World Sustainable Energy Days
27 February – 1 March 2019, Wels/Austria

Higher energy efficiency and lower business risks - Reducing the energy performance gap in buildings

Modelling energy in buildings for urban sustainability

Modelling Optimization of Energy Efficiency in Buildings for Urban Sustainability

Project duration: November 2015 – April 2019

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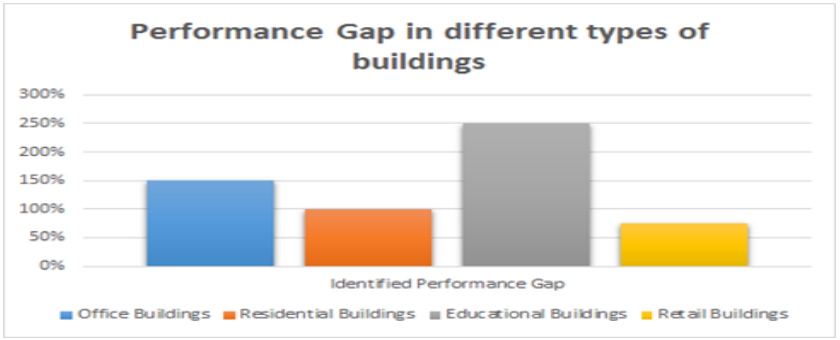
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 680517

Project rationale

Huge gaps between predicted and actual energy consumption

- **Inability of current modelling techniques** to represent realistic use and operation of buildings
  - Model simplifications
  - Alterations in buildings during life
  - Non – efficient control strategies
  - Loss of performance
  - Environmental inaccuracies



- Impact of **occupants' behaviour** on the energy performance of buildings
  - Inadequate assumptions + current simulation tools inaccuracies

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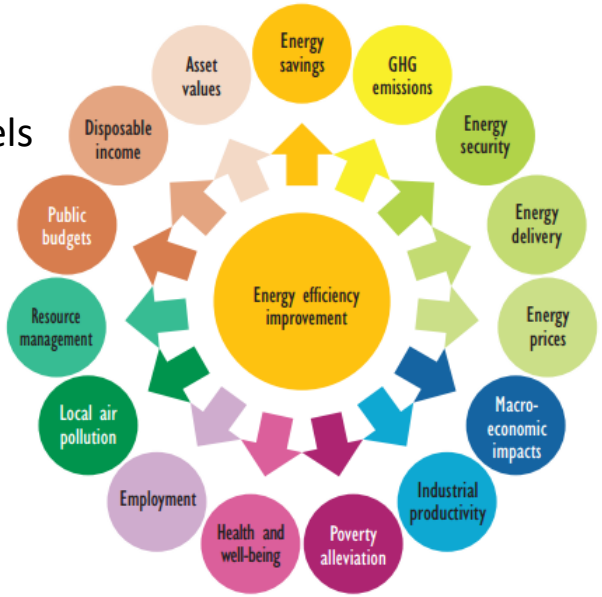
Project rationale

Prohibit the scaled deployment of energy efficiency projects

- Lack of adequate energy consumption base-lining models
- Inability to estimate savings across a yearly time period with adequate granularity
- Analysis of historical data totally vulnerable
- Absence of and lack of knowledge around building lifecycle energy performance assessment concepts.



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Project rationale

- **Reduction of the gap** narrowed down to values consistent with EPC
  - ✓ Develop methodologies and tools to monitor and assess actual building energy performance
  - ✓ Include energy performance diagnostics to support decision making during the different stages in the life of the buildings
  - ✓ Real time optimisation of energy demand and supply using intelligent energy management systems

- Solutions with high **replication potential**
  - ✓ A holistic “open” approach to building control and monitoring systems
  - ✓ Validation in real-life conditions

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MOEEBIUS solution

Advance the capabilities of current BDEPST to enable accurate predictions through addressing current modelling and measurement & verification inefficiencies

Further optimise the performance gap through human-centric fine grained control, predictive maintenance and retrofitting at building and district level

Enable the efficient integration of distributed and intermittent energy resources into the Smart Grid and enhancing reliability and security of energy supply

Facilitate Energy Performance Contracting penetration in EU Energy Services Markets through the provision of a replicable and easily transferable framework

Introduce Novel ESCO Business Models and New Energy Market Roles enabling the transition to demand-driven Smart Grid Services through Demand Side Aggregators

Holistic energy performance optimization framework is required

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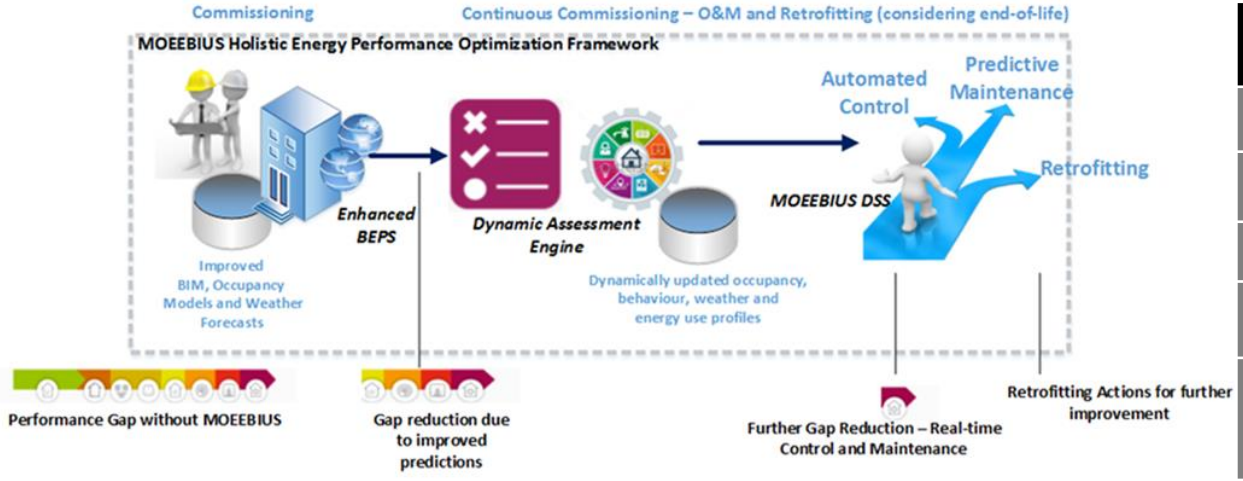
MOEEBIUS solution



- Improved Building Energy Performance Assessment
  - Precise allocation of detailed performance contributions of critical building components
    - Real-time building performance optimization including advanced simulation-based control and real-time self-diagnosis features
      - Optimized retrofitting decision making on the basis of improved and accurate LCA/ LCC-based performance predictions
        - Real-time peak-load management optimization at the district level

MOEEBIUS Components
Integrated Sensor/ Actuator Device
Ambient User Interfaces
User Behaviour Profiling Mechanism
Middleware System
District and Building Energy Performance Simulation System
Dynamic Assessment Engine
DER Forecasting, Aggregation and Flexibility Analysis Module
Predictive Maintenance Module
Retrofitting Advisor Module

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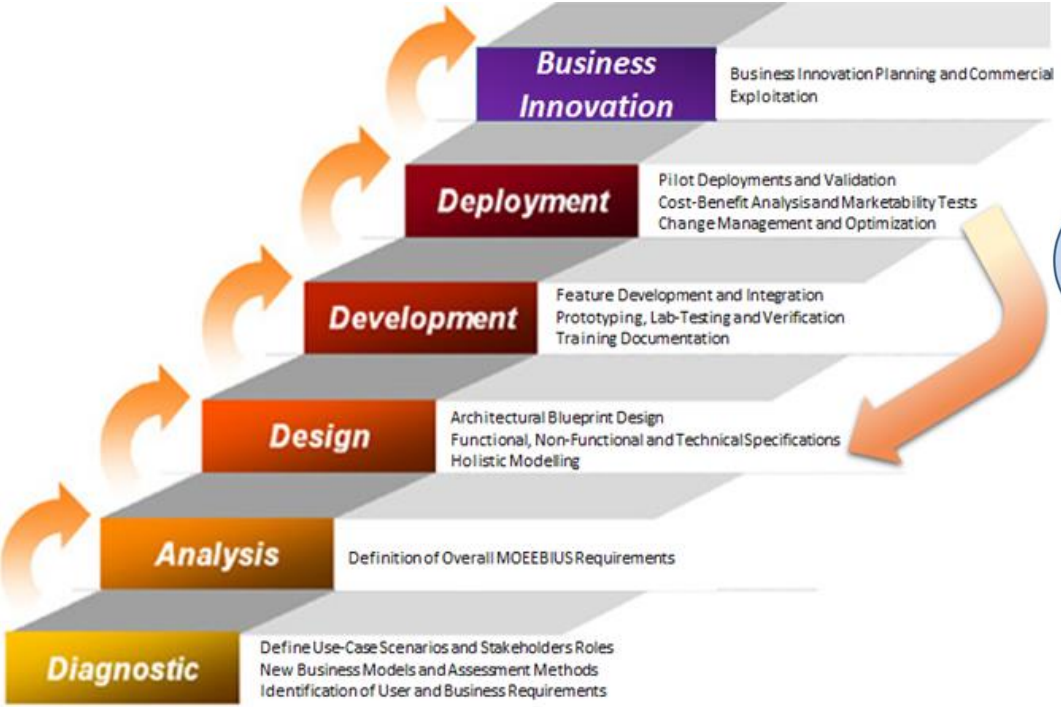
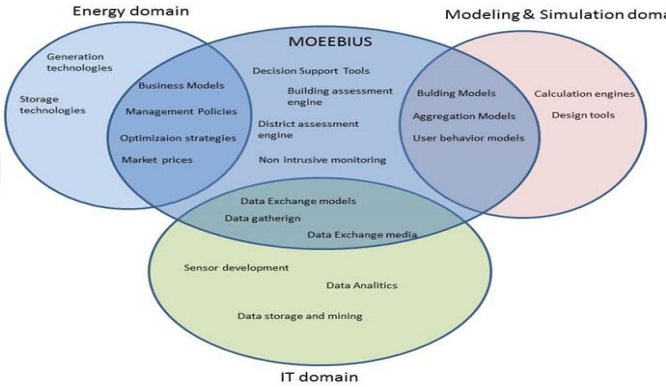
Implementation approach





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Implementation approach

- User-Driven Innovation Approach to be followed aims at involving end-users and buildings occupants throughout all stages of the project life-cycle, as key enablers of the MOEEBIUS innovation process

- Based on the establishment of the MOEEBIUS Living Lab:
  - Widely disseminate
  - Create opportunities for exploitation / replication
  - Obtain feedback

- Early Validation and Verification protocols (ensure the reliability of the final outcomes)

Continuous end user requirements revision as well as fine-tuning of the quality of the final outcome

TECNALIA's KUBIK test facility

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Validation framework

Location	No of Buildings	Types of Buildings	Total Surface of Buildings	Total Annual Consumption	No of Occupants	Shared Infrastructure
UK - London	4	Residential, Hotels, Retail	22.500 m^2	3.100 MWh (EL) 80 MWh (NG)	1.200	RES (PV), Back-up Generators
Portugal – Mafra	5	Educational, Sports, Office	8.100 m^2	535 MWh (EL) 760 MWh (NG)	800	HVAC (Natural Gas Boilers)
Serbia - Belgrade	48	Educational, Office, Residential, Retail	434.000m^2	12.400 MWh (EL)	11.700	District Heating

Main MOEEBIUS Impact	Targeted Value
Performance Gap Reduction	<10%
Additional MOEEBIUS Quantified Impacts	***Annual Values***
Peak demand reduction	50%
Energy demand reduction	35%
GHG emissions reduction	180.000 Tn CO_2

20 Months in real-life conditions, in different buildings within districts characterized by increased heterogeneity and interaction features and under different environmental, social and cultural contexts in three dispersed geographical areas.

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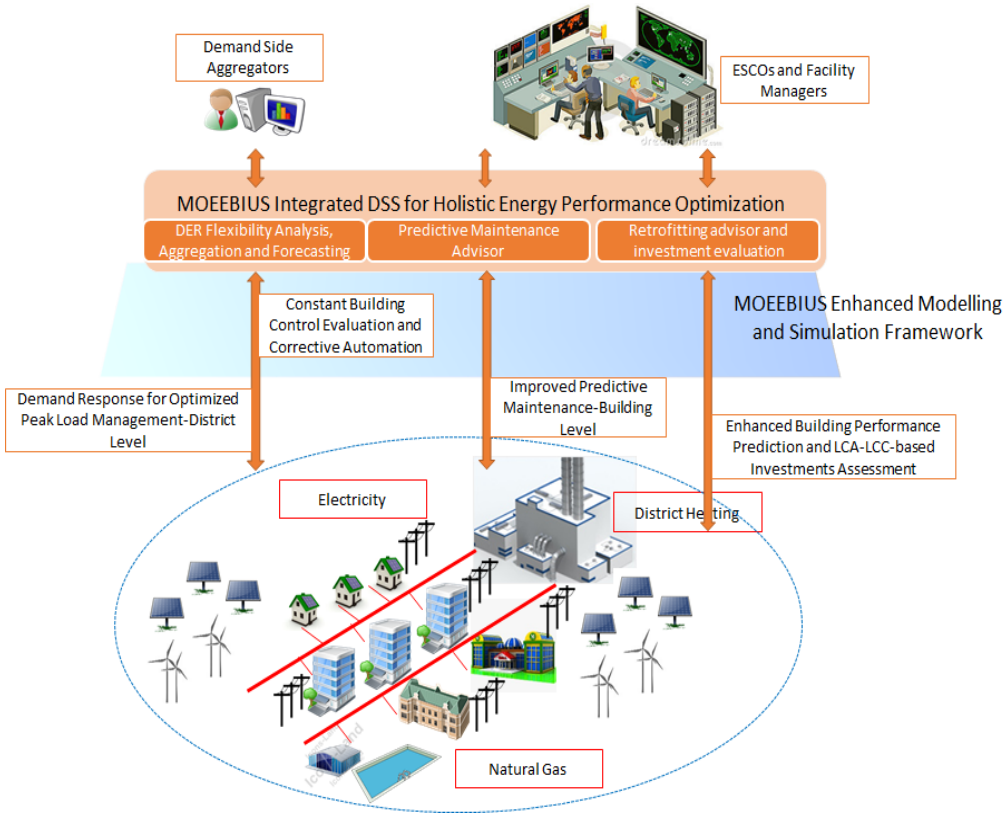
Business opportunities



Through the provision of a robust technological framework MOEEBIUS enables the creation of attractive business opportunities for ESCOs, Aggregators, Maintenance Companies and Facility Managers in evolving and highly competitive energy services markets

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MOEEBIUS Partners

tecnalia Inspiring Business
Honeywell
HYPERTECH energy labs
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INSTITIÚID TEICNEOLAÍOCHTA CHORCAÍ
Solintel
Tyndall National Institute
Institiúid Náisiúnta
almende ORGANIZING NETWORKS
TECHNISCHE HOCHSCHULE NÜRNBERG GEORG SIMON OHM
KiWiPOWER demand management
iSQ
GRINDROP Smart Homes and Living Offices
Beogradske elektrane BELGRADE PUBLIC UTILITY COMPANY
ASM Market Research and Analysis Centre

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