

BIO4ever project concept to promote the bio-based materials in modern construction sector

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The trend for increase use of novel material solutions at reduced-costs through predictive design of materials and innovative production technologies is observed currently. As a consequence, higher numbers of well performing (also in severe environments) construction materials are available on the market. The expansion of bio-based products availability and its wide utilization in modern buildings is a derivative of the Europe 2020 strategies. As a result it is estimated that bio-materials will play progressively more significant role in the future, in order to assure the full sustainability of the construction sector.

The goal of BIO4ever project is to take an advantage of the exchange between different scientific disciplines, such as material sciences, wood technology, biology, building physics, engineering, architecture and information technology (IT), in order to demonstrate advantages of emerging bio-based building materials.

Today's bio-based building materials, even if well characterized from the technical point of view, are often lacking of reliable models describing their performance during service life. The challenge is therefore to co-involve physics, chemistry and mathematics, as well as psychology and customer preference research in order to extend the length and time scales to which available models can be usable.

The project embraces a number of aspects such as:

- design and management of buildings and constructed assets

- proper choice of materials
- efficient energy use
- the physical, functional and aesthetical performances of building materials
- interaction with the urban and economic development and management.

The intention is to promote use of bio-materials in modern construction by understanding and modelling its performance as function of time and weathering conditions and to identify most sustainable treatments of bio-material residues at the end of life, improving even more their environmental impact.

Three different approaches are used for samples degradation:

- natural weathering of bio-materials on the living laboratory - structure designed by Renzo Piano and installed at CNR-IVALSA (San Michele All'Adige, ITALY); samples will be exposed for different weathering doses/periods and characterized in the laboratory (2 replicates/biomaterial/cycle)
- natural weathering of bio-materials on the robotized stand, (South exposure, 45° inclination); samples will be automatically characterized daily with a multi sensor scanner installed on the stand (3 replicates/bio-material)
- artificial weathering tests: SUN-test, QUV and custom weathering machine (3 replicates/bio-material/test)

The output of the research will be tested with new generation of low-cost reconstruction and interaction tools developed within c-Space project. The digital models will be used for scientific visualization, controlling and monitoring of material deterioration on the building facades and for simulation and validation of the system. The tool developed within both projects will be dedicated for investors, architects, construction engineers, professional builders, suppliers and other relevant parties, including also final customers.

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