„PNRR: Fonduri pentru România modernă și reformată!”

National Competence Centre and solutions for the development of Climate Neutral and Smart Cities

Deliverables - Project 1

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Deliverables - Project 1

P1.D1.1. Climate-Neutral and Smart Cities Governance
This is an analysis on the role of Digital Twin technologies in supporting the governance of smart and climate-neutral cities. The report analyses how European and national decarbonization strategies can be translated into urban governance models, policy processes, and institutional coordination mechanisms. It identifies opportunities and challenges related to digital infrastructure, interoperability, data-driven decision-making, and the institutional capacity required to support the climate transition. The analysis also includes an assessment of Romania's strategic, legislative, and infrastructure framework, highlighting the need for integrated governance models, multi-level coordination, and better alignment between urban policies, digital tools, and climate neutrality objectives.
P1.D1.2. Interaction platform with citizens and authorities
The report presents the design and development of a digital platform aimed at facilitating interaction between citizens and public authorities in the context of climate neutrality policy implementation. The proposed platform is based on a modular architecture and includes functionalities related to data collection, policy evaluation, stakeholder feedback, performance indicators, and decision-support processes. The platform promotes transparency and stakeholder engagement through tools that enhance communication and collaboration between local administrations and communities.
P1.D1.3. GHG assessment framework methodology
The comparative analysis of the main international methodologies used for estimating and reporting greenhouse gas emissions at the urban level, focuses on their strengths and applicability within smart city contexts. The report describes the core principles of emissions accounting, inventory boundary setting, and calculation methodologies for key emission-generating sectors, including stationary energy, transportation, waste, industrial processes, and land use.

P1.D2.1. Co-creation, co-design and co-production model: technical report
This deliverable presents the results of activities on social and economic innovation in climate governance, focusing on citizen engagement through co-creation, co-design, and co-production processes to support the achievement of climate neutrality in smart cities. It clarifies the core concepts of participatory governance and presents the associated tools, supported by national and international best practice examples. The report also presents national and international examples of good practice and details the stages of policy co-creation, stakeholder integration, participatory processes, knowledge management, policy convergence in design and implementation.
P1.D2.2. Toolkit platform for NetZeRoCities project
The report presents the conceptual and methodological basis for a toolkit platform dedicated to multi-level governance (MLG) in the context of energy transition and sustainable urban development. The importance of coordination across european, national, regional, and local levels is emphasized to ensure effective governance in the fields of energy and climate change. The report analyzes the benefits of multi-level governance, including policy flexibility, knowledge sharing, stakeholder engagement, institutional capacity-building, and the adaptation of solutions to local contexts. It also addresses policy coherence, monitoring and evaluation mechanisms, and collaboration between public and private actors.
P1.D3.1. Governance models and policies – technical report
In this deliverable, the evolution of the smart city concept and urban digital infrastructures is analyzed in a global, European, and national context, with a focus on the transition toward sustainable mobility and climate neutrality. It presents a set of four interrelated technical reports, collectively addressing the governance frameworks, policy instruments, and digital technologies required to support Romania's transition towards climate-neutral and smart cities. The energy report analyzes governance frameworks for renewable energy integration, Positive Energy Districts, prosumer ecosystems, and energy poverty mitigation, with reference to Romania's National Integrated Energy and Climate Plan. The buildings report addresses sustainable construction standards,

IoT-enabled energy management, renovation financing mechanisms, and alignment with NZEB and BREEAM/LEED certification frameworks. The mobility report analyses smart mobility governance, IoT sensor infrastructure, Sustainable Urban Mobility Plans, and case studies from several flagship cities, with an assessment of Bucharest's urban transport challenges and digital transformation pathways. The Smart City/Smart Campus report develops integrated digital governance models encompassing AI, IoT/IoE infrastructure, data governance, multi-level institutional coordination, and participatory governance, with the UNSTPB Smart Campus presented as a relevant national case study.

P1.D3.1. Governance models and policies – technical report

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P1.D3.2. NetZeRoCities solution portfolio

This deliverable presents a structured portfolio of digital and technological solutions that can support the transition of Romanian and European cities towards climate neutrality. The document identifies, analyses, and classifies relevant technologies for urban decarbonization, including artificial intelligence, Internet of Things, Digital Twin frameworks, blockchain, cloud-edge architectures,

and Extended Reality. The solutions are organized across thematic categories such as energy efficiency, smart mobility, waste management, smart buildings, urban monitoring, interoperability, and decision support. The deliverable also proposes a multi-criteria evaluation matrix based on criteria such as greenhouse gas emission reduction potential, interoperability, scalability, and relevance for decision-making. In addition, it outlines several AI-driven application concepts, including a Carbon Footprint Calculator, Romania GHG Dashboard, NetZero Assistant, and a NetZero Planning Tool for SMEs, alongside an Open Science platform framework.

P1.D4.1. Standards and guidelines portfolio for Net Zero transition – technical report

The report maps the regulatory, normative, and methodological framework governing the transition towards climate-neutral cities within the NetZeRoCities project. The document systematically analyses the European legislative area for Net Zero agenda and sectoral directives on renewable energy, circular economy, biodiversity, and sustainable mobility, alongside the relevant national legislative framework applicable in Romania. A major contribution is the structured typology of standards and guidelines across four distinct categories: strategic and governance standards, environmental and energy management standards (including ISO 14064, GHG Protocol, and SECAP/SUMP frameworks), technical standards pertaining to buildings, smart grids, and urban mobility, and data, indicator, and monitoring standards. The document concludes by identifying success factors and systemic challenges in the adoption of sustainable urban mobility policies, showing the importance of integrated planning instruments, institutional capacity, and coherent long-term public policy frameworks.

P1.D4.2. Monitoring platform and performance analysis report

The deliverable presents the conceptual design, technical architecture, and operational framework of a data-driven monitoring platform intended to support the governance of the Net Zero transition. It defines a multidimensional evaluation framework integrating energy, environment, mobility, buildings, socio-economic factors, and institutional governance, structured around KPIs aligned with recognized frameworks such as the GHG Protocol for Cities, SECAP, and SUMP. The report describes the platform architecture as a layered model incorporating IoT-based data collection, Big Data integration, Digital Twin modelling, and AI-driven analytics. It also discusses performance analysis through multi-criteria

decision analysis and scenario-based approaches, as well as governance elements related to roles, data access, accountability, and stakeholder involvement.

P1.D5.1. Feasibility study report

The study presents an empirical investigation into the structural, institutional, and cultural barriers affecting the interaction between citizens and public administration in the context of climate-neutral governance in Romania. Based on surveys, open-ended responses, and documentary review, the study identifies barriers related to administrative interaction, public service delivery, institutional efficiency, citizen engagement, access to information, citizens' rights protection, accountability, and transparency. The findings highlight a set of interconnected challenges, including bureaucracy, insufficient administrative coordination, inadequate digital infrastructure, limited participation mechanisms, and low levels of institutional trust. The analysis is also accompanied by a discussion on the gap between citizens' willingness to participate in decision-making and their actual involvement, pointing to the need for more inclusive and accessible engagement mechanisms.

P1.D5.2. Implementation strategy for Net-Zero transition

This deliverable presents a sector-integrated roadmap for supporting the Net Zero transition in Romanian urban contexts, with reference to cities such as Cluj-Napoca, Bucharest Sector 2, and Suceava. The strategy addresses five main sectors: buildings, centralized heating systems, electrical energy infrastructure, circular economy and waste management, and digital transformation. The report analyses the current situation and proposes targeted intervention directions for each sector. It also discusses governance and financing mechanisms based on multi-level stakeholder partnerships, European and national funding opportunities, transparency and traceability mechanisms, and the potential use of Digital Twin technologies, IoT infrastructure, and open data dashboards. Education, awareness, and community engagement are also addressed as important conditions for long-term implementation.

P1.D5.3. Training and competition roadmap

The deliverable describes a structured training programme, comprising five thematic courses: climate-neutral governance, renewable energy and climate neutrality, sustainable and energy-efficient buildings, sustainable urban mobility, and smart cities and Digital Twins. Each thematic course is built across introductory, intermediate, and specialization modules deliverable both in intensive face-to-face format and through an online Learning Management System. The target audience includes public administration representatives, private sector actors, urban planners, researchers, civil society organizations, students, and young professionals. The report also presents the three competitions organized within the NetZeRoCities centre, which engaged early-career researchers, students, and professionals in developing ideas and context-specific solutions for urban decarbonization and smart city transformation.

P1.D5.5. Communication and dissemination plan report

This deliverable presents the communication and dissemination strategy of the NetZeRoCities project, aligned with the PNRR requirements and European good practices in research communication. The report distinguishes between dissemination activities targeting specialized audiences, such as public authorities, researchers, and policy makers, and communication activities aimed at broader stakeholder communities and the general public. It covers the project's visual identity, web presence, social media communication, target audiences, and dissemination channels. It also documents key dissemination activities, including participation in scientific conferences and events, the organization of three open innovation competitions, and the publication of two scientific volumes on smart city governance and multi-level governance models.