



NORO GREEN CITIES
Smart Future

NORO Green Cities Project
NORwegian - ROmanian GREEN Cooperation Initiatives Towards Innovation and Environmental Sustainability

Institute of National Economy (INE) - P4

Role: Research and Data Analysis

Responsibilities:

1. Conduct analysis and research
2. Develop surveys and a needs assessments report to inform the project's strategic direction.
3. Participate to workshops and study visits organised by project partners
4. Contribute to the development of Foundation for Smart City roadmap report

The aim of the INE involvement in this project is to identify the needs for developing and implementing the Foundation for Smart City Roadmap report.

The project activities involved (mentioned in Partnership Agreement):

Activity 1 - Capacity Building, Stakeholder Engagement, Knowledge Exchange and Needs Assessment

Activity 2 - Development of the Foundation for Smart City Roadmap Report

Needs Assessment Report and Foundation
for Smart City Roadmap

Authors:

Valentina Vasile

Marius-Razvan Surugiu

Raluca Mazilescu

Razvan Vasile

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0. Executive Summary - Brief overview of the report's purpose, key findings, and recommended actions

Needs Assessment Report and Foundation for Smart City Roadmap - Purpose

- This report serves as a foundational document for the NORO Green Cities project.
- The successful implementation of **Activity 1** of **NORO Green Cities Project**, as evidenced by this report, results in a shared understanding among stakeholders of the challenges, priorities, and opportunities for sustainable urban development.
- Project results prepared by Institute of National Economy as partner in the project consortium. Research team: Valentina Vasile, Marius-Razvan Surugiu, Raluca Mazilescu, Razvan Vasile

By providing a comprehensive understanding of the urban development landscape, the report ensures that all subsequent activities are well-informed and strategically focused.

This shared understanding fosters collaboration, builds trust, and ensures that proposed interventions are responsive to the actual needs and preferences of the community, leading to sustainable and impactful urban solutions. Ultimately, this process enhances the long-term well-being of the community and maximizes the impact of the NORO project activities.

Scientific study's purpose

- To identify the foundations for creating a realistic roadmap for the development of the urban environment in Romania
- To facilitate a reconstruction of local development strategies that harmonize citizens' expectations with the development requirements of the local business environment, preserving the ecological balance and using the facilities offered by new technologies associated with local services of general interest and the advantages of ICT.
- In order to substantiate the needs, and to create a new culture of smart and ecological local development.

Specific approach

Engages a diverse range of stakeholders to ensure a comprehensive understanding of urban development needs and to foster inclusive project outcomes. The stakeholders involved include:

- **Local Governments:** Mayors' offices, urban planning departments, and other municipal authorities who play a crucial role in policy making and implementation of urban development projects.
- **Businesses:** Local enterprises, particularly those in technology, construction, and services sectors, which contribute to or are affected by urban development.
- **Academic Institutions:** Universities and research centre specializing in urban studies, environmental science, and technology development, providing expert insights and innovative solutions.
- **Community Groups:** Non-governmental organizations (NGOs), community-based organizations (CBOs), and advocacy groups representing the interests of residents, particularly those from vulnerable populations.
- **Residents:** Citizens of the communities involved in the project, whose daily lives are directly impacted by urban development initiatives.
- **Experts and Consultants:** Industry experts, consultants, and thought leaders who bring specialized knowledge in smart cities, sustainability, and related fields.

Report content

- **The value of Needs Assessment for designing a robust roadmap for Smart city development**
The emerging concept of Smart city and local development + Stakeholders' cooperation as driven factor for performant and realistic Smart city roadmap – best practices from Nordic EU Member States
- **Research methods for identifying the main factors that can contribute to an innovative roadmap** (State of the art in designing and implementing smart city – a literature review based on WoS scrapping on the specific topic + Qualitative methods – SWOT and surveys addressed to local stakeholders)

- Research results (Where we are in Romania- asymmetric development of the knowledge and implementation of smart city instruments – main consideration + Surveys results and comments)
 - Survey 1 - Questionnaire on stakeholder perceptions of smart city initiatives: current level of understanding, expectations and challenges
 - Survey 2 - Enhanced Survey on Stakeholders' Additional Insights Based on the Discussions and Interactions During the First Themed Workshop and Study Visit in Romania Regarding Smart Cities Initiatives
 - Survey 3 - Comprehensive Analysis and Validation
- Conclusion and policy recommendation

Research conducted were based on:

- Starting from WHERE WE ARE IN ROMANIA
 - Knowledge
 - Opening to smart city implementation
 - Best practices
 - Literature review of the scientific papers related to specific components of SMART CITY/GREEN CITY + sustainability & resilience
- Capture the feedback after project activities implementation – workshops and study visit
 - Best practices from Norway
 - Short informative sessions about roadmap design
 - Learning from experts about new opportunities
 - Opening collaboration with partners from Norway
- Future expectations – the value added of the communication, collaboration
 - stakeholders at local level
 - Potential for development as modern smart/green city

Needs Assessment Report summarizes the findings from data collection, analysis, and stakeholder consultations conducted in the target regions of Bucharest-Ilfov and South-Muntenia. Its goal is to identify the specific needs in the area of Smart Cities, considering the opportunities offered by mapping Norwegian experience and present challenges in Romania. The report provides an overview of the urban development challenges, priorities, and opportunities identified by stakeholders, as well as recommendations for action.

A number of best practices from Nordic EU Member States were identified, taking into account the areas covered by various definitions discussed in this study. These topics included electricity use in smart villages; games created as a discussion starter for stakeholders to aid in planning for future mobility; waste-to-energy solutions; open systems for stakeholders to track urban pollution levels.

A literature review based on WoS scrapping on designing and implementing smart city highlights key trends in smart city research.

Experts' interest for scientific approach and technological transfer

- Concept development:
- Smart City and Green City

City sustainability, from modernist paradigm to ecological thinking

- the modernist paradigm= Smart city --- ecological thinking = green city
- sustainable & resilient urban development refers to the ability of cities to cope with environmental, economic and social challenges and to quickly adapt to changes.
- Research interest for this topic: “SMART”+”roadmap” =119 papers
- “Romania” =319 papers in Web of Science database
- “Norway”=300 papers in Web of Science database

The SWOT analysis of Romania's current status regarding smart city initiatives highlighted increasing stakeholder awareness of smart city initiatives, emerging public-private partnerships, and expanding research on smart and green urban development.

The preliminary SWOT analysis of Romania's current status regarding smart city initiatives

- Increasing stakeholder awareness of smart city initiatives
- Asymmetry in the implementation at municipalities level
- Emerging public-private partnerships- low efficiency
- Poor local authority communication with beneficiaries: citizens and local stakeholders
- Challenges for future development
 - The absence of a national strategy
 - High technology maintenance costs
 - Needs for knowledge and training
 - To foster a participatory approach to urban planning
 - The need for international collaboration.

Surveys:

- The report synthesizes findings from comprehensive data collection, stakeholder engagement, and expert analysis conducted within the target regions of South-Muntenia and Bucharest-Ilfov.
- Its aim is to identify and articulate the specific needs named by stakeholders (survey 1 & 2) with opportunities offered by mapping Norwegian experience (survey 3) and present challenges & barriers in Romania.
- Provide useful information to facilitate the resetting of the approach to smart city development, in accordance with
 - The dynamics of technical progress
 - The requirements of the SDGs, as directions of human development in harmony with the environment
 - Citizens' expectation on quality of life -a decent, comfortable, inclusive, safe life that balances environmental requirements with the need for urban digital development

- Urban development models
- Local culture on societal development

Methods and database:

- The survey is developed to identify the perception and knowledge on smart city initiatives.
- Structured questionnaires distributed both online and in person to collect quantitative and qualitative data. Surveys were designed to assess stakeholders' awareness, expectations, and perceived challenges related to smart city initiatives
- Survey 1 = 293
- Survey 2 = 42
- Survey 3 = 12

The structure of the questionnaires

Questionnaire	Similar module	Specific modules
Questionnaire 1	Module 5 – Demographic profile	Module 1 – Identify current knowledge levels Module 2 – Understand initial expectations Module 3 – Highlight immediate challenges Module 4 – Focusing future efforts
Questionnaire 2	Module 1 – Demographic Profile	Module 2 – Validation of Initial Findings Module 3 – Identifying Additional Opportunities Module 4 – Participation in Questionnaire 1 Module 5 – Active Partnerships for Smart Local Development - Refining Stakeholder Needs Module 6 – Future Activities

Questionnaire 3	Module 1 – Demographic Profile	Module 2 – Capitalise the knowledge from the visit in Norway Module 3 – Prioritise Action Areas for future development Module 4 – Prepare Stakeholders for the Next Phase of the Smart City Initiatives
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1. Introduction

Purpose of the Report: The Needs Assessment Report is a component of the NORO Green Cities project.

This report provides a crucial baseline from which all project activities will be developed and measured. It serves to ensure that the strategies and actions of the NORO Green Cities project are deeply informed by and responsive to the real-world contexts and requirements of the communities we aim to transform.

The report synthesizes findings from comprehensive data collection, stakeholder engagement, and expert analysis conducted within the target regions of South-Muntenia and Bucharest-Ilfov.

Its aim is to identify and articulate the specific needs identified by stakeholders with opportunities offered by mapping Norwegian experience and present challenges in Romania.

Through the selected analysis methods, the study aimed to provide useful information to facilitate the resetting of the approach to smart city development, in accordance with the dynamics of technical progress and the requirements of the SDGs, as directions of human development in harmony with the environment.

The community in which we live must respond to the aspirations of its own citizens for a decent, comfortable, inclusive, safe life that balances environmental requirements with the need for urban digital development

From defining current landscape, to selection of good practices and identifying adaptation possibilities for the implementation in Romania of technologies associated with digital services for citizens, the results of the report constitute components of the substantiation of the local roadmap, with the broad and active involvement of local stakeholders and the creation/adjustment of the culture of balanced, inclusive and sustainable urban development, "city for all" (Jati et al, 2023).

Report Overview:

- **Stakeholder Insights:** Gathering diverse perspectives from local residents, business owners, public officials, and experts to gain a comprehensive understanding of the community's aspirations and concerns.
- **Urban Challenges and Opportunities:** Analysing the unique urban development challenges faced by South-Muntenia and Bucharest-Ilfov, while also identifying potential opportunities for smart city interventions.
- **Recommendations for Action:** Offering targeted recommendations that are designed to address identified needs and to capitalize on opportunities to enhance urban livability and sustainability.

Through this needs assessment, the NORO Green Cities project aims to foster a participatory approach to urban planning. By engaging a broad spectrum of stakeholders and grounding our strategies in empirical data and localized insights, we strive to ensure that our smart city solutions are not only innovative but also inclusive and equitable.

Significance of the Findings: The findings from this assessment are intended to guide the strategic direction of the NORO Green Cities project. They provide a framework for aligning project goals with community needs, enabling effective planning, resource allocation, and implementation of smart city technologies and practices.

As we move forward, the insights garnered from this report will be instrumental in shaping interventions that are both impactful and sustainable. It is a guide for all stakeholders involved, offering a clear path towards a more connected, resilient, and smart urban future.

The NORO Green Cities project, standing for "NORwegian - ROmanian GREEN Cooperation Initiatives Towards Innovation and Environmental Sustainability," is an innovative collaboration between Norway and Romania designed to address and transform urban development challenges into sustainable solutions through smart city initiatives. The project aims to leverage cutting-edge technology and foster bilateral cooperation to create resilient, inclusive, and environmentally sustainable urban environments.

Key objectives include:

- **Promote Sustainable Urban Development:** Implement smart city solutions that enhance the environmental, social, and economic sustainability of urban areas.
- **Strengthen Bilateral Relations:** Build and strengthen the partnership between Norwegian and Romanian entities, sharing knowledge, technology, and best practices in urban development.
- **Innovate through Technology:** Integrate advanced digital technologies, such as IoT, big data, and AI, to improve city services and infrastructure.
- **Enhance Quality of Life:** Improve urban liveability by addressing key issues such as mobility, energy efficiency, waste management, and public services.
- **Build Capacity and Empowerment:** Increase the capacity of local authorities and stakeholders to plan, implement, and manage smart city projects through training and knowledge transfer.
- **Create Replicable Models:** Develop frameworks and models that can be adapted and replicated in other cities and regions, promoting broader impacts of the project's outcomes.

2. The value of Needs Assessment for designing a robust roadmap for Smart city development

The needs assessment report within the NORO Green Cities project is to comprehensively understand and document the current state, challenges, and opportunities related to urban development in the targeted areas.

This assessment is crucial for the following reasons:

- **Identify Specific Urban Challenges:** To pinpoint the unique challenges each city or community within the project's scope faces, enabling targeted interventions.
- **Gauge Stakeholder Perceptions and Expectations:** To gather insights from a broad range of stakeholders, including local governments, businesses, community groups, and citizens, ensuring that the project addresses real needs and gains wide support.
- **Establish Baseline Data:** To collect baseline data against which the impact of subsequent smart city initiatives can be measured.
- **Guide Project Strategy and Prioritization:** To inform the strategic direction of the NORO project by identifying key areas where interventions could yield significant benefits, thus ensuring effective use of resources.
- **Foster Collaboration and Buy-in:** To engage stakeholders from the outset, fostering a sense of ownership and collaboration that is critical for the successful implementation and sustainability of smart city solutions.

2.1. The emerging concept of Smart city and local development

The concepts of Smart City and Green City are not identical. They deal with different angles of urban development but some areas overlap.

The Smart City concept deals with the use of digital technology to enhance the quality of life, the efficiency of public services as well as the management of resources. The concept involves, but is not limited to, IoT (Internet of Things) in use for urban infrastructure management, smart mobility

(public transport optimization, electrical vehicles, and intelligent traffic management), smart energy (smart electricity grids and efficient consumption management).

On the other hand, Green City is related to, among others, pollution reduction, enhanced protection of the environment, increased use of renewable energies, creation of green spaces, low carbon footprint, circular economy, and responsible consumption, etc.

Both concepts aim at efficient use of resources and improving life standards. The green objectives can be attained by using smart solutions. These aspects can be related, for example, to monitoring air quality and green public transport. Thus, sustainable development can be reached by using advanced technologies and green measures. Smart City and Green City concepts are different but complementary. A model city can combine both technological innovations (Smart City) and ecological principles (Green City). This approach can ensure sustainable, intelligent urban development.

There are various definitions of a smart city in the literature. Thus, a city is smart when “investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic growth and a high quality of life, with a wise management of natural resources, through participatory governance” (Caragliu et al., 2011). A smart city “implies a high-tech intensive and an advanced city that connects people, information and city elements using new technologies in order to create a sustainable, greener city, competitive and innovative commerce and a recuperating life quality with a straightforward administration and a good maintenance system” (Bakıcı et al., 2013). Some newer definitions emphasize that a smart city “is a place where traditional networks and services are made more efficient with the use of digital solutions for the benefit of its inhabitants and business” (European Commission, 2025a). Also, “a smart city is an urban area where technology and data collection help improve quality of life as well as the sustainability and efficiency of city operations” (Gomstyn and Jonker, 2023), “an urban area that uses an array of digital technologies to enrich residents’ lives, improve infrastructure, modernize government services, enhance accessibility, drive sustainability, and accelerate economic development” (Microsoft, 2025).

Considering the above definitions, a smart city is a place where ICT infrastructure is used to enhance government services and quality of life of its inhabitants, and support businesses. The main goals are efficiency, connectivity, and data-driven decision-making.

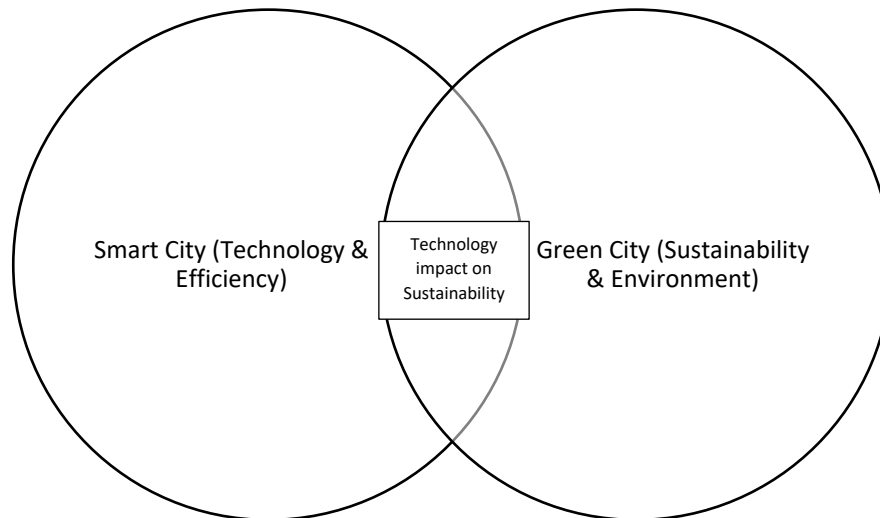
Table 1 Differences between smart city and green city principles

	Smart City	Green City
Focus	Technology & efficiency	Sustainability & environment
Goal	Use technology to improve the quality of life	Use community engagement to reduce environmental impact
Key Elements	IoT, AI, Big Data	Clean energy, nature
Example	A city that uses sensors for urban services	A city that prioritizes green spaces and CO ₂ reduction

Source: developed by the authors

The green city concept is also known as a sustainable city, and according to UN (2025), “promoting sustainable human settlements development’ is the subject of Chapter 7 of Agenda 21, which calls for 1) providing adequate shelter for all; 2) improving human settlements management; 3) promoting sustainable land-use planning and management; 4) promoting the integrated provision of environmental infrastructure: water, sanitation, drainage and solid waste management; 5) promoting sustainable energy and transport systems in human settlements; 6) promoting human settlements planning and management in disaster-prone areas; 7) promoting sustainable construction industry activities; and 8) promoting human resource development and capacity-building for human settlements development”. Also, a green city “is an urban enclave where construction, design, and operation prioritise the preservation of the natural world alongside the social, physical, and economic health and wellness of the city’s inhabitants” (Loughlin, 2024). Green cities “are those which are specifically designed or adapted in such ways they reduce their environmental impact and make life better for its citizens. A green city is a sustainable city which considers the environmental, social and economic impact of the city's infrastructure on both its current and future inhabitants” (Ropero Portilo, 2023).

Figure 1 The relationship between Smart & Green Principles



Source: developed by the authors

Considering the above definitions, a green city is focused, among others, on developing sustainable land-use planning, providing renewable energy and eco-friendly transport systems. Also, these settlements preserve the natural environment. This approach considers policies, community engagement, and technological innovations to obtain a more sustainable urban environment. Various cities around the world aim to combine both concepts to be smart and sustainable at the same time.

The concept of a green city is closely related to that of a green transition. The two concepts are complementary. The green transition is a broader concept related to the transformation of the entire economy and society towards sustainable models characterized by low carbon emissions and a more responsible use of resources. This involves changes in various sectors, such as energy, transport and industry.

In this context, cities are important for the green transition, as they are responsible for a large share of global carbon emissions and resource consumption. Therefore, measures adopted at the urban level can contribute to achieving the broader goals of the green transition.

The growth strategy of Europe is the European Green Deal. By 2050, the European Green Deal seeks to reduce pollution, develop sustainable industry and transportation, increase economic growth through green technologies, and make Europe climate neutral (European Commission, 2025b). The European Green Deal targets are zero net greenhouse gas emissions by 2050 and an economic growth decoupled from resource use (European Commission, 2025c). These aspects emphasise the concept of green transition.

The green transition is also influenced by various smart components that leverage technology and innovation. Examples include smart energy systems integrating renewable energy sources, sustainable mobility solutions such as electric vehicles for public use, public transport apps, and digital platforms that promote shared mobility. Other examples are smart traffic systems designed to reduce congestion and emissions, and smart buildings equipped with automated energy-saving systems. These innovations show how the green transition and smart technologies are connected, with smart solutions helping cities achieve sustainability goals.

In discussions about sustainable urban development, resilience refers to the ability of cities to cope with environmental, economic and social challenges and to quickly adapt to changes.

In the context of green cities, resilience is linked to the ability of cities to implement ecological solutions that respond to environmental challenges. Thus, the efficient management of natural resources and the reduction of carbon emissions contribute to building cities that are resilient to climate change. These cities can have solutions such as the use of renewable energy sources and the implementation of pollution reduction solutions.

In the context of smart cities, advanced technologies play an important role in improving the resilience of cities. For example, intelligent traffic management systems can help reduce congestion and pollution, and environmental monitoring solutions can provide real-time data to enable quick responses to challenges.

In conclusion, resilience is a complex concept. In the context of green and smart cities, it refers to technological and ecological solutions to create cities capable of responding effectively to various challenges. These cities will be better prepared to cope with challenges and protect the well-being of their communities in the long term.

Table 2 Definitions of resilience

Organisation	Definition
Canadian International Development Agency	The ability of individuals, households, governments, regions, and systems to mitigate , resist, absorb, and recover from the effects of shocks and disasters in a timely, sustainable, and efficient manner
UK Department for International Development	The ability of countries, communities and households to manage change by maintaining or transforming living standards in the face of shocks or stresses without compromising their long-term prospects
European Commission	The ability of an individual, a household, a community, a country or a region to withstand, to adapt , and to quickly recover from stresses and shocks
German Federal Ministry of Economic Cooperation and Development	The ability of people and institutions – be they individuals, households, communities or nations – to deal with acute shocks or chronic burdens (stress) caused by fragility, crises, violent conflicts and extreme natural events, adapting and recovering quickly without jeopardising their medium and long-term future
Grantham Institute - Climate Change and Environment	The capacity or ability to anticipate and cope with shocks, and to recover from their impacts in a timely and efficient manner
Intergovernmental Panel on Climate Change	The ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organisation, and the capacity to adapt to stress and change
International Federation of Red Cross and Red Crescent Societies	The ability of individuals, communities, organizations or countries exposed to disasters, crises and underlying vulnerabilities to anticipate, reduce the impact of, cope with and recover from the effects of adversity without compromising their long-term prospects
London Resilience Partnership	An enabler which helps London to survive and prosper. It is the ability of institutions and communities to work together to prevent, handle then recover and learn from disruption , and adapt to change
OECD	The ability of individuals, communities and states and their institutions to absorb and recover from shocks, while positively adapting and transforming their structures and

Organisation	Definition
	means for living in the face of long-term changes and uncertainty
Oxfam	The ability of women, men, and children to realise their rights and improve their well-being despite shocks, stresses, and uncertainty
Stockholm Resilience Centre	Resilience is the capacity of a system, be it an individual, a forest, a city or an economy, to deal with change and continue to develop. It is about how humans and nature can use shocks and disturbances like a financial crisis or climate change to spur renewal and innovative thinking
World Economic Forum	Resilience is the ability to deal with adversity, withstand shocks, and continuously adapt and accelerate as disruptions and crises arise

Source: based on Forsyth (2023).

The definitions from the table above describe resilience across various contexts, with common themes around adaptation, recovery, and sustainability in the face of shocks. These concepts align with principles of green and smart cities, which emphasize sustainable, adaptable, and innovative urban areas. Thus, the key connections are:

- **mitigation and recovery from shocks:** in the context of green cities, green infrastructure (e.g., parks) mitigates the impacts of climate change. Also, the renewable energy sources and energy-efficient systems reduce dependency on fossil fuels, enhancing resilience to energy crises. In the context of smart cities, IoT-based warning systems for climate monitoring improve real-time response.
- **adapting to long-term changes and uncertainty:** in the context of green cities, circular economy reduces resource consumption, fostering environmental resilience. In the context of smart cities, AI can forecast urban needs, enabling cities to adapt to various challenges. Smart water management systems ensure efficient use of water resources.
- **maintaining or transforming living standards:** in the context of green cities, low-carbon transport systems maintain mobility while reducing emissions. In the context of smart cities, intelligent public transport systems optimize mobility and reduce congestion.

Resilience is at the core of both green and smart city strategies. Green cities concept is focused on ecological and environmental resilience, while smart cities concept is related to technological adaptability. Together they are creating a comprehensive approach to urban areas. These concepts are important to achieving sustainability and resilience in the face of various challenges.

The definitions from the above table have some components that are not directly connected to green or smart city principles but emphasize broader aspects of resilience. These include social or institutional dimensions:

- **learning from disruption** - shows the ability to learn from past disruptions, which could involve institutional reforms and policy changes;
- **ability of a social system** - the role of communities in resilience, without an emphasis on ecological or technological approach;
- resilience of **women, men, and children** - addressing this aspect shows inclusion / equity rather than technological or environmental solutions.

While various definitions of resilience align with green and smart city principles, they also have references to broader aspects of social and institutional resilience. These dimensions refer to the ability to learn from the past, the role of communities in resilience and the inclusion / equity aspects, which are important in understanding the resilience but are not directly connected to green or smart city concepts.

There are various documents developed by different institutions that incorporate guidelines and standards for green and smart cities. All of these works help create a framework that can be used in the process of developing green and smart communities.

The Guidelines for the development of a smart sustainable city action plan (UNECE, 2018) contain a framework to guide stakeholders through the action plan drafting process. This document contains components of an action plan and provides concrete examples and tools to guide the development of the plan.

UN-Habitat has developed a draft of an International Guidelines on People-Centred Smart Cities, a non-binding framework for developing national and local smart city regulations, plans and strategies to ensure that digital urban infrastructure and data contribute to making cities and communities that are sustainable, inclusive, prosperous, gender-responsive and human rights-

based (UN-Habitat, 2024). This document contains a definition of people-centred smart cities, the core values and actions to uphold the international guidelines and a step-by-step process recommended to ensure successful implementation of the guidelines.

Another important document is the Smart City Guidance Package (SCGP) that contains information about planning smart city and low energy district projects in an integrated way. It describes situations and provides real-life examples. The document contains information about experiences and expertise of cities, businesses, citizens, research institutes and NGOs. The document provides a view regarding the challenges for cities, the responses for those challenges, some key issues in integrated planning and management of smart city projects, the necessary steps from planning to implementation, and various examples (Borsboom-van Beurden et al., 2019).

A set of guidelines were developed by EGDC (2024), and the document is called Deployment Guidelines – Smart Cities Sector. The guidelines provide recommendations for solution developers and providers, as well as considerations for buyers/users of ICT solutions, investors, and policy makers to maximise resource and energy savings enabled by ICT solutions, minimise solutions' emissions, define metrics and track them to understand solutions' impact, design the solution to broaden its reach, and consider other sustainability impacts beyond carbon.

The Norwegian roadmap for smart and sustainable cities and communities (Design and Architecture Norway et al., 2019) is a guide for municipalities and county councils. The roadmap is the result of co-creation between inhabitants and 150 actors from the public sector, industry and commerce and academia and is a guide for municipalities and county councils wishing to use smart city as a method. It aims to promote the development of sustainable, productive and adaptable cities and communities. The vision of the roadmap emphasises that the smart cities and local communities shall be attractive, inclusive, efficient, climate-friendly, adaptable, and health-promoting. The principles used in the study are: focus on citizens, think holistically, prioritise climate and environment, emphasise inclusion and co-creation, invest in next-generation industry and commerce, share and make use of open data, invest in skills development, restructuring and innovation, and start locally, think globally.

2.2. Stakeholders' cooperation as driven factor for performant and realistic Smart city roadmap – best practices from Nordic EU Member States

Based on this discussion related to the definitions of resilience, the following table was developed, considering the topics covered by those definitions. Thus, the best practices presented in the table are connected to topics such as:

- electricity use in a smart village;
- a game developed as a conversation starter for stakeholders to help plan for future of mobility;
- an open system for stakeholders to monitor pollution levels in cities;
- waste-to-energy solutions.

Table 3 Examples of best practices for green and smart cities – European level

No.	Project Name / Project Deliverable / Objective / Domain / Location	Financing program / Duration / Status / Weblink
1.	Electricity Use in the Smart Village Skarpnes / To examine how the electrical distribution network can be designed and managed in an optimal way in the future, where new requirements in the building sector implies an increasing proportion of new "near-zero energy" houses. The introduction of low-energy housing with local energy production from photovoltaic systems is expected to provide changing consumption patterns / Energy sector, building sector / Arendal, Norway	Research Council of Norway (RCN) / 26.11.13 - 31.01.18 / Concluded / https://www.norceresearch.no/en/projects/226139-nfr-electricity-usage-in-smart-village-skarpnnes
2.	Nordic Urban Mobility 2050 – Future Cities / In-depth interviews with mobility experts, and testing, Finnish service design company Hellon have together with Nordic Innovation developed the Nordic Urban Mobility 2050 Futures Game. The intention of the game is to be used as a conversation starter for municipalities, companies and citizens to help plan and prepare for future of mobility, and to encourage participants to identify areas for Nordic	Nordic Innovation program Nordic Smart Mobility and Connectivity / 2019 – 2020 / Closed / https://www.nordicinnovation.org/programs/nordic-urban-mobility-2050-future-cities

No.	Project Name / Project Deliverable / Objective / Domain / Location	Financing program / Duration / Status / Weblink
	collaboration / Public administration / Nordic cities	
3.	The Nordic Smart City Roadmap / With this joint Nordic Smart City Roadmap some principles are promoted – conceptual, ethical and political guidelines – that honour a more human centric, inclusive and collaborative approach to developing smarter and more sustainable communities / Public administration / Nordic cities and municipalities	Nordic Innovation through the Nordic Sustainable Cities program / Closed / https://www.nordicinnovation.org/2021/nordic-smart-city-roadmap
4.	+CityxChange EU Horizon 2020 project / How to PED. The +CityxChange Cookbook: Experiences and Guidelines on Positive Energy Districts / The “How to PED” cookbook contains experiences, lessons learned, and recommendations gained throughout the 5 years of the +CityxChange EU Horizon 2020 project, specifically focused on the variety of activities necessary to design and build Positive Energy Districts (PEDs) in smart sustainable cities and communities / Public administration / Trondheim, Limerick, Sestao, Alba Iulia, Pisek, Võru, Smolyan	European Union's Horizon 2020 research and innovation programme / November 2018 – 31 October 2023 / Closed / https://cityxchange.eu/knowledge-base/how-to-ped-cookbook/
5.	Carbon Track and Trace Project (CTT) / Reducing CO2 emissions, combating climate change in cities and also developing a decision support system for cities greenhouse gas (GHG) emissions monitoring. This project wants to provide municipalities and public institutions with an open system to allow inhabitants know what happens in their cities in relation to GHG and pollution / Public administration, Climate / Trondheim (Norway) and Vejle (Denmark)	EU Climate KIC programme / 2016 / Finished / https://www.libelium.com/libeliumworld/success-stories/enhancing-environmental-control-and-reducing-emissions-in-nordic-smart-cities/ / https://orbit.dtu.dk/en/projects/carbon-track-and-trace
6.	Creating Actionable Futures / Horizon Europe funded project bringing together cities and their citizens, policymakers, arts and academia to jointly shape the transition to climate neutrality (collaborative governance models) / Climate / More than 70 EU municipalities	New European Bauhaus (NEB) initiative of the European Union / European Union’s Horizon Europe Research and Innovation programme / 05/2022-06/2025 / https://craft-cities.eu/about-the-project

No.	Project Name / Project Deliverable / Objective / Domain / Location	Financing program / Duration / Status / Weblink
7.	DatSam – Data-driven co-creation: - methods and tools for sustainable innovation and societal development / The project investigates innovation and co-creation methods towards the SDGs in the public sector / Public administration / Bærum and Ålesund municipalities, Norway	Research Council of Norway / 2021-2025 / https://prosjektbanken.forskingsradet.no/project/FORISS/321102/ / https://www.baerum.kommune.no/datadrevet-samskaping
8.	Waste to Energy Facility in Högbytorp / With the recycling facility in Högbytorp, E.ON contribute to solving this challenge by transforming what no one wants – waste – into something that everyone needs – energy – while creating conditions for sustainable growth in Sweden’s most expansive region / Climate & Environment / Högbytorp, Sweden	https://smartcitysweden.com/best-practice/438/waste-to-energy-facility-in-hogbytorp
9.	A sustainable, intelligent district heating system in Karlshamn / In Karlshamn, a collaboration between several organisations has created a sustainable, intelligent district heating system. The system is controlled using the latest AI technology and is constantly evolving to create a future-proof sustainable energy supply / District Heating & Cooling, Digitalisation, Energy / Karlshamn, Sweden	https://smartcitysweden.com/best-practice/430/the-intelligent-district-heating-system-makes-use-of-ai
10.	Electromobility in Gothenburg Creates a Greener and Cleaner City / Gothenburg is home to several leading projects within ‘electromobility’, which refers to various types of electrically powered transport. The city has already made significant progress in electrifying its public transport, last-mile deliveries and waste transport. The goal now is for the entire transport system to be electrified and fossil-free by 2030 / Mobility, Electrification, Public Transport / Gothenburg, Sweden	https://smartcitysweden.com/best-practice/432/electromobility-in-gothenburg-creates-a-greener-and-cleaner-city
11.	Meet the Ecosystem: Danish Innovators Redefine Affordable Green Housing / Smaller apartment units alongside shared spaces, circularity in construction and prioritizing sustainable materials, aiming for a reduction in	https://bloxhub.org/ikke-kategoriseret/danish-disrupters-redefine-affordable-green-housing

No.	Project Name / Project Deliverable / Objective / Domain / Location	Financing program / Duration / Status / Weblink
	environmental footprints / Real Estate / Copenhagen, Denmark	
12.	Bicycle parking in Copenhagen / Well-designed bicycle parking means a well-organized urban space, pedestrian accessibility, greater use of collective transport, support of local shops, etc. / Urban Partnerships / Copenhagen, Denmark	https://bloxhub.org/impact-stories/bicycle-parking-in-copenhagen
13.	The Future Workplace / Organizing workplaces in the future; at home, in the corporate workplace and in-between? The challenges were: design ideas for the home office, develop the environments outside of homes and offices to implement a flexible workplace, and working from home impact on companies' physical space. Five solutions were found: Home office – The full package; Redesign the HQ – Value-based design & architecture; The digital twin – connecting the third place; A sense of belonging; The ultra flexible office “studio” / Urban Partnerships / Copenhagen, Denmark	https://bloxhub.org/case/the-future-workplace
14.	The project of Danish Gehl, Dutch Bernard van Leer Foundation and Copenhagen Solutions Lab applies data from air measurements, that Copenhagen Solutions Lab carried out together with Google and Utrecht University, to set up concrete guidelines for urban planning. The goal is to provide practitioners, urban planners and decision makers with tools in the form of fact-based design codes for healthy urban environments that at the same time works as an invitation to outdoor and social activities / Copenhagen, Denmark	https://cphsolutionslab.dk/en/projekter/themes/air/copenhagen-solutions-lab-indgar-i-et-nyt-projekt-om-luftforurening
15.	Smart services and future solutions found in Kalasatama area of Helsinki: new forms of housing - floating apartments, digital health services and new practices, shared electric new forms of vehicles, smart metering and home remote-control service allowing residents to connect and operate their appliances with mobile devices, waste collection system based	https://fiksukalasadama.fi/en/building-blocks/project-portfolio/

No.	Project Name / Project Deliverable / Objective / Domain / Location	Financing program / Duration / Status / Weblink
	on vacuum and underground pipelines, etc. / Helsinki, Finland	
16.	Turning wastewater into green energy: <u>VCS Denmark (VandCenter Syd in Danish)</u> is a water and wastewater utility in Denmark that is energy positive: producing more energy than it's consuming. In the VSC Denmark's largest facility, the Ejby Mølle plant, renewable energy is produced by turning sludge into biogas, which is then transformed into heat and electricity. Digesters and buildings are heated by waste heat from gas motors, and surplus heat production is sold to the regional district heating utility / Denmark	https://stateofgreen.com/en/news/10-examples-of-smart-city-solutions/
17.	District heating in Castelnuovo del Garda, Italy: the municipality of Castelnuovo del Garda received funding in 2012 to establish a district heating system. The district heating project desired to exploit residual heat recovered from the local industry <u>Air Liquide</u> . The excess heat is extracted through a heat pump and delivered to a newly established district heating network, supplying a public school and a sports centre. Air Liquide is a multinational company producing industrial gasses / Italy	https://smart-cities-marketplace.ec.europa.eu/insights/solutions/district-heating-castelnuovo-del-garda-italy

3. Research methods for identifying the main factors that can contribute to an innovative roadmap

The purpose of this report is to identify the foundations for creating a realistic roadmap for the development of the urban environment in Romania, to facilitate a reconstruction of local development strategies that harmonize citizens' expectations with the development requirements of the local business environment, preserving the ecological balance and using the facilities offered by new technologies associated with local services of general interest and the advantages of ICT.

In order to substantiate the needs, and to create a new culture of smart and ecological local development, we considered it appropriate to consider a) both the specialized literature in the field and national and international good practices, but also b) a scan of the current position of local actors - the business environment, local authorities and citizens, the communication between them and the involvement in the sustainable development of the municipality representing a robust component of the roadmap design.

That's why The NORO Green Cities project engages a diverse range of stakeholders to ensure a comprehensive understanding of urban development needs and to foster inclusive project outcomes. The stakeholders involved include:

- Local Governments: Mayors' offices, urban planning departments, and other municipal authorities who play a crucial role in policy making and implementation of urban development projects.
- Businesses: Local enterprises, particularly those in technology, construction, and services sectors, which contribute to or are affected by urban development.
- Academic Institutions: Universities and research centre specializing in urban studies, environmental science, and technology development, providing expert insights and innovative solutions.
- Community Groups: Non-governmental organizations (NGOs), community-based organizations (CBOs), and advocacy groups representing the interests of residents, particularly those from vulnerable populations.

- Residents: Citizens of the communities involved in the project, whose daily lives are directly impacted by urban development initiatives.
- Experts and Consultants: Industry experts, consultants, and thought leaders who bring specialized knowledge in smart cities, sustainability, and related fields.

The research methods used to carry out this study were selected based on this integrated and participatory approach, considering that a realistic construction of the roadmap includes the added value offered by the academic environment but also the experience of the business environment and communities. Therefore, to effectively gather input and foster engagement from the listed stakeholders, the NORO Green Cities project utilizes several methods:

- A selective analysis of the specialized literature in the field, using modern methods of querying scientific databases such as Web of Science (WoS), which presents current research in the field and local development directions, from a scientific perspective, but also good practices (their analysis, highlighting the added value and the potential for technological transfer to other geographical areas and types of communities, with different degrees of urban, intelligent and ecological development). VOSviewer was used as a tool. The literature review is presented in Annex 1;
- Workshops: Interactive sessions where stakeholders can collaboratively explore specific issues, generate ideas, and prioritize actions. Workshops often involve brainstorming, problem-solving exercises, and scenario planning, and are facilitated by experts to ensure productive discussions;
- Study visits and Advisory Panels: Meetings with a panel of experts and key stakeholders from Norway who provide detailed information and personal experiences, different perspectives in decision-making processes.
- Surveys: Structured questionnaires distributed both online and in person to collect quantitative and qualitative data. Surveys were designed to assess stakeholders' awareness, expectations, and perceived challenges related to smart city initiatives.

The following qualitative methods were used: **SWOT analysis** and **surveys** addressed to local stakeholders

3.1. SWOT analysis – A preliminary view on the Romania’s experience in Smart city development

A very brief SWOT analysis of Romania’s current status regarding smart city initiatives was developed based on the wider and non-systematic literature review. To this we added a synthesis of examples of good practices identified in the regions of analysis and from discussions with local stakeholders who participated in the meetings organized within the project.

Strengths:

- growing awareness regarding the importance of smart city initiatives among stakeholders;
- various funding opportunities at European Union level dedicated to smart city development (e.g., PNRR (National Recovery and Resilience Plan));
- projects developed by Romanian cities;
- emerging collaboration - Public-Private Partnerships (PPPs).

Weaknesses:

- absence of a national strategy for smart cities;
- disparities between urban and rural areas in terms of technology adoption;
- conflicting interests between stakeholders;
- reluctance of stakeholders to adopt new technologies;
- lack of skilled workforce;
- high costs associated with technology maintenance;
- technological obsolescence.

Opportunities:

- alignment with Sustainable Development Goals for sustainable urban planning;
- implementation of emerging technologies for improved public services;
- access to best practices from other countries;
- collaboration with other countries in various projects (bilateral cooperation/twin cities);

- a growing number of scientific studies addressing topics related to green city / smart city/ smart development / local development.

Threats:

- data breaches and cyberattacks due to increased reliance on digital technologies
- dependence on the technology developed by other countries in the implementation of smart cities.
- a further in-depth analysis will take into account the research results of the 319 scientific papers published in WoS.

3.2. Technical details on Surveys - The concept and content of the questionnaires

Three questionnaires were developed to capture the situation from Romania on smart cities topic, focused on identifying the perception and knowledge of stakeholders on smart city initiatives, validating the initial results obtained from the application of the first survey, refining the understanding of needs and identifying additional opportunities on smart city initiatives, and finalizing the needs assessment, prioritizing action areas, and preparing the stakeholders for the next phase of the smart city initiatives. The results from each survey highlight key insights into smart city perceptions and behaviors.

The questionnaires were applied in three rounds of qualitative surveys:

a) The first one included a wider audience, namely representatives of local authorities and stakeholders from municipalities in the South-Muntenia and Bucharest-Ilfov areas, distributed online and during workshops organized in Romania with experts from Norway. The selection of the target group was random, using the contact database of the Romanian project partners. It is not a survey based on a statistically representative sample at the level of municipalities and stakeholders operating in the areas considered in the project (South-Muntenia and Bucharest-Ilfov), the short time of the project (about 3 months of research) not allowing this. The aim was to identify, as much as possible, the current state of knowledge in the field of the various stakeholders

and to test their degree of interest in involving the development of the municipalities in which they live and work. The questionnaire for Survey 1 can be found in Annex 2.1, while the detailed results are presented in Annex 2.2.

b) The second questionnaire was developed to identify the participants' perception and the degree of in-depth knowledge of the local development components associated with smart city development. It was primarily addressed to the participants at the formal and informal meetings within the project. They were completed online, in an anonymous system, after the project meetings, thus giving time to reflect and reconsider their own perception, degree of knowledge and awareness of the opportunities existing in Romania. The questionnaire for Survey 2 can be found in Annex 3.1, while the detailed results are presented in Annex 3.2.

c) The third questionnaire aimed at understanding the potential for the transfer of good practices from Norway to urban communities in Romania. The target group was represented by the participants in the working visit to Norway and aimed to identify the change in perception towards the opportunities of local development in Romanian cities - identifying needs, possibilities of technological transfer, prioritizing priorities taking into account a) the barriers - financial, legislative, administrative, institutional management, local governance methods and their efficiency, the local cultural model and b) the aspirations for development at the local level. This questionnaire was also applied after participating in the working visit to Norway and included a broader subjective component, the aim being to inventory opinions about what and how the experience from Norway can be capitalized on in Romanian communities. The questionnaire for Survey 3 can be found in Annex 4.1, while the detailed results are presented in Annex 4.2.

Questionnaires 2 and 3 allowed for a detailed exploration of expert opinions presented in the organized meetings, identifying specific challenges, and nuanced perspectives that might not emerge in broader forums. Completed post-event, they also captured the elements of reflection necessary for the coagulation of possible local initiatives post-implementation of the present project, by capitalizing on the opportunities offered by the project - signing bilateral MoUs and initiating collaborations for accessing European funds aimed at local development.

In order to ensure greater accuracy of the answers and to highlight the honest perception of the respondents, all questionnaires were completed anonymously, given the position of the respondents in the communities in Romania.

The main technical details on the questionnaires design are as follows:

a) Number de respondents

- The number of respondents for Questionnaire 1 was 293, for Questionnaire 2 was 42, and for Questionnaire 3 was 12.
- **The number de respondents from outside the selected two regions (South-Muntenia and Bucharest-Ilfov) were**
 - o For Questionnaire 1, we identified 23 respondents from another region based on their email addresses;
 - o For Questionnaire 2, we were unable to determine if there were respondents from outside the two regions;
 - o For Questionnaire 3, we identified 1 respondent from another region based on the email addresses.

b) The **population of the project analysis topic, statistically represented, includes:**

- In the South-Muntenia region, there are 48 large cities (Romanian "municipiu"), cities and towns;
- In the Bucharest-Ilfov region, there are 9 large cities (Romanian "municipiu"), cities and towns.

Table 4 The number of municipalities in the selected regions

Region	No. of large cities (Romanian "municipiu")	No. of cities and towns	Total
South-Muntenia	16	32	48
Bucharest-Ilfov	1	8	9

Source: developed by the authors, based on National Institute of Statistics Romania (2023). 2021 Population and Housing Census, www.recensamantromania.ro/rezultate-rpl-2021/rezultate-definitive/

- According to National Institute of Statistics, in 2023 there were 78,927 active enterprises in the South-Muntenia region, and 171,755 active enterprises in the Bucharest-Ilfov region.

Table 5 The number of active enterprises in the selected regions, 2023

Region	Number of active enterprises
South-Muntenia	78,927
Bucharest-Ilfov	171,755

Source: National Institute of Statistics Romania, Tempo Online database, accessed on February, 10, 2025

- c) The structure of the questionnaires was modular, with a common denominator, namely the content of the information in the demographic module.

The thematic construction of the other modules took into account the scope and objectives of the project. They were carried out "in cascade", following the detailing of relevant aspects for the local roadmap for smart and green city development design in municipalities in Romania

Table 6. The structure of the questionnaires

Questionnaire	Similar module	Specific modules
Questionnaire 1	Module 5 – Demographic profile	Module 1 – Identify current knowledge levels Module 2 – Understand initial expectations Module 3 – Highlight immediate challenges Module 4 – Focusing future efforts
Questionnaire 2	Module 1 – Demographic Profile	Module 2 – Validation of Initial Findings Module 3 – Identifying Additional Opportunities Module 4 – Participation in Questionnaire 1 Module 5 – Active Partnerships for Smart Local Development - Refining Stakeholder Needs Module 6 – Future Activities

Questionnaire 3	Module 1 – Demographic Profile	Module 2 – Capitalise the knowledge from the visit in Norway Module 3 – Prioritise Action Areas for future development Module 4 – Prepare Stakeholders for the Next Phase of the Smart City Initiatives
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Source: developed by the authors based on the 3 questionnaires applied in this research

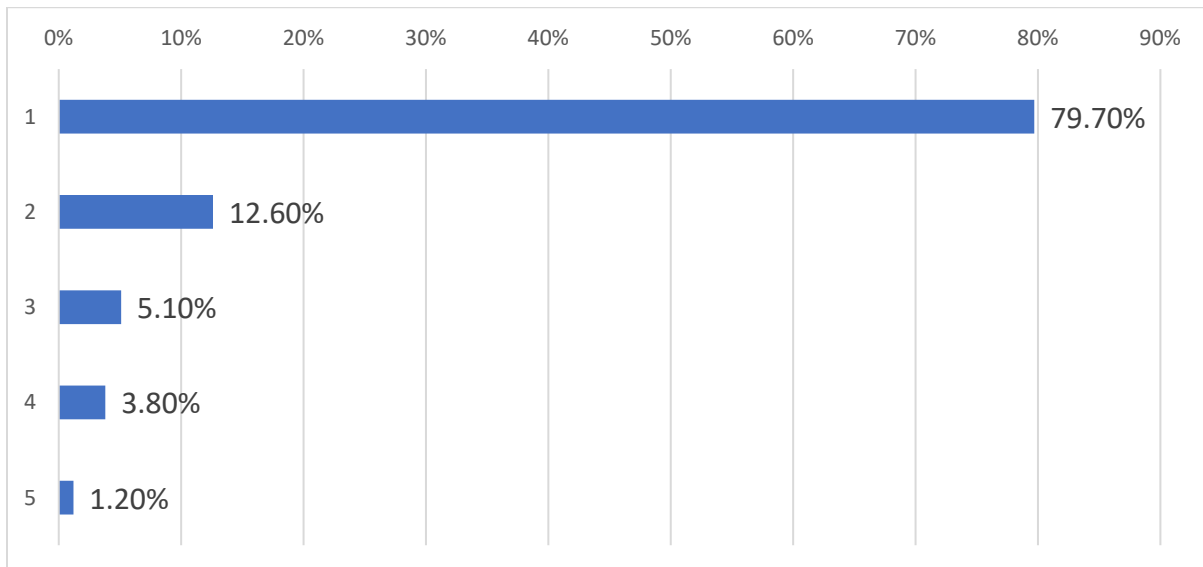
4. Results and discussions

Below are briefly presented some of the main results of the questionnaire analysis.

Survey 1

Respondents' Structure

Type of your organization



1	Public sector
2	Small and Medium Enterprise (SME)
3	Clusters from sectors relevant to smart cities, such as smart city technology, energy, creative industries, transport and mobility, prop-tech, and citizen engagement
4	European Digital Innovation Hub (EDIH)
5	Other

Survey 1

Demographic profile of the respondents

TOTAL SAMPLE	Women	Men	I don't want to mention	Grand Total
under 29 years old	26	16	2	44
30-39 years old	31	31	3	65
40-49 years old	52	42	6	100
50-59 years old	41	27		68
over 60 years old	7	9		16
Grand Total	157	125	11	293
PUBLIC SECTOR				
under 29 years old	16	13	2	31
30-39 years old	26	22	3	51
40-49 years old	47	33	5	85
50-59 years old	39	20		59
over 60 years old	4	4		8
Grand Total	132	92	10	234

TOTAL SAMPLE	High school	Undergraduate studies	Master's studies	Doctoral studies	Grand Total
under 29 years old	13	21	10		44
30-39 years old	6	16	37	6	65

40-49 years old	3	26	57	14	100
50-59 years old	2	20	42	4	68
over 60 years old	2	4	6	4	16
Grand Total	26	87	152	28	293
PUBLIC SECTOR					
under 29 years old	8	14	9		31
30-39 years old	5	9	34	3	51
40-49 years old	2	24	52	7	85
50-59 years old	1	19	37	2	59
over 60 years old	1	2	3	2	8
Grand Total	17	68	135	14	234

Survey 1

The relationship between the familiarity with the concept of smart cities and the perceived importance of smart city initiatives for urban development

TOTAL SAMPLE	Not at all familiar	Very familiar	Neither familiar nor unfamiliar	Somewhat familiar	Slightly familiar	Grand Total
Extremely important	4	28	6	35	5	78
Very important	4	21	23	101	26	175
Neither important nor unimportant	2		4	9	6	21

Slightly important	4		1	11	3	19
Grand Total	14	49	34	156	40	293
PUBLIC SECTOR						
Extremely important	2	20	3	24	4	53
Very important	4	14	20	85	23	146
Neither important nor unimportant	2		3	7	5	17
Slightly important	3		1	11	3	18
Grand Total	11	34	27	127	35	234

Survey 1

The relationship between online availability of basic public services and the perceived ease of use of online services and systems

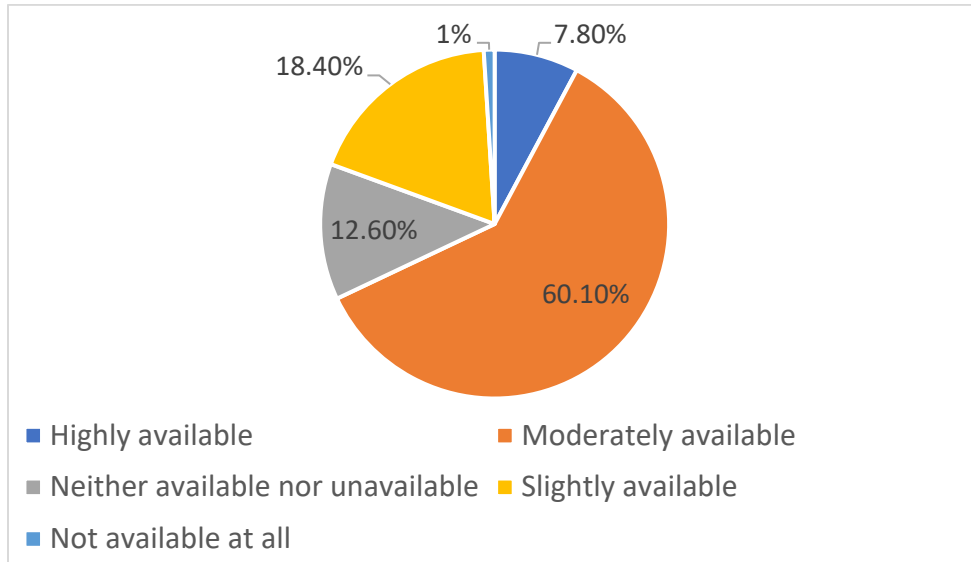
TOTAL SAMPLE	Not available at all	Highly available	Moderately available	Neither available nor unavailable	Slightly available	Grand Total
Very difficult to use	2		1	2	3	8
Very easy to use		13	19	2	2	36
Neither easy nor difficult to use		2	36	14	16	68

Somewhat difficult to use	1		19	7	14	41
Somewhat easy to use		8	101	12	19	140
Grand Total	3	23	176	37	54	293
PUBLIC SECTOR						
Very difficult to use	1			2	2	5
Very easy to use		11	16	1	2	30
Neither easy nor difficult to use		2	27	10	10	49
Somewhat difficult to use	1		13	6	11	31
Somewhat easy to use		6	87	10	16	119
Grand Total	2	19	143	29	41	234

Survey 1

Smart Cities Solutions Availability

To what extent are basic public services (municipal forms and payments, banking, health services, business licenses, registers and databases, post office) available online?

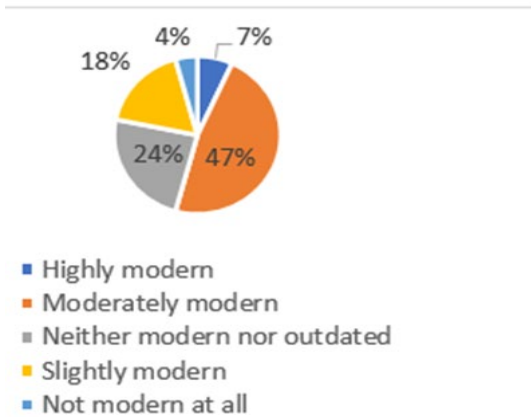


- Data based on Survey 1 = 293 respondents

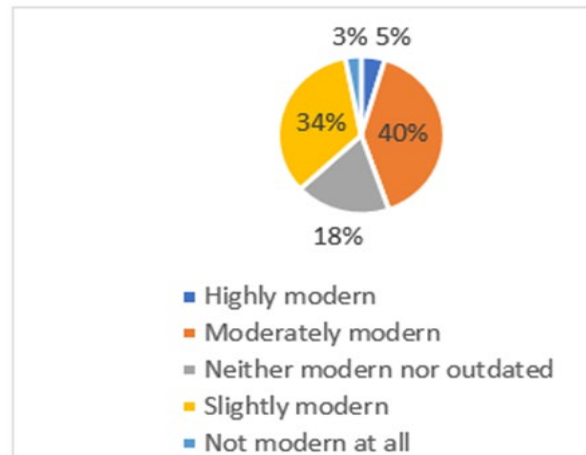
Survey 1

Perception of modernity in online services and systems

Public sector



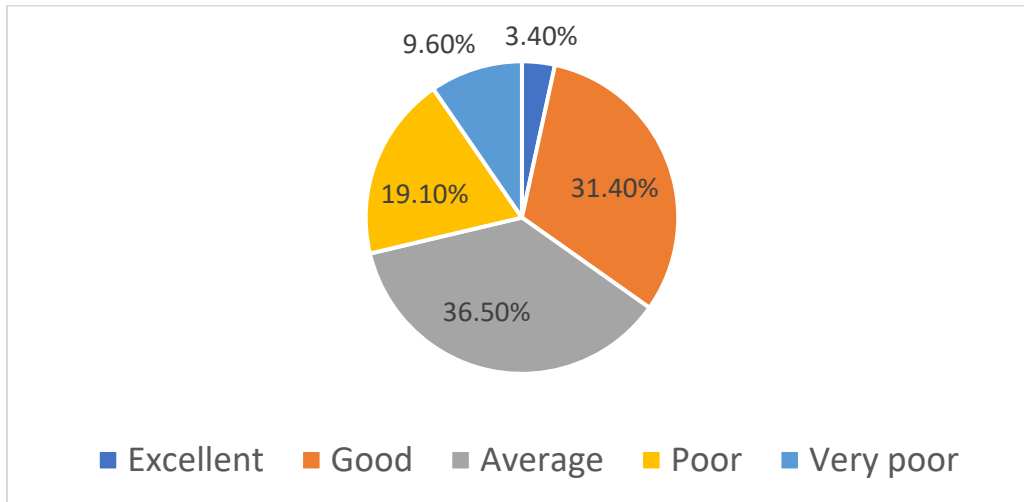
Other Local stakeholders



Survey 1

Smart Cities Solutions Availability

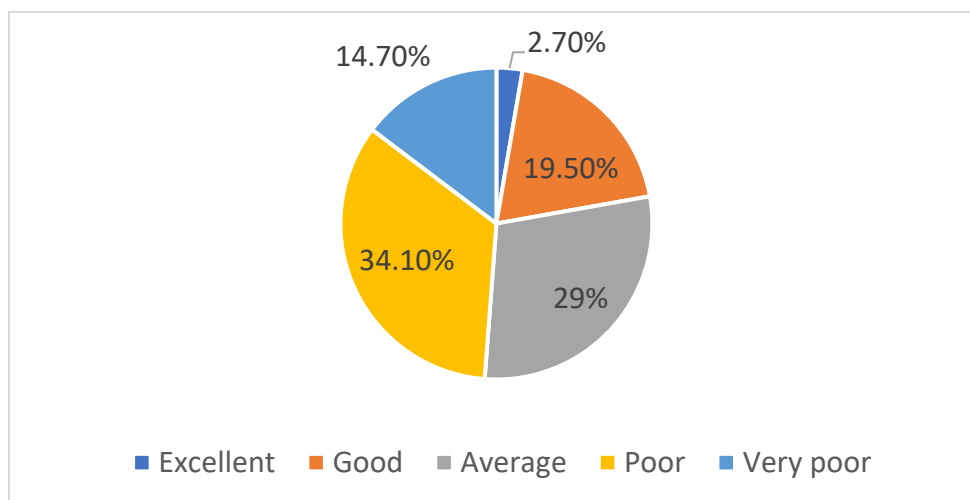
How do you rate public transport in your region?



Survey 1

Smart Cities Solutions Availability

How do you rate online access to healthcare (searching for information, availability of health records, online appointment scheduling for medical consultations, telemedicine)?



Survey 1

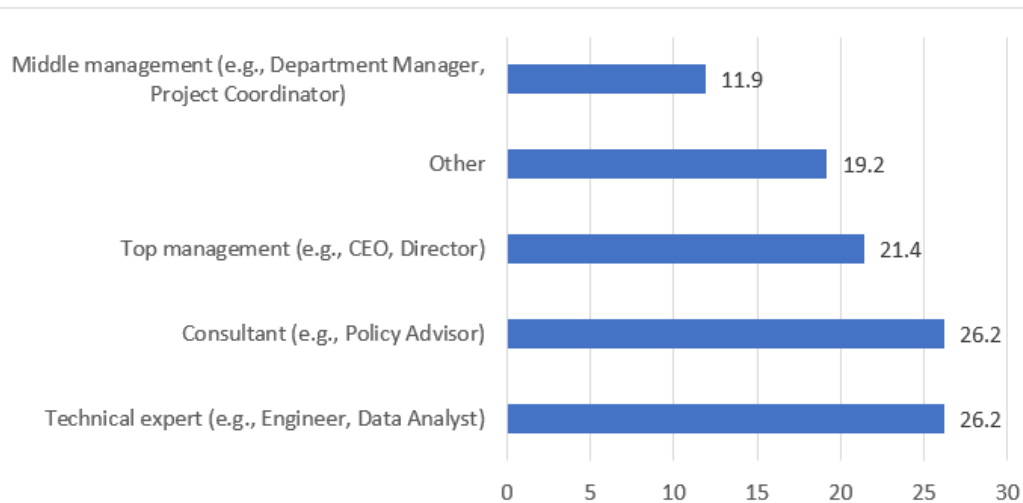
Openness Degree of Respondents

Have you been involved previously in any smart city projects?

TOTAL SAMPLE	Yes	No	Grand Total
Public sector	25	203	228
Small and Medium Enterprise (SME)	5	30	35
Clusters from sectors relevant to smart cities, such as smart city technology, energy, creative industries, transport and mobility, prop-tech, and citizen engagement	1	10	11
European Digital Innovation Hub (EDIH)	3	4	7
Other (management of large enterprises, bank)		4	4
European Digital Innovation Hub (EDIH), Clusters from sectors relevant to smart cities, such as smart city technology, energy, creative industries, transport and mobility, prop-tech, and citizen engagement		2	2
Public sector, Clusters from sectors relevant to smart cities, such as smart city technology, energy, creative industries, transport and mobility, prop-tech, and citizen engagement	1	1	2
Public sector, European Digital Innovation Hub (EDIH)	1	1	2
Public sector, Small and Medium Enterprise (SME)		2	2
Grand Total	36	257	293

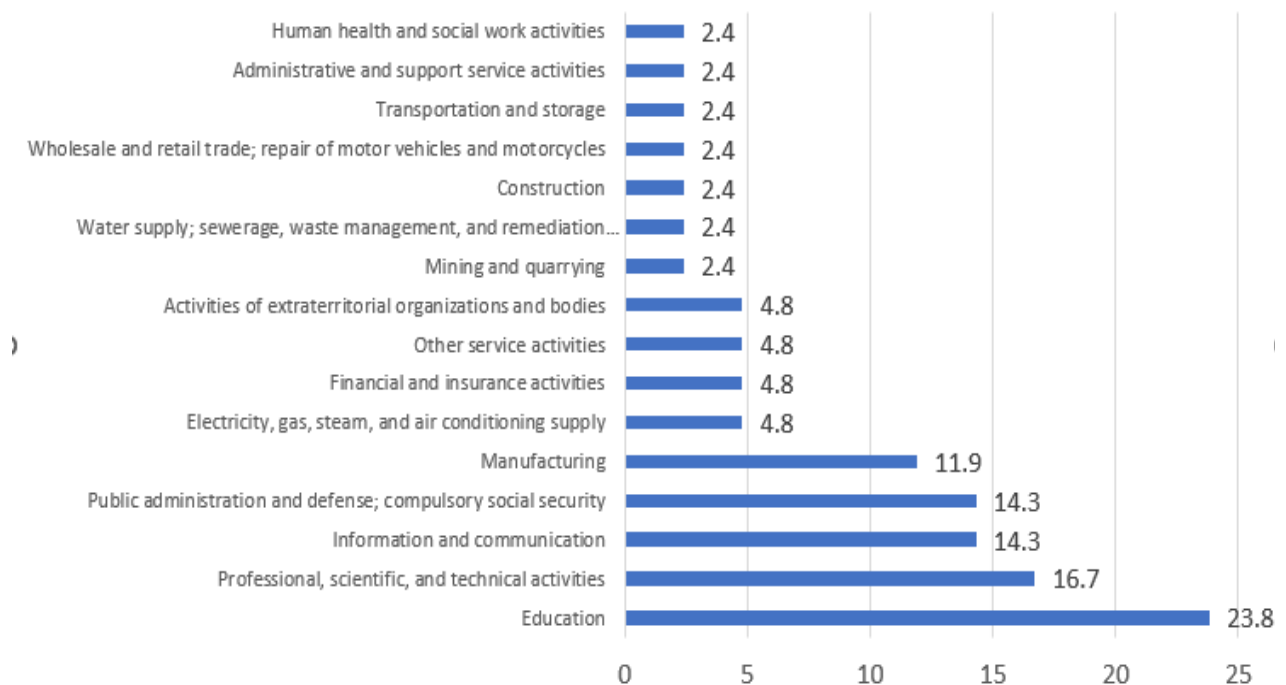
Survey 2

The distribution of the respondents by their role in smart city initiatives (%)



Survey 2

The distribution of the respondents by economic sector in which their organization operates (%)



SWOT Analysis post surveys

SWOT analysis of Romania's current status regarding smart city initiatives

Strengths:

- Growing awareness regarding the importance of smart city initiatives among stakeholders;
- Various funding opportunities at European Union level dedicated to smart city development (e.g., PNRR (National Recovery and Resilience Plan));
- Projects developed by Romanian cities;
- Emerging collaboration - Public-Private Partnerships (PPPs).

Weaknesses:

- Lack of a national strategy for smart cities;
- Disparities between urban and rural areas in terms of technology adoption;
- Conflicting interests between stakeholders;
- Reluctance of stakeholders to adopt new technologies;
- Lack of skilled workforce;
- High costs associated with technology maintenance;
- Technological obsolescence.

Opportunities:

- Alignment with Sustainable Development Goals for sustainable urban planning;
- Implementation of emerging technologies for improved public services;
- Access to best practices from other countries;
- Collaboration with other countries in various projects (bilateral cooperation/twin cities);
- A growing number of scientific studies addressing topics related to green city / smart city/ smart development / local development.

Threats:

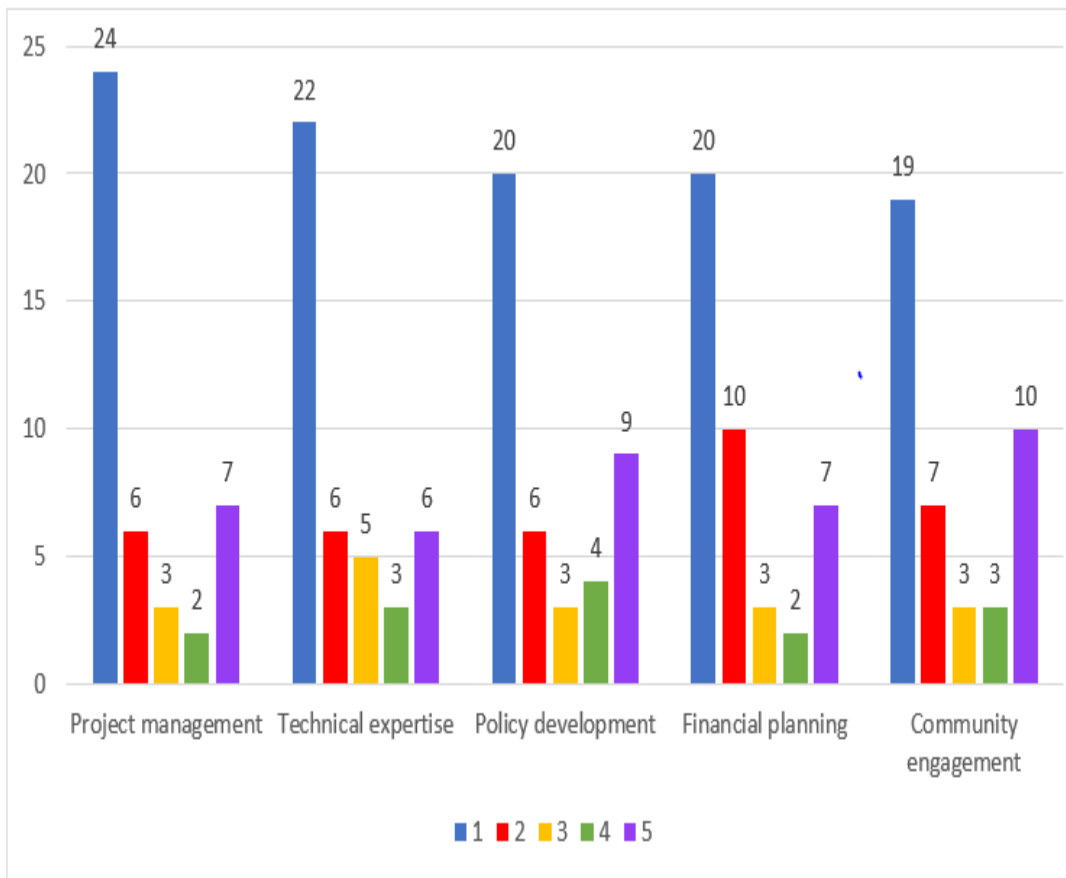
- Data breaches and cyberattacks due to increased reliance on digital technologies
- Dependence on the technology developed by other countries in the implementation of smart cities.
- A further in-depth analysis will take into account the research results of the 319 scientific papers published in WoS.

Identified Needs

- **To adopt innovative smart city technologies** to enhance sustainability, energy efficiency, and public services, including traffic management, waste collection, and green energy integration
- A focus on solutions for citizens **to improve accessibility, public safety, education, and overall quality of life** through digital tools and infrastructure modernization.
- **City needs several essential types of support.** to ensure the financial sustainability and long-term success of smart projects.
 - Legislative framework
 - Technical assistance, and capacity building,
 - **Government support and enabling policies** - subsidies and grants: to reduce the financial pressure on the local budget and allow cities to launch innovative projects without accumulating significant debt.
 - **European funds** - in the EU, structural and cohesion funds for infrastructure projects and sustainable technologies that can transform the city.
 - Community engagement, knowledge exchange, and partnerships.
 - Training

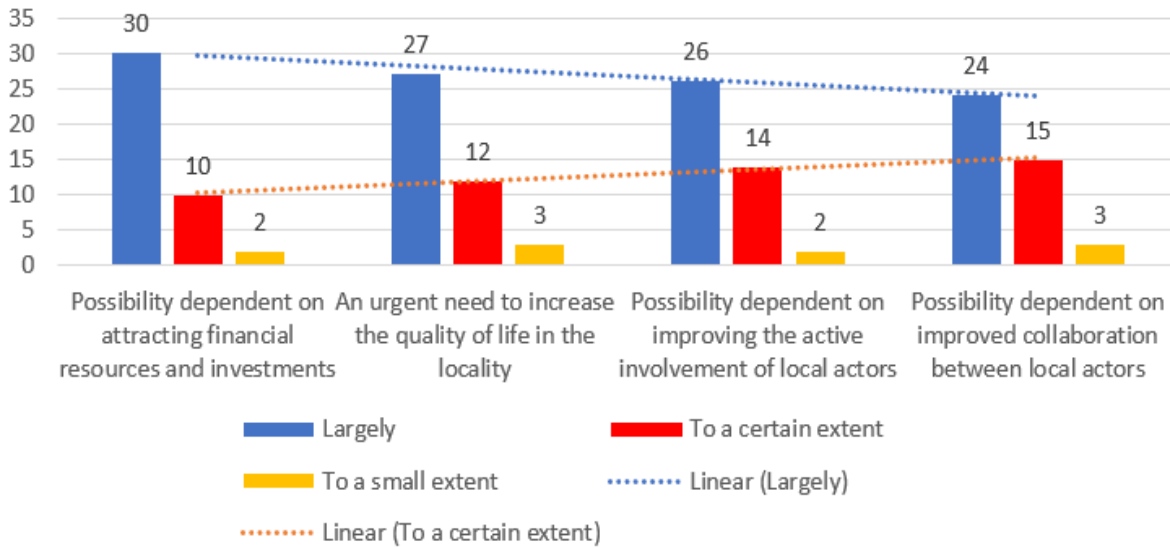
Survey 2

Additional skills / knowledge needed by stakeholders to improve the success of smart city projects (1 = most important)



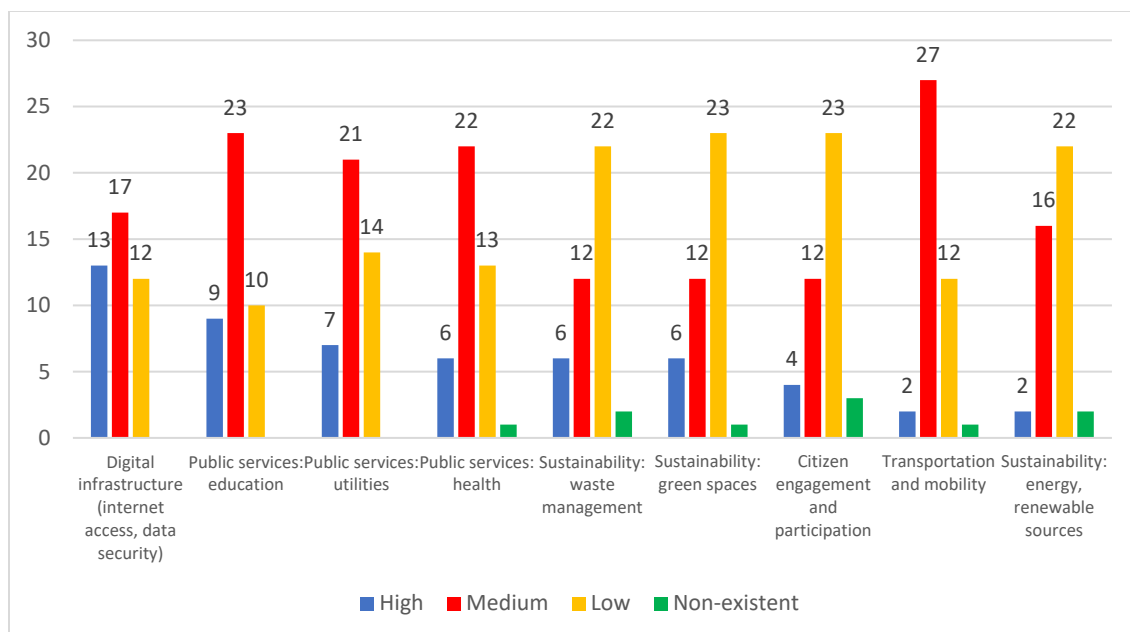
Survey 2

The distribution of the respondents by the need to implement smart city solutions in their region



Survey 2

The distribution of the respondents by the assessment of the level of development/implementation of smart solutions in their locality



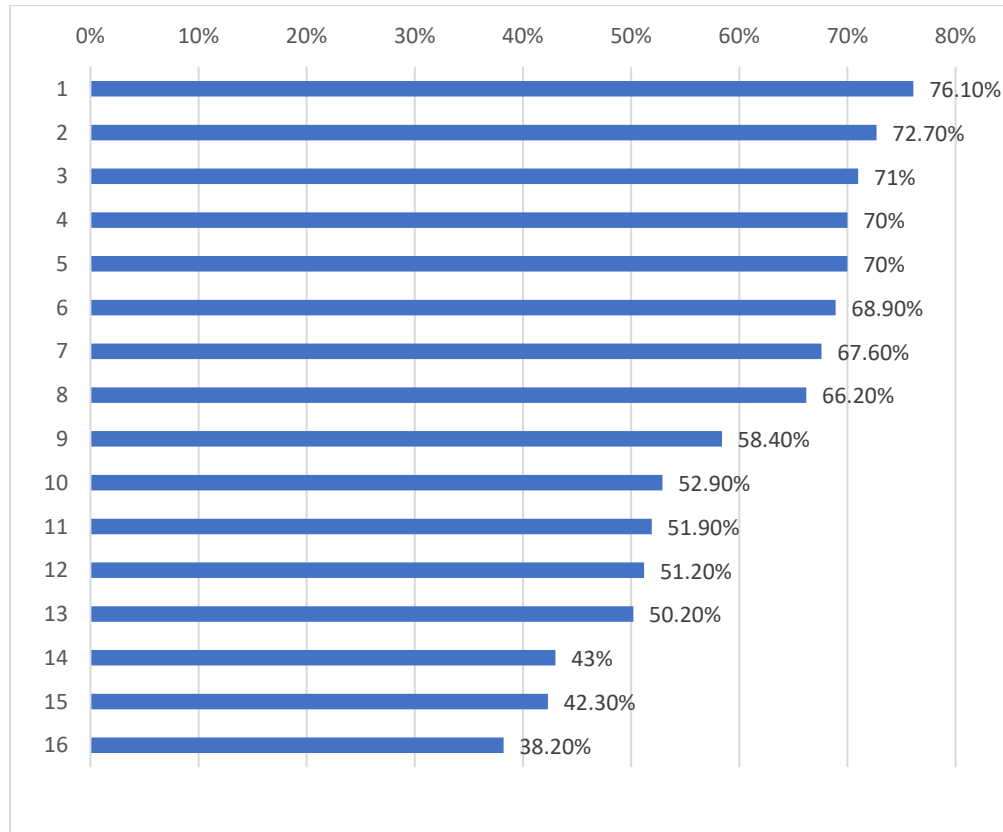
The cornerstone = The Need for an Integrated Strategy

Components:

- **Policy and regulation alignment / legislative coherence**– a unified approach would ensure that sustainability standards are consistent across different cities
- **Harmonization of local initiatives for common services** – a national strategy would ensure coherence across cities
- Efficient use of resources (natural, financial, human etc.) – efficacy, efficiency
- **Stakeholder collaboration** – a strategic framework would facilitate better collaboration and knowledge-sharing
- **Replicability** – best practices from one city can be adapted and implemented in others
- **Management of digital divide** – large cities have made progress but smaller municipalities often lack the resources and expertise to implement smart city solutions; → to bridge this gap.

Survey 1

Perceived benefits of smart city initiatives for communities and sectors - total sample

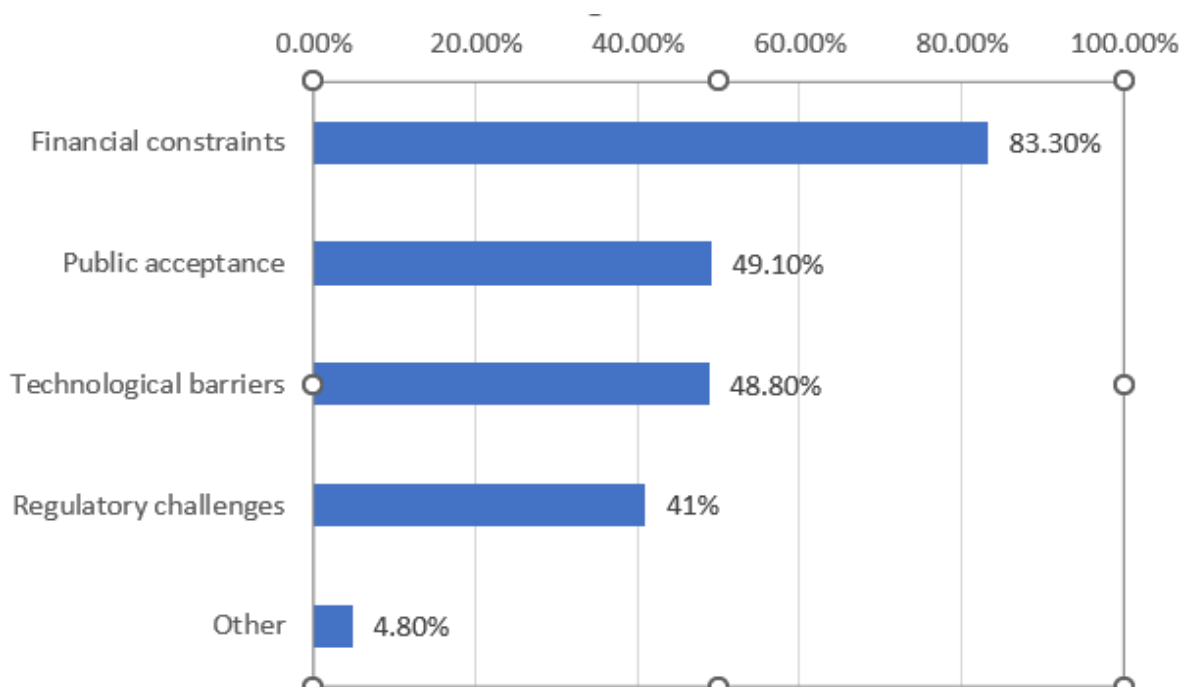


1	Improved public transport (real-time traffic management systems)
2	Waste management (smart waste management systems)
3	Quality of life
4	Increased public safety (smart surveillance systems and IoT sensors)
5	Education improvements (digital systems and e-learning platforms)
6	Environmental sustainability (smart energy supply systems)
7	Economic development (smart city technologies)
8	Health improvements (smart healthcare systems)
9	Water management (IoT-enabled water monitoring systems)
10	Stimulating innovation
11	Transparent and democratic decision-making
12	Infrastructure management (predictive maintenance technologies)

13	Well-being and social inclusion
14	Increased civic engagement (digital platforms for civic engagement)
15	Building resilience
16	Promoting equality

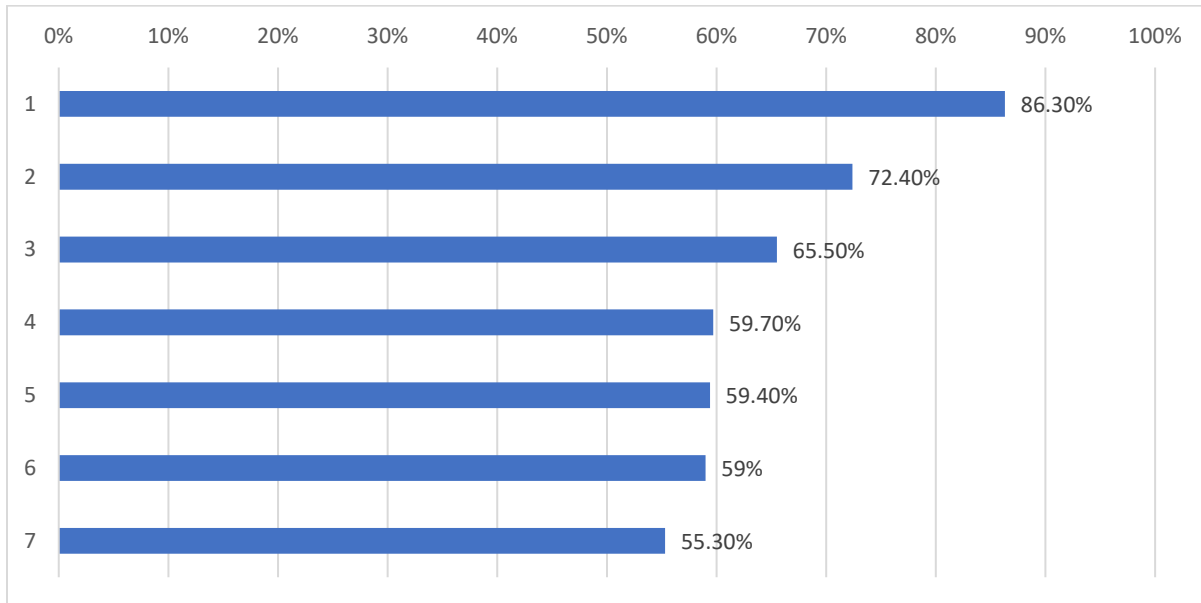
Survey 1

Anticipated challenges in the implementation of smart city projects - total sample



Survey 1

Necessary support to overcome challenges in smart city project implementation - total sample

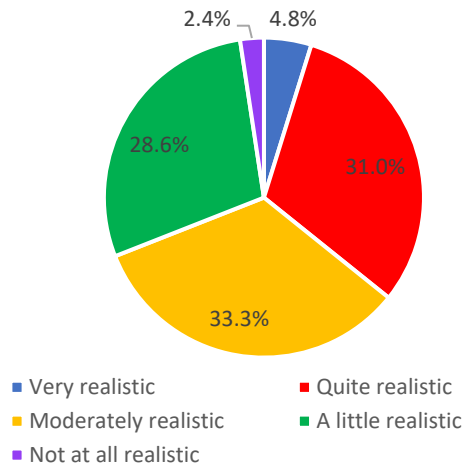


1	Financial aid (grants, subsidies, or investment in specific technologies).
2	Technical assistance (expertise in the latest technologies, software solutions).
3	Partnerships and collaborations (collaboration between public, private, and academic sectors).
4	Policy and regulatory frameworks (data privacy laws or zoning regulations).
5	Community engagement and awareness programs (initiatives to increase public understanding and acceptance).
6	Capacity building (training and development programs for skills enhancing).
7	Research and development support (funding or resources for R&D activities)

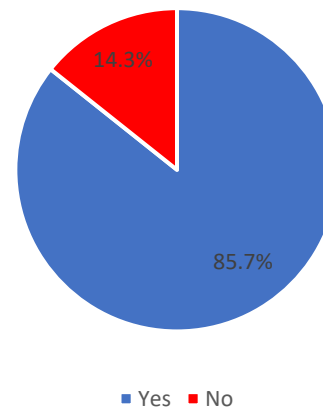
Survey 2

Additional opportunities or innovative solutions

Perceived realism of current smart city projects implementation plans considering challenges and resources



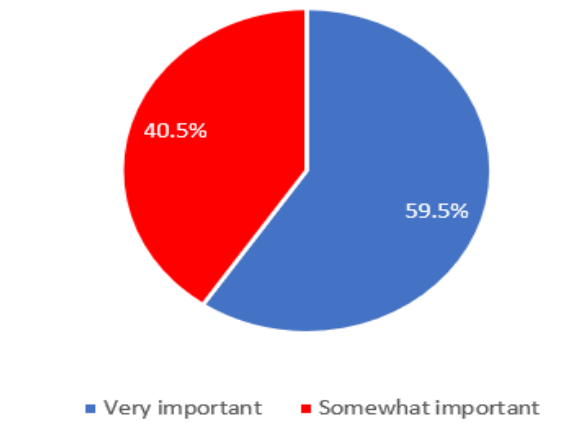
Views on whether there are unexplored areas for smart city technology application (beyond November 2024 workshop)



- Road infrastructure
- Implementation of smart lighting around pedestrian crossings, both on poles and on the roadway, so that when a pedestrian is detected, they light up.
- Collection and analysis of real-time data to obtain useful information about the functioning of the city and to make better-informed decisions regarding urban planning and service delivery.
- Virtual assistants for education and training
- Integration of artificial intelligence technologies
- Predictive systems-early detection of problems in infrastructure
- Digitalization of services
- Implementation of new technologies

Survey 2

The role of the partnerships (local, national, or international) should play in the successful development of smart city initiatives



Measures to enhance the development of smart city projects in their regions through public-private partnerships, such as:

- Developing participating entities, very attentive to the needs of the local community.
- Implementing their technologies used in factories/centers/headquarters on a larger scale. Also, their consulting would be beneficial
- Through investments
- Projects
- Through reliable communication
- To maintain collaboration in the interest of citizens
- Through financing - private management - quality services
- Involvement of a greater extent of the private environment
- Access to financing
- Innovation and technology
- Operational efficiency

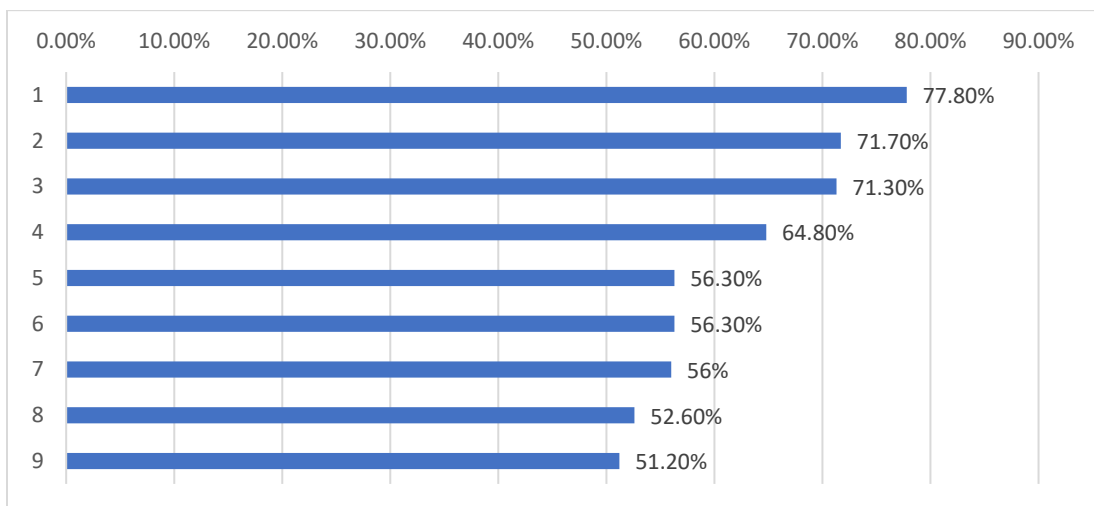
- Shared risk
- Flexibility in implementation
- Increasing the degree of use of technologies
- Community engagement

Best Practices from Nordic Countries

- A number of **best practices** from Nordic Countries were identified
- These topics included:
 - Electricity use in smart villages
 - Games created as a discussion starter for stakeholders to aid in planning for future mobility
 - Waste-to-energy solutions
 - Open systems for stakeholders to track urban pollution levels

Survey 1

Key focus areas for maximizing the impact of the NORO Green Cities project - total sample



1	Urban mobility (enhancing public transportation systems, developing smart traffic management, or promoting electric vehicle usage)
2	Waste management (advanced recycling technologies, waste-to-energy solutions, or innovative reduction strategies)
3	Energy efficiency (integrating renewable energy sources, implementing smart grid technologies, or improving building energy management)
4	Public safety and health (emergency response enhancements, health monitoring systems, or pollution reduction initiatives)
5	Social inclusion and education (digital literacy programs, accessible e-government services, or inclusive smart city planning)
6	Sustainable urban development
7	Digital infrastructure (broadband expansion, IoT integration for various services, or cybersecurity enhancements)
8	Water management (smart water metering, efficient irrigation systems, or pollution control measures)
9	Smart buildings and workspaces

Survey 2

Views on the existence of opportunities for international collaboration to support smart city initiatives

The respondents strongly believed (76.2%) that there are opportunities for international collaboration to support smart city initiatives in their regions and mentioned the following areas of international collaboration:

- Infrastructure
- Public administration
- Digitalization and ESG
- Education
- Exchange of experience with other managers who have implemented smart city projects
- Geothermal energy
- Transport, health, waste management

- Energy and transport sector
- Health, education
- Collaboration with local administrations that have implemented smart city initiatives to obtain the necessary data
- There are models to follow from other countries.
- Technology, technical, communications
- Utilities, energy, environment, education, transport
- EU funding

Survey 2

Key success factors critical for the sustainable implementation of smart city solutions

- Changing the mindset, people willing and prepared to manage such projects, support and financing
- Policy
- Road infrastructure and transport
- Improvement of actors involved in projects
- Trust, stability, transparency, consultation
- Administration
- Long-term testing of the respective solutions on smaller areas, or implementation of solutions that have proven to be efficient and resilient.
- Innovation
- Funding, agreement and community involvement
- Involvement. If people do not get involved and do not show interest then something successful cannot be implemented.

- Data and analysis, financing
- Funds
- A well-established management
- Collaboration between public institutions and the private sector
- Human resources, the vision of decision-makers
- Trained people
- Financial resources and people well-trained and open-minded for progress
- Well-defined objectives
- Recognition of the existence of problems and permanent involvement in order to solve them
- Strategic planning and long-term vision
- Collaboration between public authorities, the private sector and citizens
- Adequate and sustainable financing
- Solid and scalable technological infrastructure
- Education and community involvement
- Transparency and effective governance
- Data protection and cybersecurity
- Continuous monitoring and adaptability to emerging needs
- Alignment with sustainable development goals
- Integration of solutions into a coherent urban ecosystem
- Precise theme, clarity, pragmatism, technical skills, accommodation of the theme with all stakeholders, including citizens
- Digitalization

What do we need for a realistic and efficient roadmap for Smart/ Green City Development?

- RESEARCH RESULTS

- Integrated framework
- Strategic approach
- Multiple needs, unbalanced with financial support from local funds
- High dependence on the national/ international financial support for building smart city concept
- New culture of communication and collaboration at local level between stakeholders → societal responsibilities & accounting in using available local resources
- Digitalisation and AI implementation – an opportunity with high risks that cannot be avoided
- adapting best practices for better results in implementation & technical support
- Continuing training, opening for change and innovative solution for specific local needs
- Public consultation

Short term implementation of some solutions for SMART CITY DEVELOPMENT

- Green energy
- Real-time public transport monitoring application
- Improving the efficiency of public transport
- Health monitoring systems
- Smart lighting
- Green spaces
- Application for reporting problems
- Public transport

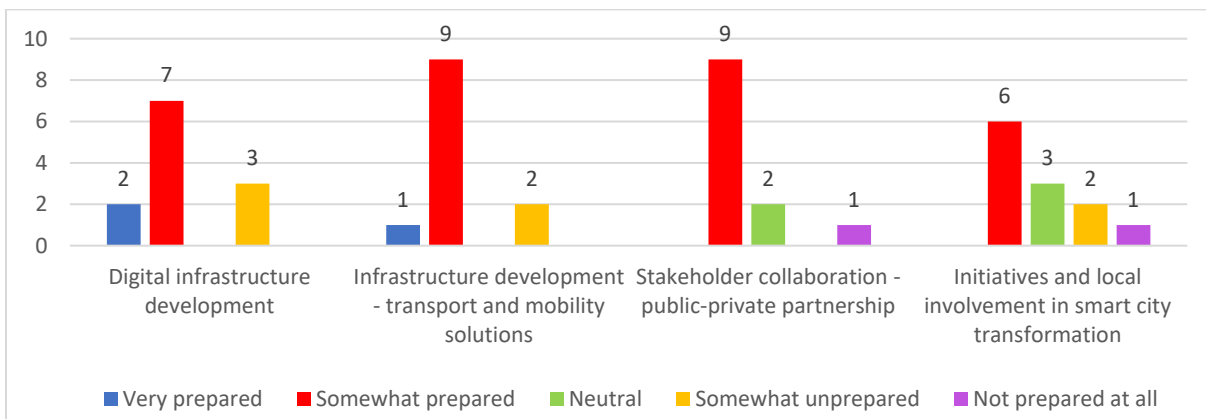
Barriers

- Bureaucracy
- Financing
- Resistance to change: both local authorities and citizens may be reluctant to face the major changes imposed by the transition to a smart city, especially due to fears of job losses or the impact on lifestyle.
- Indifference of authorities
- Modernization of the city
- High implementation costs
- Internal organization of city halls in implementing such projects
- Human resources
- Political will

Are local authorities prepared for SMART CITY implementation?

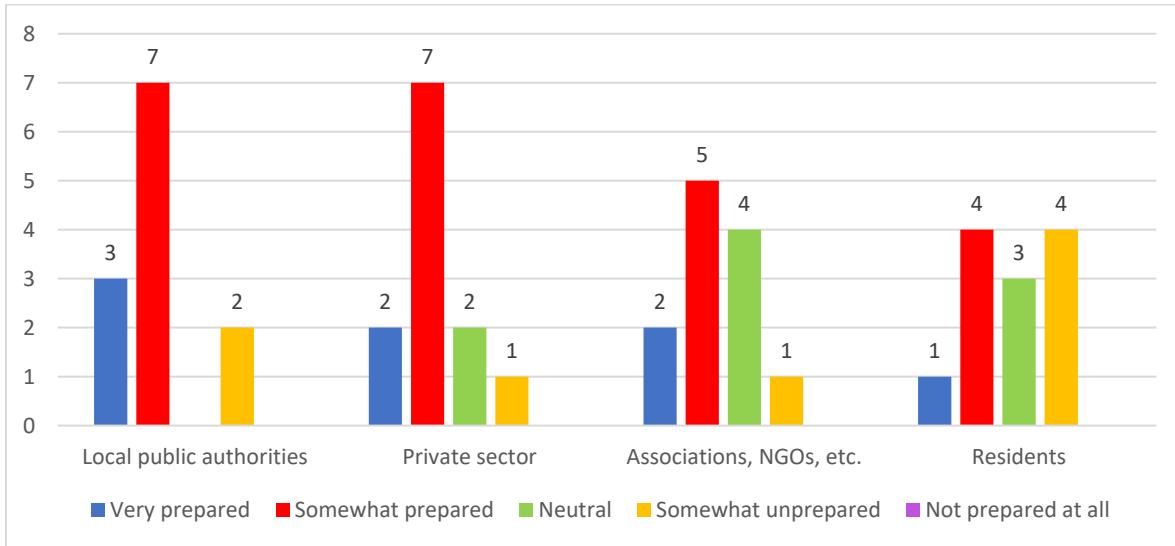
Survey 3

How do you assess your region's current readiness for implementing the solutions identified by the smart city?



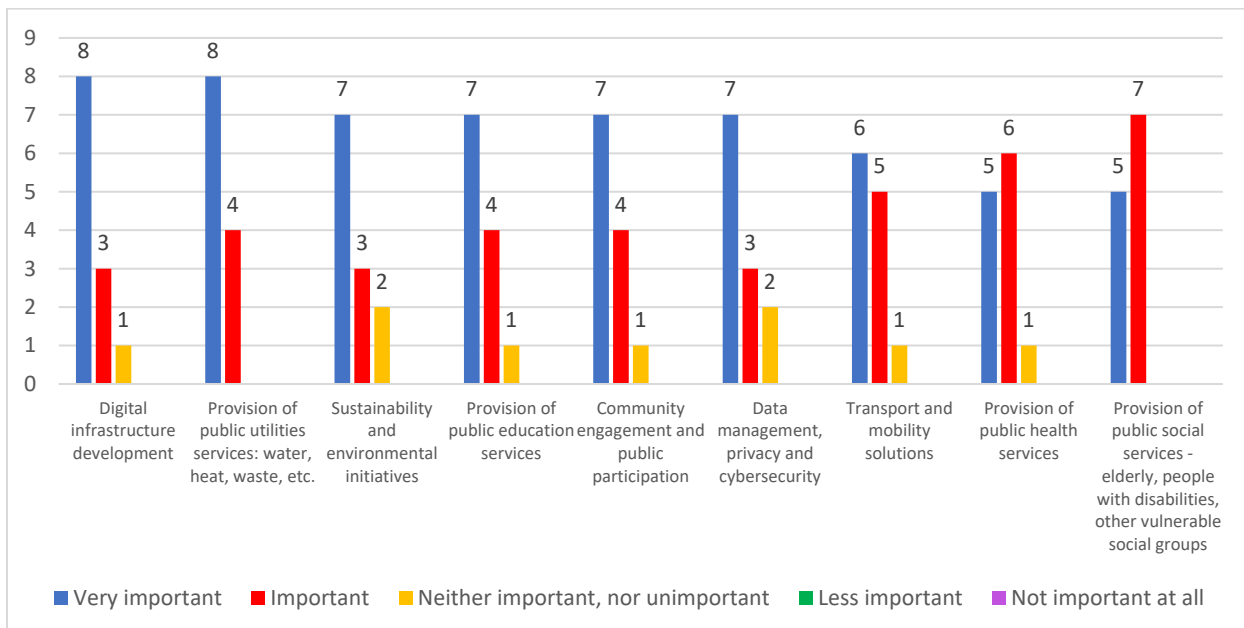
Survey 3

How would you assess the current capacity of institutions in your region to lead or support smart city projects (e.g. local government, utility providers, private sector, NGOs)?



Survey 3

Based on the discussions at the workshop and the study visit to Norway, which areas do you think should be chosen for short-term actions in your region?



5. Conclusion and policy recommendation

Needs Assessment Report summarizes the findings from data collection, analysis, and stakeholder consultations conducted in the target regions of Bucharest-Ilfov and South-Muntenia. Its goal is to identify the specific needs in the area of Smart Cities, considering the opportunities offered by mapping Norwegian experience and present challenges in Romania.

The report provides an overview of the urban development challenges, priorities, and opportunities identified by stakeholders, as well as recommendations for action.

Green cities and smart cities concepts address urban development from various perspectives. The Smart City concept focuses on using digital technology to improve resource management, public service efficiency, and quality of life. The Green City concept is associated with a number of factors, including less pollution, improved environmental protection, a greater use of renewable energy sources, the development of green spaces, a low carbon footprint, the circular economy, and responsible consumption. Both concepts are related to the improvement of the living standards and effective use of available resources. A model city can incorporate both ecological principles (Green City) and technology innovations (Smart City). This strategy can guarantee a sustainable urban development.

The ability of cities to deal with environmental, economic, and social challenges and quickly adapt to changes is referred to as resilience. Resilience in the context of green cities refers to the capacity of urban areas to adopt ecological solutions in response to environmental problems. In the context of smart cities, advanced technology is crucial for enhancing urban resilience.

Guidelines and standards for green and smart cities are included in a number of documents created by various organizations. They all contribute to the development of a framework that can be applied to the process of creating smart and green communities.

A number of best practices from Nordic EU Member States were identified, taking into account the areas covered by various definitions discussed in this study. These topics included electricity use in smart villages; games created as a discussion starter for stakeholders to aid in planning for future mobility; waste-to-energy solutions; open systems for stakeholders to track urban pollution levels.

The analysis of the scientific literature on smart and green cities showed that:

- the interest in the topic is significant and growing, a fact particularly highlighted during the last decade;
- the lack of a consensus on the definitions of the concepts makes comparative analysis between countries and regions difficult;
- research is based predominantly on qualitative analyses and the presentation of good practices.

The SWOT analysis of Romania's current status regarding smart city initiatives developed showed, among others:

- increasing awareness of the importance of smart city initiatives among stakeholders;
- an emerging collaboration - Public-Private Partnerships (PPPs);
- lack of a national strategy for smart cities;
- high costs implied by the maintenance of technologies;
- access to best practices from other countries;
- possibility of collaboration with other countries in various projects (bilateral cooperation/twin cities);
- a growing number of scientific studies addressing topics related to green city / smart city/ smart development / local development.

To capture the situation from Romania on smart cities topic, three surveys were developed:

- a) The first one was developed to identify the perception and knowledge of stakeholders on smart city initiatives.
- b) The second one was addressed to validate the initial results obtained from the application of the first survey, refine the understanding of needs and identify additional opportunities on smart city initiatives in respondents' areas.
- c) The third one has the purpose of finalizing the needs assessment, prioritizing action areas, and preparing the stakeholders for the next phase of the smart city initiatives.

The results obtained from the surveys emphasised interesting results:

- a) Survey 1
 - High familiarity with the concept of smart cities is associated with higher perceived importance of smart city initiatives for urban development.

- A correlation between online availability of basic public services and perceived ease to use of online services and systems. As online availability decreases, the association with ease of use becomes weaker and more varied.
- A general openness of respondents to using options like public transport, cycling, or other alternatives instead of driving their own car.
- An active involvement of respondents in diverse projects emphasizing smart city initiatives, including digitalization, urban mobility, green transport, and environmental sustainability. Also, the focus was on the development and implementation of smart city strategies and infrastructure, emphasizing digitalization and environmental monitoring.
- Management roles in strategy development are emphasised, and also in technology implementation, and promotion of innovative urban solutions.
- The results highlighted the use of technology and software solutions to enhance public services, urban living, and industry-specific digital transformation.
- The respondents emphasised the smart city initiatives that they considered important and believed that could significantly benefit their community or sector: the prioritization of digitalization, sustainable resource management, and advanced infrastructure to improve public services, mobility, and environmental quality. Also, the responses showed the need to adopt innovative smart city technologies to enhance sustainability, energy efficiency, and public services, including traffic management, waste collection, and green energy integration.
- There is a focus on enhancing quality of life through innovative technologies, citizen engagement, and smart governance for sustainable urban development. The emphasis is on solutions that enhance for accessibility, public safety, education, and overall quality of life of citizens through digital tools and infrastructure modernization.
- Anticipated challenges in the implementation of smart city projects were the financial ones, followed by public acceptance, technological barriers, and regulatory challenges.
- The support respondents do believe is necessary to overcome these challenges were represented by financial aid (grants, subsidies, or investment in specific technologies), technical assistance (expertise in the latest technologies, software solutions), and partnerships and collaborations (collaboration between public, private, and academic sectors).

b) Survey 2

- The participants agreed with the importance of implementing smart city solutions in their region.
- Smart city solutions are needed in public services – health, public services – education, waste management, and energy (renewable sources).
- Respondents believed that there are various pressing needs or gaps in infrastructure that should be prioritized for smart city initiatives in their area. Their answers reveal the importance of prioritizing essential infrastructure and services, particularly in the areas of health, education, transport, mobility, public safety, green energy, sustainability, and digitalization. Common themes include improving public services, addressing environmental concerns, enhancing urban mobility, and fostering digital innovation.
- The strategies that respondents considered most effective for involving citizens in the smart city development process included public consultations, followed by digital engagement tools, community workshops, and surveys and feedback forms. This result indicates that the participants consider direct and transparent dialogue with citizens to be the most effective strategy to engaging them in the development of smart cities.
- The participants believed that project management, technical expertise, policy development, financial planning, and community engagement are all needed by stakeholders to improve the success of smart city projects in their area.
- The respondents emphasised the need for technological integration in urban development, with a focus on smart infrastructure, data-driven decision-making, digitalization of services, artificial intelligence, and predictive systems for proactive urban management.
- They also positively assessed the role of partnerships (local, national, or international) played in the successful development of smart city initiatives.
- The respondents' answers suggest prioritizing collaboration and resource sharing in public-private partnerships, focusing on community engagement, investment, access to financing, technological innovation, operational efficiency, and flexible implementation to enhance smart city projects.
- They emphasised international collaboration in areas such as infrastructure, energy, transport, education, digitalization, and public administration. Common themes include knowledge sharing, leveraging successful models from other countries, and adopting advanced technologies to support smart city initiatives.

- They mentioned collaboration, funding, transparency, and strategic vision as key success factors for smart city implementation. The participants also highlighted the importance of citizen involvement, well-trained human resources, and alignment with sustainable goals, alongside adaptability and continuous monitoring.
- Among the resources needed to promote smart city projects in their region, funding ranked first, followed by technical support, knowledge exchange, networking opportunities, and policy guidance.
- They strongly believed that there are specific industries or sectors (e.g., agriculture, education, tourism) where smart city initiatives could have a significant impact in their region. They also positively assessed the role of innovation in data sharing, privacy protection and cybersecurity in the development of smart cities in their region.
- The participants highlighted the need for local authorities to play a strategic and facilitating role in smart city projects, focusing on creating favorable legal frameworks, attracting funding, and ensuring collaboration between community, public and private sectors. They also emphasized leadership, transparency, and citizen participation.
- They mentioned the importance of workshops, digital tools, and adapting best practices, alongside public consultations, collaborative meetings, and sensor data to advance smart city initiatives. This means that a successful implementation of projects requires a combination of these aspects, ensuring that smart city solutions are effective, inclusive, and sustainable.
- They highlighted short-term solutions focused on enhancing public transport efficiency, integrating green energy, implementing smart lighting, and introducing health monitoring systems and green spaces.
- The respondents identified challenges such as bureaucracy, financing, resistance to change, high implementation costs, and a lack of political will in implementing smart city solutions.

c) Survey 3

- When asked to assess their region's current readiness for implementing the solutions identified by the smart city, a significant share of respondents chose the “Somewhat prepared” option for all the smart solutions presented. It is interesting to note that only in the case of two smart solutions, there were a few respondents who mentioned a very high level of readiness (Digital infrastructure development and Infrastructure development - transport and mobility solutions). On the other hand, Stakeholder collaboration - public-private partnership and

Initiatives and local involvement in smart city transformation were the only two smart solutions that some respondents assessed as not prepared at all for implementation in their region

- In the responses to the question about the assessment of the current capacity of institutions in their region to lead or support smart city projects, a significant number of respondents chose the “Somewhat prepared” option, especially when assessing Local public authorities and Private sector. On the other hand, when asked to rate the residents’ capacity to support such projects, the largest number of respondents indicated the “Somewhat unprepared” option. Considering this, Local public authorities and Private sector are seen as better prepared than the residents to lead or support smart city projects.
- When asked to assess the level of public awareness and understanding of the zero-emission principle and smart city development in their region, the largest share of respondents selected the “High” option, followed by “Neutral” and “Low”, which was chosen by a quarter of the respondents.
- Respondents are presented with nine areas and asked to evaluate their importance in implementing short-term actions in their region. A significant number of respondents chose the “Very important” option for seven areas (Digital infrastructure development; Provision of public utilities services: water, heat, waste, etc.; Sustainability and environmental initiatives; Provision of public education services; Community engagement and public participation; Data management, privacy and cybersecurity; Transport and mobility solutions). In the case of the other two areas, respondents selected the “Important” option in a higher number (Provision of public social services - elderly, people with disabilities, other vulnerable social groups; Provision of public health services). It is interesting to note that, although there were five options to choose from, none of the respondents assessed the presented areas as less important or not important at all.
- When asked to indicate the most important enabling factor for the success of smart city initiatives in their region, the majority of respondents opted for “Government support and policy”, followed by “Funding and investment”, and “Public-private partnerships”.
- When asked about the types of partnerships to be prioritized for promoting smart city projects in their region, the majority of respondents indicated “International collaboration”, followed by “Local public administration and citizens” and “Private sector and public sector”.

- In the responses to the question about the assessment of the importance of integrating international best practices in the development of smart cities in their region, all the respondents considered all five options as generally important. About three quarters of the respondents selected the “Very important” option.
- The largest share of the respondents mentioned “Financing and investment” as the most important resource for successfully implementing smart city projects in their region, followed by “Infrastructure development” and “Public education for the transformation of the smart city (youth and seniors)”
- When asked about their perception of the engagement and motivation of the stakeholders in their region in promoting smart city initiatives, the largest share agreed that there was a sufficient level of stakeholder engagement and motivation.

By engaging stakeholders in the needs’ assessment process, the project builds trust, fosters collaboration, and ensures that interventions are responsive to local needs and preferences. Ultimately, the result is an evidence-based approach to sustainable urban development that maximizes the impact of project activities and contributes to the long-term well-being of communities.

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ANNEX 1

State of the art in designing and implementing smart city – a literature review based on WoS scrapping on the specific topic

Recent developments in the "smart city" concept highlight a similar trend of the main components but with nuances and thematic developments depending on the specifics of urban development, the demographic, social, and cultural attributes of the area and municipality analysed, with strong influences determined by the level of development and financing opportunities.

“A smart city refers to an intelligent environment obtained by deploying all available resources and recent technologies in a coordinated and smart manner” (Rathee, 2020).

Choi et al. (2023) analyse the dynamics of the smart city concept from several perspectives, namely a) “incorporating smart technologies into urban activities and services”, b) “as green, low-carbon, carbon neutral, ecological, and circular cities”, considering a municipality as “a complex social, economic, and environmental system”.

Hajduc (2016) goes further, identifies and analyses the fact that “smart cities create knowledge and innovation; suggest an integrated and comprehensive vision of all aspects of city life, including economy, government, transportation, green, healthcare, and culture; and optimize the performance and efficiency of city processes, activities, and services by combining various components and actors in an intelligent system using ICT”.

Two opinions are found in several studies and are emerging from the perspective of the development of the issues associated with smart cities, namely the driving nature of the technological components and recent knowledge, but also the risks and vulnerabilities generated by the increasingly accentuated dynamics of transformation. Thus Heymans et al. (2019) and Wheeler (2016) developed “the ecological perspective” that regards the human and natural systems considered “as dynamic, evolutionary, and interdependent”. Rigenson et al. (2017) consider that, “despite the declaration of urban sustainability, most smart city projects continue to have issues,

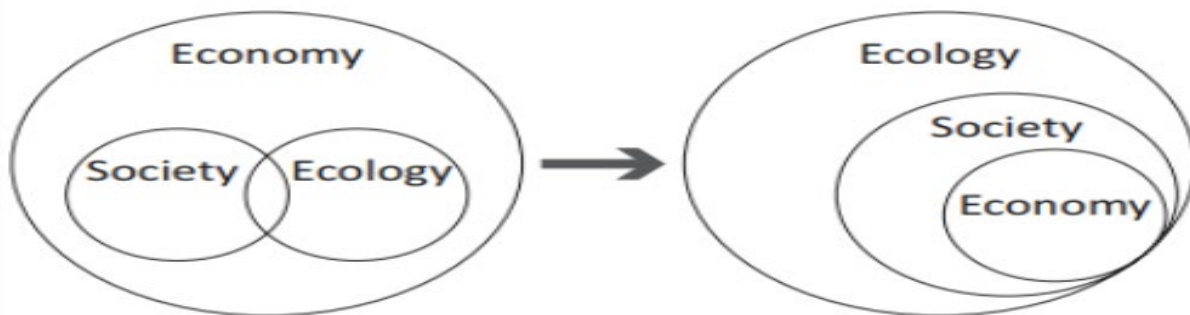
such as increasing urban vulnerability and deepening personal information gaps due to uncertainty”.

According to Wheeler (2016), in fact, we are witnessing the dynamics of the concept of "smart city" towards that of "sustainable smart city", based mainly on the transition from the modernist paradigm to that of ecological thinking.

Figure 1 City sustainability, from modernist paradigm to ecological thinking

the modernist paradigm= Smart city

ecological thinking = green city



Source: based on Wheeler (2016)

Starting from inclusive development policies, associated with SDGs targets, there is discussion about a city that encompasses smart and green attributes for the benefit of all - be it citizens or the business environment, with a balance between economic performance, social and societal development and good governance (in the new vision of collaboration of local actors for development for the benefit of all). In this context, Jati et al. (2023) define the term of “city for all’ as referring to two main keywords, i.e., “inclusiveness” and “sustainability”. The term “inclusiveness” means fair participation among locals and migrants in contributing to the development of the new capital city. Meanwhile, the term “sustainability” refers to a sustainable environment that embraces eco-friendly and smart city approaches in developing the new capital city.

So, the smart city concept does not have one authoritative definition, but it has many working definitions. It also depends on the country, which may have its own implementation (Camero &

Alba, 2019). The concept includes smart mobility, smart economy, and also smart governance (Kirimtat et al., 2020; Benevolo et al., 2016; Neirotti et al., 2014).

This is also the reason why, in the bibliometric analysis conducted by querying the WoS database, we used a combination of terms, such as “smart city”, “green city”, “sustainable city” and “smart sustainable city”.

The results show that “smart city” is analysed in 29,155 papers and “green city” in only 1,021 (query carried out on February 10, 2025.). The two concepts are used simultaneously only in 66 papers, and if we add the term “local development”, only one paper is found. Smart city associated with green development is found in 37 papers, but green city and smart development appear only in one paper. If we analyse the development of a “sustainable city”, it is found in 2,936 papers.

Therefore, the use of different terms, associated with the same thematic area of analysis is diverse and versatile.

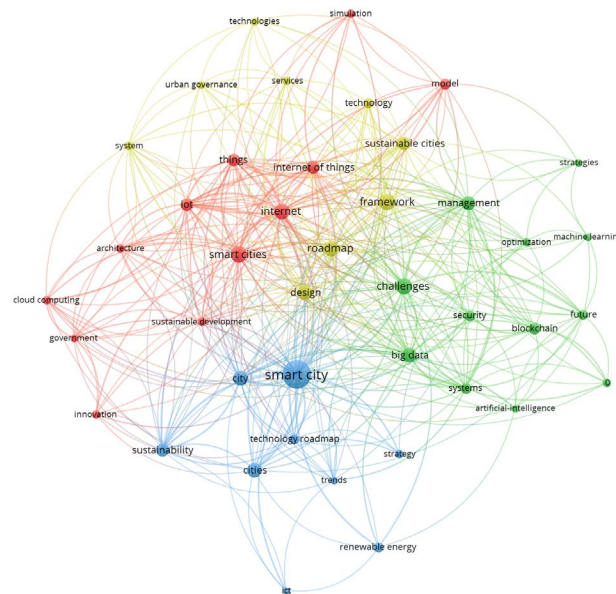
If we go further with the reasoning of terminological association to substantiate the concerns of experts for the dynamics of smart city development and we also associate it with the need to develop strategies or roadmaps to define future directions, then the association of smart city with the term roadmap is found in 119 papers.

A graphical representation of the result of querying the database based on keywords using the VOSviewer software also shows us the thematic clustering on groups of associated words.

If we were to limit our research to the area of interest of our study, we selected from the variety of term combinations only 3 variants, namely: a) roadmap and smart city, with 119 papers; b) green city or smart city and Norway (300 papers); c) green city and smart city and Romania (319 papers). For the 3 analysis variants, we also presented the clustering of the determining word chains.

a) Smart city + roadmap (3) (119)

Figure 2 Bibliometric analysis of the papers published in the WoS database on the topics of “smart city” and “roadmap”



VOSviewer

Source: developed by the authors, based on the data extracted from Web of Science database and processed with VOSviewer software.

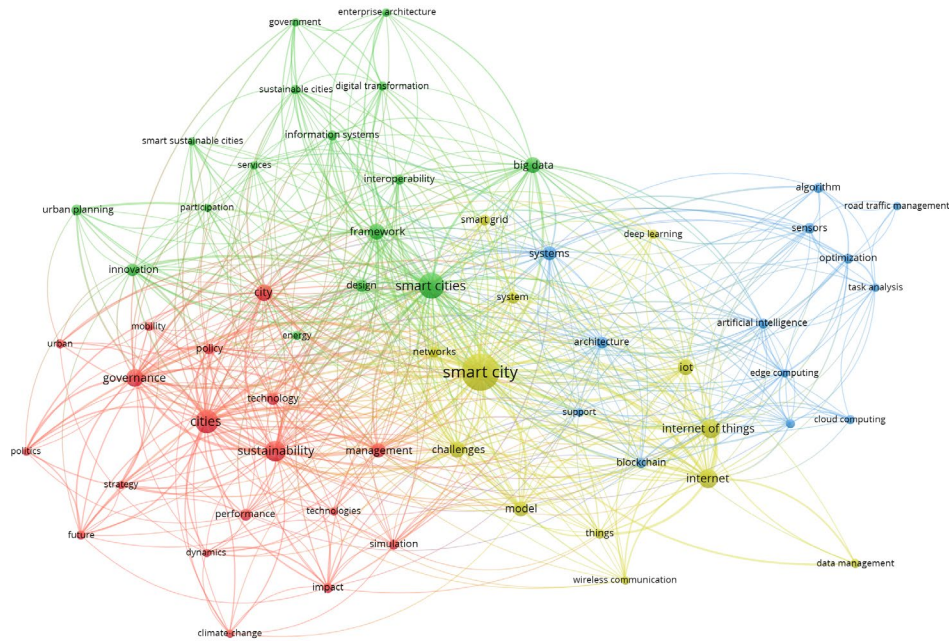
Table 1 Main keywords revealed by the bibliometric analysis of the papers published in the WoS database on the topics of “smart city” and “roadmap”

Red 12	Green 12	Yellow 9	Blue 9
Smart city Internet Architecture Sustainable development Model	Challenges Big data Management Security Blockchain	Roadmap Framework Design Sustainable cities Services	Smart city Cities Technology roadmap Sustainability Strategy

Source: developed by the authors.

b) Green city + Norway or smart city + Norway (5) (300)

Figure 3 Bibliometric analysis of the papers published in the WoS database on the topics of “green city” + “Norway” or “smart city” + “Norway”



VOSviewer

Source: developed by the authors, based on the data extracted from Web of Science database and processed with VOSviewer software.

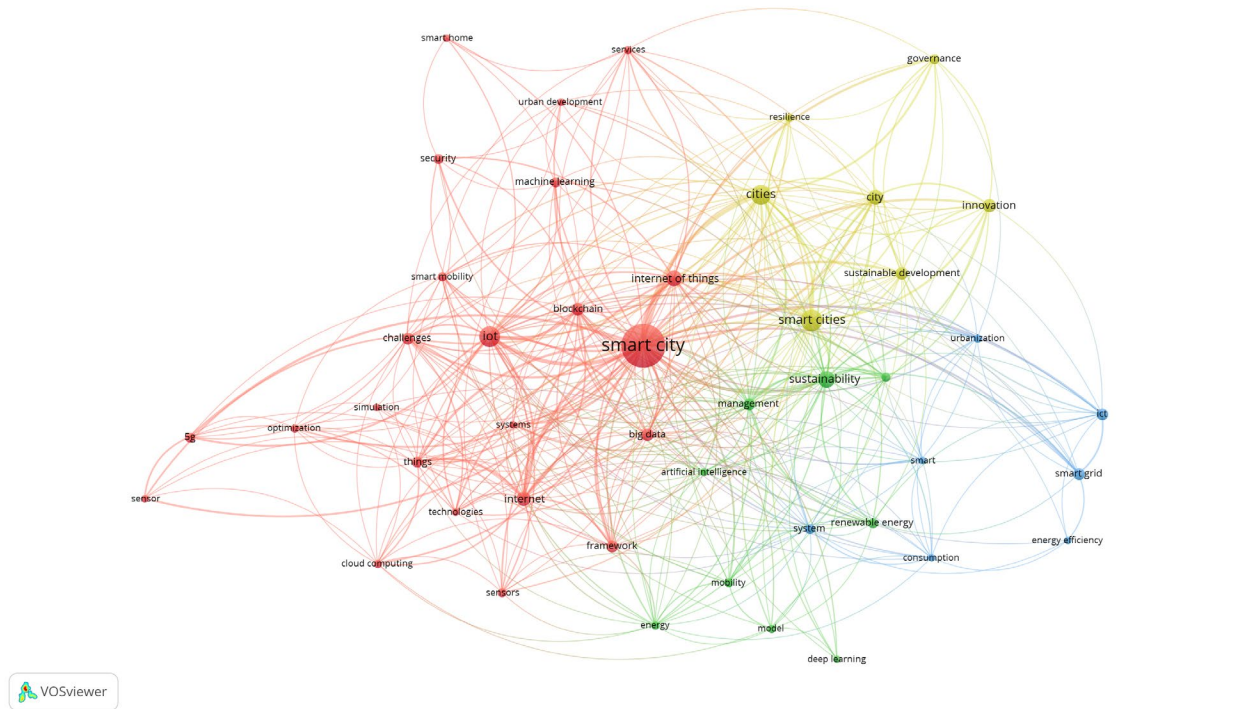
Table 2 Main keywords revealed by the bibliometric analysis of the papers published in the WoS database on the topics of “green city” + “Norway” or “smart city” + “Norway”

Red 18	Green 16	Yellow13	blue 13
Cities	Smart cities	Smart city	Systems
Governance	Framework	Internet of things	Artificial intelligence
Sustainability	Big data	Challenges	Architecture
Management	Innovation	System	Cloud computing
Technology	Urban planning	Deep learning	Optimization

Source: developed by the authors.

c) Green city + Romania or smart city + Romania (5) (319)

Figure 4 Bibliometric analysis of the papers published in the WoS database on the topics of “green city” + “Romania” or “smart city” + “Romania”



Source: developed by the authors, based on the data extracted from Web of Science database and processed with VOSviewer software.

Table 3 Main keywords revealed by the bibliometric analysis of the papers published in the WoS database on the topics of “green city” + “Romania” or “smart city” + “Romania”

Red 23	Green 9	Yellow 7	Blue 7
Smart city IOT Challenges Big data Machine learning	Artificial intelligence Management Renewable energy Sustainability Technology	Cities Governance Innovation Resilience Smart cities	Consumption Energy efficiency ICT Smart Smart grid

Source: developed by the authors.

The conclusions can be identified as the following:

- the interest in the topic is important and growing, a fact particularly highlighted during the last decade;

- the lack of a consensus on the definition of the concept makes comparative analysis between countries and regions difficult;
- research is based predominantly on qualitative analyses and the presentation of good practices.

Regarding the thematic interest through research addressed to the Romanian space, we can appreciate that, although, or perhaps precisely because in Romania there is an uneven development of urban communities and the implementation/development of cities as "smart" and "green" is emerging, the number of papers is higher than those presenting analyses on the development of green/smart cities in Norway.

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NORO GREEN CITIES

Smart Future

Survey on Stakeholders' Insights Regarding Smart Cities Initiatives: Current Understanding, Expectations, and Challenges

Dear respondent,

We address this questionnaire for identifying your perception and knowledge on smart city initiatives in your geographical area. This survey is part of the Norwegian - Romanian Green Cooperation Initiatives Towards Innovation and Environmental Sustainability (NORO Green Cities project). The partners are: DIH Oceanopolis AS, Norway; Nordic Edge AS with Smart City Innovation Cluster Arena Pro, Norway; Danube Engineering Hub, Romania; City Cluster, Romania; Institute of National Economy - Romanian Academy, Romania.

The **project's primary goal** is to prepare Romanian public and private organisations for the deployment of smart city solutions. It aims to identify strengths, weaknesses, and opportunities for collaboration and knowledge exchange with Norwegian entities. This will help increase the use of digital tools and solutions to develop Smart City Roadmaps. The Roadmaps will serve as a guide for municipalities and county councils to implement smarter digital solutions and promote the development of sustainable, cost-effective, and user-friendly solutions.

Thank you for taking the time to provide your input. We kindly request approximately 15 minutes of your time. The information provided is confidential and will only be used for statistical purposes.

Your insights are essential in guiding our approach to smart city initiatives. This survey aims to identify your current knowledge levels, understand your initial expectations, and highlight any immediate challenges you perceive.

Module 1 – Identify current knowledge levels

1. How familiar are you with the concept of smart cities?

A. Very familiar	B. Somewhat familiar	C. Neither familiar nor unfamiliar	D. Not very familiar	E. Not familiar at all

2. How important do you believe smart city initiatives are for urban development?

A. Extremely important	B. Very important	C. Neither important nor unimportant	D. Slightly important	E. Not at all important

3. To what extent are basic public services (municipal forms and payments, banking, health services, business licences, registers and databases, post office) available online?

A. Highly available	B. Moderately available	C. Neither available nor unavailable	D. Slightly available	E. Not available at all

4. How modern do you think the online services and systems provided are?

A. Highly modern	B. Moderately modern	C. Neither modern nor outdated	D. Slightly modern	E. Not modern at all

5. How easy to use are the online services and systems provided?

A. Very easy to use	B. Somewhat easy to use	C. Neither easy nor difficult to use	D. Somewhat difficult to use	E. Very difficult to use

6. How do you rate public transport in your region?

A. Excellent	B. Good	C. Average	D. Poor	E. Very poor

7. How flexible are you in choosing a mode of transport other than driving your own car (public transport, cycling, car sharing, scooter rental, walking)?

A. Highly flexible	B. Moderately flexible	C. Neither flexible nor inflexible	D. Slightly flexible	E. Not flexible at all

8. How do you rate the municipal waste recycling system (glass, plastic, paper, municipal waste, etc.)?

A. Excellent	B. Good	C. Average	D. Poor	E. Very poor

9. How do you rate online access to healthcare (searching for information, availability of health records, online appointment scheduling for medical consultations, telemedicine)?

A. Excellent	B. Good	C. Average	D. Poor	E. Very poor

10. Have you been involved in any smart city projects previously?

- A. Yes
- B. No

11. If you answered with "yes" to the previous question, please briefly describe your involvement:

12. What was the domain? _____

Module 2 – Understand initial expectations

13. What are your primary expectations from smart city initiatives? *(Please check all that apply)*

- A. Improved urban infrastructure
- B. Enhanced public services

- C. Increased sustainability
- D. Better data utilization
- E. Other (please specify): _____.

14. How do you think smart city initiatives can benefit your community or sector? *(Please check all that apply)*

- A. Improved Public Transportation (real-time traffic management systems)
- B. Enhanced Public Safety (smart surveillance systems and IoT sensors)
- C. Environmental Sustainability (smart energy systems)
- D. Economic Development (smart city technologies)
- E. Healthcare Improvements (smart healthcare systems)
- F. Education Enhancements (digital tools and e-learning platforms)
- G. Waste Management (smart waste management systems)
- H. Water Management (IoT-enabled water monitoring systems)
- I. Enhanced Civic Engagement (digital platforms for civic engagement)
- J. Infrastructure Management (predictive maintenance technologies)
- K. Welfare and social inclusion
- L. Increasing the quality of life
- M. Promoting equality
- N. Transparent and democratic adoption of decisions
- O. Stimulating innovation
- P. Building resilience

15. Please write any other smart city initiatives you consider important. Include those that you believe could significantly benefit your community or sector: _____

Module 3 – Highlight immediate challenges

16. What challenges do you anticipate in the implementation of smart city projects in your area? *(Please check all that apply)*

- A. Financial constraints
- B. Technological barriers
- C. Regulatory challenges
- D. Public acceptance
- E. Other (please specify): _____

17. What support do you believe is necessary to overcome these challenges? *(Please check all that apply)*

- A. Technical assistance (expertise in the latest technologies, software solutions)
- B. Financial aid (grants, subsidies, or investment in specific technologies)
- C. Policy and regulatory frameworks (data privacy laws or zoning regulations).
- D. Capacity building (training and development programs for skills enhancing)
- E. Community engagement and awareness programs (initiatives to increase public understanding and acceptance)
- F. Partnerships and collaborations (collaboration between public, private, and academic sectors)
- G. Research and development support (funding or resources for R&D activities)

18. Please identify the types of support you believe are essential to overcome the challenges you have identified, and elaborate on why these supports are critical. You may also suggest any additional forms of support that have not been listed above. _____

Module 4 - Focusing future efforts

19. What key areas should the NORO Green Cities project focus on to maximize its impact? *(Please check all that apply)*
- A. Urban mobility (enhancing public transportation systems, developing smart traffic management, or promoting electric vehicle usage)
 - B. Energy efficiency (integrating renewable energy sources, implementing smart grid technologies, or improving building energy management)
 - C. Waste management (advanced recycling technologies, waste-to-energy solutions, or innovative reduction strategies)
 - D. Water management (smart water metering, efficient irrigation systems, or pollution control measures)
 - E. Digital infrastructure (broadband expansion, IoT integration for various services, or cybersecurity enhancements)
 - F. Public safety and health (emergency response enhancements, health monitoring systems, or pollution reduction initiatives)
 - G. Social inclusion and education (digital literacy programs, accessible e-government services, or inclusive smart city planning)
 - H. Sustainable urban development
 - I. Smart buildings and workspaces

20. Please specify any key areas you think are critical for the NORO Green Cities project to focus on, along with any specific initiatives or technologies that could be implemented to address these areas effectively:

21. Please specify any additional comments or suggestions to better tailor our smart city initiatives to meet your needs: _____

Module 5 – Demographic profile

22. Your organization type:

- A. Public sector
- B. Small and Medium Enterprise (SME)
- C. European Digital Innovation Hub (EDIH)
- D. Clusters from sectors relevant to smart cities, such as smart city technology, energy, creative industries, transport and mobility, prop-tech, and citizen engagement
- E. Other (please, specify): _____

23. What is your role in smart city initiatives:

- A. Top management (e.g., CEO, Director)
- B. Middle management (e.g., Department Manager, Project Coordinator)
- C. Technical expert (e.g., Engineer, Data Analyst)
- D. Consultant (e.g., Policy Advisor)
- E. Other (please, specify): _____

24. Your age group:

- A. 29 years and below
- B. 30-39 years
- C. 40-49 years
- D. 50-59 years
- E. 60 years and above

25. Your gender:

- A. Female
- B. Male
- C. Not declared

26. Level of education (check the last level of school completed):

- A. High school
- B. Undergraduate studies
- C. Master's studies
- D. Doctoral studies

27. Please, provide your sector's NACE (Nomenclature of Economic Activities) code: _____

28. What is the economic sector in which your organization operates:

- A. Agriculture, forestry, and fishing
- B. Mining and quarrying
- C. Manufacturing
- D. Electricity, gas, steam, and air conditioning supply
- E. Water supply; sewerage, waste management, and remediation activities
- F. Construction
- G. Wholesale and retail trade; repair of motor vehicles and motorcycles
- H. Transportation and storage
- I. Accommodation and food service activities
- J. Information and communication
- K. Financial and insurance activities
- L. Real estate activities
- M. Professional, scientific, and technical activities
- N. Administrative and support service activities
- O. Public administration and defense; compulsory social security
- P. Education
- Q. Human health and social work activities
- R. Arts, entertainment, and recreation
- S. Other service activities
- T. Activities of households as employers; undifferentiated goods and services producing activities of households for own use
- U. Activities of extraterritorial organizations and bodies

Thank you for participating in our survey on smart cities. Your input will help us understand various perspectives on smart city initiatives and development. If you would like to receive the results of the survey after its completion, please provide your email address:



NORO GREEN CITIES

Smart Future

Partners:



The NORO GREEN CITIES project is financed within the "Open Call for Bilateral Cooperation in the Green Transition Romania and Norway, Iceland or Liechtenstein Fund for Bilateral Relations - SMEs Growth Romania", reflecting the joint commitment of Norway and Romania to pioneering sustainable urban development.

Supported by a grant from Iceland, Liechtenstein and Norway through the EEA Grants Romania 2014-2021, in the frame of the SME Growth Programme Romania, Open Call for Bilateral Cooperation in the Green Transition

Working together for a green, competitive and inclusive Europe

ANNEX 1

Survey 1 - Questionnaire on stakeholder perceptions of smart city initiatives: current level of understanding, expectations and challenges

1. Main coordinates for research purpose

- **The survey is developed to identify the perception and knowledge** on smart city initiatives. This survey is part of the Norwegian - Romanian Green Cooperation Initiatives Towards Innovation and Environmental Sustainability (NORO Green Cities project). The partners are: DIH Oceanopolis AS, Norway; Nordic Edge AS with Smart City Innovation Cluster Arena Pro, Norway; Danube Engineering Hub, Romania; City Cluster, Romania; Institute of National Economy - Romanian Academy, Romania.
- **The project's primary goal** is to prepare Romanian public and private organisations for the deployment of smart city solutions. It aims to identify strengths, weaknesses, and opportunities for collaboration and knowledge exchange with Norwegian entities. This will help increase the use of digital tools and solutions to develop Smart City Roadmaps. The roadmaps will serve as guides for municipalities and county councils to implement smarter digital solutions and promote the development of sustainable, cost-effective, and user-friendly solutions.
- Objectives: Identify Current Knowledge Levels, Understand Initial Expectations, Highlight Immediate Challenges. Is based on the Initial Stakeholder Insights to gather baseline data and initial insights from stakeholders about their current understanding, expectations, and challenges related to smart city initiatives.

2. Results and comments

In this study, we developed the analysis on the sample of 293 responses (**total sample**), and we also analysed two subsamples, namely **public sector** subsample (n=234) and **other stakeholders** subsample (n=65), to examine any differences in responses. The difference resulting from summing the number of respondents by subsamples is due to the fact that the split was based on the answers to the question “Type of your organization” (Q22), where some respondents selected two options, meaning they belong to two institutions (for example, some selected both “public institution” and “SME”).

Question 1 (How familiar are you with the concept of smart cities?) and question 2 (How important do you believe smart city initiatives are for urban development?) are analysed together, and the table below shows how many people answered the first question in a certain way (Q1) and how the answers are distributed according to perceived importance (Q2).

Table 1 The relationship between the familiarity with the concept of smart cities and the perceived importance of smart city initiatives for urban development

TOTAL SAMPLE	Not at all familiar	Very familiar	Neither familiar nor unfamiliar	Somewhat familiar	Slightly familiar	Grand Total
Extremely important	4	28	6	35	5	78
Very important	4	21	23	101	26	175
Neither important nor unimportant	2		4	9	6	21
Slightly important	4		1	11	3	19
Grand Total	14	49	34	156	40	293
PUBLIC SECTOR						
Extremely important	2	20	3	24	4	53

TOTAL SAMPLE	Not at all familiar	Very familiar	Neither familiar nor unfamiliar	Somewhat familiar	Slightly familiar	Grand Total
Very important	4	14	20	85	23	146
Neither important nor unimportant	2		3	7	5	17
Slightly important	3		1	11	3	18
Grand Total	11	34	27	127	35	234
OTHER STAKEHOLDERS						
Extremely important	2	9	3	12	1	27
Very important		9	4	17	3	33
Neither important nor unimportant			1	2	1	4
Slightly important	1					1
Grand Total	3	18	8	31	5	65

The big picture shows a correlation between familiarity and perceived importance, with familiarity driving higher ratings of importance. For the **total sample**, the **public sector** subsample, and **other stakeholders** subsample the respondents who are “Very familiar” with the concept of smart cities perceive smart city initiatives as “Extremely important” or “Very important” for urban development. The responses from the “Very familiar” group confirm a clear trend. High familiarity is associated with higher perceived importance.

On the other hand, for the **total sample** and the **public sector** subsample, those who are “Not at all familiar” display a mixed perception, with their responses distributed relatively evenly across “Extremely important”, “Very important”, “Neither important nor unimportant”, and “Slightly important”. In the case of **other stakeholders’** subsample, the responses are found only for “Extremely important” (2) and “Slightly important” (1).

Respondents in “Not at all familiar” category appear uncertain, with no clear bias toward one level of importance for the case of the **total sample** and the **public sector** subsample. The relatively

even distribution suggests that a lack of familiarity limits the ability to form strong opinions. For **other stakeholders’** subsample, it appears that the options “Extremely important” and “Slightly important” were ticked.

Respondents (**from all 3 samples**) who are “Somewhat familiar” or “Slightly familiar” tend to perceive smart city initiatives as “Extremely important” or “Very important” more frequently than other levels of importance. This suggests that even moderate familiarity positively influences perceptions of importance.

The distribution of responses in the “Not at all familiar” category could be considered unusual. Despite the lack of familiarity, some respondents still rated smart city initiatives as “Extremely important” and “Very important”. This situation could suggest that some respondents did not fully understand the question or were uncertain about how to evaluate the importance of smart city initiatives.

Familiarity correlates with perceived importance. Measures adopted to raise public awareness about the benefits of smart city initiatives can enhance the perceived importance and support, especially among those less familiar with the concept.

Question 3 (To what extent are basic public services (municipal forms and payments, banking, health services, business licences, registers and databases, post office) available online?) and question 5 (How easy to use are the online services and systems provided?) are analysed together, and the table below shows how many people answered to Q3 in a certain way and how the answers are distributed according to the ease of use (Q5).

Table 2 The relationship between online availability of basic public services and the perceived ease of use of online services and systems

TOTAL SAMPLE	Not available at all	Highly available	Moderately available	Neither available nor unavailable	Slightly available	Grand Total
Very difficult to use	2		1	2	3	8
Very easy to use		13	19	2	2	36
Neither easy nor difficult to use		2	36	14	16	68

TOTAL SAMPLE	Not available at all	Highly available	Moderately available	Neither available nor unavailable	Slightly available	Grand Total
Somewhat difficult to use	1		19	7	14	41
Somewhat easy to use		8	101	12	19	140
Grand Total	3	23	176	37	54	293
PUBLIC SECTOR						
Very difficult to use	1			2	2	5
Very easy to use		11	16	1	2	30
Neither easy nor difficult to use		2	27	10	10	49
Somewhat difficult to use	1		13	6	11	31
Somewhat easy to use		6	87	10	16	119
Grand Total	2	19	143	29	41	234
OTHER STAKEHOLDERS						
Very difficult to use	1		1		1	3
Very easy to use		3	3	1		7
Neither easy nor difficult to use			9	6	7	22
Somewhat difficult to use			6	2	3	11
Somewhat easy to use		2	15	2	3	22
Grand Total	1	5	34	11	14	65

The table shows a correlation between online availability and perceived ease to use. For the **total sample**, the **public sector** subsample, and **other stakeholders** subsample the respondents who consider basic public services as “Highly available” and “Moderately available” perceive that the provided online services and systems are “Very easy to use” or “Somewhat easy to use” in a higher

percentage. High and moderate online availability is associated more with “Very easy to use” and “Somewhat easy to use” (positive usability perceptions).

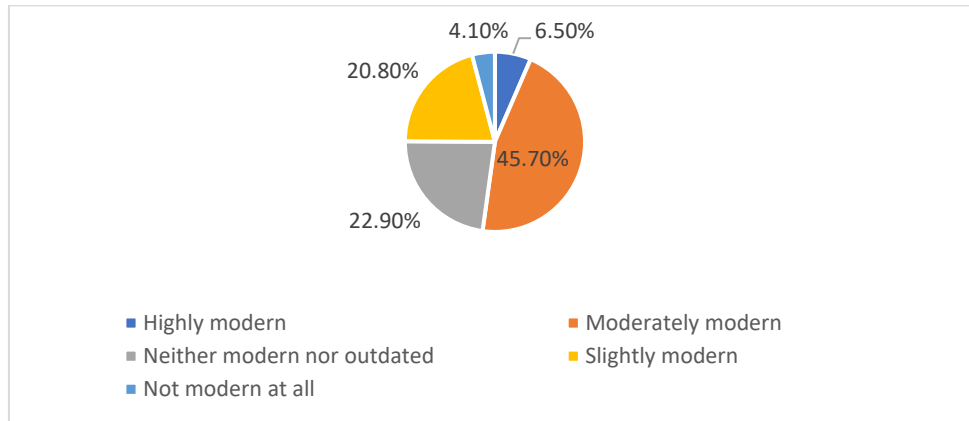
For the **total sample** and the **public sector** subsample, the basic public services perceived as “Neither available nor unavailable” reflect uncertainty. The distribution appears more mixed and less correlated with ease of use. This aligns with the ambiguity inherent in the “Neither available nor unavailable” category. In the case of the **other stakeholders’ subsample**, the answers are highly connected to the “Neither easy nor difficult to use” category. This reflects a neutral stance on both online availability and usability.

For basic public services perceived as “Slightly available”, the distribution shows some tendency toward easier usability perceptions (except the **other stakeholders’ subsample**), but the responses are spread out. This suggests more moderate or mixed perceptions of usability, but there is a tendency toward “Somewhat easy to use”. This suggests that as online availability decreases, the association with ease of use becomes weaker and more varied.

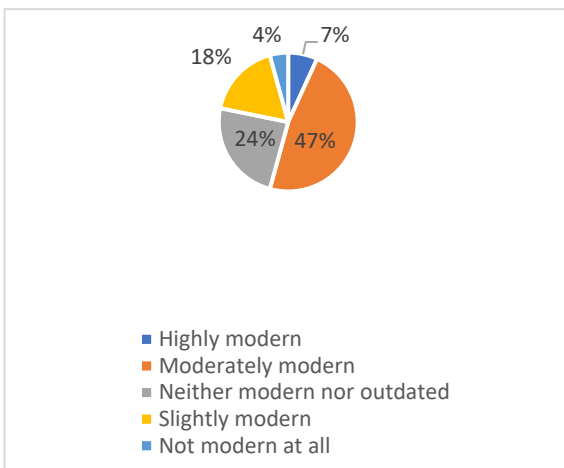
Measures adopted to make basic public services more visible and accessible through improved communication (awareness campaigns or online platforms) can improve the availability perceptions. Measures to improve usability, such as simpler navigation and multilingual interfaces, can improve the easy-to-use perceptions.

The following figures are based on the responses to Q4: How modern do you think the online services and systems provided are? The results for the **total sample** show that the highest percentage (45.7%) chose the “Moderately modern” option, followed by “Neither modern nor outdated” (22.9%) and “Slightly modern” (20.8%). The remaining options had smaller percentages: “Highly modern” (6.5%) and “Not modern at all” (4.1%).

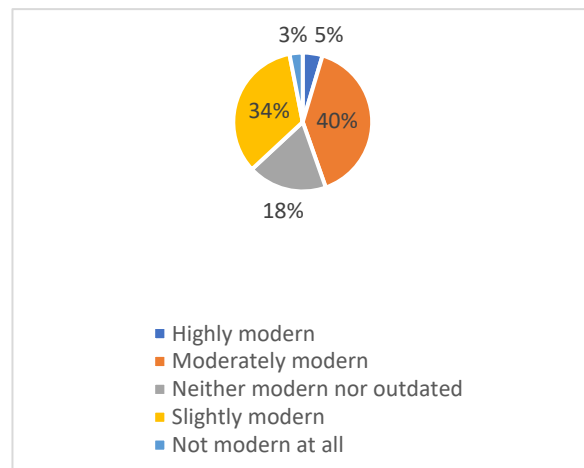
Figure 1 Perceptions of modernity in online services and systems



a.)



b.)



c.)

a. total sample, b. public sector, c. other stakeholders

For the **public sector** subsample, the ranking of responses remains the same, with different percentages. However, for the **other stakeholders'** subsample, the ranking changes, with the highest percentage for the "Moderately modern" option, followed by "Slightly modern", and "Neither modern nor outdated" in third place. These results suggest that respondents tend to view the online services and systems as less modern than they would prefer.

Question 6 (How do you rate public transport in your region?), Question 8 (How do you rate the municipal waste recycling system (glass, plastic, paper, municipal waste, etc.)?) and question 9 (How do you rate online access to healthcare (searching for information, availability of health records, online appointment scheduling for medical consultations, telemedicine?)) are analysed together. The table below shows the distribution of answers to questions 6 (public transport) and 8 (recycling), filtered by the responses to online health access (Q9). The analysis includes all responses from Q9, correlating the ratings of online health access with the ratings of public transport and recycling.

Table 3 The relationship between ratings of various public services: transport, waste recycling, and online healthcare access

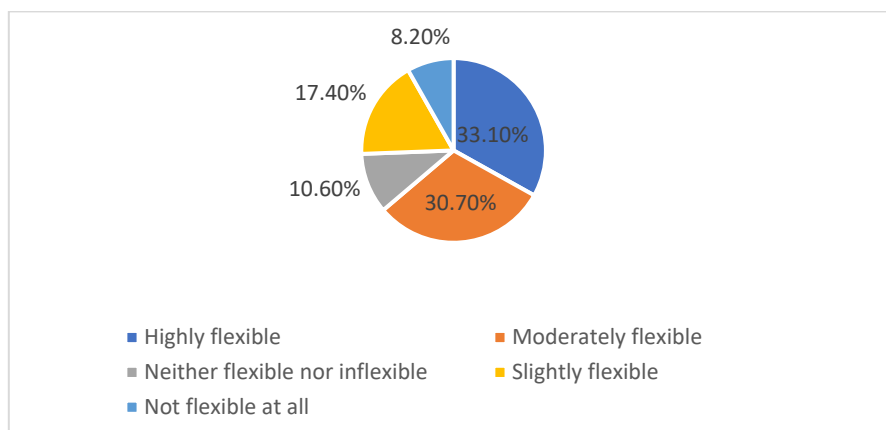
Filter: How do you evaluate online access to health services?						
Count of: How do you rate public transport in your region?						
TOTAL SAMPLE	Good	Excellent	Very poor	Average	Poor	Grand Total
Good	41	7	3	27	14	92
Excellent	3	4		2	1	10
Very poor	7		10	7	4	28
Average	30	1	8	38	30	107
Poor	8	2	3	26	17	56
Grand Total	89	14	24	100	66	293
PUBLIC SECTOR						
Good	36	6	3	23	9	77
Excellent	2	4		1	1	8
Very poor	4		6	7	3	20
Average	25	1	6	31	19	82
Poor	8	2	3	21	13	47
Grand Total	75	13	18	83	45	234
OTHER STAKEHOLDERS						
Good	6	1		5	6	18
Excellent	1			1		2
Very poor	3		4		1	8

Average	5		2	8	12	27
Poor			1	5	4	10
Grand Total	15	1	7	19	23	65

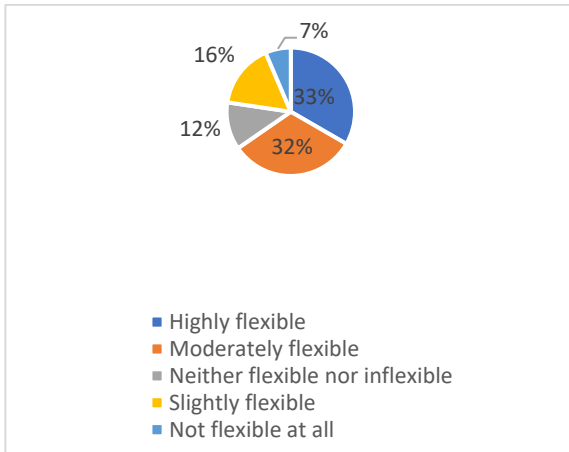
The table shows that people who give positive ratings (e.g., “Good” or “Excellent”) to questions about public transport and recycling tend to rate online health at a similar level, although the overall distribution of responses for online health access shows a tendency towards more negative ratings (“Poor”). Most responses for public transport and recycling are distributed around the values “Good” and “Average”, indicating a mixed assessment of these services, with a more positive outlook in the **total sample** and the **public sector** subsample.

The following figures are based on the responses to Q7: How flexible are you in choosing a mode of transport other than driving your own car (public transport, cycling, car sharing, scooter rental, walking)? The results for the **total sample** show that the highest percentage (33.1%) chose the “Highly flexible” option, followed by “Moderately flexible” (30.7%) and “Slightly flexible” (17.4%).

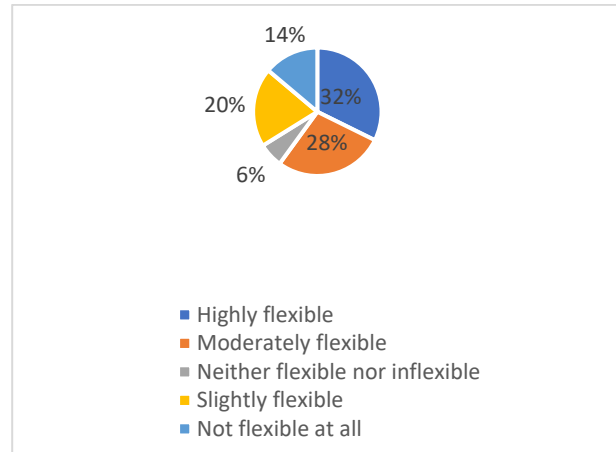
Figure 2 Flexibility in choosing alternative modes of transport other than driving own car



a.)



b.)



c.)

a. total sample, b. public sector, c. other stakeholders

For the **public sector** subsample, the ranking remains the same. However, for the **other stakeholders'** subsample, the ranking holds for the first three options, while the last two (“Neither flexible nor inflexible” and “Not flexible at all”) switched places. The results show a general openness of respondents to using options like public transport, cycling, or other alternatives instead of driving their own car.

Question 10 (Have you been involved in any smart city projects previously?) and Question 22 (Type of your organization) are analysed together. The table below shows the distribution of answers to Q10 based on the type of organization (Q22). The results are influenced by the fact that multiple options could be selected at Q22, as well as by the “Other, please mention” option.

Table 4 Involvement in smart city projects by organization type

TOTAL SAMPLE	Yes	No	Grand Total
Public sector	25	203	228
Small and Medium Enterprise (SME)	5	30	35
Clusters from sectors relevant to smart cities, such as smart city technology, energy, creative industries, transport and mobility, prop-tech, and citizen engagement	1	10	11

TOTAL SAMPLE	Yes	No	Grand Total
European Digital Innovation Hub (EDIH)	3	4	7
Other (management of large enterprises, bank)		4	4
European Digital Innovation Hub (EDIH), Clusters from sectors relevant to smart cities, such as smart city technology, energy, creative industries, transport and mobility, prop-tech, and citizen engagement		2	2
Public sector, Clusters from sectors relevant to smart cities, such as smart city technology, energy, creative industries, transport and mobility, prop-tech, and citizen engagement	1	1	2
Public sector, European Digital Innovation Hub (EDIH)	1	1	2
Public sector, Small and Medium Enterprise (SME)		2	2
Grand Total	36	257	293
PUBLIC SECTOR	Yes	No	Grand Total
Public sector	25	203	228
Public sector, Clusters from sectors relevant to smart cities, such as smart city technology, energy, creative industries, transport and mobility, prop-tech, and citizen engagement	1	1	2
Public sector, European Digital Innovation Hub (EDIH)	1	1	2
Public sector, Small and Medium Enterprise (SME)		2	2
Grand Total	27	207	234
OTHER STAKEHOLDERS	Yes	No	Grand Total
Clusters from sectors relevant to smart cities, such as smart city technology, energy, creative industries, transport and mobility, prop-tech, and citizen engagement	1	10	11
European Digital Innovation Hub (EDIH)	3	4	7
Small and Medium Enterprise (SME)	5	30	35
Public sector, Clusters from sectors relevant to smart cities, such as smart city technology, energy, creative industries, transport and mobility, prop-tech, and citizen engagement	1	1	2

TOTAL SAMPLE	Yes	No	Grand Total
Public sector, European Digital Innovation Hub (EDIH)	1	1	2
Public sector, Small and Medium Enterprise (SME)		2	2
European Digital Innovation Hub (EDIH), Clusters from sectors relevant to smart cities, such as smart city technology, energy, creative industries, transport and mobility, prop-tech, and citizen engagement		2	2
Other (management of large enterprises, bank		4	4
Grand Total	11	54	65

In the case of the **total sample**, the public sector has the highest results, but the involvement of the respondents in various smart city projects is low. The same result is also found in the case of the **public sector** subsample. In the case of **other stakeholders'** subsample, we can also find a low level of involvement. If we check the grand totals by subsamples, the **public sector** involvement in the project is higher than in the case of **other stakeholders'** subsample.

Question 10 (Have you been involved in any smart city projects previously?) and Question 23 (What is your role in smart city initiatives) are analysed together. The table below shows the distribution of answers to Q10 based on the role played in smart city initiatives (Q23). The results are influenced by the fact that multiple options could be selected at Q23, as well as by the "Other, please mention" option.

Table 5 Involvement in smart city projects by participant roles

PUBLIC SECTOR	Yes	No	Grand Total
mayor		2	2
vicemayor		1	1
civil servant		10	10
administrative staff		1	1
employee		3	3
assistant		1	1
assistant counselor	1		1

PUBLIC SECTOR	Yes	No	Grand Total
counselor	1	10	11
researcher		1	1
project manager/assistant project manager		1	1
consultant (e.g., Policy Advisor)	1	51	52
technical expert (e.g., Engineer, Data Analyst)	4	29	33
technical expert (e.g., Engineer, Data Analyst), consultant (e.g., Policy Advisor)	1	3	4
inspector		4	4
top management (e.g., CEO, Director)	4	12	16
top management (e.g., CEO, Director), middle management (e.g., Department Manager, Project Coordinator)		2	2
middle management (e.g., Department Manager, Project Coordinator)	9	39	48
middle management (e.g., Department Manager, Project Coordinator), technical expert (e.g., Engineer, Data Analyst)	2	2	4
middle management (e.g., Department Manager, Project Coordinator), technical expert (e.g., Engineer, Data Analyst), Consultant (e.g., Policy Advisor)	1		1
project activity monitoring	1		1
beneficiary		4	4
partner		1	1
participant		1	1
environmental protection in transport sector		1	1
expert		1	1
student	1		1
tourism expert		1	1
not involved	1	26	27
Grand Total	27	207	234
OTHER STAKEHOLDERS	Yes	No	Grand Total
beneficiary		1	1

PUBLIC SECTOR	Yes	No	Grand Total
counselor		1	1
consultant (e.g., Policy Advisor)	1	16	17
economist		1	1
technical expert (e.g., Engineer, Data Analyst)	1	5	6
technical expert (e.g., Engineer, Data Analyst), consultant (e.g., Policy Advisor)	1	1	2
top management (e.g., CEO, Director)	2	14	16
top management (e.g., CEO, Director), technical expert (e.g., Engineer, Data Analyst), consultant (e.g., Policy Advisor)	1		1
top management (e.g., CEO, Director), middle management (e.g., Department Manager, Project Coordinator)		1	1
middle management (e.g., Department Manager, Project Coordinator)	4	6	10
middle management (e.g., Department Manager, Project Coordinator), technical expert (e.g., Engineer, Data Analyst)	1	1	2
student		1	1
not involved		6	6
Grand Total	11	54	65

In the case of **both subsamples**, the highest score related to involvement in projects comes from middle management (e.g., Department Manager, Project Coordinator), and the highest score related to the lack of involvement come from consultant category (e.g., Policy Advisor). In the case of the **public sector**, there is an inconsistency, where a respondent declared a lack of involvement in projects but still selected “Yes” for Q10. This could indicate a potential misunderstanding of the question.

The description of the involvement of respondents in smart city projects (Q11) emphasised the following results:

- In the case of the **public sector** subsample:
 - NetZeRoCities project, Digital Twin component

- Project implementation / project management
- Blue ocean matrix
- Implementation and promotion of online payment and services platform
- Promotion of green transport
- Implementation and promotion of notification application
- Implementation of urban forests project
- Promotion of smart lighting project
- Promotion of agri-food markets application
- Part of the M100 Committee, national contact point for the 100 smart cities mission
- Electronic services portal for the municipality of Deva
- Smart parking project
- IT equipment project for schools
- E-ticketing system expansion project
- Projects related to the digitalization of public services
- Digital Cities Challenge and Intelligent Cities Challenge project manager
- Communication manager in projects financed for the digitalization of public services
- Workshops at the faculty, professional courses related to urban mobility, landscaping and urbanism, renewable energy and the risk of increased pollution in the urban environment
- Urban mobility
- Online service portal
- Doctoral studies in progress on the evolution of e-government in Romania
- Elaboration of smart city strategies
- Development of environmental monitoring solutions
- Member of the project team for creating an intelligent real-time monitoring system for public transport
- Development of the strategy for the digital transformation of Sector 6, Bucharest
- Development of a big data analysis system

- Utilization of waste for energy production
- Access to European funds and project implementation
- Project manager for video surveillance systems, traffic management system, bicycle rental system, smart lighting system
- Maintaining contact with the regional representative in Romania

The responses above showed an active involvement in diverse projects emphasizing smart city initiatives, including digitalization, urban mobility, green transport, and environmental sustainability. Also, there are emphasised the management roles in strategy development, technology implementation, and promotion of innovative urban solutions. In the case of the **other stakeholders**' subsample, the responses were:

- Smart City Strategy of Constanta
- Smart City Timisoara
- Infrastructure
- NetZeRoCities, PLENTY-LIFE
- Software development and systems design
- Data Integration
- Project manager for a portal of public services offered by local public authority
- The activity of the company I worked for
- Digitalization of the hospitality industry (access to food orders, restaurant reservations, etc.)
- Smart city strategies
- Development of environmental monitoring solutions

Thus, according to responses above, the focus was on the development and implementation of smart city strategies and infrastructure, emphasizing digitalization and environmental monitoring. Also, the responses showed an application of technology and software solutions to enhance public services, urban living, and industry-specific digital transformation.

The respondents mentioned various domains of activity (Q12). Thus, in the case of the **public sector** subsample, the responses were:

- Climate neutrality, Digital Twin
- Communication and management
- Innovation Management
- Academic
- Student
- ICT & Intelligent Systems
- Digitalization of services, mobility, energy efficiency, afforestation, public lighting, trade
- Horizon Europe projects, policy
- Digital/smart public services, development strategies
- Civil Engineering
- Electric buses, bicycle lanes
- IT infrastructure configuration and management
- Research
- Smart city and smart mobility
- Architecture and urbanism
- Local Development
- Environmental monitoring - data acquisition, data presentation
- Public lighting
- Climate change resilience, adaptation
- Public transport
- Public administration
- Energy sector
- Energy efficiency
- Public administration
- Tourism and economic growth
- Technical
- Creating bicycle lanes
- Smart public lighting

- Eco buses
- Eco digital garbage islands
- Video monitoring
- Urban mobility
- Smart City consortium

The responses above showed an engagement with smart city initiatives, focusing on digitalization, energy efficiency, urban mobility, and climate resilience. Interdisciplinary roles were mentioned, spanning innovation, research, public administration, and technical infrastructure development for sustainable urban growth. In the case of the **other stakeholders'** subsample, the responses were:

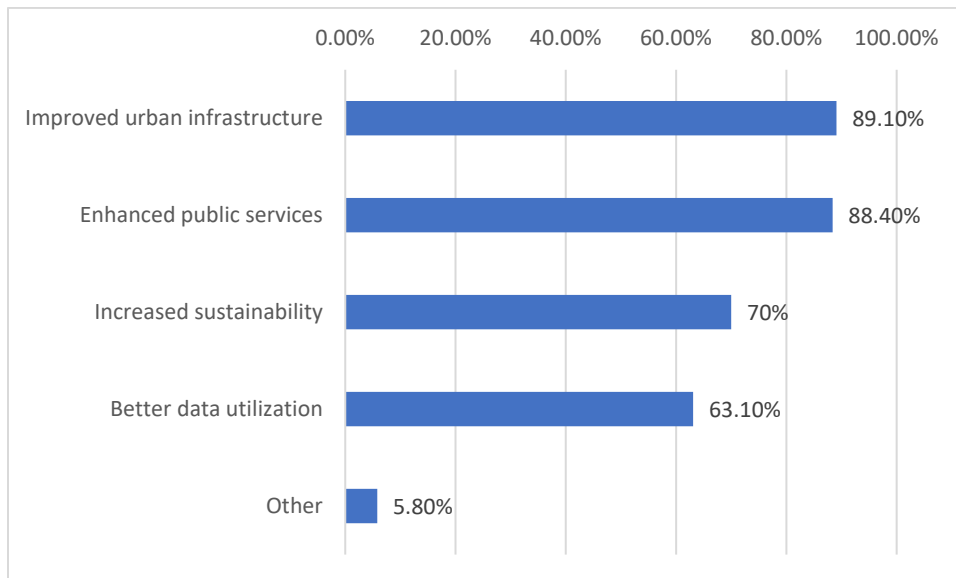
- VR
- Strategic planning and project idea portfolio
- Energy
- IoT
- Technology
- IT/Big data analysis
- Economics
- Traffic Management
- Public services of a ATU
- Sustainability
- Horeca
- Smart city and smart mobility
- Environmental monitoring - data acquisition, data presentation

The responses above focused on integration of technology, data analysis, and sustainability into strategic planning and smart city development across various sectors.

The following figure is based on responses to Q13: What are your primary expectations from smart city initiatives? The results show that the top three expectations are improved urban infrastructure (modernized roads, bridges, utilities, etc.), enhanced public services (efficient and accessible education, healthcare, public transport, etc.), and increased sustainability (initiatives that promote

environmental sustainability, such as reducing pollution, using renewable energy, or creating greener urban spaces).

Figure 3 The expectations from smart city initiatives - total sample



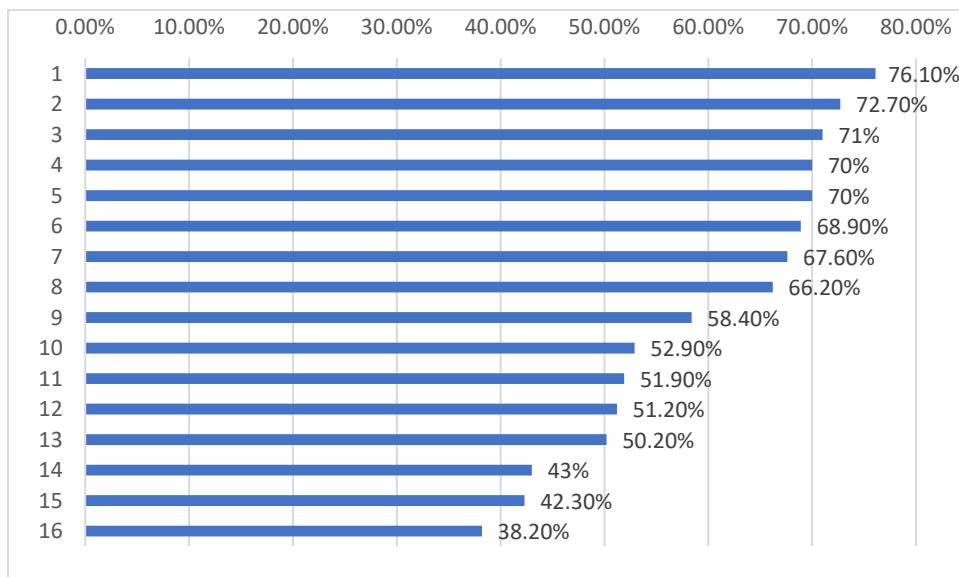
In the “Other” category, the following responses were included:

- Greater civic involvement
- Easy access to tax payments, doctor's appointments, predictable public transport
- Implementation of innovative solutions and examples of good practice
- Quality of life and sense of community
- Urban waste recovery
- Rapid public transport
- Increased digitalization and reduction of paper use
- Reduction of documentation required in various procedures
- Energy management
- Improved mobility and smart transport
- Increased security through technology
- Health, video surveillance, quality of life

- Diversified opportunities, innovative projects
- Personal data security
- Reduction of environmental impact
- Rapid adaptation to technological, economic and social changes
- Interconnection of services offered to citizens
- Green transition
- Efficiency of interaction between authority and citizen regarding administrative acts
- Promenade area in the central area

The following figure is based on responses to Q14: 'How do you think smart city initiatives can benefit your community or sector?' The results show three distinct clusters of benefits. The most important cluster includes: improved public transport (real-time traffic management systems), waste management (smart waste systems), quality of life, increased public safety (smart surveillance and IoT sensors), education improvements (digital systems and e-learning platforms), environmental sustainability (smart energy systems), economic development (smart technologies), and health improvements (smart healthcare systems).

Figure 4 Perceived benefits of smart city initiatives for communities and sectors - total sample



1	Improved public transport (real-time traffic management systems)
2	Waste management (smart waste management systems)
3	Quality of life
4	Increased public safety (smart surveillance systems and IoT sensors)
5	Education improvements (digital systems and e-learning platforms)
6	Environmental sustainability (smart energy supply systems)
7	Economic development (smart city technologies)
8	Health improvements (smart healthcare systems)
9	Water management (IoT-enabled water monitoring systems)
10	Stimulating innovation
11	Transparent and democratic decision-making
12	Infrastructure management (predictive maintenance technologies)
13	Well-being and social inclusion
14	Increased civic engagement (digital platforms for civic engagement)
15	Building resilience
16	Promoting equality

The second cluster contains: water management (IoT-enabled monitoring systems), stimulating innovation, transparent and democratic decision-making, infrastructure management (predictive maintenance technologies), and well-being and social inclusion. The final cluster includes: increased civic engagement (digital platforms), building resilience, and promoting equality. These findings highlight the significance of benefits in driving the success of smart city initiatives.

The respondents emphasised the smart city initiatives that they considered important and believed that could significantly benefit their community or sector (Q15). Thus, in the case of the **public sector** subsample, the responses were:

- Improving public transport by installing passenger information panels (displaying arrival times at stations)
- Digitalization
- Sustainable management of local resources, valorization of local products

- Digitalization of all services, public transport, alternative transport, waste management
- 100 smart cities mission, M100 Mirror Hub and its financing
- Complete GIS (see GIS Vienna)
- Air quality according to European regulations in force, respected to safety and sustainability standards
- Expanding and valorizing green spaces, including artificially arranged spaces on non-circulatory terraces, unused public spaces.
- Air quality monitoring
- Digitalization of medical services
- Traffic Management System
- Improving the quality of environmental factors
- Creating infrastructure to encourage cycling, to reduce pollution.
- Advanced waste management system, based on smart technologies
- Massive investments in road infrastructure, attracting investors
- Quality electronic public services
- Online access to medical records
- Access to online family doctor services for issues that do not involve physical consultation
- Interconnectivity of public platforms
- Increasing the quality of life through: reducing traffic and pollution, energy efficient buildings, efficient energy distribution and reducing losses, smart waste management system, sensors for measuring the level of pollution in the city, urban water cleaning and restoration projects, green facades (vertical parks), green roofs and urban gardens, improved public health and safety, digital platforms for communication with the administration in the sense of creating applications through which citizens can report problems, online public consultations and surveys for new projects, free Wi-Fi points in public spaces, digital literacy programs for vulnerable groups, etc.
- Smart Specialization in Tourism

- Waste Management
- Improving Health and Transportation
- Interconnection of data systems of public institutions
- Development of the education system
- Development of bicycle infrastructure
- Accessibility for people with disabilities, mothers with newborns, the elderly
- Digital governance
- Secure and unified authentication to databases similar to the interface.
- Smart stations
- Fluidizing traffic
- Monitoring of green spaces and the perspective of developing green areas
- Smart governance, smart economy, smart mobility, smart environment. The cities of the future, smart and sustainable, will be engines of economic growth and generators of highly qualified jobs
- Multimodal urban transport powered by locally produced renewable energy
- Green areas
- Traffic management
- Bicycle lanes
- More investments in 5G to allow the development
- Involvement of co-tenants
- Research, development, innovation
- Interactive smart panels for direction/information, smart urban furniture (with charging stations included), smart toilets, smart play centers
- Smart lighting, street lamps that automatically adjust their light, to save energy.
- Waste management systems, smart containers that monitor the filling level to optimize collection routes.
- Citizen applications.
- Air quality monitoring systems.
- Initiatives in the road, recycling, electricity and natural gas fields
- Monitoring urban services through technologies

- Urban regeneration, rehabilitation and energy efficiency
- Technologies for real reduction of air pollution
- Expansion of home care programs for the elderly
- Stimulation of individual freedom and human rights
- Expansion and modernization of the video surveillance and traffic monitoring system

The responses above showed the prioritization of digitalization, sustainable resource management, and advanced infrastructure to improve public services, mobility, and environmental quality. Also, there is a focus on enhancing quality of life through innovative technologies, citizen engagement, and smart governance for sustainable urban development. In the case of **other stakeholders'** subsample, the responses were:

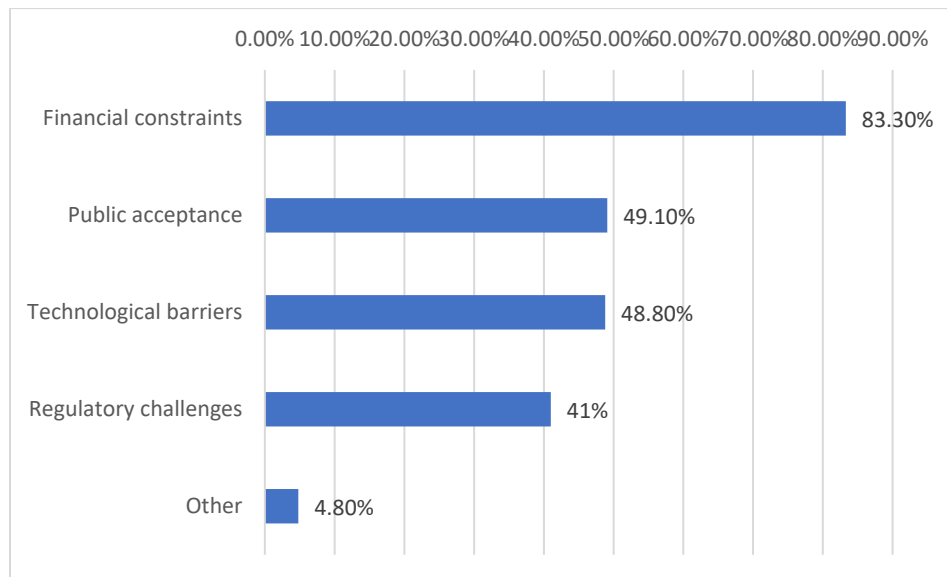
- City pollution monitoring system
- Green spaces
- Public information
- Implementation of a real-time traffic monitoring and management system that optimizes traffic lights and provides alternative route recommendations. This would reduce congestion, travel times and pollution, benefiting the transport sector and city residents in particular.
- Smart public lighting
- Modernization of the lighting system with remotely controllable LEDs, equipped with motion and daylight sensors, to reduce energy consumption and maintenance costs. This would improve public safety and reduce the city's carbon footprint.
- A mobile application or online portal that integrates public services, such as paying taxes, requesting documents and reporting urban issues. This would facilitate citizens' interaction with public administration and simplify access to information of public interest.
- Smart waste collection solutions

- Equipping garbage containers with sensors that monitor the filling level and optimize collection routes. This system would reduce the frequency of collections, costs and emissions, being beneficial for the sanitation sector and for a cleaner city.
- Research center and research / innovation projects
- Promoting cities that have implemented Smart city solutions. Presentation of the challenges faced by cities that have implemented Smart city solutions. Presentation of the solution; advantages, disadvantages.
- Integration of green technologies (green roof systems, pollution reduction technologies)
- Improved accessibility for people with disabilities (intelligent navigation and access systems)
- Increased energy efficiency (automatic climate control systems in buildings)
- Green Energy
- Covered parking lots equipped with photovoltaic panels
- Intelligent waste collection systems
- Comprehensive monitoring of energy consumption and optimization of the use of energy resources, with immediate effect on the decrease in the price of energy to the user and the decrease in global consumption; contribution to balancing the NES
- Public safety, health
- Promoting equal opportunities
- Improved public transport
- Commercial and passenger air micro mobility

The responses above showed the need to adopt innovative smart city technologies to enhance sustainability, energy efficiency, and public services, including traffic management, waste collection, and green energy integration. There is a focus on solutions for citizens to improve accessibility, public safety, education, and overall quality of life through digital tools and infrastructure modernization.

The following figure is based on responses to Q16: What challenges do you anticipate in the implementation of smart city projects in your area? The results show that the first challenge is a financial one, followed by public acceptance, technological barriers, and regulatory challenges.

Figure 5 Anticipated challenges in the implementation of smart city projects - total sample



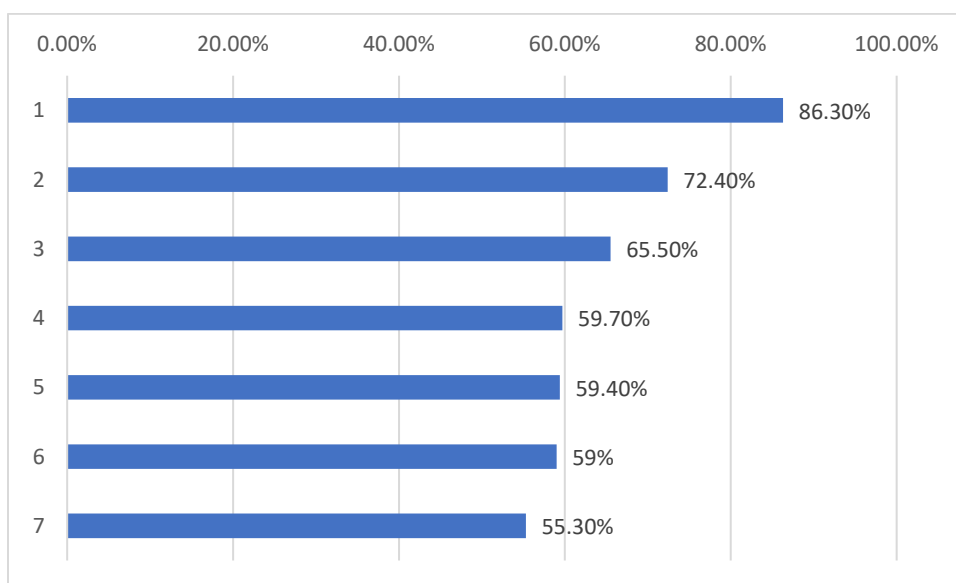
In the “Other” category, the following responses were included:

- Education level and civic spirit
- Politics
- Bureaucracy
- Reluctance of authorities to use funding
- Capitalizing on knowledge from senior citizens
- Insufficiently qualified personnel
- A mixed type of challenge with forms of each type presented previously
- Lack of local technical expertise
- Infrastructure problems
- Conflicting interests between stakeholders
- Challenges related to data security and confidentiality

- Incompetence of the city hall
- Lack of specialists and entrepreneurs in the field who are willing to implement such new technologies
- Digital inequalities: there is a risk that certain groups of citizens will be excluded from access to digital technologies, amplifying social gaps, as well as the adaptability of legislation to the pace of excluded innovations
- Lack of sufficient and trained personnel for the purpose of implementing projects
- Disinterest
- Corruption of public authorities

The following figure is based on responses to Q17: What support do you believe is necessary to overcome these challenges? The first three places are represented by financial aid (grants, subsidies, or investment in specific technologies), technical assistance (expertise in the latest technologies, software solutions), and partnerships and collaborations (collaboration between public, private, and academic sectors).

Figure 6 Necessary support to overcome challenges in smart city project implementation - total sample



1	Financial aid (grants, subsidies, or investment in specific technologies).
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2	Technical assistance (expertise in the latest technologies, software solutions).
3	Partnerships and collaborations (collaboration between public, private, and academic sectors).
4	Policy and regulatory frameworks (data privacy laws or zoning regulations).
5	Community engagement and awareness programs (initiatives to increase public understanding and acceptance).
6	Capacity building (training and development programs for skills enhancing).
7	Research and development support (funding or resources for R&D activities)

On the last four places there are the policy and regulatory frameworks (data privacy laws or zoning regulations), community engagement and awareness programs (initiatives to increase public understanding and acceptance), capacity building (training and development programs for skills enhancing), and research and development support (funding or resources for R&D activities). Although the percentages are higher for the first three answer options, the percentages for the last four options remain above 50%, highlighting the significance of all these aspects for the success of smart city projects.

The respondents identified various types of support they believed are essential to overcome the challenges identified (Q18). Thus, the responses for the **public sector** subsample emphasised the following:

- Local media publications.
- Technical assistance and community engagement programs to help citizens and governments understand the benefits, financial aid and support for research and development to advance the field, legislative framework, partnerships and collaborations to create synergies.
- Local support
- Personal support
- Financial aid, partnerships and collaborations
- Local campaigns to raise awareness of the benefits of smart cities by the community;
- Knowledge exchange (partnerships)
- Financial and technical support

- Efficient and transparent communication of problems, solutions and results between partners, stakeholders and target groups
- Community engagement and awareness programs (initiatives to increase public understanding and acceptance)
- Financial support
- Technical assistance through which the traffic management system would be implemented
- Support for research and development
- To overcome the financial challenges of implementing smart city initiatives, a city needs several essential types of support. These types of support are crucial to ensure the financial sustainability and long-term success of smart projects. 1. Government support and enabling policies-Subsidies and grants: Financial support from government or international institutions in the form of subsidies and grants helps cover the initial costs of smart infrastructure. These funds reduce the financial pressure on the local budget and allow cities to launch innovative projects without accumulating significant debt. 2. European funds - In the EU, structural and cohesion funds are an important resource for supporting smart city initiatives. These funds are essential for infrastructure projects and sustainable technologies that can transform the city."
- Legislative framework or concrete regulations for the regional development of the North-East region.
- Capacity development - qualified personnel is essential for the implementation of such initiatives
- Community engagement and awareness programs - citizens must understand the importance and usefulness of the initiatives in order to respect and use them. The real ability of people to use new means is also essential, as new technologies are often difficult for ordinary people to access and the number of technical requirements that contemporary people have to continuously familiarize themselves with makes new technologies/applications increasingly unpopular.
- Legal and implementation support, because a clear legislative framework prevents abuses, ensures citizens' rights and reduces the risks of technological or legal

blockages; financial support, because smart projects are based on cutting-edge technology, investments in infrastructure and innovation reduce technical risks and improve the quality of implementation; social and educational support, because social support and education reduce resistance to change, build citizens' trust and ensure the efficient use of smart solutions; support for innovation and research, because research and innovation allow the development of efficient and sustainable solutions that respond to urban challenges; support for international collaboration, because international collaboration reduces costs by sharing resources and experiences and accelerates implementation; environmental and sustainability support, as sustainability is a priority for smart cities, and environmental support contributes to reducing the carbon footprint and increasing the quality of life; facilitating access to urban data for researchers and companies to develop innovative solutions; systems to collect and analyse citizen feedback and the performance of implemented projects; involving local companies in project development, stimulating the local economy and creating jobs.

- Exchanges of experience with cities in the Nordic countries (Sweden, Norway, Denmark, Finland) countries extremely advanced in the implementation of the Smart - City concept, Smart Specialisation
- Financial support: programs to finance integrated smart-city projects, not just focused on a certain area, such as mobility or digitalisation. Legislative framework: many projects cannot be implemented because beneficiaries cannot obtain management rights over properties that intersect the investment locations. Capacity development: the added value of training programs is not perceived, so that employers are motivated to invest in employee training. Public acceptance: probably when the current generation of children reaches adulthood, the prevalence of the perception that any type of operations performed through digital tools are risky and lead to data/money theft or do not reach the recipient will disappear. Intersectoral partnerships. The vast majority of funding programs offer grants addressed either to ATU, SMEs, or universities. Fewer calls within which partnerships between the 3 types of entities are eligible. In instances where some calls specifically request partnership, for example ATU-research institute, these partnerships are more formal than actually materialized.

- The cheapest type of "support" is a model from other communities that have managed to develop at least public transport infrastructure
- Involvement of local administration
- Simple interfaces to understand and use, without pictures and CVs of suppliers or financiers on the front pages.
- Evaluation of the advantages that this system brings and their presentation, argued, by reporting on the real benefits it brings compared to the current situation. Digitalization does not automatically mean evolution.
- Community engagement and awareness programs (initiatives to increase public understanding and acceptance)
- Partnerships
- European funds, volunteering
- Grants and subsidies.
- Multiple sources of funding (national, operational, community programs, etc.)
- Adapting the regulatory framework, attracting citizens, capitalizing on local material and human potential
- Being a small community, resources are limited, so any form of support, especially financial aid, is vital to supporting smart city initiatives.
- Digitalization, reducing bureaucracy
- Technical assistance and financial aid.
- Exchanges of experience where the concept works
- Legislative and regulatory framework
- Capacity development (training and development programs to improve skills) and community involvement and awareness programs
- Grants and/or prizes awarded for projects selected in order to provide a broad and complementary development.
- Community involvement and awareness programs
- Financial aid (grants, subsidies or investments in specific technologies)
- Coherent and long-term policies

- Support/consultancy to identify and integrate technological solutions adapted to the urban and social structure.

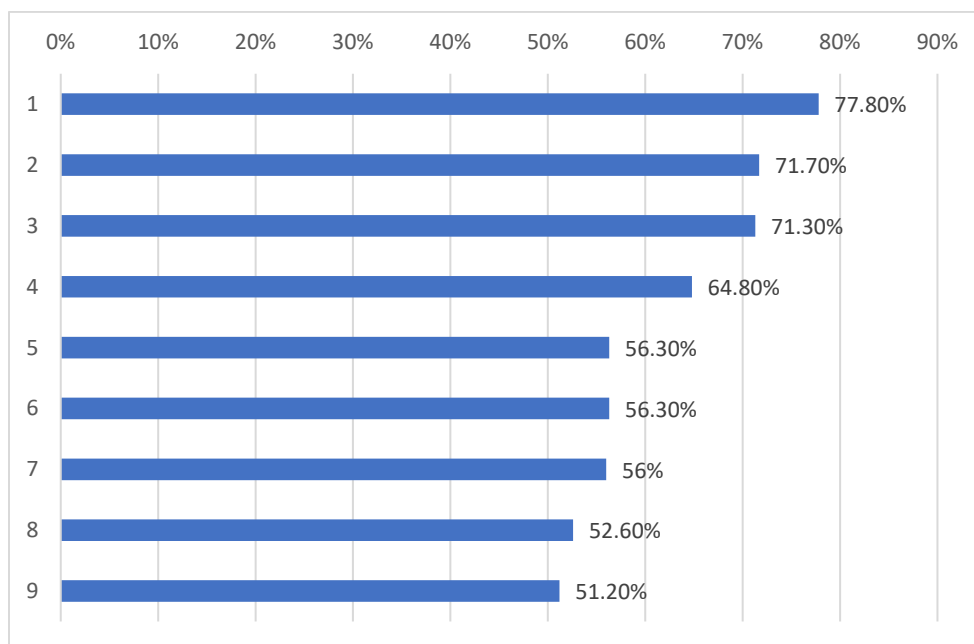
The responses showed the need for support systems, including financial aid, legislative frameworks, technical assistance, and capacity building, considered important for overcoming challenges in smart city initiatives. Also, other factors are considered important, such as community engagement, knowledge exchange, and partnerships. The responses for **other stakeholders**' subsample emphasised the following:

- Financial support
- Study visits
- Appropriate government support
- Political support
- Associative initiatives for the development of the legal framework (local and national)
- Grants, funding, investments
- Funding and project management
- Community involvement and awareness programs
- Expertise from city managers in other countries.
- Legislative and regulatory framework (data protection laws or zoning regulations)
- Financial support is absolutely necessary; raising awareness of local authorities and engaging them in constructive collaboration; developing a coherent strategy with identifying the sections to be addressed
- Support for knowledge development is the main support that consumers should receive.
- Support for research and development
- Financial support, support in changing the perspective from which societal problems are seen, support in understanding the equal opportunities of each individual
- Public-private partnership, involvement of resident corporations in local development

The responses above emphasised the importance of financial, legislative, and community-driven support in fostering collaboration, innovation, and effective implementation of smart city initiatives.

The following figure is based on responses to Q19: What key areas should the NORO Green Cities project focus on to maximize its impact? There are two clusters of key areas. The first cluster is represented by urban mobility (enhancing public transportation systems, developing smart traffic management, or promoting electric vehicle usage), waste management (advanced recycling technologies, waste-to-energy solutions, or innovative reduction strategies), energy efficiency (integrating renewable energy sources, implementing smart grid technologies, or improving building energy management), and public safety and health (emergency response enhancements, health monitoring systems, or pollution reduction initiatives).

Figure 7 Key focus areas for maximizing the impact of the NORO Green Cities project - total sample



1	Urban mobility (enhancing public transportation systems, developing smart traffic management, or promoting electric vehicle usage)
2	Waste management (advanced recycling technologies, waste-to-energy solutions, or innovative reduction strategies)
3	Energy efficiency (integrating renewable energy sources, implementing smart grid technologies, or improving building energy management)
4	Public safety and health (emergency response enhancements, health monitoring systems, or pollution reduction initiatives)

5	Social inclusion and education (digital literacy programs, accessible e-government services, or inclusive smart city planning)
6	Sustainable urban development
7	Digital infrastructure (broadband expansion, IoT integration for various services, or cybersecurity enhancements)
8	Water management (smart water metering, efficient irrigation systems, or pollution control measures)
9	Smart buildings and workspaces

The second cluster contains social inclusion and education (digital literacy programs, accessible e-government services, or inclusive smart city planning), sustainable urban development, digital infrastructure (broadband expansion, IOT integration for various services, or cybersecurity enhancements), water management (smart water metering, efficient irrigation systems, or pollution control measures), and smart buildings and workspaces. This result suggests that an approach based on both environmental and social factors is important for the success of the project.

The respondents mentioned key areas that can be critical for the NORO Green Cities project to focus on (Q20). Thus, the responses for the **public sector** subsample emphasised the following:

- Technologies that could be implemented
- Medical domain
- Climate Change Resilience
- Dissemination of good practice examples
- Networking
- Integrated community teams, beggars' issues, homeless
- Customizing construction and engineering for a smarter city
- Green spaces and urban biodiversity
- Vertical gardens and green roofs: Expanding green spaces through technologies that allow planting on buildings and urban structures.
- Digital platforms for biodiversity monitoring: Applications and sensors that monitor plant and animal species in the city to support biodiversity.

- Smart parks: Green spaces equipped with sensors that monitor air quality and usage levels to improve their management.
- Technology and digitalization for civic participation
- Citizen feedback applications: Platforms that allow citizens to report problems, propose ideas and interact with the city hall to solve environmental and infrastructure problems.
- Real-time information systems: Displays and applications that provide information on air quality, traffic levels and events in the city.
- E-government platforms: Technologies that allow citizens to access municipal services and participate in decision-making processes in a transparent way.
- Innovation and sustainable education
- Ecological education programs: Courses and workshops on sustainable practices and efficient use of resources, supported by educational institutions.
- Urban innovation labs: Spaces designed to experiment and test new technologies before their large-scale implementation.
- Smart buildings
- Health system and education system
- Educating the population in the use of new technologies, to improve online accessibility in accordance with European directives. An efficient support system
- Circular economy platforms; ensuring green infrastructure in the field of environmental protection - expanding green spaces, vertical gardens and green roofs; the field of urban mobility, with the initiative of vehicle sharing systems (car-sharing and bike-sharing) through digital platforms for quick and easy access to public transport vehicles; regarding urban health and well-being, health centers connected to each other through digital platforms for monitoring the health status of citizens can be created; in the field of social inclusion and education, innovation hubs and urban laboratories can be implemented, courses on the use of smart solutions and the adoption of a sustainable lifestyle, alliances between universities and public administrations, etc.
- Tourism

- Healthcare
- Real-time crime mapping, traffic monitoring, air quality, digital management of trash pickup
- Encouraging Communities and Stakeholders
- Knowledge exchange and capacity building between Norway and Romania
- Modernization of the healthcare system, development of specific research laboratories
- Expanding green and recreational areas
- Multimodal urban transport powered by renewable energy
- Adapting the regulatory framework and application rules
- Public administration
- Road/pedestrian infrastructure
- Air pollution reduction technologies specific to each area

The responses above showed key areas such as innovative technologies, expanded green spaces, and citizen-focused digital platforms for civic engagement and biodiversity monitoring. Also, fostering collaboration and knowledge exchange between Norway and Romania is considered important, while advancing sustainable education, healthcare modernization, and regulatory adaptations for resilient cities. The responses for the **other stakeholders**' subsample emphasised the following:

- Data collection and analysis, identification of data-driven needs and potential solutions, supported by data
- Urban mobility
- Back-up solution for the provision of basic services in disasters.
- Implementation of a coherent vision on the management of energy resources. including local energy production using waste
- Education
- Sports
- Imposing much higher fines on illegal deforestation
- Improved railway infrastructure

- Education in all forms of pre-university, professional and vocational education

The answers above showed the importance of implementing data-driven solutions, energy resource management, disaster resilience, while prioritizing infrastructure improvements.

The respondents suggested some additional comments to better tailor the smart city initiatives to meet the needs of the society (Q21). Thus, the responses for the **public sector** subsample emphasised the following:

- Pollution reduction;
- Better collaboration and increased partnership between stakeholders. Perhaps one of the most important challenges of a smart city is achieving a high degree of complexity and resilience. In a complex and resilient city, the community of citizens depends on the strength of the organizations and procedures in that community. In turn, this power depends on the degree of support of organizations and procedures and their level of institutionalization (Huntington, 1999: "modernization largely involves the multiplication and diversification of social forces in society" and Sartori, 1999);
- Vocational training;
- More intense cooperation between central authorities - local authorities - associations of local authorities;
- Collaboration with best practice cities;
- Smart buildings;
- Creating a safe environment in education, health, and public order;
- There is a high degree of functional illiteracy in civil society that such initiatives often ignore and which should be the starting point. Also, technological challenges (especially those of elderly people but not exclusively) should not be considered;
- Analysing the specifics of the city through detailed studies on its needs and problems, as personalized solutions increase the relevance of the project and the efficiency of implementation;
- Actively involving community representatives by creating public consultation platforms through which citizens can contribute ideas and vote on project priorities, as

well as organizing online forums and surveys to understand the main concerns of residents (mobility, environment, technology);

- Prioritizing initiatives with immediate impact, namely small but visible projects that quickly demonstrate the benefits of a smart city;
- Ensuring access to digital and technological infrastructure for all residents, regardless of income or age;
- Digital literacy programs for seniors and subsidies for low-income households to access smart technologies;
- Establishing partnerships with universities and companies to develop innovative and sustainable solutions, as well as creating innovation hubs in collaboration with research institutions to test new solutions, such as green building materials or autonomous vehicles;
- Providing grants or tax incentives to local companies that develop technological and sustainable solutions as well as supporting start -ups that offer IoT solutions for transport or energy efficiency;
- Developing projects that can be expanded depending on their initial success and adapted to new technological requirements as well as testing intelligent traffic systems in a pilot district before expanding them throughout the city
- Conducting public education campaigns on the benefits of sustainability and the use of smart technologies and programs in schools about renewable energy and community activities for recycling;
- Implementing strict data protection and cybersecurity policies, including regular audits, as well as partnerships with cybersecurity experts to protect critical infrastructure.
- Digitalized interaction between local public administration and citizens - access to public data, creating accessible and safe cities should be the key priorities.
- Integration and partnerships with local companies
- Environmental protection measures
- Awareness and information process in order to make public administration personnel responsible

- Financial aid in important areas
- A method must be found through which the beneficiary (community) becomes aware that the implementation of these technologies is a necessity, to perceive them after implementation as normality, to send feedback to identify weaknesses in order to improve them.

The responses above emphasised the importance of fostering collaboration between stakeholders, improving vocational training, and ensuring access to technology and education for all residents, while addressing societal needs through personalized solutions and community engagement.

The responses for the **other stakeholders'** subsample emphasised the need for better media coverage of projects of this type.

Question 24 (Age group) and Question 25 (Gender) are analysed together. The table below shows the distribution of persons in each age group (Q24) based on their gender (Q25).

Table 6 Participant demographics: age group and gender distribution

TOTAL SAMPLE	Women	Men	I don't want to mention	Grand Total
under 29 years old	26	16	2	44
30-39 years old	31	31	3	65
40-49 years old	52	42	6	100
50-59 years old	41	27		68
over 60 years old	7	9		16
Grand Total	157	125	11	293
PUBLIC SECTOR				
under 29 years old	16	13	2	31
30-39 years old	26	22	3	51
40-49 years old	47	33	5	85
50-59 years old	39	20		59
over 60 years old	4	4		8
Grand Total	132	92	10	234

TOTAL SAMPLE	Women	Men	I don't want to mention	Grand Total
OTHER STAKEHOLDERS				
under 29 years old	11	3		14
30-39 years old	5	12		17
40-49 years old	5	10	1	16
50-59 years old	2	8		10
over 60 years old	3	5		8
Grand Total	26	38	1	65

For the **total sample** and the **public sector** subsample, the number of women exceeds the number of men overall. For the **other stakeholders'** subsample, the situation is the opposite, with the number of men being higher. The age group with the highest number of men and women is 40-49 years old for the **total sample** and the **public sector** subsample, but in the case of the **other stakeholders'** subsample, most women are in the age group under 29 years old, and the most men are in the age group 30-39 years old.

Question 24 (Age group) and Question 26 (Level of education) are analysed together. The table below shows the distribution of persons in each age group (Q24) based on their level of education (Q26).

Table 7 Participant demographics: age group and level of education

TOTAL SAMPLE	High school	Undergraduate studies	Master's studies	Doctoral studies	Grand Total
under 29 years old	13	21	10		44
30-39 years old	6	16	37	6	65
40-49 years old	3	26	57	14	100
50-59 years old	2	20	42	4	68
over 60 years old	2	4	6	4	16
Grand Total	26	87	152	28	293
PUBLIC SECTOR					

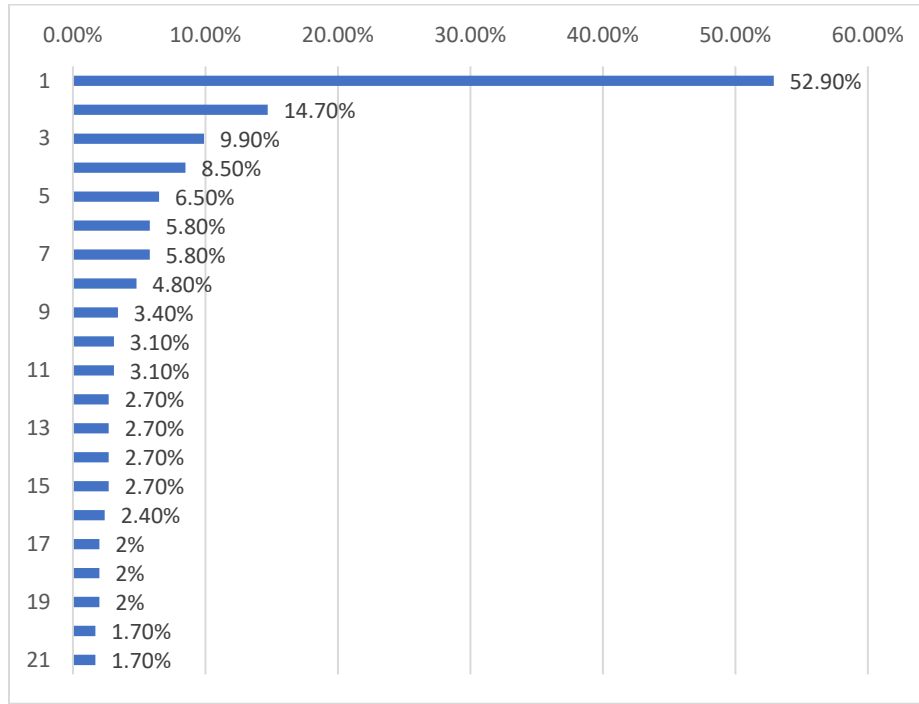
under 29 years old	8	14	9		31
30-39 years old	5	9	34	3	51
40-49 years old	2	24	52	7	85
50-59 years old	1	19	37	2	59
over 60 years old	1	2	3	2	8
Grand Total	17	68	135	14	234
OTHER STAKEHOLDERS					Grand Total
under 29 years old	5	8	1		14
30-39 years old	1	7	5	4	17
40-49 years old	1	3	5	7	16
50-59 years old	1	1	5	3	10
over 60 years old	1	2	3	2	8
Grand Total	9	21	19	16	65

For the **total sample** and the **public sector** subsample, the number of persons with master's studies is the highest overall. For the **other stakeholders'** subsample, the highest number of persons is recorded in the "Undergraduate studies" category.

The age group with the highest number of persons with master's studies is 40-49 years old for the **total sample** and the **public sector** subsample. This age group from these **samples** has also the highest numbers of persons for categories "Undergraduate studies" and "Doctoral studies". The age group with the highest number of persons with undergraduate studies is under 29 years old for the **other stakeholders'** subsample.

The following figure is based on responses to Q28: What is the economic sector in which your organization operates? The first place is represented by "Public administration and defense; compulsory social security". Other sectors with important share are (from 2nd to 8th place) "Other service activities", "Education", "Administrative and support service activities", "Information and communication", "Human health and social work activities", "Professional, scientific, and technical activities", "Financial and insurance activities".

Figure 8 Economic sector of the organization - total sample



1	Public administration and defense; compulsory social security
2	Other service activities
3	Education
4	Administrative and support service activities
5	Information and communication
6	Human health and social work activities
7	Professional, scientific, and technical activities
8	Financial and insurance activities
9	Construction
10	Transportation and storage
11	Water supply; sewerage, waste management, and remediation activities
12	Manufacturing
13	Agriculture, forestry, and fishing
14	Wholesale and retail trade; repair of motor vehicles and motorcycles
15	Arts, entertainment, and recreation

16	Accommodation and food service activities
17	Activities of extraterritorial organizations and bodies
18	Electricity, gas, steam, and air conditioning supply
19	Mining and quarrying
20	Real estate activities
21	Activities of households as employers; undifferentiated goods and services producing activities of households for own use

The results show that the majority of organizations operate within the public administration sector, with significant representation also in sectors such as education, healthcare, and professional services.



NORO GREEN CITIES
Smart Future

Enhanced Survey on Stakeholders' Additional Insights Based on the Discussions and Interactions During the First Themed Workshop and Study Visit in Romania Regarding Smart Cities Initiatives:

Refine Stakeholder Needs, Validate Initial Findings, and Identify Additional Opportunities

Dear respondent,

We address this **survey (2nd survey)** to validate the initial results obtained from the application of the **1st survey**, refine the understanding of needs and identify additional opportunities on smart city initiatives in your geographical area. This **2nd survey** is part of the Norwegian - Romanian Green Cooperation Initiatives Towards Innovation and Environmental Sustainability (NORO Green Cities project). The partners are: DIH Oceanopolis AS, Norway; Nordic Edge AS with Smart City Innovation Cluster Arena Pro, Norway; Danube Engineering Hub, Romania; City Cluster, Romania; Institute of National Economy - Romanian Academy, Romania.

The **project's primary goal** is to prepare Romanian public and private organisations for the deployment of smart city solutions. It aims to identify strengths, weaknesses, and opportunities for collaboration and knowledge exchange with Norwegian entities. This will help increase the use of digital tools and solutions to develop Smart City Roadmaps. The Roadmaps will serve as a guide for municipalities and county councils to implement smarter digital solutions and promote the development of sustainable, cost-effective, and user-friendly solutions.

Thank you for taking the time to provide your input. We kindly request approximately 15 minutes of your time. The information provided is confidential and will only be used for statistical purposes.

Your insights are essential in guiding our approach to smart city initiatives. This **2nd survey** aims to refine the understanding of needs, validate initial findings obtained from the application of the **1st survey**, and identify additional opportunities you perceive.

Module 1 – Demographic profile

1. Your organization type:
 - A. Public sector
 - B. Small and Medium Enterprise (SME)
 - C. European Digital Innovation Hub (EDIH)
 - D. Clusters from sectors relevant to smart cities, such as smart city technology, energy, creative industries, transport and mobility, prop-tech, and citizen engagement
 - E. Other (please, specify): _____

2. What is your role in smart city initiatives:
 - A. Top management (e.g., CEO, Director)
 - B. Middle management (e.g., Department Manager, Project Coordinator)
 - C. Technical expert (e.g., Engineer, Data Analyst)
 - D. Consultant (e.g., Policy Advisor)
 - E. Other (please, specify): _____

3. Your age group:
 - A. 29 years and below
 - B. 30-39 years
 - C. 40-49 years
 - D. 50-59 years
 - E. 60 years and above

4. Your gender:
 - A. Female
 - B. Male
 - C. Not declared

5. Level of education (check the last level of school completed):
 - A. High school
 - B. Undergraduate studies
 - C. Master's studies
 - D. Doctoral studies

6. Please, provide your sector's NACE (Nomenclature of Economic Activities) code: _____

7. What is the economic sector in which your organization operates:
 - A. Agriculture, forestry, and fishing
 - B. Mining and quarrying
 - C. Manufacturing
 - D. Electricity, gas, steam, and air conditioning supply
 - E. Water supply; sewerage, waste management, and remediation activities
 - F. Construction
 - G. Wholesale and retail trade; repair of motor vehicles and motorcycles
 - H. Transportation and storage
 - I. Accommodation and food service activities
 - J. Information and communication
 - K. Financial and insurance activities
 - L. Real estate activities
 - M. Professional, scientific, and technical activities
 - N. Administrative and support service activities
 - O. Public administration and defense; compulsory social security

- P. Education
- Q. Human health and social work activities
- R. Arts, entertainment, and recreation
- S. Other service activities
- T. Activities of households as employers; undifferentiated goods and services producing activities of households for own use
- U. Activities of extraterritorial organizations and bodies

Module 2 – Validation of initial findings

8. How do you assess the necessity of implementing smart city solutions in your region?

	Largely	To a certain extent	Slightly
An urgent necessity for improving the quality of life in the locality			
Development opportunity through the initiation and implementation of projects			
Possibility dependent on attracting financial resources and investments			
Possibility dependent on improving collaboration between local actors			
Possibility dependent on improving the active involvement of local actors			

9. How do you assess the level of development/implementation of smart solutions in your locality?

	High	Medium	Low	Non-existent
A. Transport and mobility				
B1. Public services - health				
B2. Public services - education				
B3. Public services - utilities				
C1. Sustainability - waste management				
C2. Sustainability - green spaces				
C3. Sustainability - energy, renewable sources				
D. Digital infrastructure (internet access, data security)				
E. Citizen involvement and participation				

10. Which aspects of smart city initiatives do you believe require more attention or development in your region? (Check all that apply, in order of importance)

Aspect	Please indicate the order of importance for each selected aspect, using a scale from 1 to 9, where 1 represents the most important aspect, and 9 represents the least important
A. Transport and mobility	
B1. Public services - health	
B2. Public services - education	
B3. Public services - utilities	
C1. Sustainability - waste management	

Aspect	Please indicate the order of importance for each selected aspect, using a scale from 1 to 9, where 1 represents the most important aspect, and 9 represents the least important
C2. Sustainability - green spaces	
C3. Sustainability - energy, renewable sources	
D. Digital infrastructure (internet access, data security)	
E. Citizen involvement and participation	

11. What smart development initiatives are missing at the level of your locality?

12. Do you consider that the current smart city initiatives adequately address the unique/specific needs of your region?

Yes, completely	Yes, to a large extent	Only partially	No, not at all

13. What aspects do you think should be improved?

14. What do you believe are the most pressing needs that should be prioritized for smart city initiatives in your area?

15. Regarding community engagement, what strategies do you think would be most effective for involving citizens in the smart city development process?

- A. Public consultations
- B. Surveys and feedback forms
- C. Digital engagement tools
- D. Community workshops
- E. Other - please specify _____

16. In your opinion, what additional skills or knowledge are needed by stakeholders to enhance the success of smart city projects in your area? (Check all that apply, in order of importance, starting with 1 = most important)

- A. Policy development
- B. Technical expertise
- C. Financial planning
- D. Project management
- E. Community engagement
- F. Other - please specify _____

17. How realistic do you think the current plans for implementing smart city projects in your region are, considering the current challenges and resources?

A. Very realistic	B. Quite realistic	C. Moderately realistic	D. Slightly realistic	E. Not at all realistic

Module 3 - Identifying additional opportunities

18. Do you believe there are unexplored areas where smart city technologies could be applied in your region (that were not covered during the **first workshop** in November 2024)?

- a. Yes
- b. No

19. Are there additional opportunities or innovative solutions that you believe should be considered for the future development of smart cities in your region? (Open-ended)

20. What role do you think partnerships (local, national, or international) should play in the successful development of smart city initiatives?

A. Very important	B. Quite important	C. Moderately important	D. Slightly important	E. Not at all important

21. In your opinion, how can public-private partnerships enhance the development of smart city projects in your region? (Open-ended)

22. Do you believe there are opportunities for international collaborations to support smart city initiatives in your region?

- a. Yes
- b. No

23. If you answered 'Yes' to the previous question, please specify the areas:

24. What are the key success factors that you believe are essential for the sustainable implementation of smart city solutions? (Open-ended)

25. What kind of support or resources would help you in promoting smart city projects in your region?

- A. Policy guidance

- B. Technical support
- C. Funding
- D. Knowledge sharing
- E. Networking opportunities
- F. Other - please specify _____

26. Are there specific industries or sectors (e.g., agriculture, education, tourism) in which you believe smart city initiatives could have a significant impact in your region?

- A. Yes
- B. No

27. What role do you think innovation in data sharing, privacy protection, and cybersecurity should play in the development of smart cities in your region?

A. Very important	B. Quite important	C. Moderately important	D. Slightly important	E. Not at all important

28. What role do you think local authorities should play in the development of smart city projects? (Open-ended)

29. What other specific data or technological tools do you believe would be most beneficial in promoting smart city initiatives in your region? (Open-ended)

Module 4 – Attendance in Survey 1

30. Have you completed the previous survey (Questionnaire 1 regarding the current state of smart city development in Romania)?

- A. Yes
- B. No

31. If you answered 'No' to the previous question, would you like to complete the first questionnaire?

- A. If your answer is 'Yes', please access the following link:: <https://docs.google.com/forms/d/1J4-Li-bqzHFuhpzks6p5miS64TFIYoCAj-lJlf3o7ds/edit>
- B. I do not wish to complete the first questionnaire.

Module 5 - Active partnerships for smart local development - refining stakeholder needs

32. Did you attend the **first workshop** and the **first study visit** in Romania?

- A. Yes

B. No

33. How do you assess the evolution of your understanding of smart cities after attending the **first workshop** and the **first study visit** in Romania in November 2024?

A. It has improved greatly	B. It has improved slightly	C. It has not improved or deteriorated	D. No change	E. It has worsened

34. Were the examples or case studies shared during the **workshop** relevant to the potential for smart city development in your region?

A. Very relevant	B. Somewhat relevant	C. Neither relevant nor irrelevant	D. Somewhat irrelevant	E. Very irrelevant

35. Do you think the **workshop** offered new perspectives or solutions to challenges that you were not aware of before?

- A. Yes
- B. No

36. Which of these perspectives/solutions do you consider possible to implement in the short term in your city? (Open-ended)

37. What specific challenges or barriers do you foresee in implementing smart city solutions in your region? (Open-ended)

38. Based on the discussions during the **workshop**, do you think your initial expectations regarding the smart development of your city have changed?

- A. Yes
- B. No

39. How have your initial expectations changed? (Open-ended)

40. Do you consider the solutions presented during the **workshop** to be aligned with the needs of your region?

- A. Yes
- B. No

41. What alternative solutions would you propose? (Open-ended)

42. How would you assess the practicality of integrating the smart city solutions discussed at the **workshop** into the current legal, economic and social context of your region?

A. Very practical	B. Quite practical	C. Moderately practical	D. Slightly practical	E. Not at all practical

Module 6 – Future activities

43. Would you be interested in participating in **future workshops** related to smart cities?

- A. Yes
- B. No

44. If your answer to the previous question was “Yes”, please indicate your email address to be contacted.

Thank you for participating in our 2nd survey on smart cities. Your input will help us understand various perspectives on smart city initiatives and development. If you would like to receive the results of the 2nd survey after its completion, please provide your email address:



NORO GREEN CITIES

Smart Future

Partners:



The NORO GREEN CITIES project is financed within the "Open Call for Bilateral Cooperation in the Green Transition Romania and Norway, Iceland or Liechtenstein Fund for Bilateral Relations - SMEs Growth Romania", reflecting the joint commitment of Norway and Romania to pioneering sustainable urban development.

Supported by a grant from Iceland, Liechtenstein and Norway through the EEA Grants Romania 2014-2021, in the frame of the SME Growth Programme Romania, Open Call for Bilateral Cooperation in the Green Transition

Working together for a green, competitive and inclusive Europe

ANNEX 2

Survey 2 - Enhanced Survey on Stakeholders' Additional Insights Based on the Discussions and Interactions During the First Themed Workshop and Study Visit in Romania Regarding Smart Cities Initiatives

Main coordinates for research purpose

The purpose of applying the questionnaire was to Refine Stakeholder Needs, Validate Initial Findings, and Identify Additional Opportunities.

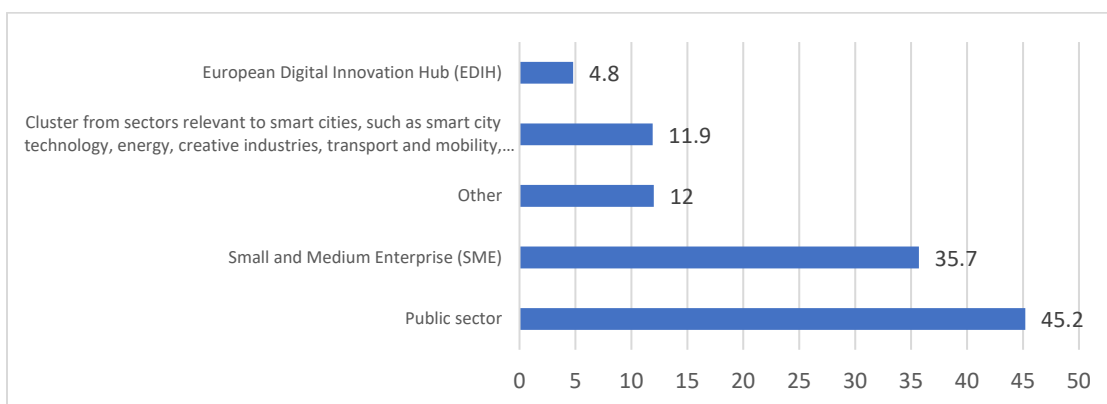
So, this survey (2nd survey) is addressed to validate the initial results obtained from the application of the 1st survey, refine the understanding of needs and identify additional opportunities on smart city initiatives in your geographical area.

Results and comments

For the 2nd survey, the sample is represented by 42 responses.

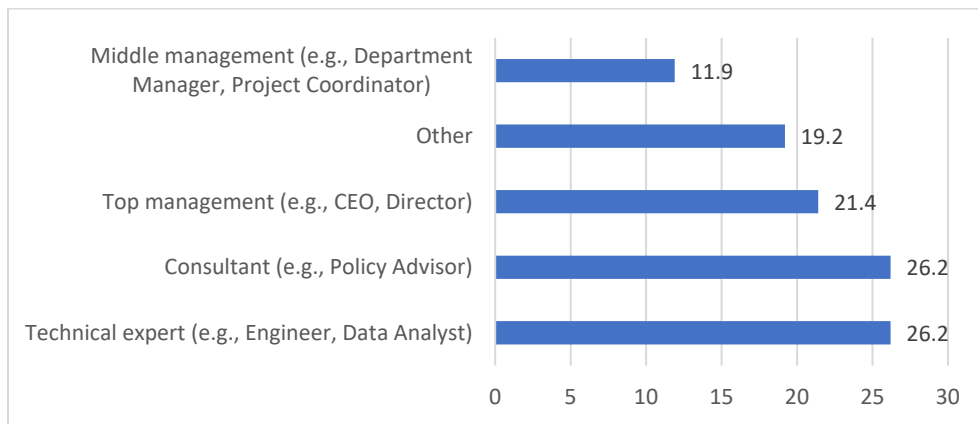
The first question is “Type of your organization” (Q1) and the largest number of responses comes from the public sector (45.2%), followed by SMEs (35.7%) and Clusters from relevant sectors for smart cities and Other category in the third place, each with 12%.

Figure 1 The distribution of the respondents by organization type (%)



Regarding the role held in smart city initiatives, Consultant (e.g., Policy Advisor) and Technical expert (e.g., Engineer, Data Analyst) are on the first place, each with 26.2%, followed by Top management (e.g., CEO, Director) (21.4%) and Middle management (e.g., Department Manager, Project Coordinator) (11.9%).

Figure 2 The distribution of the respondents by their role in smart city initiatives (%)



Other: Master's student, Student, Execution function, Researcher, Civilian, Management consultant

Among the respondents, the largest share is represented by those under 29 years old (33.3%), this group being followed by those aged 40-49 (28.6%), 30-39 (19%) and 50-59 (14.3%). The respondents from the age group over 60 years old recorded a share of 4.8%.

Figure 3 The distribution of the respondents by age group (%)

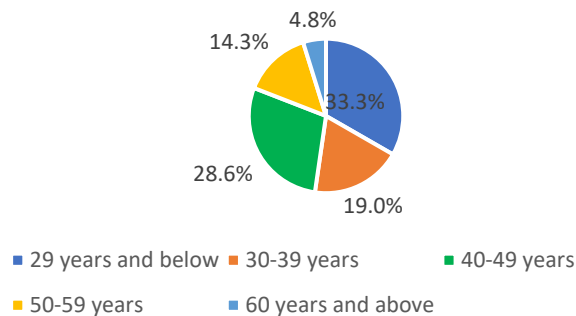


Figure 4 The distribution of the respondents by gender (%)

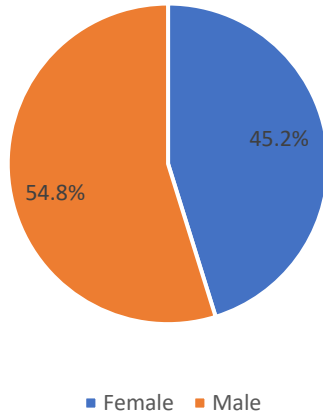
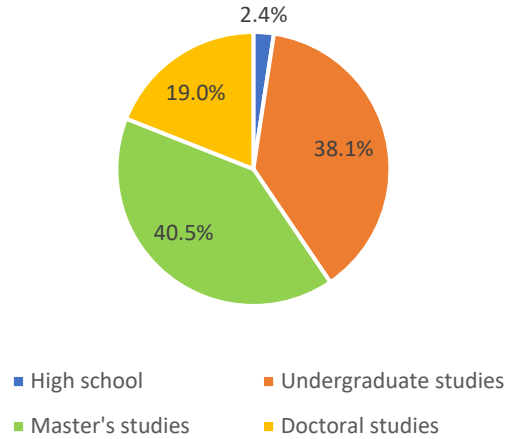


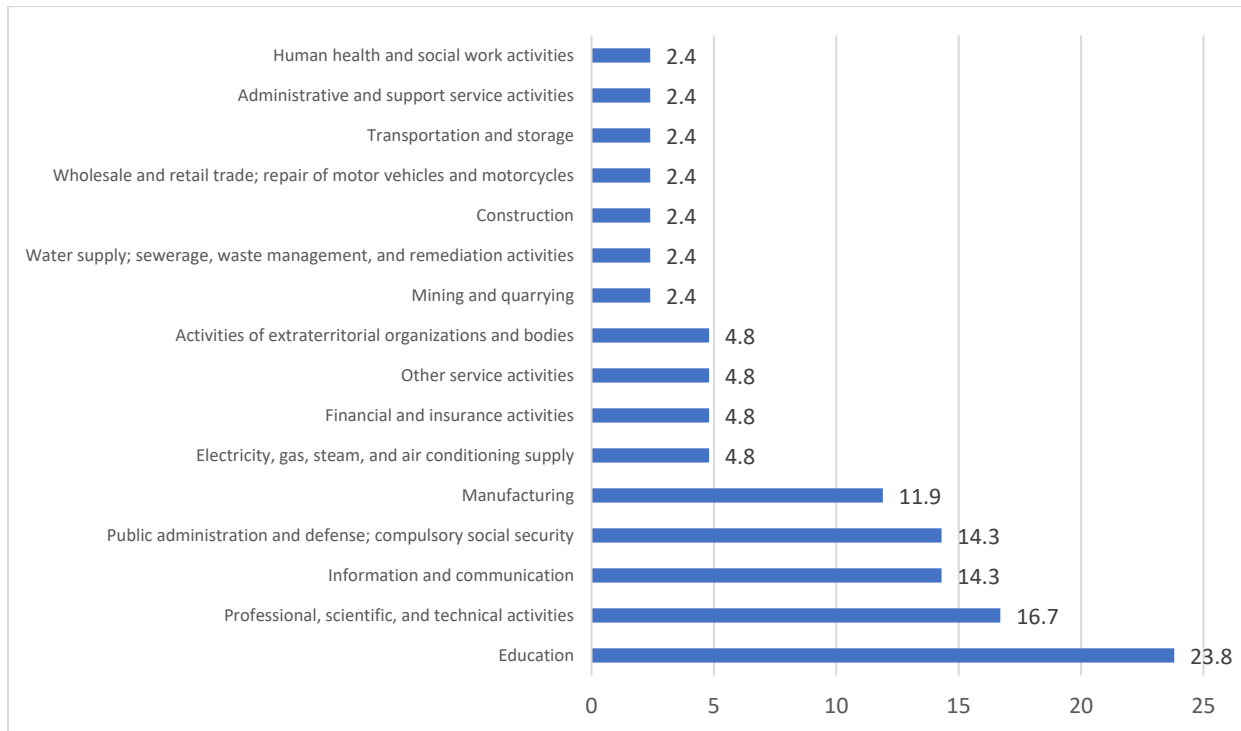
Figure 5 The distribution of the respondents by level of education (the last level of school completed) (%)



Of the total number of respondents, the largest share was represented by men (54.8%), with women having a share of (45.2%). The respondents have a high level of education, with master’s studies (40,5%), undergraduate studies (38,1%), and doctoral studies (19%).

The following figure is based on responses to Q7: What is the economic sector in which your organization operates? The first place is represented by “Education”. Other sectors with an important share are (from 2nd to 4th place) “Professional, scientific, and technical activities”, “Public administration and defense; compulsory social security” and “Information and communication” (both in 3rd place), and “Manufacturing”.

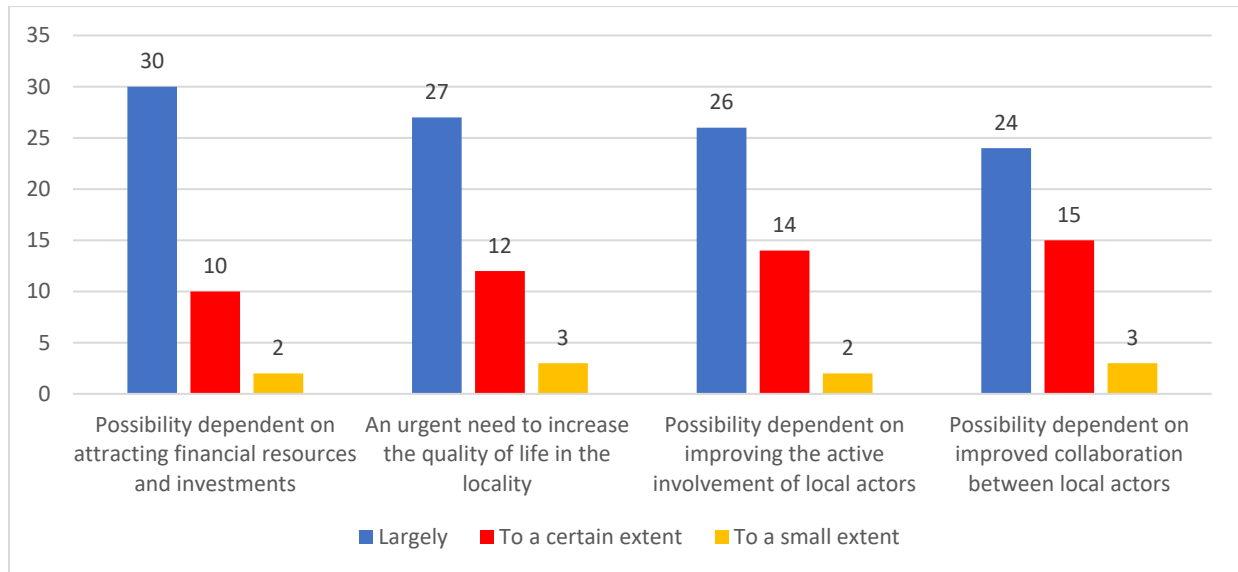
Figure 6 The distribution of the respondents by economic sector in which their organization operates (%)



The analysis showed that the sample does not have respondents from the following sectors: Activities of households as employers; undifferentiated goods and services producing activities of households for own use; Arts, entertainment, and recreation; Accommodation and food service activities; Real estate activities; Agriculture, forestry, and fishing.

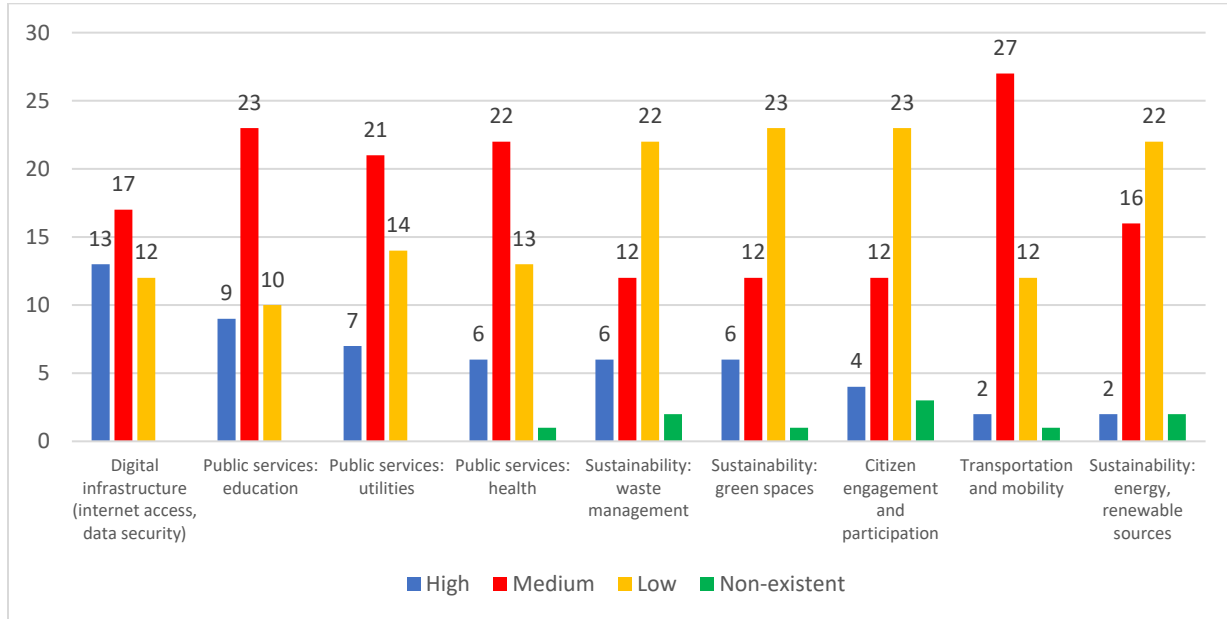
According to the distribution of the respondents by the need to implement smart city solutions in their region, the highest share largely agreed or to a certain extent, with the importance of implementation. The highest share of respondents who chose the option “Largely” is for “Possibility dependent on attracting financial resources and investments”, followed by “An urgent need to increase the quality of life in the locality” and “Possibility dependent on improving the active involvement of local actors”.

Figure 7 The distribution of the respondents by the need to implement smart city solutions in their region



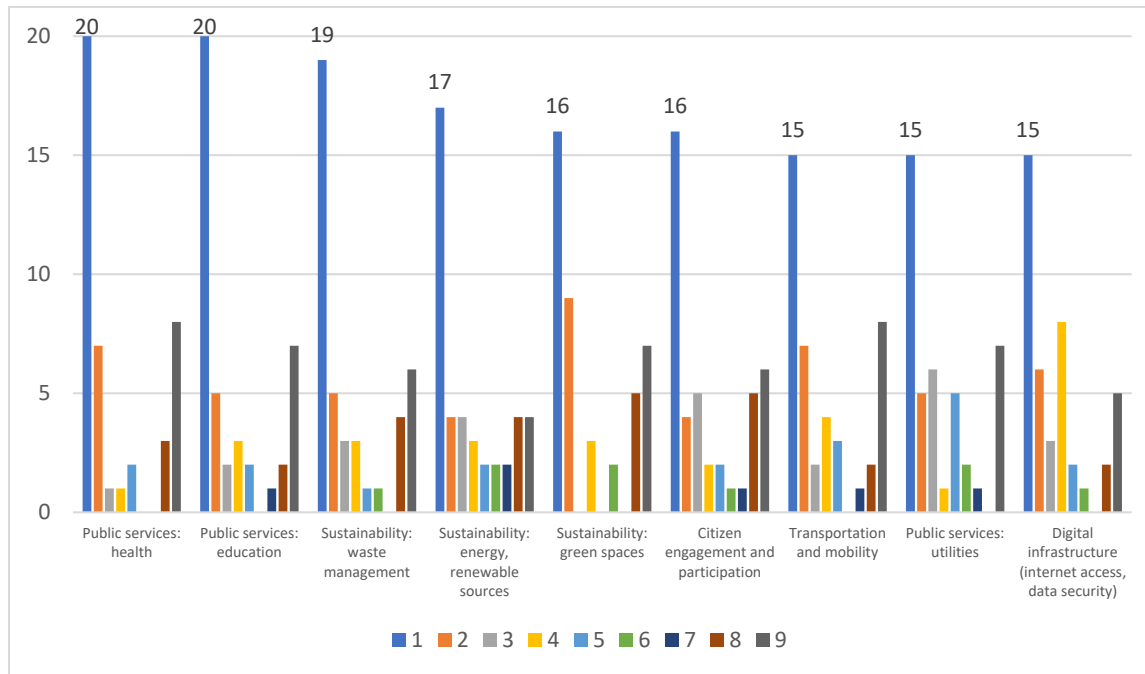
In the next question, respondents are presented with nine smart solutions and asked to rate their level of development/implementation in their locality (Q9). A significant share of respondents chose the “Medium” option for five smart solutions (Transport and mobility, Public services - education, Public services - health, Public services - utilities, and Digital infrastructure - internet access, data security). In the case of three solutions, respondents chose the “Low” option in a higher share (Sustainability - green spaces, Citizen involvement and participation, and Sustainability - waste management).

Figure 8 The distribution of the respondents by the assessment of the level of development/implementation of smart solutions in their locality



Question 10 refers to the assessment of the importance of attention for / development of various aspects of smart city initiatives in respondents' regions. The respondents provided various answers, from 1 - most important to 9 - least important, but the highest share was represented by the “Most important” option, for all the aspects presented. For this option, the first three places are represented by “Public services – health” and “Public services – education” (both on the 1st place), followed by “Sustainability - waste management” and “Sustainability - energy, renewable sources”.

Figure 9 The distribution of the respondents by the assessment of the importance of attention or development that should be given to various aspects of smart city initiatives in their region (1= most important, 9 = least important)



At the question regarding smart development initiatives that are missing in respondents' localities (Q11), they provided the following answers:

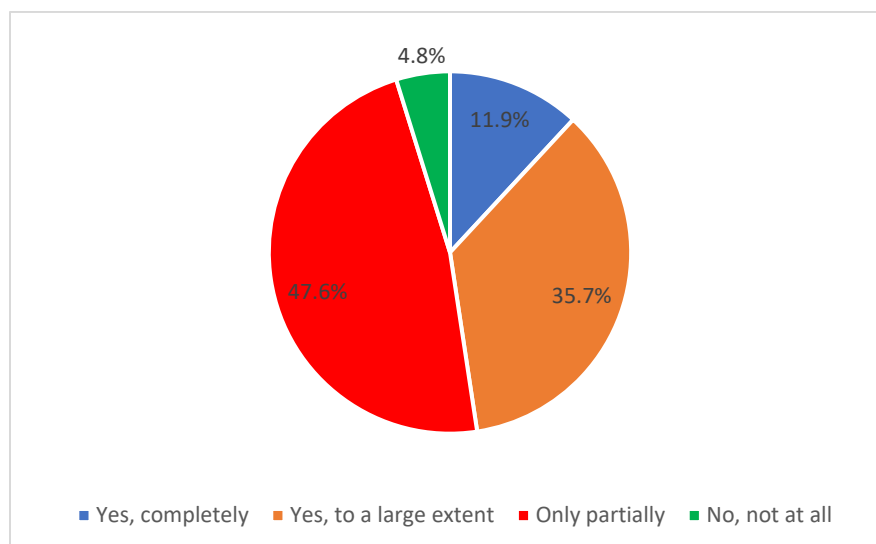
- Transport and mobility
- Recreational spaces, pedestrian road infrastructure
- Initiatives related to the expansion of road infrastructure for both vehicles and pedestrians, development plans that could result in reducing pollution and noise within localities
- Public transport visualization application
- Lack of smart electric bike or scooter rental stations
- Public transport means that use green, renewable energy
- Energy efficiency. Solar panels on public institution buildings
- Development of applications that allow the population to access information
- Education and training

- Application of more electric car charging stations
- Smart public safety
- Renewable sources
- Free WiFi networks in public spaces
- Digitalization
- Smart public safety and order
- Sustainability of green spaces, renewable energy, transport
- Smart utilities
- All are missing / the majority are missing

Thus, the respondents highlighted a diverse range of missing smart development initiatives, predominantly focused on transport and mobility, renewable energy, digitalization, and the sustainability of public and green spaces.

Therefore, on question 12 regarding the adequate approach of the unique/specific needs of their region by current smart city initiatives, the highest share is held by the “Only partially” option (47.6%), followed by the “Yes, to a large extent” option (35.7%).

Figure 10 Do you believe the current smart city initiatives adequately address the unique needs of your region?



The respondents were asked to highlight what aspects they considered that should be improved, and the provided answers were as follows (Q13):

- Health, education, energy competitiveness, waste management, intra-county transport
- Waste
- Transport, environmental protection
- Public transport and alternative transport
- Political aspects
- Air and environmental quality monitoring sensors
- Conducting surveys to uncover citizens' problems.
- Implementing digital educational solutions
- Infrastructure, education, parks
- Public transport
- Health, education, public services
- Utilities
- Modernisation of roads and sidewalks
- Digitalisation and interconnection of institutions
- Public transport, public health services
- Public services in education, health, urban mobility, etc.
- Citizen participation, communication, workshops
- Communication

They identified a variety of areas needing improvement, with a focus on health, education, transport, environmental protection, digitalization, public services, and citizen participation.

They also believed that there are various pressing needs or gaps in infrastructure that should be prioritized for smart city initiatives in their area (Q14), such as:

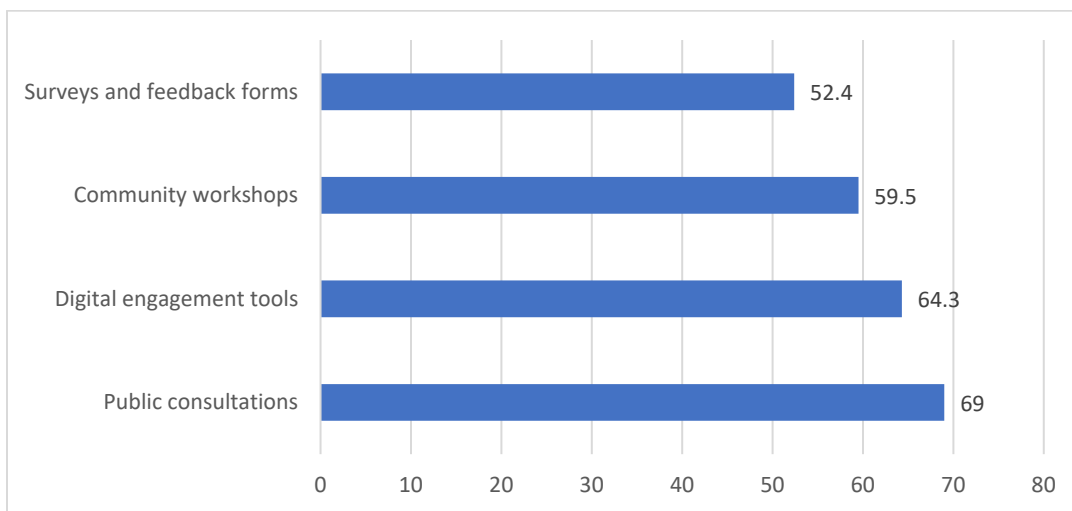
- Health, education, energy competitiveness and hydropower
- Corruption in state institutions
- Transport, utilities, road infrastructure
- Health, transport, education

- Reducing pollution and noise, access to high-quality public health services.
- Sewage, transport, green energy
- Security and mobility of citizens
- Need for safety
- Smart security systems to monitor the city, to prevent crime and ensure the safety of citizens.
- Optimizing public transport.
- Access to advanced technology
- Utilities
- Modern buses
- Public services, mobility
- Education
- Digital platforms for public services
- Interconnection of public institutions
- Public health services
- Digital infrastructure and connectivity
- Traffic management and sustainable mobility
- Green energy and sustainability
- Waste management and smart recycling
- Public health and integrated social services
- Public safety
- Civic participation and transparency
- Education for digital transformation
- Traffic and urban mobility
- Green spaces

The respondents' answers reveal the importance of prioritizing essential infrastructure and services, particularly in the areas of health, education, transport, mobility, public safety, green energy, sustainability, and digitalization. Common themes include improving public services, addressing environmental concerns, enhancing urban mobility, and fostering digital innovation.

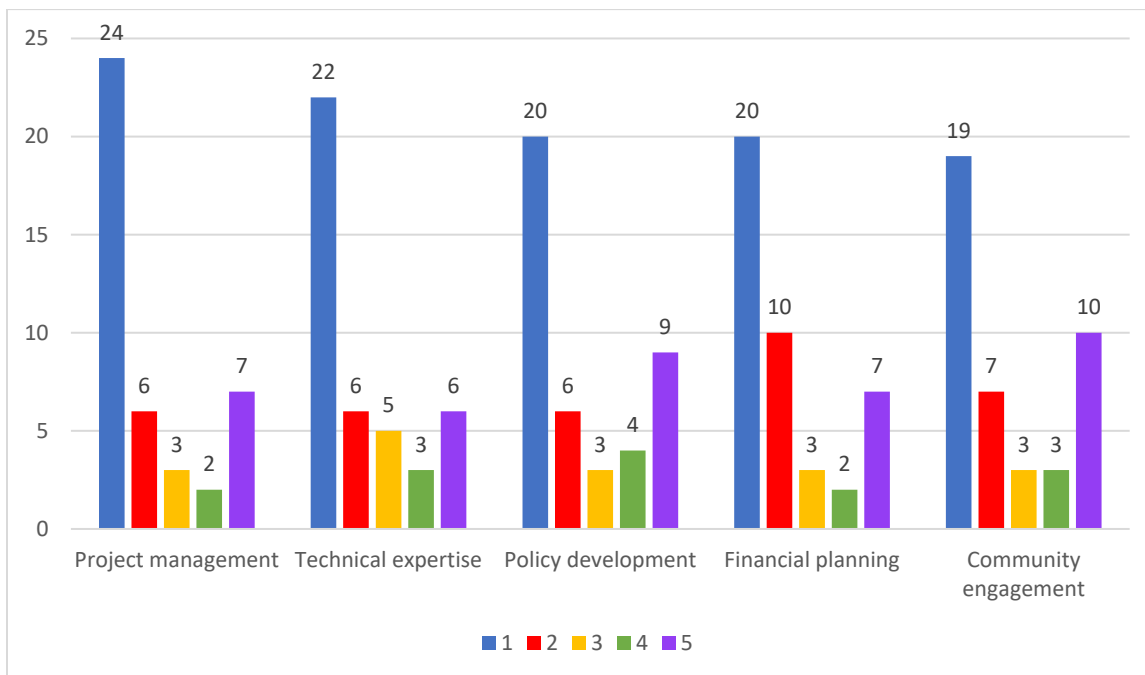
Question 15 was focused on strategies that respondents considered to be most effective to involve citizens in the smart city development process. The highest share is held by “Public consultations” option, followed by “Digital Engagement tools”, “Community workshops”, and “Surveys and feedback forms”. The first place for the “Public Consultations” option shows that the respondents consider direct and transparent dialogue with citizens to be the most effective strategy for involving them in the development of smart cities.

Figure 11 Effective strategies to involve citizens in the smart city development process (%)



The respondents believed that project management, technical expertise, policy development, financial planning, and community engagement are all needed by stakeholders to improve the success of smart city projects in their area (Q16).

Figure 12 Additional skills / knowledge needed by stakeholders to improve the success of smart city projects (1 = most important)



When they were asked to mention how realistic they think the current plans for implementing smart city projects in their region are, considering the current challenges and resources (Q17), the positive assessments (“Very realistic” and “Quite realistic”) registered the highest share in total (35.8%), followed by “Moderately realistic” (33.3%) and “Slightly realistic” (28.6%). The results suggest that they generally trust the feasibility of current smart city plans, though with some reservations about the challenges and resources needed for implementation.

They also strongly believed that there are unexplored areas where smart city technologies could be applied in their region (Q18).

Figure 13 Perceived realism of current smart city projects implementation plans considering challenges and resources

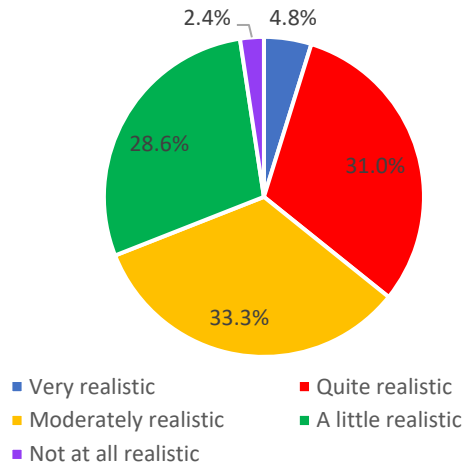
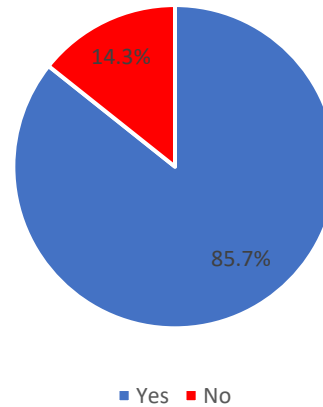


Figure 14 Views on whether there are unexplored areas for smart city technology application (beyond November 2024 workshop)



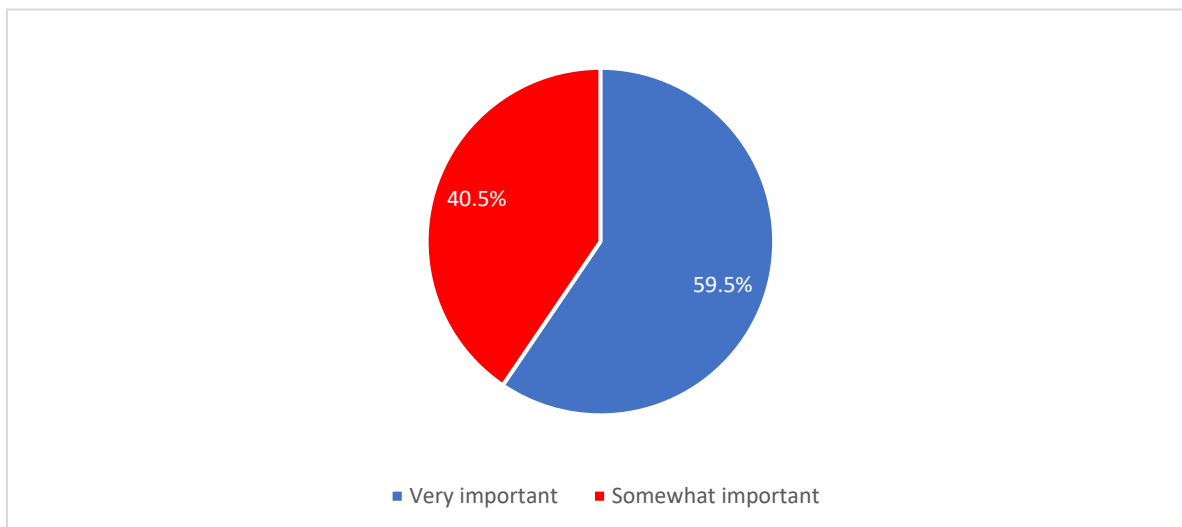
The respondents believed that there are additional opportunities or innovative solutions that should be considered for the future development of smart cities in their region (Q19), such as:

- Road infrastructure
- Implementation of smart lighting around pedestrian crossings, both on poles and on the roadway, so that when a pedestrian is detected, they light up.
- Collection and analysis of real-time data to obtain useful information about the functioning of the city and to make better-informed decisions regarding urban planning and service delivery.
- Virtual assistants for education and training
- Integration of artificial intelligence technologies
- Predictive systems-early detection of problems in infrastructure
- Digitalization of services
- Implementation of new technologies

The respondents emphasised the need for technological integration in urban development, with a focus on smart infrastructure, data-driven decision-making, digitalization of services, artificial intelligence, and predictive systems for proactive urban management.

They also positively assessed the role of partnerships (local, national, or international) played in the successful development of smart city initiatives (Q20), with “Very important” (59.5%) and “Quite important” (40.5%).

Figure 15 The role the partnerships (local, national, or international) should play in the successful development of smart city initiatives



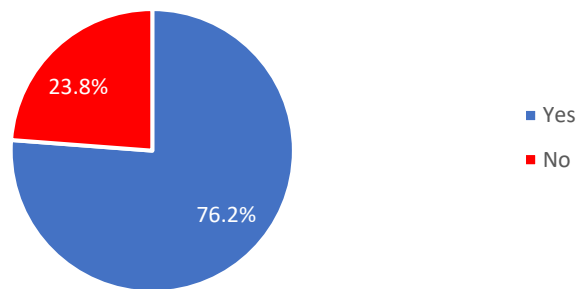
The respondents emphasised some measures to enhance the development of smart city projects in their regions through public-private partnerships (Q21), such as:

- Developing participating entities, very attentive to the needs of the local community.
- Implementing their technologies used in factories/centers/headquarters on a larger scale. Also, their consulting would be beneficial
- Through investments
- Projects
- Through reliable communication
- To maintain collaboration in the interest of citizens

- Through financing - private management - quality services
- Involvement of a greater extent of the private environment
- Access to financing
- Innovation and technology
- Operational efficiency
- Shared risk
- Flexibility in implementation
- Increasing the degree of use of technologies
- Community engagement

The respondents' answers suggest prioritizing collaboration and resource sharing in public-private partnerships, focusing on community engagement, investment, access to financing, technological innovation, operational efficiency, and flexible implementation to enhance smart city projects.

Figure 16 Views on the existence of opportunities for international collaboration to support smart city initiatives



The respondents strongly believed (76.2%) that there are opportunities for international collaboration to support smart city initiatives in their regions (Q22) and mentioned the following areas of international collaboration (Q23):

- Infrastructure
- Public administration

- Digitalization and ESG
- Education
- Exchange of experience with other managers who have implemented smart city projects
- Geothermal energy
- Transport, health, waste management
- Energy and transport sector
- Health, education
- Collaboration with local administrations that have implemented smart city initiatives to obtain the necessary data
- There are models to follow from other countries.
- Technology, technical, communications
- Utilities, energy, environment, education, transport
- EU funding

The respondents' answers emphasised international collaboration in areas such as infrastructure, energy, transport, education, digitalization, and public administration. Common themes include knowledge sharing, leveraging successful models from other countries, and adopting advanced technologies to support smart city initiatives.

They believed that the key success factors critical for the sustainable implementation of smart city solutions (Q24) are the following:

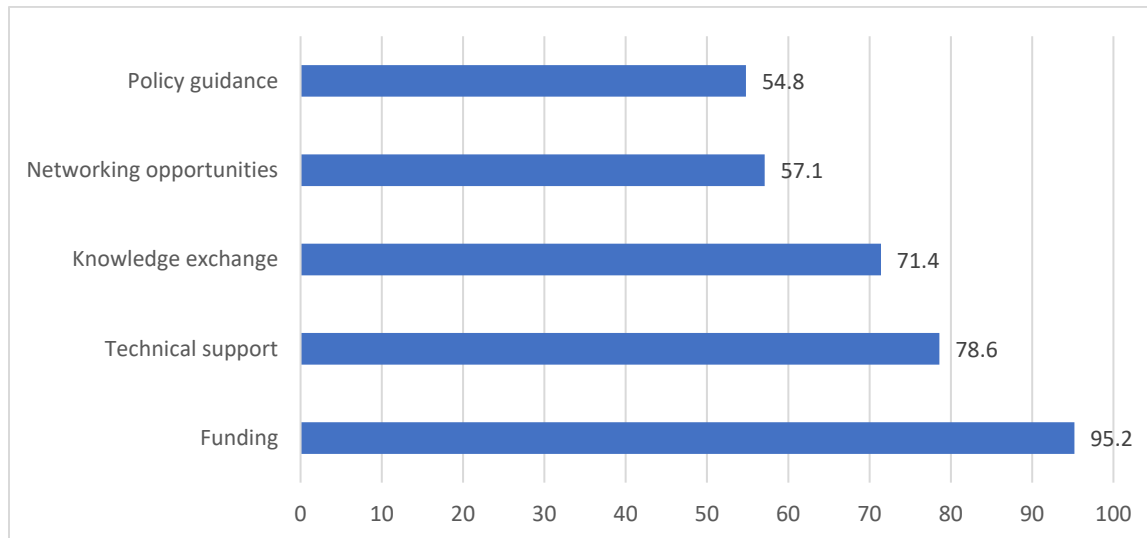
- Changing the mindset, people willing and prepared to manage such projects, support and financing
- Policy
- Road infrastructure and transport
- Improvement of actors involved in projects
- Trust, stability, transparency, consultation
- Administration
- Long-term testing of the respective solutions on smaller areas, or implementation of solutions that have proven to be efficient and resilient

- Innovation
- Funding, agreement and community involvement
- Involvement. If people do not get involved and do not show interest then something successful cannot be implemented
- Data and analysis, financing
- Funds
- A well-established management
- Collaboration between public institutions and the private sector
- Human resources, the vision of decision-makers
- Trained people
- Financial resources and people well-trained and open-minded for progress
- Well-defined objectives
- Recognition of the existence of problems and permanent involvement in order to solve them
- Strategic planning and long-term vision
- Collaboration between public authorities, the private sector and citizens
- Adequate and sustainable financing
- Solid and scalable technological infrastructure
- Education and community involvement
- Transparency and effective governance
- Data protection and cybersecurity
- Continuous monitoring and adaptability to emerging needs
- Alignment with sustainable development goals
- Integration of solutions into a coherent urban ecosystem
- Precise theme, clarity, pragmatism, technical skills, accommodation of the theme with all stakeholders, including citizens
- Digitalization

The respondents mentioned collaboration, funding, transparency, and strategic vision as key success factors for smart city implementation. They highlighted the importance of citizen

involvement, well-trained human resources, and alignment with sustainable goals, alongside adaptability and continuous monitoring.

Figure 17 The support / resources needed to promote smart city projects (%)



Among the resources needed to promote smart city projects in their region, funding was in 1st place (95.2%), followed by technical support (78.6%), knowledge exchange (71.4%), networking opportunities (57.1%), and policy guidance (54.8%) (Q25).

They strongly believed (97.6%) that there are specific industries or sectors (e.g. agriculture, education, tourism) where smart city initiatives could have a significant impact in their region (Q26). They also positively assessed the role of innovation in data sharing, privacy protection and cybersecurity in the development of smart cities in their region (“Very important” and “Quite important”) (Q27).

Figure 18 Views on whether smart city initiatives could have a significant impact on specific industries or sectors (e.g., agriculture, education, tourism)

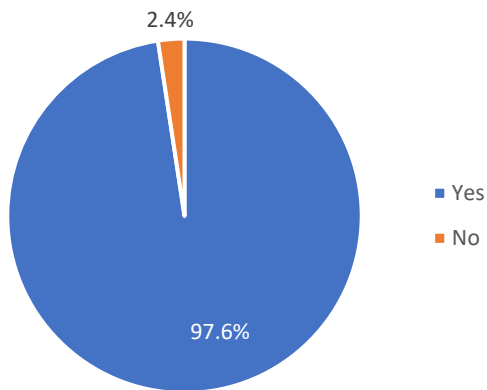
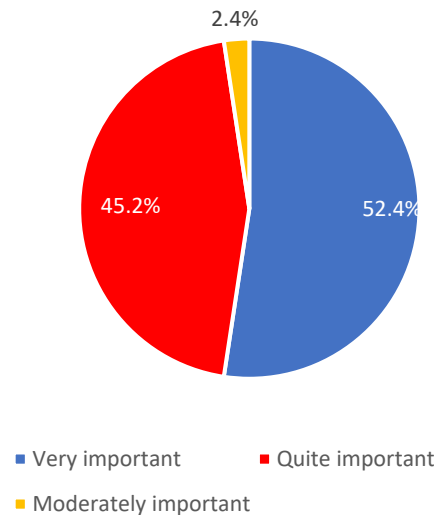


Figure 19 The role innovation in data sharing, privacy protection and cybersecurity should play in the development of smart cities



The respondents believed that the role of local authorities in developing smart city projects (Q28) should be:

- To understand and promote their need, showing the community's advantages in case of implementation, then to encourage, facilitate (subsidies for partners) and participate in such programs
- To invest in their localities
- To assist and help as they can
- Implementing and publicizing the advantages of these projects
- To contribute and collaborate in this regard
- To anticipate development needs.
- Very involved in the development of these projects
- Information, promotion and access
- Preparation of projects and securing financing
- Core of development-they must attract private partners and support them.
- Creating a favorable framework for citizens

- Development and implementation of projects
- To develop strategies
- Initiative and participation in projects to attract funds
- To create the necessary framework
- To ensure a favorable legal framework for such projects
- Protecting local residents
- Leadership and strategic vision
- Link between the public, private and NGO sectors
- Defining a strategic vision and local priorities.
- Creating a favorable legislative and regulatory framework.
- Attracting funding and managing public resources.
- Facilitating collaboration between the public, private and local communities.
- Promoting citizen participation and digital education.
- Ensuring transparency and responsible governance.
- Implementing sustainable and environmentally friendly policies.
- Monitoring implementation and assessing the impact of projects.
- Creating a local innovation ecosystem.
- Supporting local start-ups and technology initiatives.
- Coordination, strategy, implementation, monitoring

They highlighted the need for local authorities to play a strategic and facilitating role in smart city projects, focusing on creating favorable legal frameworks, attracting funding, and ensuring collaboration between community, public and private sectors. They also emphasized leadership, transparency, and citizen participation.

The respondents believed that there are also other specific data or technology tools that are beneficial in advancing smart city initiatives in their region (Q29), such as:

- Workshops
- Digitalization of public institutions.
- Artificial Intelligence
- IT innovation

- Adapting best practices to the cultural specificity and particularities of the city
- Social networks, interactive platforms
- Public consultations, alignment with European standards
- Meetings with representatives of all public services
- Examples, references, documentary visits
- Data from sensors

They mentioned the importance of workshops, digital tools, and adapting best practices, alongside public consultations, collaborative meetings, and sensor data to advance smart city initiatives. This means that a successful implementation of projects requires a combination of these aspects, ensuring that smart city solutions are effective, inclusive, and sustainable.

Among the respondents, only 38.1% completed the 1st questionnaire regarding the current situation of smart city development in Romania (Q30). Still, those who did not complete it showed interest in completing it (Q31).

Figure 20 Have you completed the previous questionnaire (questionnaire 1 regarding the current situation of smart city development in Romania)?

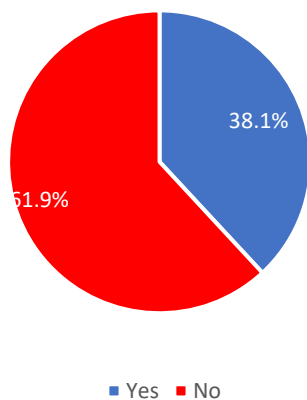
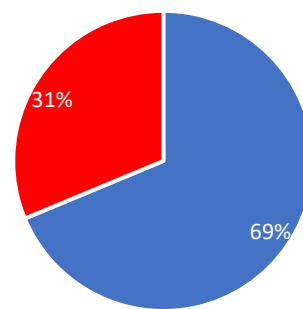


Figure 21 If you answered No to the previous question, would you like to complete the first questionnaire?



- If your answer is Yes, access the following link: <https://docs.google.com/forms/d/1J4-Li-bqzHFuhpzs6p5miS64TFIYoCAj-ljlf3o7ds/edit>
- I do not want to complete the first questionnaire

A significant percentage (69%) of respondents participated in the first workshop and the first study visit to Romania (Q32). They mentioned that their understanding of smart cities improved (59.5%) after participating in those events (Q33).

Figure 22 Did you participate in the first workshop and the first study visit in Romania?

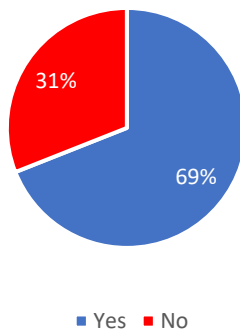
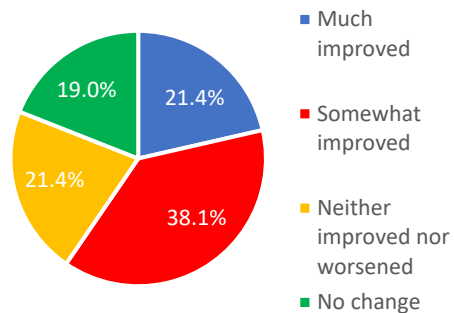


Figure 23 How do you assess that your understanding of smart cities has evolved after participating in the first workshop and the first study visit to Romania in November 2024?



The examples or case studies shared during the workshop were relevant (76.2%) to the potential for developing smart cities (Q34). The workshop offered new perspectives or solutions (90.5%) to challenges that the respondents were not aware of before (Q35).

Figure 24 Were the examples or case studies shared during the workshop relevant to the potential for developing smart cities in your region?

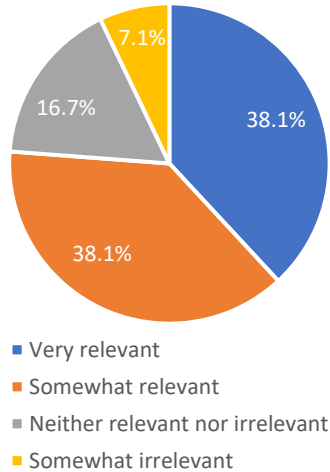
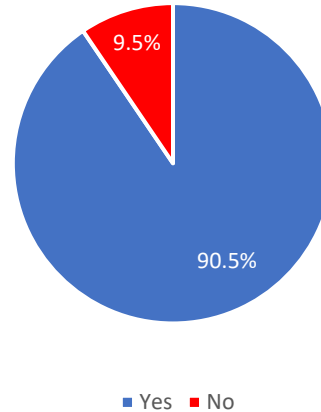


Figure 25 Do you think the workshop offered new perspectives or solutions to challenges that you were not aware of before?



The respondents considered the following perspectives/solutions possible to implement in the short term in their cities (Q36):

- Green energy
- Real-time public transport monitoring application
- Improving the efficiency of public transport
- Health monitoring systems
- Smart lighting
- Green spaces
- Application for reporting problems
- Public transport

They highlighted short-term solutions focused on enhancing public transport efficiency, integrating green energy, implementing smart lighting, and introducing health monitoring systems and green spaces.

They believed that there are some specific challenges or barriers in implementing smart city solutions in their region (Q37), such as:

- Bureaucracy
- Financing
- Resistance to change: both local authorities and citizens may be reluctant to face the major changes imposed by the transition to a smart city, especially due to fears of job losses or the impact on lifestyle.
- Indifference of authorities
- Modernization of the city
- High implementation costs
- Internal organization of city halls in implementing such projects
- Human resources
- Political will

The respondents identified challenges such as bureaucracy, financing, resistance to change, high implementation costs, and a lack of political will in implementing smart city solutions.

Their initial expectations regarding the smart development of their city have changed (69%) based on the discussions during the workshop (Q38). Also, they considered that the solutions presented during the workshop are aligned (88.1%) with the needs of their region (Q40).

The respondents suggested that their initial expectations changed (Q39) towards greater optimism, with increased confidence in the collaboration and real implementation of smart city projects, as well as a better understanding of the potential for improving citizens' quality of life.

Figure 26 Based on the discussions during the workshop, do you think your initial expectations regarding the smart development of your city have changed?

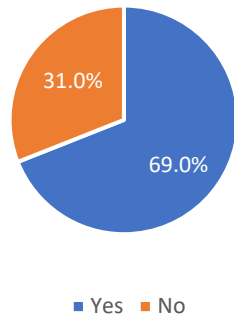
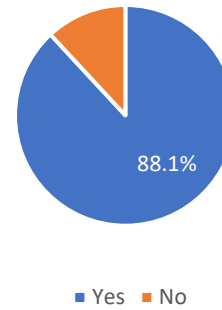


Figure 27 Do you consider the solutions presented during the workshop to be aligned with the needs of your region?



They proposed some alternative solutions (Q41), such as digitalization of public services / public administration, involving academia to a greater extent, developing more workshops, and providing proof of concept and references.

Figure 28 How would you assess the practicality of integrating the smart city solutions discussed at the workshop into the current legal, economic and social context of your region?

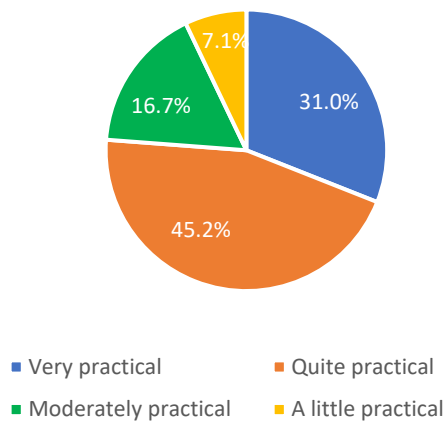
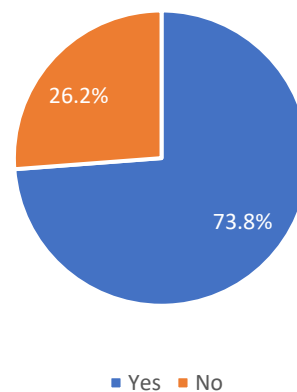


Figure 29 Would you be interested in participating in future workshops related to smart cities?



Also, they positively assessed (“Very practical” and “Quite practical”) the practicality of integrating the smart city solutions discussed at the workshop into the current legal, economic and social context of their region (Q42). They showed their interest in participating in future workshops related to smart cities (Q43).



NORO GREEN CITIES
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Survey 3: Comprehensive Analysis and Validation
Survey on Stakeholders' Insights Based on the Discussions and Interactions During the Second Themed Workshop and Study Visit in Norway Regarding Smart Cities Initiatives:
Finalize the Needs Assessment, Prioritize Action Areas, and Prepare Stakeholders for the Next Phase of the Smart City Initiatives

Dear respondent,

We address this **survey (3rd survey)** to bring insights for the needs assessment, prioritize action areas, and prepare stakeholders for the next phase of the smart city initiatives in your geographical area. This **3rd survey** is part of the Norwegian - Romanian Green Cooperation Initiatives Towards Innovation and Environmental Sustainability (NORO Green Cities project). The partners are: DIH Oceanopolis AS, Norway; Nordic Edge AS with Smart City Innovation Cluster Arena Pro, Norway; Danube Engineering Hub, Romania; City Cluster, Romania; Institute of National Economy - Romanian Academy, Romania. The **project's primary goal** is to prepare Romanian public and private organisations for the deployment of smart city solutions. It aims to identify strengths, weaknesses, and opportunities for collaboration and knowledge exchange with Norwegian entities. This will help increase the use of digital tools and solutions to develop Smart City Roadmaps. The Roadmaps will serve as a guide for municipalities and county councils to implement smarter digital solutions and promote the development of sustainable, cost-effective, and user-friendly solutions.

Thank you for taking the time to provide your input. We kindly request approximately 15 minutes of your time. The information provided is confidential and will only be used for statistical purposes.

Your insights are essential in guiding our approach to smart city initiatives.

Module 1 – Demographic profile

1. Your organization type:

- A. Public sector
- B. Small and Medium Enterprise (SME)
- C. European Digital Innovation Hub (EDIH)
- D. Clusters from sectors relevant to smart cities, such as smart city technology, energy, creative industries, transport and mobility, prop-tech, and citizen engagement
- E. Other (please, specify): _____

2. What is your role in smart city initiatives:

- A. Top management (e.g., CEO, Director)
- B. Middle management (e.g., Department Manager, Project Coordinator)
- C. Technical expert (e.g., Engineer, Data Analyst)
- D. Consultant (e.g., Policy Advisor)
- E. Other (please, specify): _____

3. Your age group:

- A. 29 years and below
- B. 30-39 years
- C. 40-49 years
- D. 50-59 years
- E. 60 years and above

4. Your gender:

- A. Female
- B. Male
- C. Not declared

5. Level of education (check the last level of school completed):

- A. High school
- B. Undergraduate studies
- C. Master's studies
- D. Doctoral studies

6. Please, provide your sector's NACE (Nomenclature of Economic Activities) code: _____

7. What is the economic sector in which your organization operates:

- A. Agriculture, forestry, and fishing
- B. Mining and quarrying
- C. Manufacturing
- D. Electricity, gas, steam, and air conditioning supply
- E. Water supply; sewerage, waste management, and remediation activities
- F. Construction
- G. Wholesale and retail trade; repair of motor vehicles and motorcycles
- H. Transportation and storage
- I. Accommodation and food service activities
- J. Information and communication
- K. Financial and insurance activities
- L. Real estate activities
- M. Professional, scientific, and technical activities
- N. Administrative and support service activities
- O. Public administration and defense; compulsory social security
- P. Education
- Q. Human health and social work activities

- R. Arts, entertainment, and recreation
- S. Other service activities
- T. Activities of households as employers; undifferentiated goods and services producing activities of households for own use
- U. Activities of extraterritorial organizations and bodies

Module 2 – Capitalise the knowledge from the visit in Norway

8. How would you rate the current readiness of your region to implement the identified smart city solutions

	Very prepared	Somewhat prepared	Neutral	Somewhat unprepared	Not prepared at all
Infrastructure development - transportation and mobility solutions					
Digital infrastructure development					
Stakeholder collaboration- public-private partnership					
Initiatives and locals' involvement in smart city transformation					

9. How would you assess the current capacity of your region's institutions to lead or support smart city projects (e.g., local government, utilities, private sector, NGOs)?

	Very prepared	Somewhat prepared	Neutral	Somewhat unprepared	Not prepared at all
Local public authorities					
Private sector					
Associations, NGOs, etc.					
Locals					

10. Based on the current status of smart city projects in your region, how would you assess the level of public awareness and understanding of net-zero and smart city development?

- A. Very high
- B. High
- C. Neutral
- D. Low
- E. Very low

11. In your opinion, what role do local communities and residents play in defining the needs of a smart city?

- A. Very important
- B. Important
- C. Neither important, nor unimportant
- D. Less important
- E. Not important at all

Module 3 - Prioritise action areas for future development

- 12. Based on the discussions during the workshop and study visit in Norway, which areas do you believe should be prioritized for action in the short term in your region?**

	Very important	Important	Neither important, nor unimportant	Less important	Not important at all
Transportation and mobility solutions					
Digital infrastructure development					
Sustainability and environmental initiatives					
Public service delivery for healthcare					
Public service delivery for education					
Public service delivery for social services-elderly, people with disabilities, other socially vulnerable groups					
Public service delivery for utilities: water, heat, waste etc					
Community engagement and public participation					
Data management, privacy, and cybersecurity					

- 13. What do you see as the most critical enabler for the success of smart city initiatives in your region?**

- A. Government support and policy
- B. Private sector involvement
- C. Public-private partnerships
- D. Community engagement
- E. Technological innovation
- F. Funding and investment
- G. Other - please specify

- 14. In your view, which challenges need to be addressed first to move forward with smart city initiatives in your region?**

(Open-ended question)

- 15. Which of the following types of partnerships do you think should be prioritized to advance smart city projects in your region?**

- A. Local government and citizens
- B. National government and local government
- C. Private sector and public sector
- D. International collaborations
- E. Research institutions and public sector
- F. Other – please specify.

- 16. Which factors (e.g., funding, technology availability, stakeholder readiness) do you think will most significantly impact the speed of smart city development in your region?**

(Open-ended question)

17. Given the discussions in the workshops, how would you rank the importance of integrating international best practices into your region's smart city development?
- A. Very important
 - B. Important
 - C. Neither important, nor unimportant
 - D. Less important
 - E. Not important at all

Module 4 - Prepare stakeholders for the next phase of the smart city initiatives

18. What are the main obstacles you foresee as your region progresses toward the implementation phase of smart city initiatives?
(Open-ended question)
19. In terms of resources and support, what do you think will be most important to successfully implement smart city projects in your region?
- A. Funding and investment
 - B. Skilled workforce for initiative implementation
 - C. Infrastructure development
 - D. Community participation
 - E. Public education for smart city transformation (youth and elderly)
 - F. Other – please specify
20. Do you feel that the stakeholders in your region are sufficiently engaged and motivated to drive forward smart city initiatives?
- A. Yes
 - B. No
 - C. I don't know
21. If your answer to previous question was "No", what steps could be taken to increase engagement?
(Open-ended question)
22. What measures do you think should be used to ensure the sustainability of smart city initiatives in your region (e.g., funding, policy frameworks, monitoring)?
(Open-ended question)
23. Are there any final comments or suggestions you would like to share to enhance the effectiveness of the smart city initiatives in your region?
(Open-ended)

Thank you for participating in our 3rd survey on smart cities. Your input will help us understand various perspectives on smart city initiatives and development. If you would like to receive the results of the 3rd survey after its completion, please provide your email address:



NORO GREEN CITIES

Smart Future

Partners:



The NORO GREEN CITIES project is financed within the "Open Call for Bilateral Cooperation in the Green Transition Romania and Norway, Iceland or Liechtenstein Fund for Bilateral Relations - SMEs Growth Romania", reflecting the joint commitment of Norway and Romania to pioneering sustainable urban development.

Supported by a grant from Iceland, Liechtenstein and Norway through the EEA Grants Romania 2014-2021, in the frame of the SME Growth Programme Romania, Open Call for Bilateral Cooperation in the Green Transition

Working together for a green, competitive and inclusive Europe

ANNEX 3

Survey 3 - Comprehensive Analysis and Validation

Main coordinates for research purpose

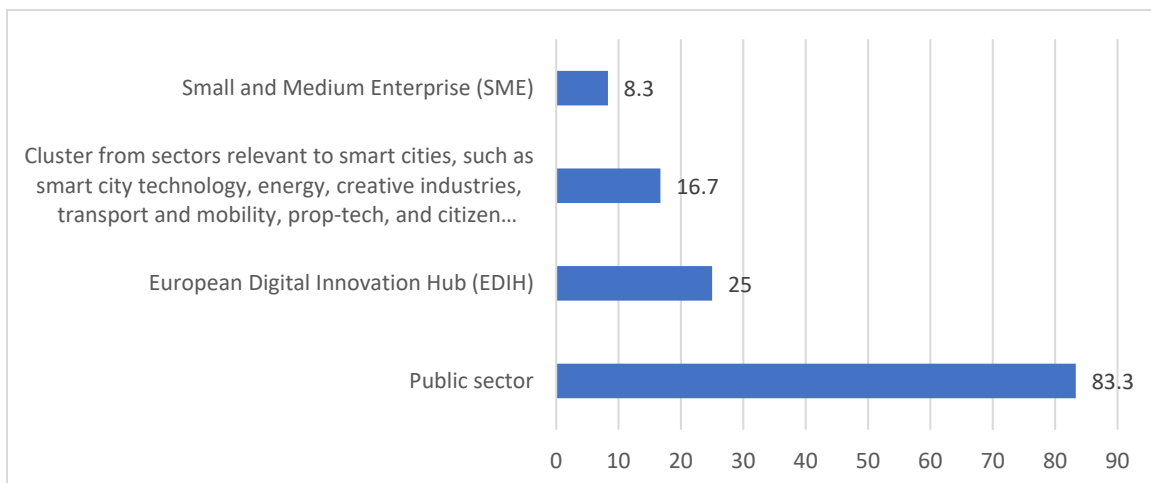
This survey on Stakeholders' Insights was mainly Based on the Discussions and Interactions During the Second Themed Workshop and the Study Visit in Norway Regarding Smart Cities Initiatives.

The purpose of applying the questionnaire was to Finalize the Needs Assessment, Prioritize Action Areas, and Prepare Stakeholders for the Next Phase of the Smart City Initiatives.

Results and comments

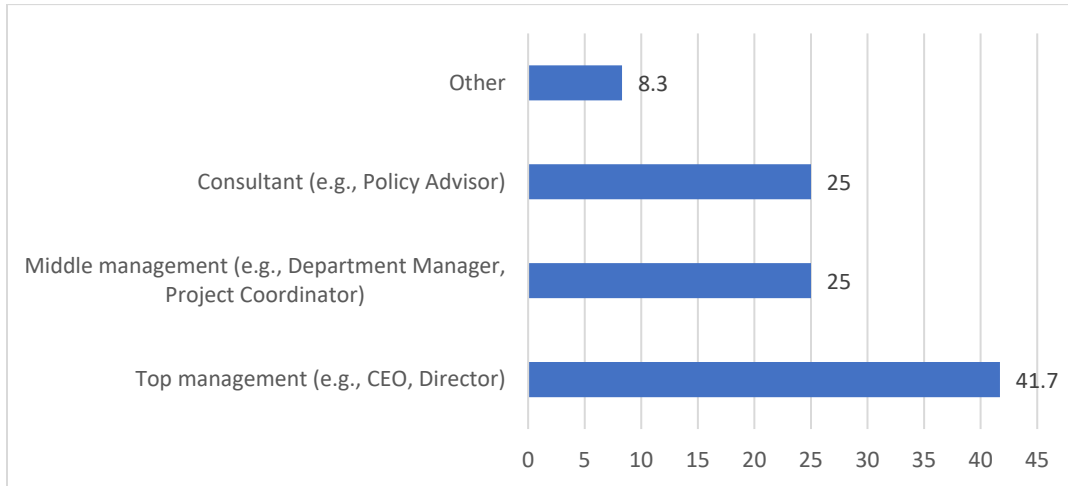
For the 3rd survey, the sample is represented by 12 responses. The first question is “Type of your organization” (Q1) and the largest number of responses comes from the public sector (83.3%), followed by European Digital Innovation Hub (25%) and Clusters from relevant sectors for smart cities in the third place (16.7%).

Figure 1 The distribution of the respondents by organization type (%)



Regarding the role held in smart city initiatives, Top management (e.g., CEO, Director) is on the first place, with 41.7%, followed by Middle management (e.g., Department Manager, Project Coordinator) and Consultant (e.g., Policy Advisor) on the third place, each with 25%.

Figure 2 The distribution of the respondents by their role in smart city initiatives (%)



Other: Mayor

Among the respondents, the largest share is represented by those aged 40-49 (50%), followed by those aged 50-59 (41.7%). The respondents from the age group over 60 years old recorded a share of 8.3%.

Figure 3 The distribution of the respondents by age group (%)

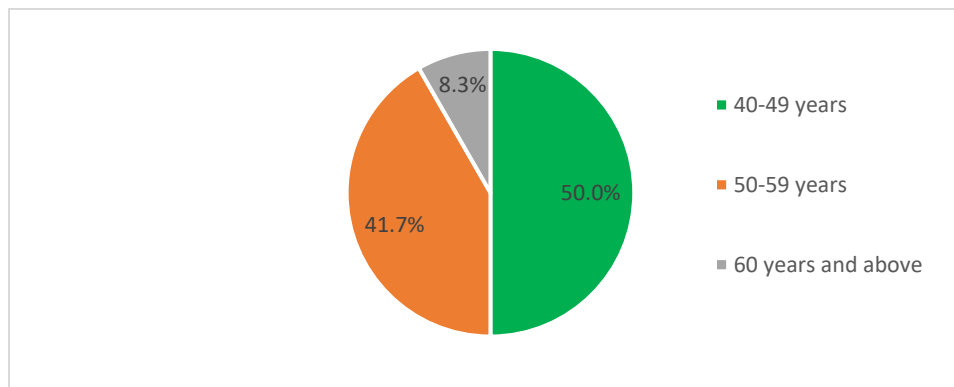


Figure 4 The distribution of the respondents by gender (%)

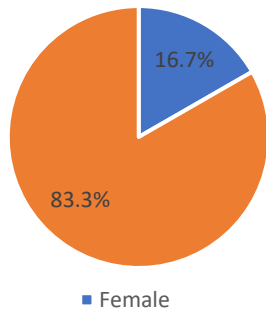
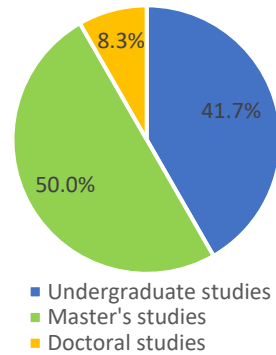


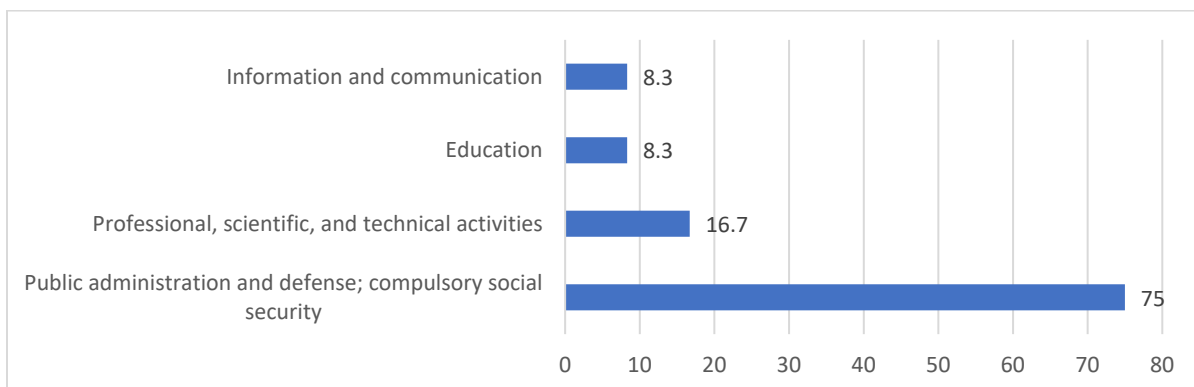
Figure 5 The distribution of the respondents by level of education (the last level of school completed) (%)



Of the total number of respondents, the largest share was represented by men (83.3%), with women having a share of 16.7%. The respondents have a high level of education, with master’s studies (50%), undergraduate studies (41.7%), and doctoral studies (8.3%).

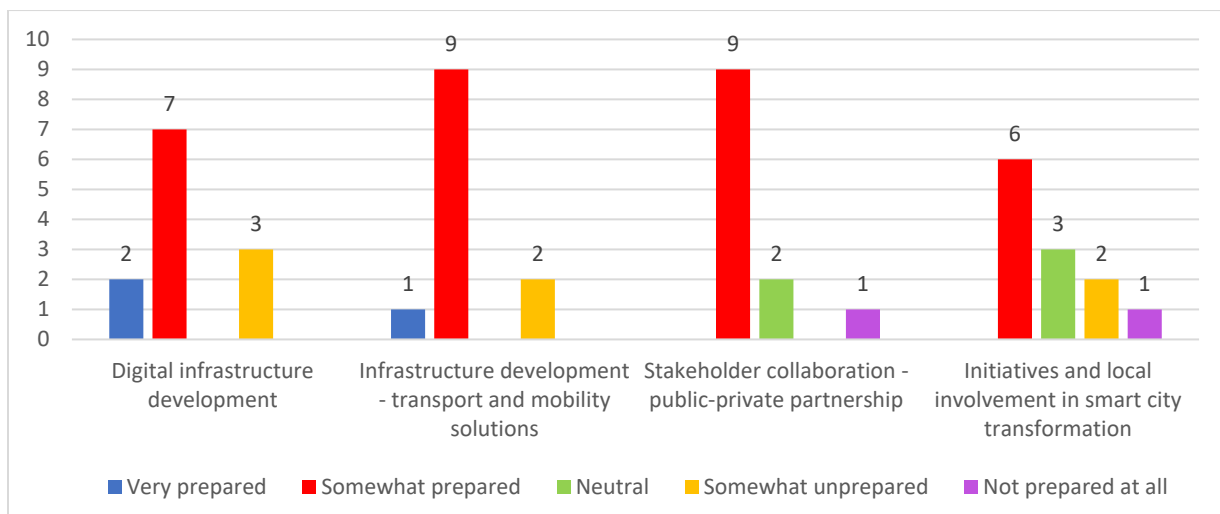
The following figure is based on responses to Q7: What is the economic sector in which your organization operates? The largest share is represented by “Public administration and defense; compulsory social security” (75%), followed by “Professional, scientific, and technical activities” (16.7%). “Education” and “Information and communication” are ranked the third, each with 8.3%.

Figure 6 The distribution of the respondents by economic sector in which their organization operates (%)



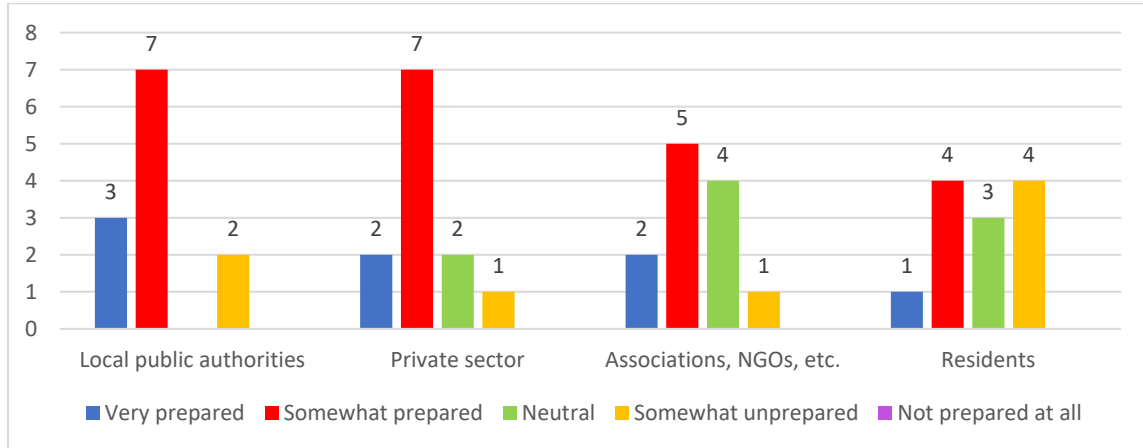
In the next question (Q8), respondents are presented with four smart solutions and asked to rate their region’s current readiness for implementing them. A significant share of respondents chose the “Somewhat prepared” option for all the smart solutions presented. It is interesting to note that only in the case of two smart solutions, there were a few respondents who mentioned a very high level of readiness (Digital infrastructure development and Infrastructure development - transport and mobility solutions). On the other hand, Stakeholder collaboration - public-private partnership and Initiatives and local involvement in smart city transformation were the only two smart solutions that some respondents assessed as not prepared at all for implementation in their region.

Figure 7 How do you assess your region's current readiness for implementing the solutions identified by the smart city?



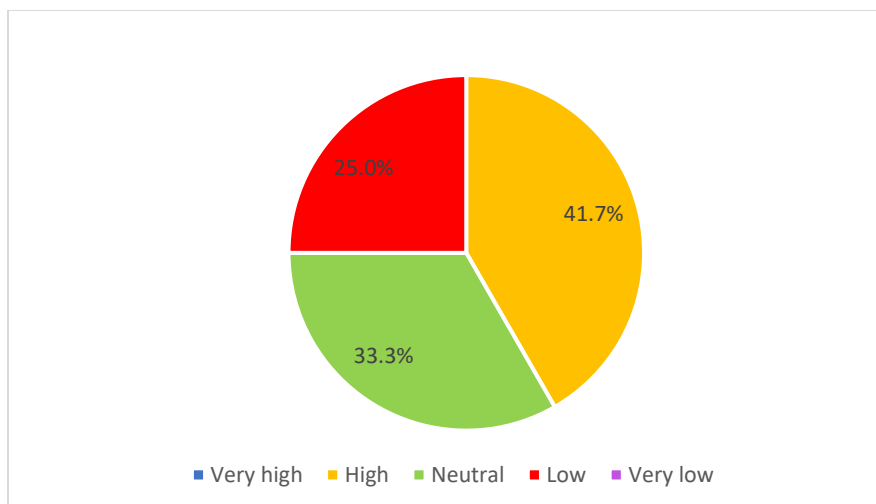
Question 9 refers to the assessment of the current capacity of institutions in their region to lead or support smart city projects. A significant number of respondents chose the “Somewhat prepared” option, especially when assessing Local public authorities and Private sector. On the other hand, when asked to rate the residents’ capacity to support such projects, the largest number of respondents indicated the “Somewhat unprepared” option. Considering this, Local public authorities and Private sector are seen as better prepared than the residents to lead or support smart city projects.

Figure 8 How would you assess the current capacity of institutions in your region to lead or support smart city projects (e.g. local government, utility providers, private sector, NGOs)?



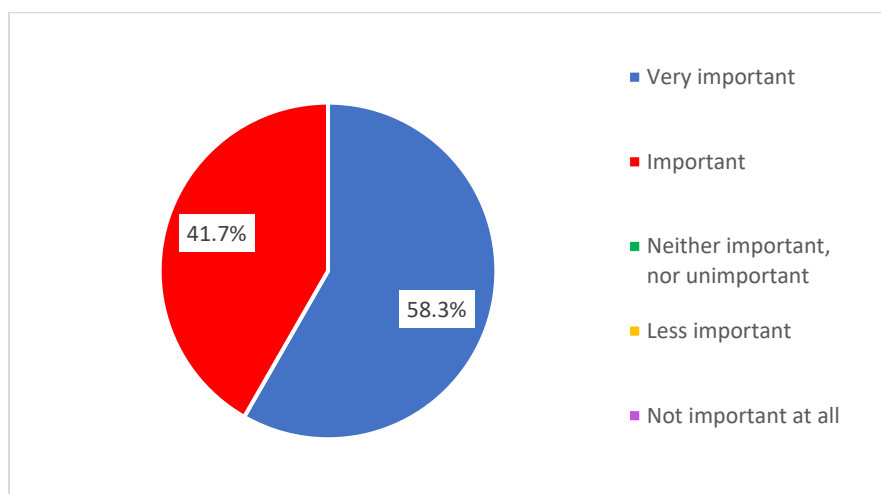
When asked to assess the level of public awareness and understanding of the zero-emission principle and smart city development in their region, the largest share of respondents selected the “High” option (41.7%), followed by “Neutral” (33.3%) and “Low”, which was chosen by a quarter of the respondents.

Figure 9 Based on the current status of smart city projects in your region, how would you assess the level of public awareness and understanding of the zero-emission principle and smart city development?



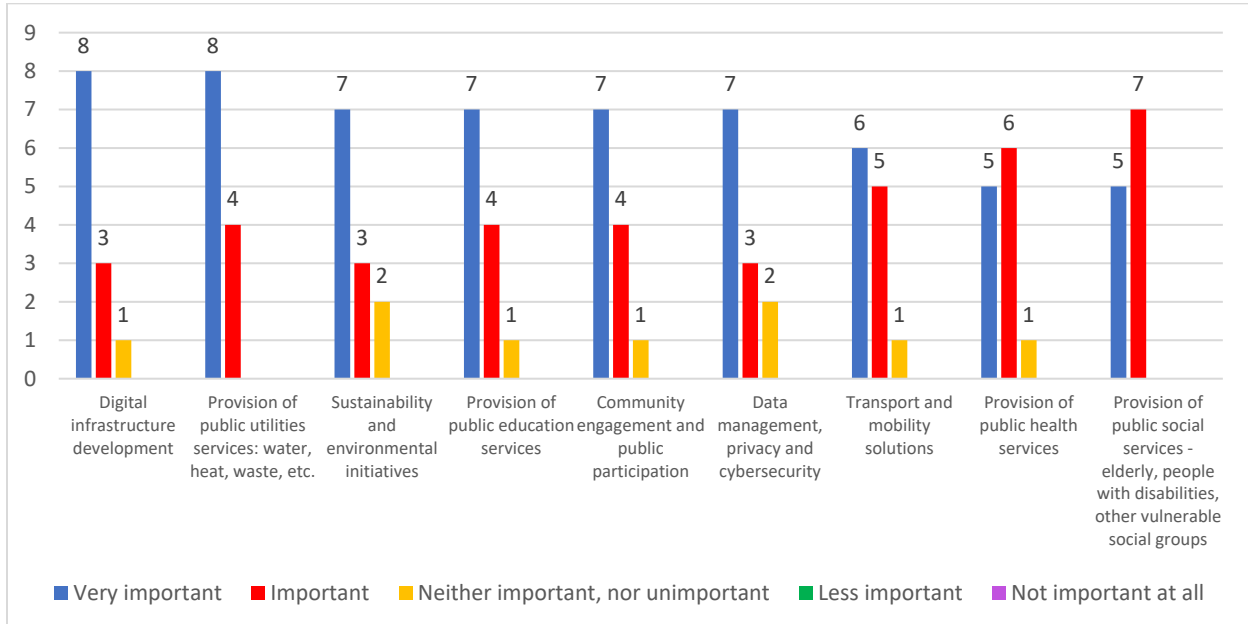
The following question (Q11) aimed to explore the role played by local communities and residents in defining the needs of a smart city. Although there were five options to choose from, all the respondents assessed this role as generally important. The majority selected the “Very important” option (58.3%), while 41.7% opted for “Important”.

Figure 10 In your opinion, what role do local communities and residents play in defining the needs of a smart city?



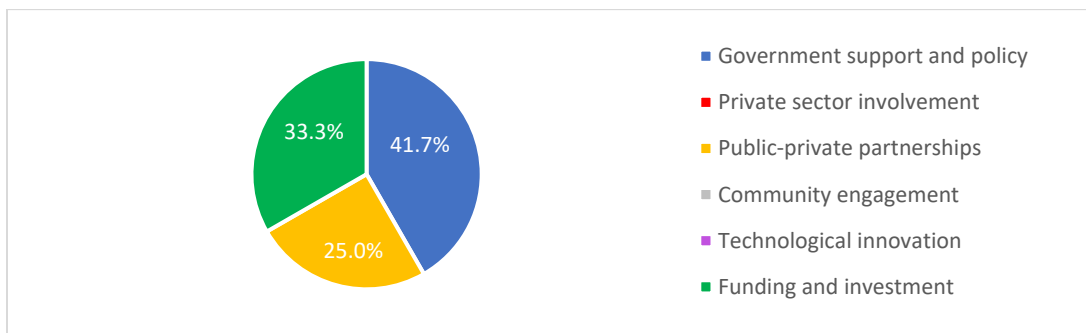
In question 12, respondents are presented with nine areas and asked to evaluate their importance in implementing short-term actions in their region. A significant number of respondents chose the “Very important” option for seven areas (Digital infrastructure development; Provision of public utilities services: water, heat, waste, etc.; Sustainability and environmental initiatives; Provision of public education services; Community engagement and public participation; Data management, privacy and cybersecurity; Transport and mobility solutions). In the case of the other two areas, respondents selected the “Important” option in a higher number (Provision of public social services - elderly, people with disabilities, other vulnerable social groups; Provision of public health services). It is interesting to note that, although there were five options to choose from, none of the respondents assessed the presented areas as less important or not important at all.

Figure 11 Based on the discussions at the workshop and the study visit to Norway, which areas do you think should be chosen for short-term actions in your region?



When asked to indicate the most important enabling factor for the success of smart city initiatives in their region (Q13), the majority of respondents opted for “Government support and policy” (41.7%), followed by “Funding and investment” (33.3%), and “Public-private partnerships” (25%).

Figure 12 What do you think is the most important enabling factor for the success of smart city initiatives in your region?

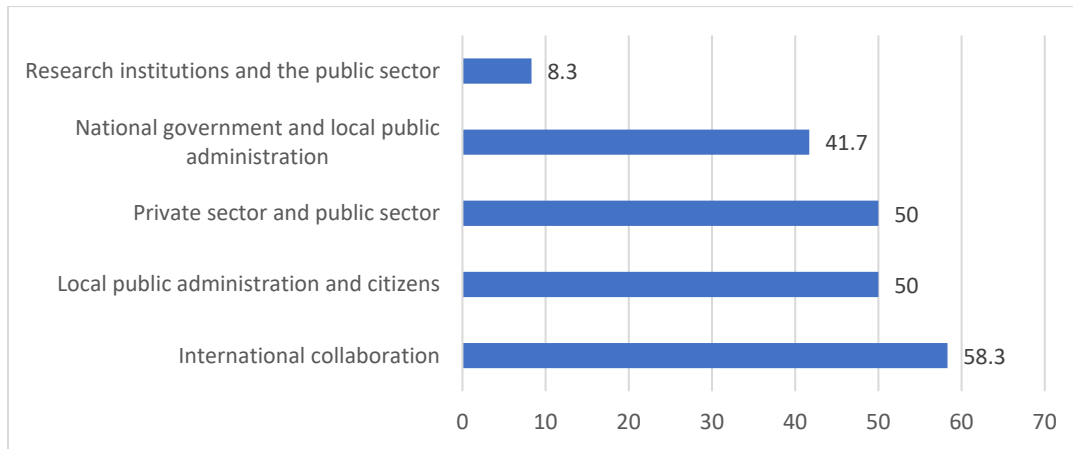


The respondents considered that are some challenges to be addressed first to progress smart city initiatives in their region (Q14), such as:

- Digitalization of public administration and data interoperability;
- Smart urban mobility and congestion reduction (integrated transport system based on big data to optimize routes and traffic flows; multimodal mobility system);
- Smart infrastructure, waste management and circular economy (smart lighting system; modernization of water and sewage networks; smart waste collection system, based on sensors; development of recycling and circular economy centers in major cities in the region);
- Energy efficiency and sustainability of buildings (energy from renewable sources; programs for thermal rehabilitation of old buildings);
- Citizen involvement and education for smart cities;
- Access to financing and investments (creation of a regional consortium to attract European funds for smart cities; development of public-private partnerships (PPP);
- Public utilities;
- Well-trained staff.

When asked about the types of partnerships to be prioritized for promoting smart city projects in their region (Q15), the majority of respondents indicated “International collaboration” (58.3%), followed by “Local public administration and citizens” and “Private sector and public sector”, with 50% each.

Figure 13 Which of the following types of partnerships do you think should be prioritized to promote smart city projects in your region?



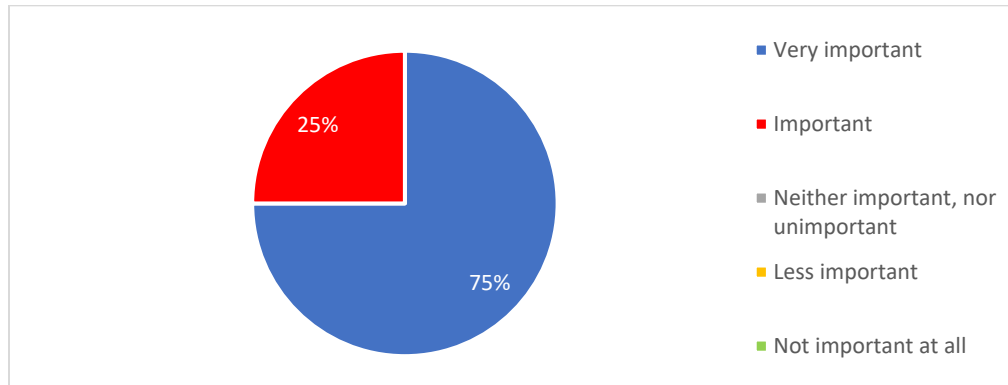
The respondents emphasized some factors they believed would have the greatest impact on the development of smart cities in their region (Q16), such as:

- Access to financing and investment mechanisms (including for start-ups);
- Public-private partnerships (PPP);
- Technology availability and adoption (5G networks and digital infrastructure; integrated data platforms; AI and automation solutions);
- Public administration capacity (including staff training and improving the digital skills for civil servants);
- Involving and educating stakeholders and citizens;
- Urban regulations and policies.

The most mentioned factor, by far, was the access to financing.

The following question (Q17) aimed to assess the importance of integrating international best practices in the development of smart cities in the respondents' region. Although there were five options to choose from, all the respondents considered them as generally important. About three quarters of the respondents selected the "Very important" option, while 25% opted for "Important".

Figure 14 Given the discussions in the workshops, how would you rank the importance of integrating international best practices in the development of smart cities in your region?



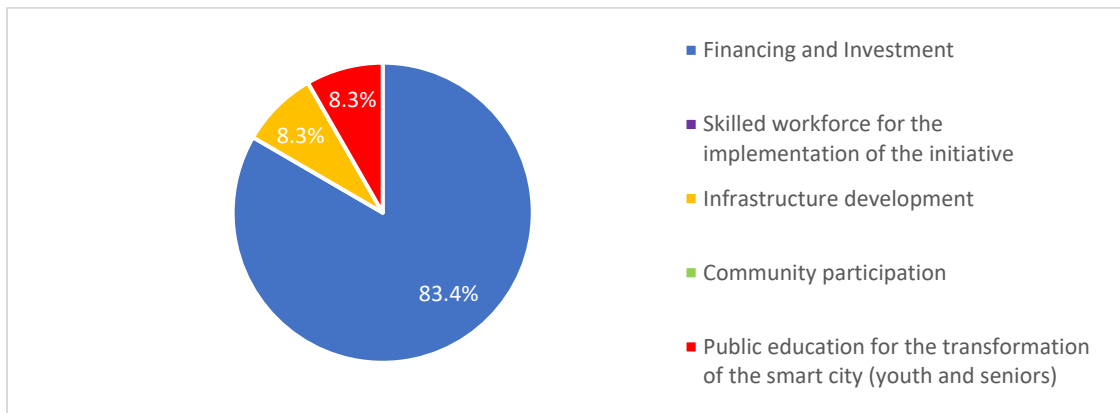
The main obstacles that could hinder progress toward the implementation phase of Smart City initiatives in the respondents' region (Q18) are as follows:

- Increased costs and insufficient funding (difficult access to European funds and lack of private investment);
- Lack of sustainable business models;
- Infrastructure and technology issues;
- Insufficient public-private collaboration;
- Integration and interoperability issues;
- Bureaucracy and lack of coordination between institutions;
- Resistance to change, low digital skills and lack of training and experience in implementing smart city projects;
- Low citizen involvement;
- Sustainability issues.

The largest share of the respondents (83.4%) mentioned “Financing and investment” as the most important resource for successfully implementing smart city projects in their region (Q19),

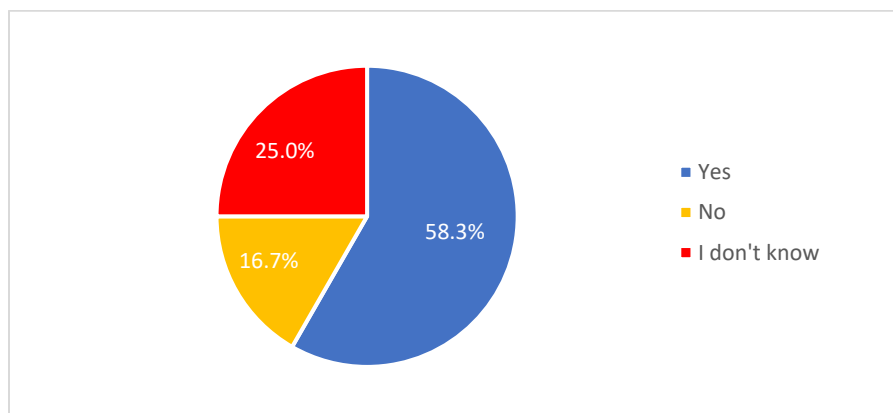
followed by “Infrastructure development” and “Public education for the transformation of the smart city (youth and seniors)”, with 8.3% each.

Figure 15 What do you think is the most important resource for successfully implementing smart city projects in your region?



When asked about their perception of the engagement and motivation of the stakeholders in their region in promoting smart city initiatives (Q20), the largest share agreed that there was a sufficient level of stakeholder engagement and motivation (58.3%), 16.7% opted for “No”, and about a quarter of the respondents did not have enough information on the subject, so they selected the option “I don’t know”.

Figure 16 Do you think that stakeholders in your region are sufficiently engaged and motivated to promote smart city initiatives?



Respondents who answered "No" to the previous question were asked to suggest measures that could be taken to increase stakeholder engagement in promoting smart city initiatives in their region (Q21). The following measures were mentioned:

- More frequent debates and additional explanations to improve the understanding of the concepts related to Smart City initiatives;
- Strengthening collaboration/partnerships (including the creation of public participation platforms, where citizens can propose and evaluate Smart City projects);
- Digital education campaigns to help residents use digital services;
- Mobile applications for urban services (transport, waste collection, public lighting and urban alerts);
- Identifying successful models whose implementation has led to improved quality of life for citizens and increased efficiency of public services; exchange of best practices.

The respondents considered the following measures that should be implemented to ensure the sustainability of smart city initiatives in their region (Q22):

- Improving /diversifying financing opportunities;
- Increasing collaboration / public-private partnerships;
- Integrated policies at regional level, aligned with EU strategies and flexible regulations for innovation;
- Digitalization and interoperability;
- Innovation and education to support the development of new solutions and the increase of digital skills;
- Increasing citizen engagement;
- Developing local skills for public administrations and supporting startups in urban innovation;

- Monitoring and evaluation – implementing performance indicators (KPIs) and a regional dashboard for transparency and efficiency.

In the final question (Q23), respondents were invited to share any final comments or suggestions. No new ideas were suggested. The majority of the respondents reaffirmed the importance of partnerships between various stakeholders in improving the effectiveness of smart city initiatives in their region. Although mentioned by fewer respondents, another key point was the need to attract qualified personnel in the fields related to smart cities, particularly in public administration, and to provide continuous training for existing employees.