HIDALGO2
CENTRE OF EXCELLENCE

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Introduction

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EuroHPC Joint Undertaking

Grant number: 101093457

Goals and agenda

Goals of the meeting:

- Immersion into HiDALGO2's world – project goals and ambitions
- Getting acquainted with use cases – learn about status and capabilities
- Finding out more on potential users needs
- Starting off discussion on potential collaboration with interested entities

Agenda:

- Introduction – Marcin Lawenda
- Urban Air Project – Zoltán Horváth
- Urban Building Model – Christophe Prudhomme
- Renewable Energy Sources – Wojciech Szeliga
- Wildfires – David Caballero Valero
- Q&A – all

Project key facts

- Project type: **Centre of Excellence** (CoE) for High Performance Computing (HPC)
  - CoEs promote the use of upcoming **exascale** and **extreme performance computing** capabilities and scale up existing parallel codes towards exascale scaling performance
  - Address the **skill gaps** in computational science in the targeted domains by specialized **trainings** for increased adoption of advanced HPC in **industry** and **academia**
  - Bring together the European **world-class knowledge** and **expertise** in applying established mechanisms, user driven development, performance tools and programming models for HPC, and co-design activities for real systems based on leading edge technologies.
- Grant number: **101093457**
- Funded by: **EuroHPC JU** and **associated countries** (Poland, Germany, Spain, Hungary, France, Greece)
- Oriented on environmental use cases
- Runtime: 48 months (start in January 2023)

Consortium composition

8 partners from 7 countries:

- **Instytut Chemii Bioorganicznej Polskiej Akademii Nauk (PSNC)** – Poland – Coordination, Use case owner
- **University Of Stuttgart (USTUTT)** – Germany – Technical Coordination
- **ATOS Spain SA (ATOS)** – Spain – Quality Manager
- **Szechenyi Istvan Egyetem (SZE)** – Hungary – Use case owner
- **Meteogrid SL (MTG)** – Spain – Use case owner
- **Universite De Strasbourg (UNISTRA)** – France – Use case owner
- **Erevnitiko Panepistimiako Institouto Systimaton Epikoinonion Kai Ypolgiston-EMP (ICCS)** – Greece – Data analytics and AI support
- **Future Needs Management Consulting LTD (Future Needs)** – Cyprus - Dissemination

Mission and Vision

Mission

- Bring together advanced solutions (HPC, HPDA, AI) to provide stakeholders and decision makers tools that would mitigate tragic consequences of climate and civilization phenomenon by delivering necessary knowledge.

Vision

- Extend the possibilities of the world's leading scientific applications in the field of environmental protection to effectively analyse phenomena, on a large scale and with high precision, that threaten human life and health.

Conceptual Project Services

Objectives

Technological

- TO1: Advancing application scalability towards novelty and Exascale systems by improving parallel codes
- TO2: Improvement of data analytics and AI capabilities for Global Challenges

Multidisciplinary

- MO1: Development and implementation for inter-domain coupling mechanisms
- MO2: Investigate methods for the integration of real-world data into the simulation execution

Socio-scientific

- SO1: Increasing the model capabilities by extending the processing pattern
- SO2: Elaboration of good practices guides, regulations and protocols for policy makers

Team Working Objectives

- WO1. Define and implement a set of IT-related basic platform services that will enable the provision of high-level services focused on environmental use cases.
- WO2. Enable collaboration and dissemination with initiatives oriented on large-scale modelling for CFD problems

Use cases

URBAN AIR PROJECT

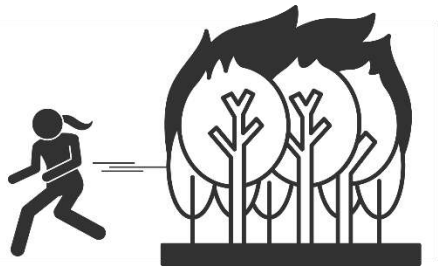
Evolution of the air in the urban areas considering pollution, wind, comfort and planning

URBAN BUILDINGS

Advanced building models for better integration with architecture. Providing a source term for heat and air pollutants (CO_2 and NO_x) to the urban air pollution model.

RENEWABLE ENERGY SOURCES

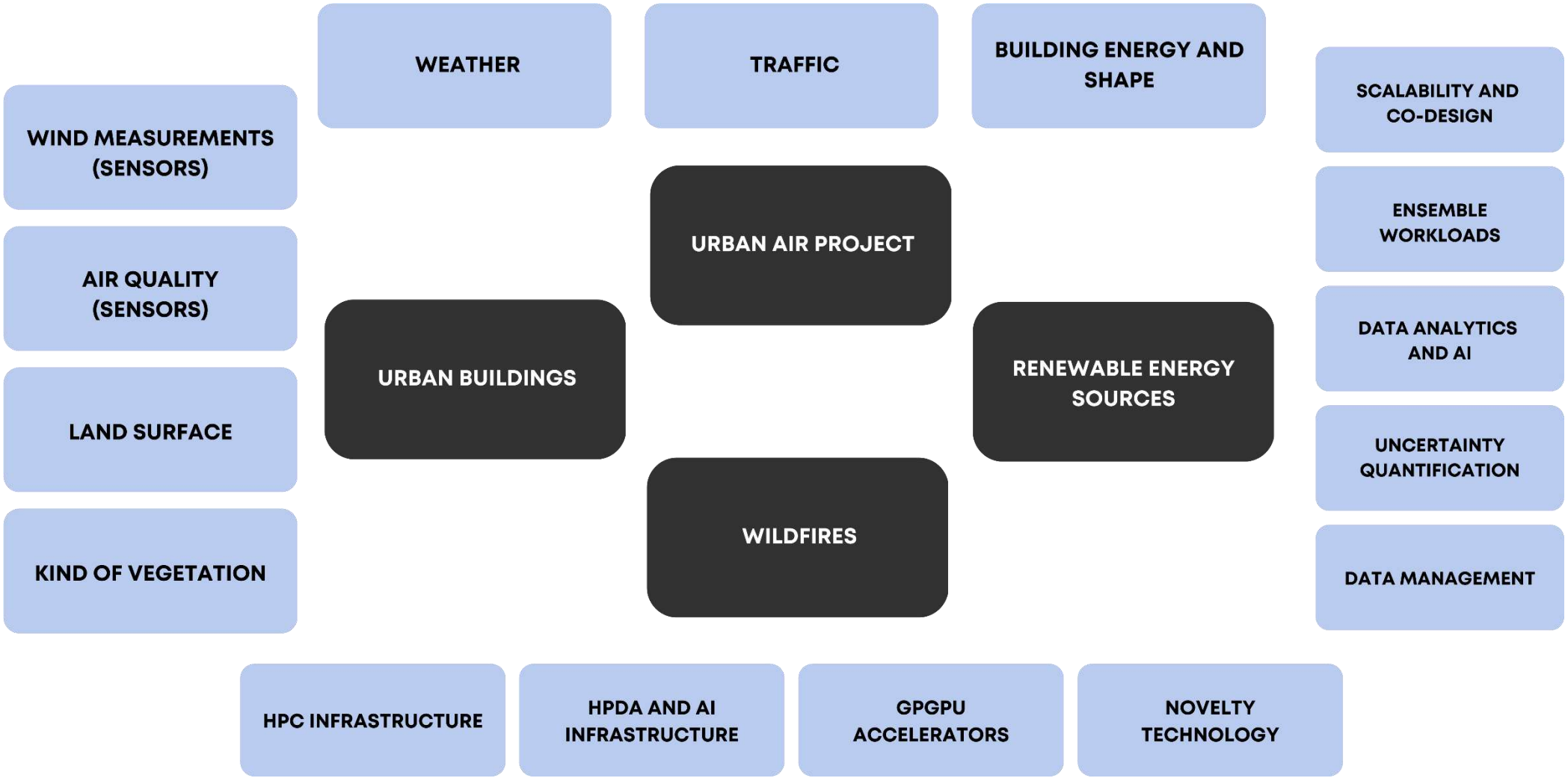
Energy production from renewable sources like wind and solar panels. Solution accustomed to urban and rural areas.



WILDFIRES

Simulation of wildfire atmosphere interactions and smoke dispersion in forest and urban areas.

Project components



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Complementary activities

Exascale Support for Global Challenges

Extend – Optimize – Advance HiDALGO2 pilots

- Setup an efficient benchmarking & profiling process
- Optimize pilots towards efficient execution on EuroHPC JU infrastructures
- Combine simulations & data analytics models
- Evaluate the impact of emerging architectures & technologies

Data Exploration and Visualisation

Efficiently tackle the technical operation of HiDALGO2

- Collection and preparation of data for exascale processing, including the definition of preferred data structures for digital twins;
- Models and tools for HPDA, especially focused on solutions for the use cases;
- Models and tools for AI, especially focused on solutions for the use cases;
- Different ways to visualise the results of the simulations and the data managed in HiDALGO2

Synergy and ensemble scenarios

Use cases synergy:

- Investigate coupling opportunities between simulation applications
- Example: Urban Building Model (UBM) and Urban Air Project (UAP) in which UBM will deliver building heat and pollutant emissions for UAP.AQ; and conversely UAP.AF will provide urban air flow information for UBM.

Ensemble scenarios:

- Orchestration of the multiple runs for results estimation (e.g. for VVUQ (Validation, Verification and Uncertainty Quantification))

Thank you for your attention

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