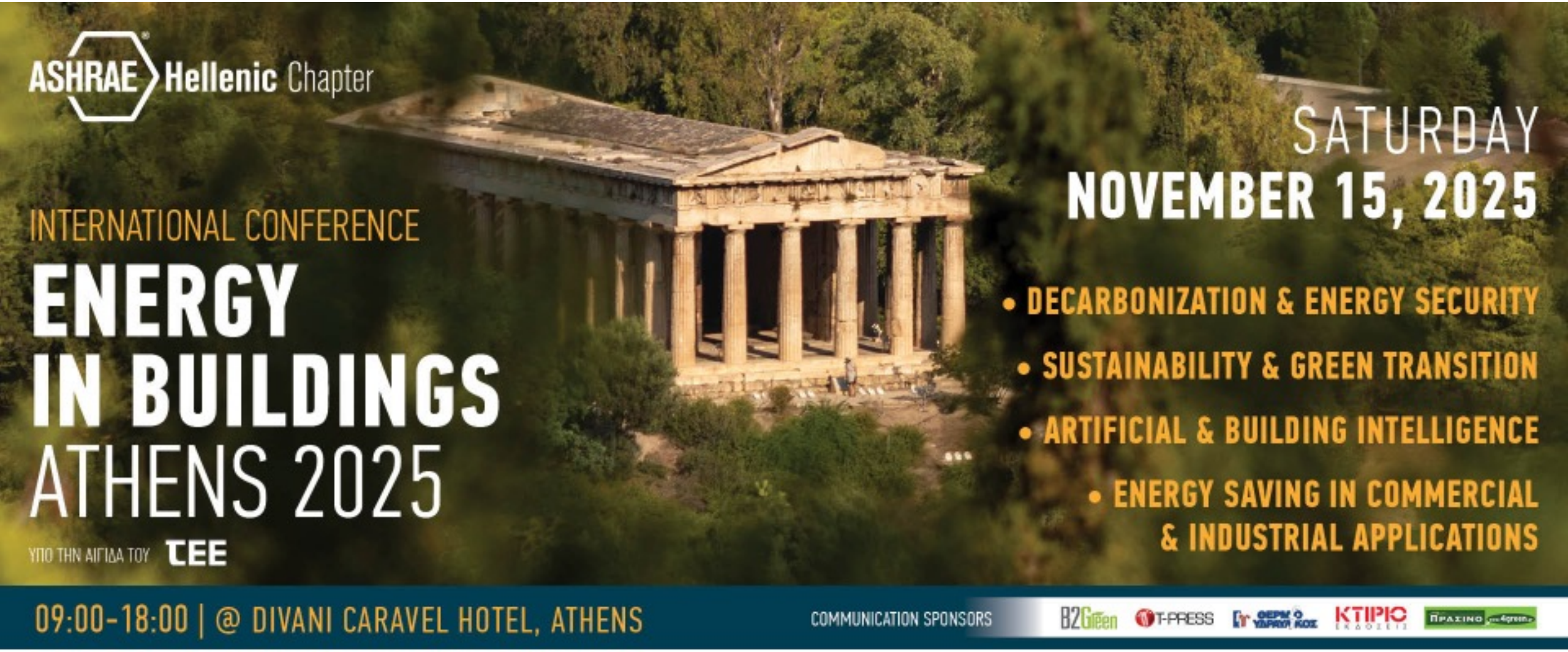


Digital Twins as enablers of a Smarter & Energy Efficient Building Sector

Elissaios Sarmas (EPU-NTUA)

Data & Buildings

- AI-Based Services for finer-grained Energy **Profiling** and **Forecasting**
- Data-driven services for Energy Recourse **Management**
- Data-Driven Energy & Non-Energy Services for **Enhanced Comfort and well-being**
- Data-driven services **for Renovation Roadmaps** and **Energy Efficiency Financing**
- Services supporting Decision-Making under Uncertainty for **Efficient and Climate Resilient Buildings**

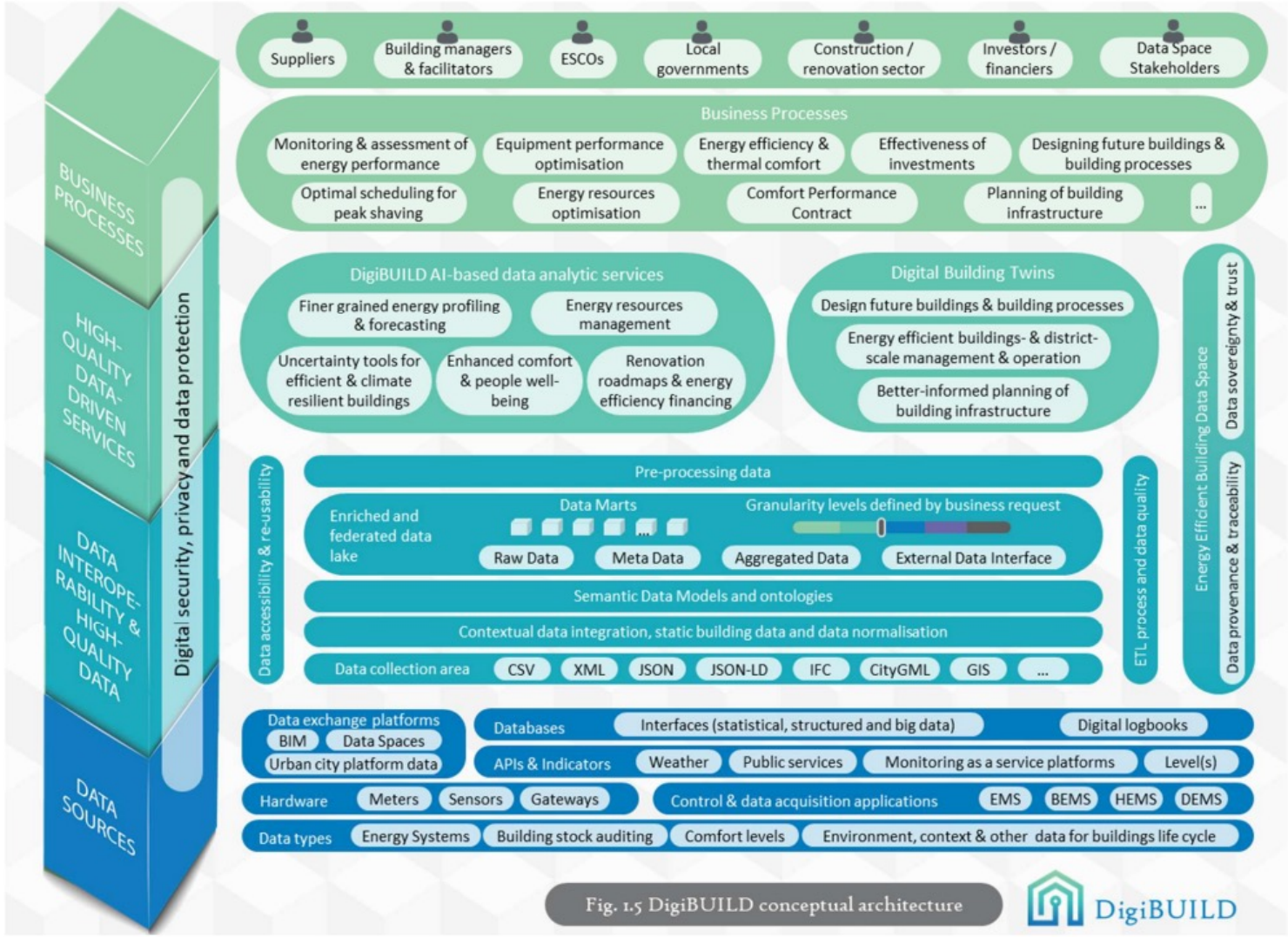


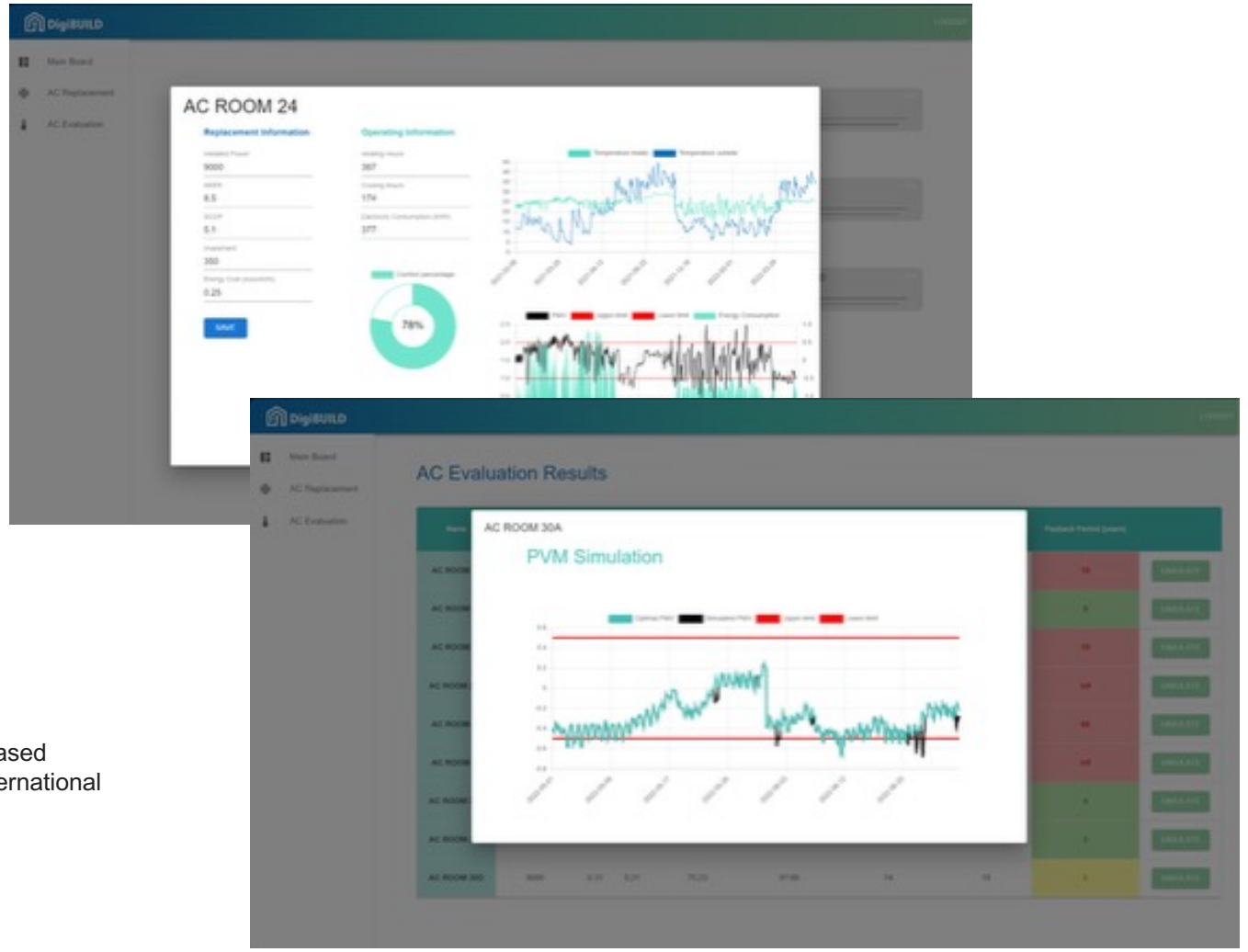
Fig. 1.5 DigiBUILD conceptual architecture

DigiBUILD

Energy Efficiency Performance Benchmarking

HVAC Benchmarking and Units Replacement Recommendations in Office Buildings

- Scalable approach
  - **User-friendly** web-app
  - **Integrated** with the building's BMS
- Monitoring & Benchmarking
  - Models **User behavior** and **occupancy patterns**
  - Real-time data **monitoring** and **visualization**
- Replacements Recommendations
  - **Economic returns** and **energy savings**
  - Used to **replace HVAC equipment** in NTUA

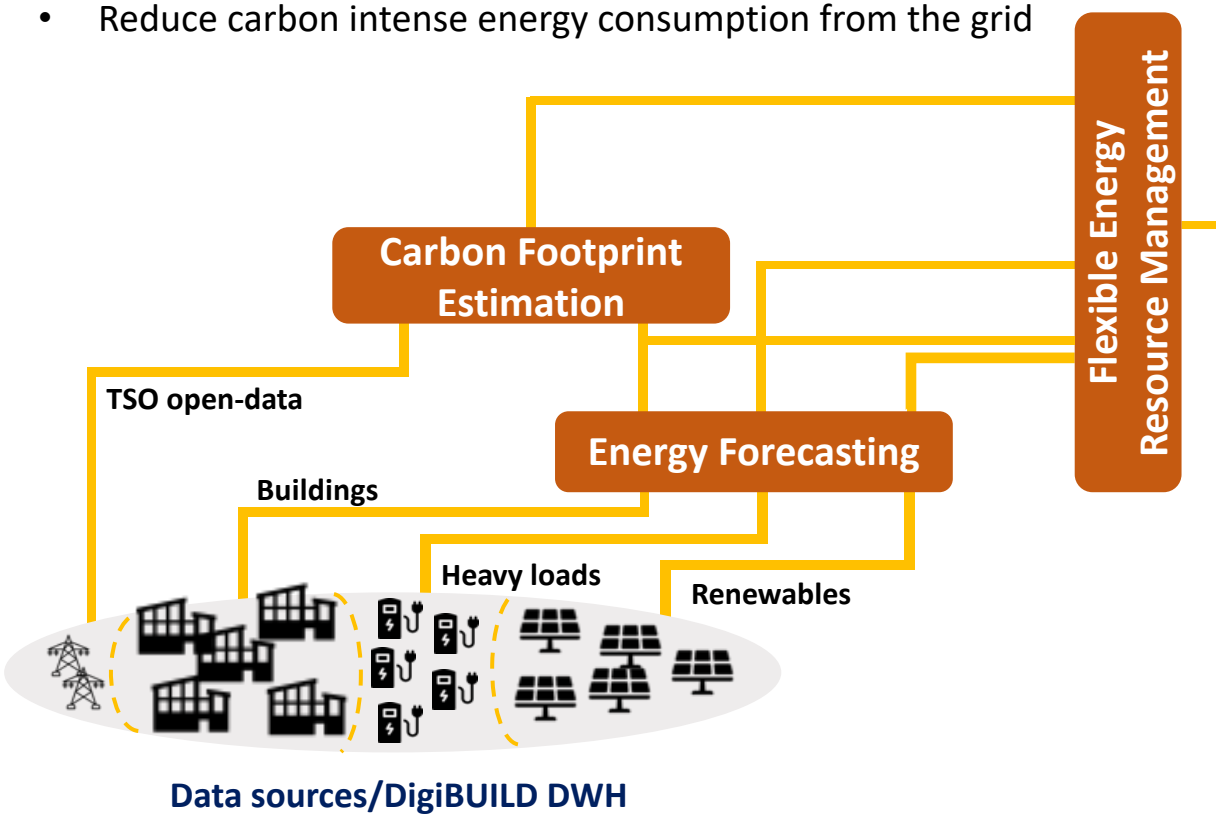


Stoian, D., Spiliotis, E., Stamatopoulos, E., Sarmas, E., & Marinakis, E. (2024, July). A web-based decision support tool for efficiently monitoring and upgrading HVAC systems. In 2024 15th International Conference on Information, Intelligence, Systems & Applications (IISA) (pp. 1-7). IEEE.

Optimal Management of Energy resources in the Built Environment

Towards zero-carbon buildings

- Heterogeneous data sources & Interoperable services
- Multiple AI-based models in action
- Energy grid informed decision support & Increased self-consumption
- Reduce carbon intense energy consumption from the grid



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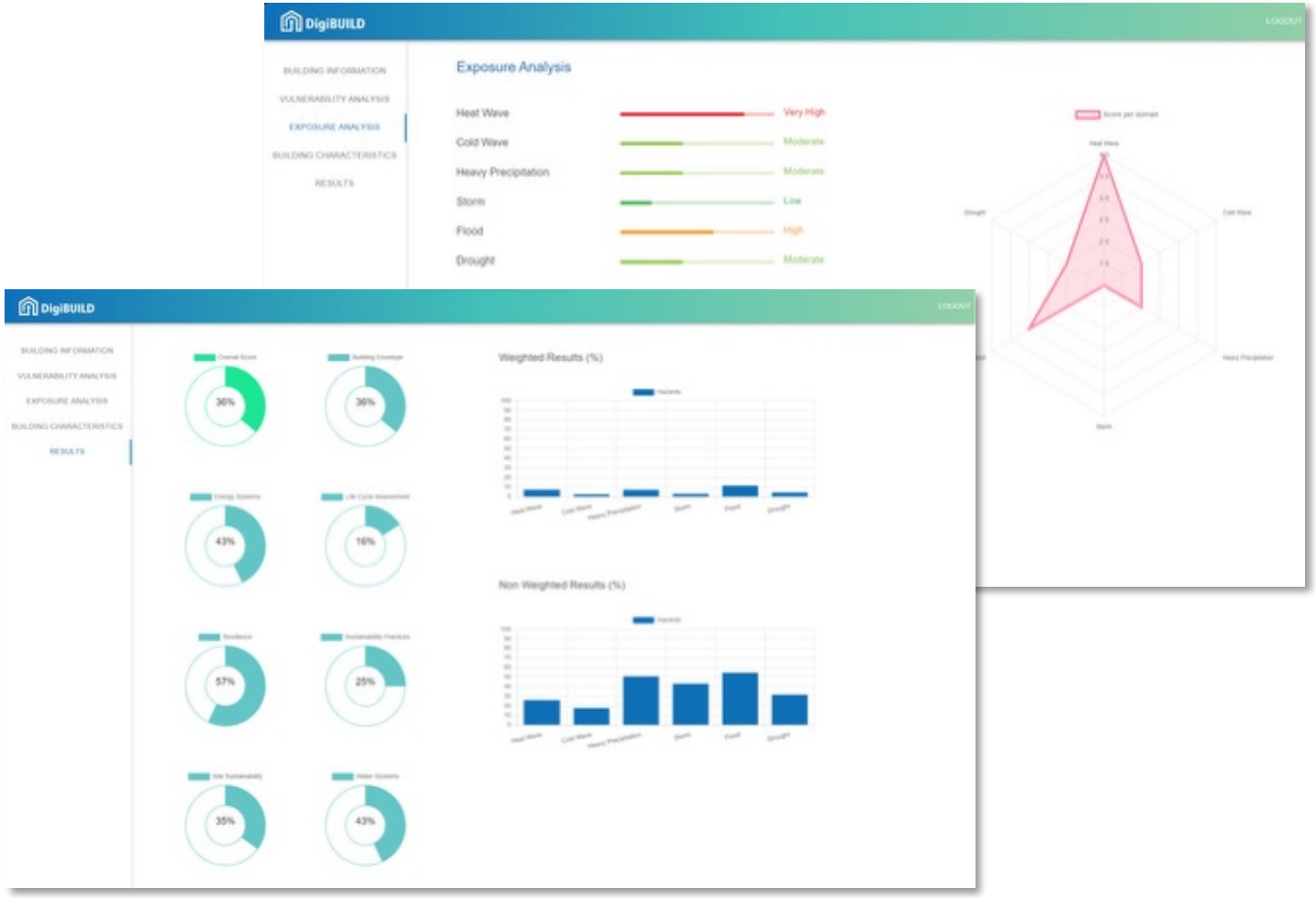
Digital Twin/Facility Manager

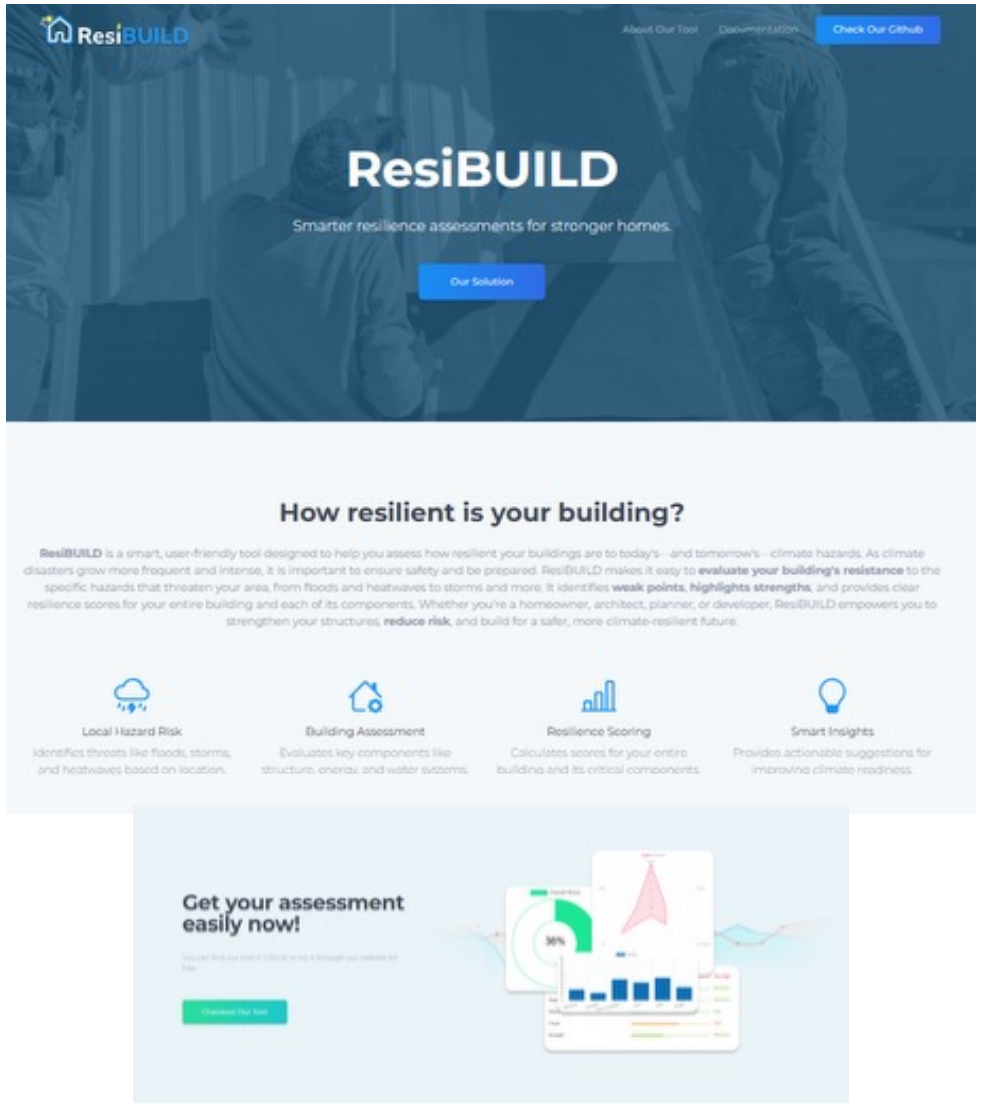
Buildings Climate Resilience Assessment Tool

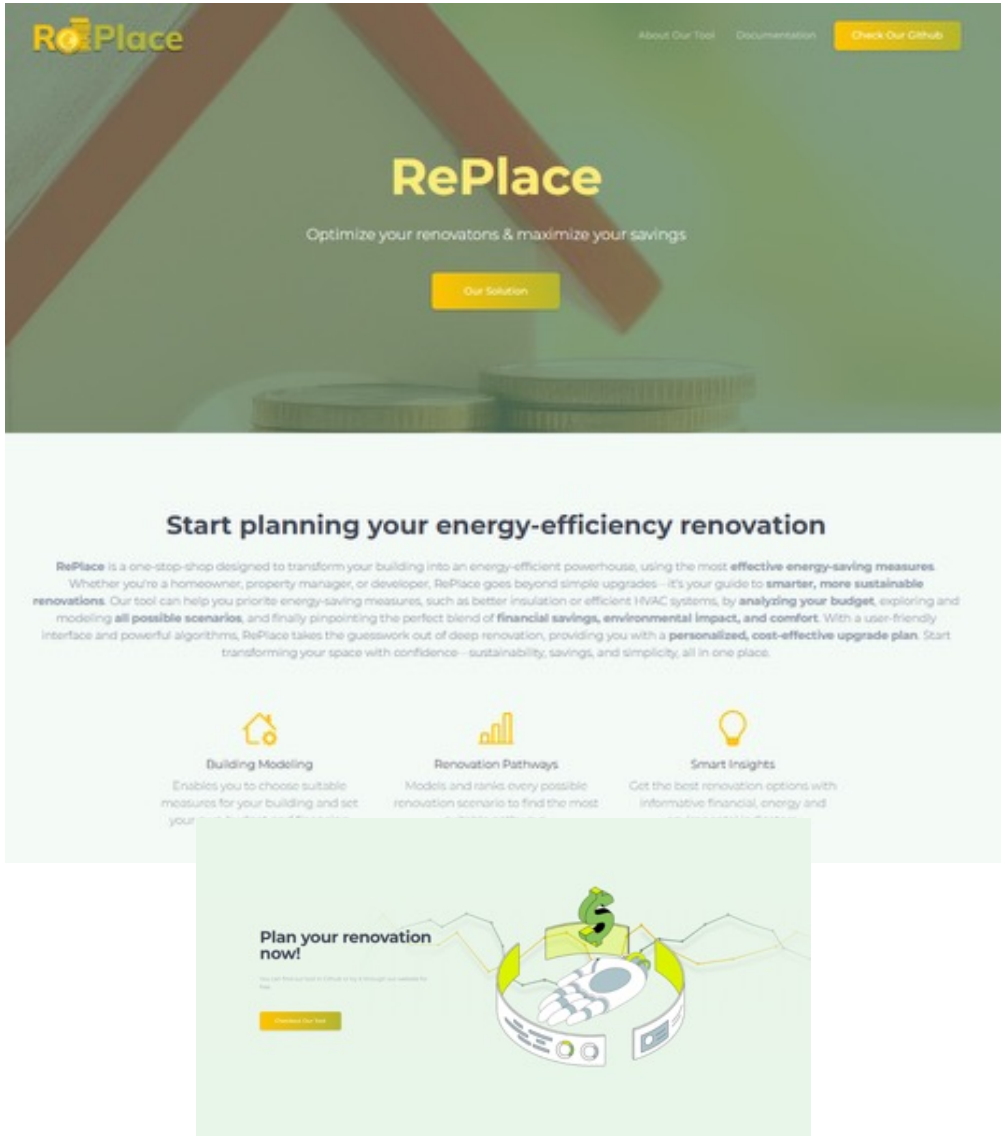
- ✓ Assesses a building's ability to **anticipate, prepare for, respond to, and recover** from climate events.
- ✓ A **dynamic weighting system** based on climate exposure was developed, allowing for **location-specific** resilience **assessments**.
- ✓ Evaluates **vulnerability** in different domains of **buildings' components** (energy systems, building envelope, water systems, etc.)



Stamatopoulos, E., Forouli, A., Stoian, D., Kouloukakis, P., Sarmas, E., & Marinakis, V. (2024). An adaptive framework for assessing climate resilience in buildings. *Building and Environment*, *264*, 111869.

From ready-to-market AI-based services…

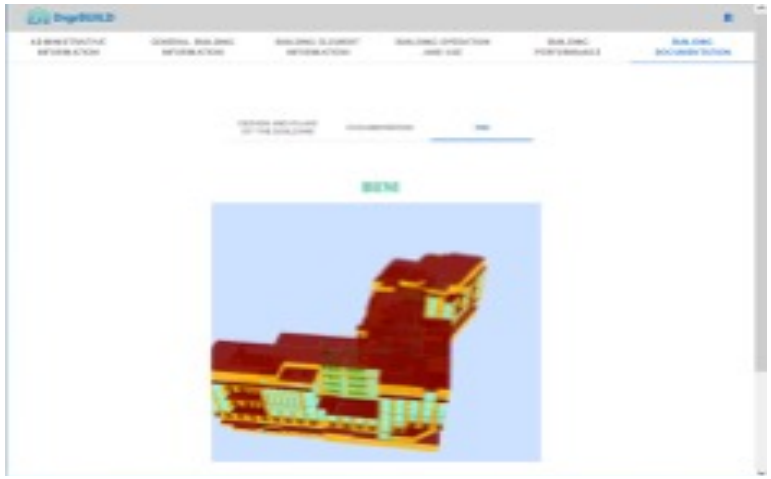




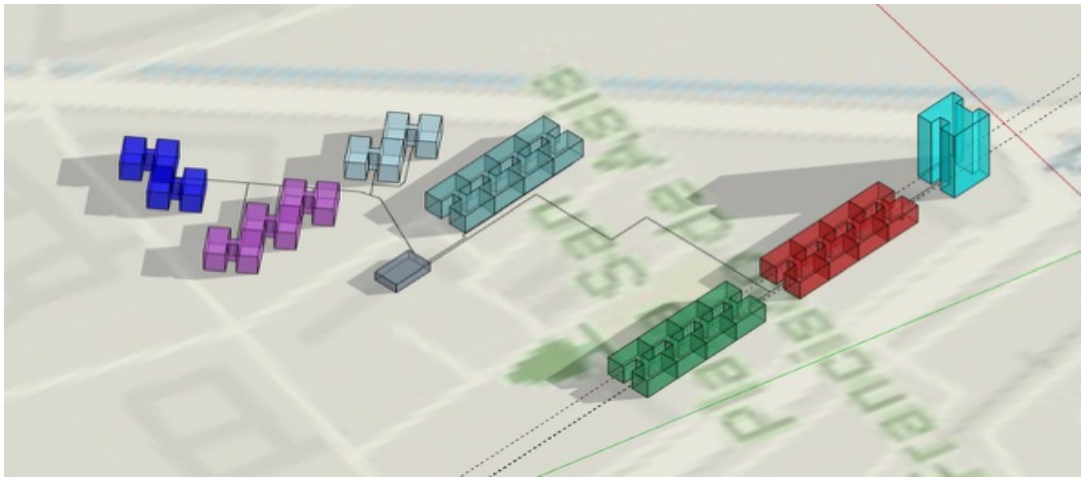
…towards Buildings' Digital Twins & Building Logbooks

Digital Twins for building operation

Digital Twins for energy efficient buildings



Digital Building Logbooks



Digital Twins for scale management and operation

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THANK YOU!
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09:00-18:00 | @ DIVANI CARAVEL HOTEL, ATHENS
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