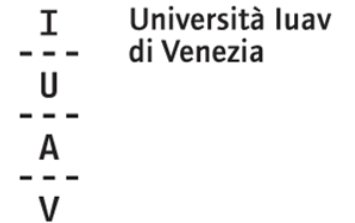


Advanced projects on sustainability: vision, university, research

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Sustainability – Contexts

- Sustainability can be seen from many points of view:
 - Energy/emissions for building design and construction
 - Energy/emissions for building management
 - Efficient management of energy networks/grids
 - Energy/emissions for energy generation
 - Energy/emissions for goods production
 - Energy/emissions for transportation
 - ...

Energy/emissions for building design and construction

- Improved design, via advanced calculation tools, by means of:
 - BIM (Building Information Modeling)
 - Coupling building energy simulations & evolutionary optimization algorithms
 - LCA-based (Life Cycle Analysis) approaches
 - Use of other advanced algorithms, such as ANNs (Artificial Neural Networks), e.g. for empirical modelling, device characterization and cost database sythesis.

Energy/emissions for building management

- Key aspects:
 - Advanced management, through:
 - BIM (Building Information Modeling) and consequent digital twin approach
 - Terrific potential of BMSs (Building Management Systems) and IoT (Internet of Things):
 - Real-time predictive building energy management
 - Fault detection, through application of ANNs and clusterization algorithms

Efficient management of energy networks/grids

■ Smart grids:

- Non-invasive Appliance Load Monitoring, for the identification and categorization of electric appliances → Improvement of the accuracy in electricity use profile prediction
- Control of electric appliances and HVAC (Heating, Ventilation and Air Conditioning) systems, by means of:
 - Dynamic price of electricity and feed-in tariffs
 - Aggregators
 - Remote control of differable electric appliances

Conclusions

- After the improvement of existing building technologies, the building construction sector may still greatly improve thanks to the "digital revolution"
- In particular, the building construction sector will be able to improve its sustainability by taking great advantage from the application of:
 - Digital twin approach (e.g.: BIM)
 - Diffuse sensors/actuators (e.g.: BMSs and IoT)
 - Advanced algorithms (e.g.: evolutionary optimization, ANNs, clustering algorithms,...)
 - Large and concurrent databases (e.g. for LCA and cost assessment)