can be divided into four specific categories:

- Category 1 – solutions that shall start being implemented in 2020. These are integrated solutions regarding building retrofit and modernization of the lighting system.
- Category 2 – solutions that are ready to be implemented, but lack different components, e.g. financing. These are integrated solutions regarding smart e-mobility and traffic monitoring and management system.
- Category 3 – solutions that are still in an early stage of development with only some of technical documentation being elaborated. These are solutions related to modernization of district heating system and implementation of monitoring and management system for entire district heating.

- Category 4 – solutions that still need to be developed. These are solutions related to citizen engagement. For these solutions, the Municipality of Focsani still need to identify a specific project linked with an integrated solution and develop it for implementation.

As a conclusion, it can be said that the development and implementation of replication solutions in Focsani city is going very well for the first two categories. However, for the last two categories there is still a need of more implication from the Municipality of Focsani.

12 References

- [1] *Program de îmbunătățire a Eficienței Energetice PIEE*, elaborat de ISPE București
- [2] *Strategia integrată de dezvoltare urbană a Municipiului Focșani 2014 – 2023*, elaborată de Primăria Municipiului Focșani
- [3] *Plan de mobilitate urbană durabilă al Municipiului Focșani*, studiu elaborat de Sigma Mobility Engineering, Pitești 2017
- [4] Magda Cozma, Studiu de fezabilitate, servicii si consultanta, analize, Faza de proiectare: **Audit energetic**, *Cresterea performantei energetice pentru cladirea tip internat si cladirea cantina a Colegiului Tehnic Gh. Asachi, Focsani, Inclusiv lucrari conexe*, Proiectant S.C. ZEST DP S.R.L. Contract de prestari servicii nr. 2307/05.07.2017.
- [5] Studiu de fezabilitate, servicii si consultanta, analize, Faza de proiectare: **Expertiza Tehnica**, *Cresterea performantei energetice pentru cladirea tip internat si cladirea cantina a Colegiului Tehnic Gh. Asachi, Focsani, Inclusiv lucrari conexe*, Proiectant S.C. ZEST DP S.R.L. Contract de prestari servicii nr. 2307/05.07.2017.
- [6] Studiu de fezabilitate, servicii si consultanta, analize, Faza de proiectare: **Documentatie de avizare a lucrarilor de interventii**, *Cresterea performantei energetice pentru cladirea tip internat si cladirea cantina a Colegiului Tehnic Gh. Asachi, Focsani, Inclusiv lucrari conexe*, Proiectant S.C. ZEST DP S.R.L. Contract de prestari servicii nr. 2307/05.07.2017.
- [7] Magda Cozma, Studiu de fezabilitate, servicii si consultanta, analize, Faza de proiectare: **Audit energetic**, *Cresterea eficientei energetice pentru imobilul corp scoala, inclusiv lucrari conexe, pentru Scoala Gimnaziala- Ion Basgan din Focsani*, Proiectant S.C. ZEST DP S.R.L. Contract de prestari servicii nr. 1531/03.07.2017.
- [8] Studiu de fezabilitate, servicii si consultanta, analize, Faza de proiectare: **Expertiza Tehnica**, *Cresterea eficientei energetice pentru imobilul corp scoala, inclusiv lucrari conexe, pentru Scoala Gimnaziala- Ion Basgan din Focsani*, Proiectant S.C. ZEST DP S.R.L. Contract de prestari servicii nr. 1531/03.07.2017.
- [9] Studiu de fezabilitate, servicii si consultanta, analize, Faza de proiectare: **Documentatie de avizare a lucrarilor de interventii**, *Cresterea eficientei energetice pentru imobilul corp scoala, inclusiv lucrari conexe, pentru Scoala Gimnaziala- Ion Basgan din Focsani*, Proiectant S.C. ZEST DP S.R.L. Contract de prestari servicii nr. 1531/03.07.2017.



- [10]Ciprian Dragusin, **Dosar de Audit energetic**, proiect: *Cresterea performantei energetice la Scoala Gimnaziala „Anghel Saligny” din municipiul Focsani*, Proiectant SC BIA CONSPROIECT SRL BRAILA, Nr proiect 108/2017.
- [11]Szalontay C. Coloman Andrei, **Faza Exteriza Tehnica**, proiect: *Cresterea performantei energetice la Scoala Gimnaziala „Anghel Saligny” din municipiul Focsani*, Proiectant SC BIA CONSPROIECT SRL BRAILA, Nr proiect 108/2017.
- [12]**Faza Documentatie de avizare a lucrarilor de interventii**, proiect: *Cresterea performantei energetice la Scoala Gimnaziala „Anghel Saligny” din municipiul Focsani*, Proiectant SC BIA CONSPROIECT SRL BRAILA, Nr proiect 108/2017.
- [13]Ciprian Dragusin, **Dosar de Audit energetic**, proiect: *Cresterea performantei energetice la corpul de cladire al Colegiului Economic, Mihail Kogalniceanu si executia lucrarilor conexe*, Proiectant SC BIA CONSPROIECT SRL BRAILA, Nr proiect 109/2017.
- [14]Szalontay C. Coloman Andrei, **Faza Exteriza Tehnica**, proiect: *Cresterea performantei energetice la corpul de cladire al Colegiului Economic, Mihail Kogalniceanu si executia lucrarilor conexe*, Proiectant SC BIA CONSPROIECT SRL BRAILA, Nr proiect 109/2017.
- [15]**Faza Documentatie de avizare a lucrarilor de interventii**, proiect: : *Cresterea performantei energetice la corpul de cladire al Colegiului Economic, Mihail Kogalniceanu si executia lucrarilor conexe*, Proiectant SC BIA CONSPROIECT SRL BRAILA, Nr proiect 109/2017.
- [16]Magda Cozma, Studiu de fezabilitate, servicii si consultanta, analize, Faza de proiectare: **Audit energetic**, *Cresterea eficientei energetice la corp cladire liceu si lucrari conexe*, la Liceul de Arta „Gheorghe Tatarescu” din Focsani. Proiectant S.C. ZEST DP S.R.L. Contract de prestari servicii nr. 2003/20.07.2017.
- [17]Studiu de fezabilitate, servicii si consultanta, analize, Faza de proiectare: **Expertiza Tehnica**, *Cresterea eficientei energetice la corp cladire liceu si lucrari conexe*, la Liceul de Arta „Gheorghe Tatarescu” din Focsani. Proiectant S.C. ZEST DP S.R.L. Contract de prestari servicii nr. 2003/20.07.2017.
- [18]Studiu de fezabilitate, servicii si consultanta, analize, Faza de proiectare: **Documentatie de avizare a lucrarilor de interventii**, *Cresterea eficientei energetice la corp cladire liceu si lucrari conexe*, la Liceul de Arta „Gheorghe Tatarescu” din Focsani. Proiectant S.C. ZEST DP S.R.L. Contract de prestari servicii nr. 2003/20.07.2017.
- [19]Magda Cozma, Studiu de fezabilitate, servicii si consultanta, analize, Faza de proiectare: **Audit energetic**, *Cresterea performantei energetice la corpul de cladire scoala si executia lucrarilor conexe*,



- pentru Scoala Gimnaziala „Duliliu Zamfirescu” din Focsani. Proiectant S.C. ZEST DP S.R.L. Contract de prestari servicii nr. 3212/13.07.2017.
- [20]Studiu de fezabilitate, servicii si consultanta, analize, Faza de proiectare: **Expertiza Tehnica**, *Cresterea performantei energetice la corpul de cladire scoala si executia lucrarilor conexe*, pentru Scoala Gimnaziala „Duliliu Zamfirescu” din Focsani. Proiectant S.C. ZEST DP S.R.L. Contract de prestari servicii nr. 3212/13.07.2017.
- [21]Studiu de fezabilitate, servicii si consultanta, analize, Faza de proiectare: **Documentatie de avizare a lucrarilor de interventii**, *Cresterea performantei energetice la corpul de cladire scoala si executia lucrarilor conexe*, pentru Scoala Gimnaziala „Duliliu Zamfirescu” din Focsani. Proiectant S.C. ZEST DP S.R.L. Contract de prestari servicii nr. 3212/13.07.2017.
- [22]Gheorghe Badea, **Audit Energetic**, *Cresterea eficientei energetice a blocurilor de locuinte din municipiul Focsani, etapa a II-a, amplasament B-dul Brailei nr 4, Bl. 10*, Proiectant general: Iulgrimoni Service SRL, Proiectant de specialitate Inovo Finance, Nr Proiect 40.3/2017.
- [23]**Documentatie de avizare a lucrarilor de interventii** *Cresterea eficientei energetice a blocurilor de locuinte din municipiul Focsani, etapa a II-a, amplasament B-dul Brailei nr 4, Bl 10*. Proiectant general: Iulgrimoni Service SRL, Proiectant de specialitate Inovo Finance, Nr Proiect 40.3/2017, contract nr 85543/14.11.2017.
- [24]Vasile Pacurar, Megyesi Emanuel, **Raport de Expertiza Tehnica**, nr E 560/12.12.2017, *Cresterea eficientei energetice a blocurilor de locuinte din municipiul Focsani, etapa a II-a, amplasament B-dul Brailei nr 4, Bl 10*. Proiectant general: Iulgrimoni Service SRL.
- [25]Gheorghe Badea, **Audit Energetic**, *Cresterea eficientei energetice a blocurilor de locuinte din municipiul Focsani, etapa a II-a, amplasament B-dul Brailei nr 7, Bl 7*, Proiectant general: Iulgrimoni Service SRL, Proiectant de specialitate Inovo Finance, Nr Proiect 40.4/2017.
- [26]**Documentatie de avizare a lucrarilor de interventii** *Cresterea eficientei energetice a blocurilor de locuinte din municipiul Focsani, etapa a II-a, amplasament B-dul Brailei nr 7, Bl 7*, Proiectant general: Iulgrimoni Service SRL, Proiectant de specialitate Inovo Finance, Nr Proiect 40.4/2017, contract nr 85543/14.11.2017.
- [27]Vasile Pacurar, Megyesi Emanuel, **Raport de Expertiza Tehnica**, nr E 562/12.12.2017, *Cresterea eficientei energetice a blocurilor de locuinte din municipiul Focsani, etapa a II-a, amplasament B-dul Brailei nr 7, Bl 7*. Proiectant general: Iulgrimoni Service SRL.



- [28]Gheorghe Badea, **Audit Energetic**, *Cresterea eficientei energetice a blocurilor de locuinte din municipiul Focsani, etapa a II-a, amplasament B-dul Bucuresti nr 17, Bl A4*, Proiectant general: Iulgrimoni Service SRL, Proiectant de specialitate Inovo Finance, Nr Proiect 40.5/2017.
- [29]**Documentatie de avizare a lucrarilor de interventii** *Cresterea eficientei energetice a blocurilor de locuinte din municipiul Focsani, etapa a II-a, amplasament B-dul Bucuresti nr 17, Bl A4*, Proiectant general: Iulgrimoni Service SRL, Proiectant de specialitate Inovo Finance, Nr Proiect 40.5/2017, contract nr 85543/14.11.2017.
- [30]Vasile Pacurar, Megyesi Emanuel, **Raport de Expertiza Tehnica**, nr E 561/12.12.2017, *Cresterea eficientei energetice a blocurilor de locuinte din municipiul Focsani, etapa a II-a, amplasament B-dul Brailei nr 7, Bl A4*. Proiectant general: Iulgrimoni Service SRL.
- [31]Gheorghe Badea, **Audit Energetic**, *Cresterea eficientei energetice a blocurilor de locuinte din municipiul Focsani, etapa a II-a, amplasament Str Dimitrie Cantemir nr 21, Bl A*, Proiectant general: Iulgrimoni Service SRL, Proiectant de specialitate Inovo Finance, Nr Proiect 40.1/2017.
- [32]**Documentatie de avizare a lucrarilor de interventii** *Cresterea eficientei energetice a blocurilor de locuinte din municipiul Focsani, etapa a II-a, amplasament Str Dimitrie Cantemir nr 21, Bl A*. Proiectant general: Iulgrimoni Service SRL, Proiectant de specialitate Inovo Finance, Nr Proiect 40.1/2017, contract nr 85543/14.11.2017.
- [33]Vasile Pacurar, Megyesi Emanuel, **Raport de Expertiza Tehnica**, nr E 558/12.12.2017, *Cresterea eficientei energetice a blocurilor de locuinte din municipiul Focsani, etapa a II-a, amplasament Str Dimitrie Cantemir nr 21, Bl A..* Proiectant general: Iulgrimoni Service SRL.
- [34]Gheorghe Badea, **Audit Energetic**, *Cresterea eficientei energetice a blocurilor de locuinte din municipiul Focsani, etapa a II-a, amplasament B-dul Independentei nr 6, Bl 6*, Proiectant general: Iulgrimoni Service SRL, Proiectant de specialitate Inovo Finance, Nr Proiect 40.8/2017.
- [35]**Documentatie de avizare a lucrarilor de interventii** *Cresterea eficientei energetice a blocurilor de locuinte din municipiul Focsani, etapa a II-a, amplasament B-dul Independentei nr 6, Bl 6*. Proiectant general: Iulgrimoni Service SRL, Proiectant de specialitate Inovo Finance, Nr Proiect 40.8/2017, contract nr 85543/14.11.2017.
- [36]Vasile Pacurar, Megyesi Emanuel, **Raport de Expertiza Tehnica**, nr E 565/12.12.2017, *Cresterea eficientei energetice a blocurilor de locuinte din municipiul Focsani, etapa a II-a, amplasament B-dul Independentei nr 6, Bl 6*. Proiectant general: Iulgrimoni Service SRL.



- [37]Gheorghe Badea, **Audit Energetic**, *Cresterea eficientei energetice a blocurilor de locuinte din municipiul Focsani, etapa a II-a, amplasament B-dul Independentei nr 8, BI 8*, Proiectant general: Iulgrimoni Service SRL, Proiectant de specialitate Inovo Finance, Nr Proiect 40.7/2017.
- [38]**Documentatie de avizare a lucrarilor de interventii** *Cresterea eficientei energetice a blocurilor de locuinte din municipiul Focsani, etapa a II-a, amplasament B-dul Independentei nr 8, BI 8*. Proiectant general: Iulgrimoni Service SRL, Proiectant de specialitate Inovo Finance, Nr Proiect 40.7/2017, contract nr 85543/14.11.2017.
- [39]Vasile Pacurar, Megyesi Emanuel, **Raport de Expertiza Tehnica**, nr E 564/12.12.2017, *Cresterea eficientei energetice a blocurilor de locuinte din municipiul Focsani, etapa a II-a, amplasament B-dul Independentei nr 8, BI 8*. Proiectant general: Iulgrimoni Service SRL.
- [40]Gheorghe Badea, **Audit Energetic**, *Cresterea eficientei energetice a blocurilor de locuinte din municipiul Focsani, etapa a II-a, amplasament Str Poenitei nr 12, BI 12*, Proiectant general: Iulgrimoni Service SRL, Proiectant de specialitate Inovo Finance, Nr Proiect 40.2/2017.
- [41]**Documentatie de avizare a lucrarilor de interventii** *Cresterea eficientei energetice a blocurilor de locuinte din municipiul Focsani, etapa a II-a, amplasament Str Poenitei nr 12, BI 12*. Proiectant general: Iulgrimoni Service SRL, Proiectant de specialitate Inovo Finance, Nr Proiect 40.2/2017, contract nr 85543/14.11.2017.
- [42]Vasile Pacurar, Megyesi Emanuel, **Raport de Expertiza Tehnica**, nr E 559/12.12.2017, *Cresterea eficientei energetice a blocurilor de locuinte din municipiul Focsani, etapa a II-a, amplasament Str Poenitei nr 12, BI 12*. Proiectant general: Iulgrimoni Service SRL.
- [43]Gheorghe Badea, **Audit Energetic**, *Cresterea eficientei energetice a blocurilor de locuinte din municipiul Focsani, etapa a II-a, amplasament B-dul Unirii, nr 54, BI 54*, Proiectant general: Iulgrimoni Service SRL, Proiectant de specialitate Inovo Finance, Nr Proiect 40.9/2017.
- [44]**Documentatie de avizare a lucrarilor de interventii** *Cresterea eficientei energetice a blocurilor de locuinte din municipiul Focsani, etapa a II-a, amplasament B-dul Unirii, nr 54, BI 54*. Proiectant general: Iulgrimoni Service SRL, Proiectant de specialitate Inovo Finance, Nr Proiect 40.9/2017, contract nr 85543/14.11.2017.
- [45]Vasile Pacurar, Megyesi Emanuel, **Raport de Expertiza Tehnica**, nr E 566/12.12.2017, *Cresterea eficientei energetice a blocurilor de locuinte din municipiul Focsani, etapa a II-a, amplasament B-dul Unirii, nr 54, BI 54*. Proiectant general: Iulgrimoni Service SRL.



- [46]Gheorghe Badea, **Audit Energetic**, *Cresterea eficientei energetice a blocurilor de locuinte din municipiul Focsani, etapa a II-a, amplasament B-dul Unirii, nr 28, Bl 28*, Proiectant general: Iulgrimoni Service SRL, Proiectant de specialitate Inovo Finance, Nr Proiect 40.6/2017.
- [47]**Documentatie de avizare a lucrarilor de interventii** *Cresterea eficientei energetice a blocurilor de locuinte din municipiul Focsani, etapa a II-a, amplasament B-dul Unirii, nr 28, Bl 28*. Proiectant general: Iulgrimoni Service SRL, Proiectant de specialitate Inovo Finance, Nr Proiect 40.6/2017, contract nr 85543/14.11.2017.
- [48]Vasile Pacurar, Megyesi Emanuel, **Raport de Expertiza Tehnica**, nr E 563/12.12.2017, *Cresterea eficientei energetice a blocurilor de locuinte din municipiul Focsani, etapa a II-a, amplasament B-dul Unirii, nr 28, Bl 28*. Proiectant general: Iulgrimoni Service SRL.
- [49]**District Heating Business Strategy for the cities of Bacau, Focsani of Oradea. Report for the City of Focsani**, Mario Ortner and Jean-Luc Poget, July 2019.
- [50] **Studiu de fezabilitate Reabilitarea sistemului de termoficare urbană la nivelul Municipiului Focșani pentru perioada 2009-2028 în scopul conformării la legislația de mediu și creșterii eficienței energetice - Etapa a III-a**, elaborat ISPE, Bucuresti 2019.
- [51]**Studiu de oportunitate pentru Modernizarea transportului public in Municipiul Focsani**, elaborat SC Urbanscope, Bucuresti, 2018.
- [52]**Studiu de trafic pentru evaluarea proiectului Modernizarea transportului public in Municipiul Focsani**, elaborat SC Urbanscope, Bucuresti, 2018.
- [53]**Actualizare studiu de trafic pentru sistematizarea circulatiei in Municipiul Focsani**, judetul Vrancea, elaborat SC Urbanscope, Bucuresti, 2018.
- [54]**Studiu de fezabilitate Dezvoltarea rețelei de piste dedicate circulatiei bicicletelor, implementare unui sistem de bike-sharing**, elaborat Global Tech Expert, Bucuresti 2018.
- [55]**Studiu de trafic model M – 2018 Municipiul Focsani pentru proiectul Dezvoltarea rețelei de piste dedicate circulatiei bicicletelor, implementare unui sistem de bike-sharing**, elaborat SC Urbanscope, Bucuresti, 2018.
- [56]**Resistematizarea infrastructurii de transport la nivelul Municipiului Focsani in vederea cresterii atractivitatii si accesibilitatii deplasarilor cu transportul public, cu bicicleta si pietonale**, elaborat SC Urbanscope, Bucuresti, 2018.
- [57]**Studiu Geotehnic pentru proiectul Resistematizarea infrastructurii de transport la nivelul Municipiului Focsani in vederea cresterii atractivitatii si accesibilitatii deplasarilor cu transportul public, cu bicicleta si pietonale**, elaborat SC Geo7 SRL, Slobozia, 2018.



- [58] ***Studiu de fezabilitate (SF-Ilum) pentru reabilitarea, modernizarea si extinderea sistemului de iluminat public in municipiul Focsani - Etapa 1 de prioritate***, studiului de fezabilitate elaborat de: S.C. Global Tech Xpert S.R.L. , Nr. contract: 98568 / 28.12.2017, Data elaborării documentației: martie 2018.
- [59] ***Studiu de fezabilitate Implementarea unui sistem de management al traficului si monitorizare in Municipiul Focsani***, elaborat SC Urbanscope, Bucuresti, 2018.
- [60] ***Studiu de trafic model M – 2018 Municipiul Focsani pentru proiectul Studiu de fezabilitate Implementarea unui sistem de management al traficului si monitorizare in Municipiul Focsani***, elaborat SC Urbanscope, Bucuresti, 2018.

Annex 1

The estimated budget of Focsani Replication Plan is 112.272.240 €. This budget is distributed as follows:

Integrated Solutions Summarize				
IS	Name of the IS	Project name	Budget (€)	Funding
IS 1.2	Near zero retrofit district.	Increasing the energy efficiency of apartment blocks in Focsani (6 blocks)	1027570	Funded
		Increasing the energy efficiency of apartment buildings in Focsani - Stage II (9 blocks)	1311727	Funded
		Increasing the energy performance of the building - School Canteen - in the administration of the Technical College "Valeriu D.Cotea" Focsani and related works to improve energy performance	294997	Funded
		Increasing the energy performance of the building of the Economic College "Mihail Kogalniceanu" and the execution of related works	396528	Funded
		Energy efficiency increase for the school building, including ancillary works, for the Gymnasium School - Ion Basgan	1319437	Funded
		Increasing the energy performance of the school building and the execution of related works "Duiliu Zamfirescu" School	1103142	Funded
		Increasing the energy performance of the "Anghel Saligny" school in Focsani, Vrancea County	546672	Funded
		Increasing the energy performance for the boarding school building and the Canteen building of the "Gh. Asachi" Focsani Technical College, including related work	2077075	Funded
		Rehabilitation, modernization of buildings and equipping of the educational infrastructure of the Kindergarten 18	916492	Funded
		Rehabilitation and modernization of urban public spaces in the Bahne area	4657049	Funded
		Rehabilitation, modernization of buildings and equipping of the educational infrastructure of the Kindergarten 18	954205	Funded
		Rehabilitation and modernization of urban public spaces in the Bahne area	817656	Funded
		Reabilitarea, modernizarea clădirilor și echiparea infrastructurii educaționale a Colegiului Tehnic "Edmond Nicolau"	6156589	Not funded yet (funding application submitted)



		Cresterea eficientei energetice a blocurilor de locuinte din Municipiul Focsani, Etapa a III-a	2654405	Not funded yet (funding application submitted)
		Cresterea eficientei energetice la corp cladire liceu si lucrari conexe, pentru Liceul de Arta "Gh. Tattarescu" din Focsani	1257864	Not funded yet (funding application submitted)
		Cresterea eficientei energetice a cladirii Primariei Municipiului Focsani	3554598	Not funded yet (funding application submitted)
		Cresterea performantei energetice si lucrari conexe pentru cladirea internat a Liceului cu program sportiv	1129260	Not funded yet (funding application submitted)
		Cresterea performantei energetice si lucrari conexe pentru Gradinita nr. 15 Focsani	877304	Not funded yet (funding application submitted)
		Cresterea performantei energetice si lucrari conexe pentru cladirea Liceului Tehnologic G.G. Longinescu Focsani	950190	Not funded yet (funding application submitted)
		Cresterea performantei energetice si lucrari conexe pentru cladirea Liceului Pedagogic Spiru Haret Focsani	1682173	Not funded yet (funding application submitted)
		Cresterea performantei energetice si lucrari conexe pentru cladirea Cinematografului Balada	1238379	Not funded yet (funding application submitted)
IS 2.2	Smart multi-sourced low temperature district heating with innovative storage solutions.	Rehabilitation of the district heating system at the level of Focșani Municipality for the period 2009-2028 in order to comply with environmental legislation and increase energy efficiency - Stage II	14589644	Funded
		Rehabilitation of the district heating system at the level of Focșani Municipality for the period 2009-2028 in order to comply with environmental legislation and increase energy efficiency - Stage III	13179998	Not funded yet (funding application submitted)
IS 3.1	Smart Solar V2G EV's charging	Modernization of public transport in Focșani	8004477	Funded
IS 3.2		Resystematization of the transport infrastructure at the level of Focșani	15342031	Funded



		Municipality, in order to increase the attractiveness and accessibility of public transport, bicycle and pedestrian transport		
	Innovative Mobility Services for the Citizens.	Acquisition of public transport - electric buses (in partnership with MDRAP)	11323309	Funded
		Development of the network of tracks dedicated to bicycle traffic, implementation of a bike-sharing system	2519921	Funded
		Support at the level of the South-East Region for the preparation of projects financed from the programming period 2021-2027 in the fields: urban mobility, urban regeneration	906473	Not funded yet (funding application submitted)
IS 4.1	Services for Urban Monitoring	Rehabilitation, modernization and expansion of the Public Lighting System - Priority Level 1	4112590	Funded
		WiFi4EU	14688	Funded
IS 4.2	Services for City Management and Planning	Vision and performance through the implementation of strategic planning tools, quality / performance management systems and innovative information systems at the level of Focșani Municipality	879804	Funded
		Improving the ICT infrastructure of pre-university education units in Focsani	1817891	Not funded yet (funding application submitted)
IS 4.3	Services for Mobility	Implementing a traffic management and monitoring system	4226347	Funded
IS 5.1	Co-creating the energy transition in your everyday environment	Planning and management of sustainable urban mobility through the elaboration of the SUMP	141412	Funded
IS 5.2	Apps and interfaces for energy efficient behavior	United for the community - efficient partnership for integrated local development in Focsani Municipality	290341	Funded
TOTAL			112272240	-