

HORIZON
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Africa-Europe BioClimatic buildings for XXI century

Rapports

Informations projet

ABC 21

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[Site Web du projet](#)

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Résumé du contexte et des objectifs généraux du projet



Europe and Africa are both facing challenges in the building construction and housing sector. Europe is struggling with an aging building stock, whose rapid and radical transformation is needed to meet the goals of reducing energy needs and protecting the climate. African countries are facing an acute housing shortage, with the continent's population projected to double by 2050, problematic access to

efficient use of clean energy for achieving thermal comfort and for cooking, and the fastest urbanization rate in the world.

Various forms of climate disruption and prolonged heat waves are affecting the planet. New constructions and retrofit interventions should be designed following concepts that will make buildings robust against expected climatic changes during their lifetime, the next 50 to 100 years.

Bioclimatic architecture and passive systems coupled with the use of bio- or geo-sourced local building materials offer a feasible and effective response to the above threats.

An adapted institutional and training framework might be a key to a faster revival and update of those approaches. Further, continuous development of simple to use, open access software focused on passive design can bring new support to pre-design and design-phase predictions of bioclimatic building performance.

ABC 21 has pursued the following four interconnected objectives:

- (1) Identify and document African and European affordable bioclimatic designs and bio- and geo-based materials with low embedded energy; document existing manufacturing of those materials
- (2) Perform exchange activities for policy makers on low-cost and effective bioclimatic construction;
- (3) Document and promote innovation on state-of-the-art surface finishings, future weather files, design techniques and software tools adapted to the new and changing climate conditions and the new knowledge about thermal comfort, also codified in recent modification of Comfort Standards.

Travail effectué depuis le début du projet jusqu'à la fin de la période considérée dans le rapport et principaux résultats atteints jusqu'à présent ▼

The consortium partners have collected a great deal of information about the regulatory and policy framework regarding potential support of bioclimatic design and training infrastructure. The project has also investigated bio- or geo- based and with low embedded energy. These findings are presented in a series of public reports (D2.1 D2.2 D2.3 D2.4 and D3.7).

A series of reports were published detailing concepts and definitions about energy performance, indoor environmental quality and energy flexibility in buildings.

D3.1 presents a critical review of the literature and international standards to identify suitable KPIs that can be used to assess the energy performance of bioclimatic buildings.

D3.2 provides a clear framework about the available methodologies, standards, tools and indicators to evaluate thermal, acoustic, visual comfort and air quality, up to date with the recent progress in

thermal comfort models, with e.g. the introduction of the “Elevated Air Speed Comfort Zone Method” and “Adaptive model”.

D3.3 explores the topic of building energy flexibility with a focus on warm climates.

24 case studies in Africa and Europe have been selected and analyzed to document existing experiences of bioclimatic design. They are collected in D3.8 and D3.9 along with technical and design aspects and energy and comfort performance characterization.

The study of future weather is addressed in reports D3.4 and D3.5. as an urgently needed ingredient for designing buildings and solutions that will be resilient to global warming and higher frequency of extreme events.

D3.11 is based on the overall work performed in the project. Taking into account a review of pre-existing manuals, it attempts to produce design guidelines and tools updated to take into account the change in weather patterns, the availability of totally new materials such as surfaces for daytime radiation to the sky, the improvements in the manufacturing process and performances of bio- and geo- based materials, the new knowledge gained in terms of modeling thermal comfort and its recent incorporation in international standards such as EN 16798: 2017 and ASHRAE 55: 2020, the experiences in the application of passive techniques also to tall buildings.

A preexisting book and MOOC have been substantially updated and are freely available.

During COP26 and COP 27, we have participated to various side-events presenting the technical aspects of local materials for buildings, climate adaptation, and summer comfort. We also have participated to the organization of a “One-health” conference during the pre-COP in Milano. A final conference has been organized in Morocco, attracting students, building designers, practitioners, policymakers.

The work developed during the project and the call for papers for the conference have led to the publication of more than 15 academic papers, on journal and conference proceedings.

Progrès au-delà de l'état des connaissances et impact potentiel prévu (y compris l'impact socio-économique et les conséquences sociétales plus larges du projet jusqu'à présent)

With the goal of making buildings robust against expected climatic changes during their lifetime, ABC 21 has developed, using state-of-the-art morphing methodologies and the latest available results from regional climate models, a database of future weather files for selected locations in West Africa and Europe for the periods 2040-2060 and 2080-2100. The future weather files are freely available.

ABC 21 guidelines also analyze the features and discuss the applicability of newly developed surface finishings that are able, even when irradiated by the sun, to export energy to the deep sky and remain at a temperature lower than that of surrounding air.

Moreover, the measurements, within ABC21, of indoor parameters and the post occupancy evaluations in selected bioclimatic buildings in Africa provide valuable feedback about actual indoor thermal comfort. Data on actual performance of buildings are overall scarce in Europe and often just missing in some African countries.

We have set up a dedicated website, which is easy to navigate and load (especially in low-speed internet areas) and we are active on social media (LinkedIn and Twitter) and web platforms such as BuildUp. The partners have been actively participating to workshop, conferences and international events organized by other entities, to present the work developed and findings.

Overall, the project will contribute significantly to increased use of adequate locally adapted bioclimatic approaches and passive systems by providing updated state of the art information on the best technologies and design methods.

Even if this project was not aimed at directly generating new bioclimatic buildings construction during its two years duration, it aims at a very large impact via the designers and investors which can be inspired and informed by the project communication and training tools. The goal is to contribute to creating the conditions for a wave of policy initiatives involving the nations that are partners of ABC 21, the nations inspired by UN-Habitat forums, and the nations influenced by our allies.

At the same time the lessons learned by the pioneering work in N-W Africa on development of techniques and certification for geo and bio sourced materials could help Europe to retrofit its aging building stock without a high burden in terms of embodied energy. This is particularly relevant since we must reduce emission very rapidly in the next three decades and the construction and renovation activities themselves are presently very energy intensive.



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