„PNRR: Fonduri pentru România modernă și reformată!”

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

Deliverables - Project 3

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Deliverables - Project 3

P3.D1.1. Acquisition report on technical requirem
We report on the technical requirements needed to implement measurement, monitoring, simulation, and analysis activities for smart and sustainable buildings. It inventories needs related to measurement equipment, sensors, monitoring systems, energy simulation software, CFD, LCA, and digital infrastructure. The main presented outcome is the definition of a technical foundation for procurement and for developing partners' capacity to carry out integrated assessments of energy performance, indoor comfort, and environmental impact.
P3.D1.2. Materials and systems use report
The deliverable summarizes how materials, technical systems, equipment, and software tools are used in project activities. Some technical systems and equipment foreseen in the previous deliverable were not procured due to lack of funds. The report highlights the link between the previously defined technical requirements and their effective application in studies, simulations, monitoring, and assessments. The outcome is a clear picture of the operational capacity built within the project, the resources used, and the limitations encountered in implementing smart and sustainable building solutions.
P3.D2.1. Report on the materials and building services available on the market
The NetZeRoCities consortium developed a comprehensive analysis of construction materials, installation systems, and market-available solutions with respect to energy efficiency, European and national requirements, sustainability, and resilience of the built environment. Innovative materials, HVAC systems, electrical systems, lighting, plumbing, and smart control solutions are analyzed. The main outcome is the consolidation of a knowledge base on existing market solutions and the competence to select appropriate technologies for energy-efficient, low-environmental-impact buildings.

P3.D2.2. Evaluation report of the tools for evaluation of the energy efficiency of different building services and materials based on real projects

This deliverable presents the evaluation of software tools and methodologies used in NetZeRoCities for analyzing the energy performance of buildings, materials, and installation systems. Functionalities, application domains, advantages, and limitations of simulation and assessment tools are compared. The outcome is the development of competence in choosing and using appropriate digital tools for real energy efficiency projects and for supporting technical decision-making.

P3.D2.3. Cost – benefit report based on previous materials, tools and building services analysed

This delivery provides the presentation of the previous work on research and impact on the energy consumption of buildings by using different types of construction materials; also are investigated buiding services, for the final complete analysis regarding their cost and benefit for implementation, lifespan, maintenance and reuse. A CO2 emission analysis is also included, as well as the complete framework of optimal solutions in terms of materials and building service.

P3.D3.1. Research report documenting users' preferences and needs for interacting in a smart building

This research report documents end-user preferences for interacting within smart buildings by focusing on novel interaction modalities, such as gesture and speech, for controlling ambient devices and services, including indoor lighting, sound/music, and airflow. Empirical results from a user study are presented and analyzed according to the characteristics of user-elicited gesture and speech commands, and positioned in the broad context of prior works and studies involving perceived indoor comfort and user profiles.

P3.D3.2. Research reports on prototypes, represented by applications for user interacting with smart building environments
This research report presents the design and development of several prototypes for supporting user interaction in smart buildings, such as HBI (Human-Building Interaction), a web-based software application that runs on mobile devices (smartphones and tablets) and wearables (smartwatches), enabling control of lighting, sound/music, and airflow for specific ambient devices; an exploration of novel wearable device designs enabling gesture-based interaction and custom feedback modalities; and an exploration of integrating control into conventional chairs with the ChairMX concept and corresponding demonstrators, where chairs become interactive elements in smart buildings. These results are presented in the context of prior scientific research in the area of interactions within smart buildings, conducted and presented in the report in the form of a systematic literature review.
P3.D3.3. Research report with evaluation of the user experience of interacting in smart buildings
The research report presents findings from the empirical evaluation of the user experience within smart buildings by addressing specific dimensions, such as attitudes and beliefs regarding smart and sustainable buildings, expressed preferences for indoor feedback modalities, transfering the experience across different environments, and the novel user experience of using conventional chairs for interaction purposes with a smart building. Furthermore, the report integrates the award-winning result of „AI as modality," a conceptual framework where AI technology is interpreted from the perspective of complementing user input in smart environments (ICMI 2024 1st Place Blue Sky Award), generating a novel kind of user experience compared to conventional devices. These results are contextualized within a discussion of indoor comfort and measurements of power consumption corresponding to various user preferences for environmental settings.
P3.D4.1. Report on selection criteria for typical buildings, new buildings and old buildings
This deliverable defines the criteria used for selecting representative buildings within the NetZeRoCities project. Building typology, age, energy performance

level, data availability, monitoring potential, and replication relevance are considered. The outcome is a methodological framework for choosing case studies and structuring comparative analyses between new, existing, and typical buildings.
P3.D4.2. Report on the monitoring parameters (energy and IEQ parameters) in typical buildings
This deliverable reports the parameters to be monitored for evaluating energy performance and indoor environment quality in typical buildings. Indicators covering energy consumption, temperature, humidity, indoor air quality, comfort, and the operation of technical systems are included. The outcome is the definition of a monitoring structure that enables the collection of relevant data for diagnosis, energy optimization, and indoor comfort assessment.
P3.D5.1. SRI evaluation report
The deliverable reports the application of the Smart Readiness Indicator (SRI) methodology to assess the smart readiness of buildings. The European legislative framework, evaluation methodology, technical domains analyzed, and how smart technologies can contribute to energy efficiency, comfort, and flexibility are presented. The presented outcome is the development of SRI assessment competence and the identification of the digitalization and automation level of the analyzed buildings.
P3.D5.2. DT framework design report
This technical report establishes the structural and conceptual foundation for the NetZeRoCities Digital Twin, documenting the creation of a high-fidelity BIM model for the EFdeN house and its integration with the IES VE simulation platform. It focuses on ensuring data interoperability and connecting real-time IoT sensors to facilitate continuous monitoring of energy performance and occupant comfort as a basis for future predictive decision support.
P3.D5.3. DT platform evaluation report
This evaluation report for the NetZeRoCities project documents the development

and refinement of a Digital Twin platform aimed at optimizing energy performance and occupant comfort in smart buildings. Using the EFdeN house as a primary case study, the document details the integration of BIM modeling, IES VE simulations, and BMS data to create a functional application for predictive decision support and real-time operational efficiency.

P3.D6.1. Good practices guideline on Smart and Sustainable Buildings design

This deliverable synthesizes the results and knowledge generated in the project in the form of a best practices guide. Topics include energy efficiency, indoor environment quality, smart technologies, resource use, circular economy, sustainable materials, water management, and bioclimatic design. The outcome is a knowledge transfer tool that can support designers, authorities, specialists, and beneficiaries in defining solutions for smart and sustainable buildings.

P3.D6.2. Communication and dissemination plan report

The report presents the strategy for communicating and disseminating project results in NetZeRoCities, including target audiences, communication channels, visual identity rules, types of activities, and promotion methods. The outcome is an organized framework for project visibility, transfer of results to stakeholders, and support for the institutional and public impact of the activities carried out.