PROJECT FACTSHEET

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DAEDALUS

Developing an integrated geospatial approach for dynamic Life Cycle Assessment of housing stock retrofit at the urban scale

Inspiration

Buildings are responsible for 40% of the final energy consumption and a large part of the greenhouse gas emissions within the European Union. Thus, the potential for energy savings and environmental impact reduction in this sector has been identified as one of the most significant. Local public authorities play an important role in this respect by setting environmental targets and developing renovation plans. However, their capacity to plan and implement sustainable policies is limited by the lack of integrated approaches to broadly assess the effect of building renovation measures, such as building insulation or heating system replacement, on energy savings and environmental impact reduction.

Life Cycle Assessment has been broadly used to evaluate the environmental performance of buildings by encompassing all life-cycle stages, from the extraction of raw materials and construction to the building use, maintenance and final disposal. Whilst the implementation of retrofit measures for buildings at the urban scale has become a prominent topic of scientific interest, there are still some existing hurdles for the application of Life Cycle Assessment (LCA) and in particular for a proper consideration of spatial-temporal aspects. A shift to Dynamic Life Cycle Assessment (DLCA) has been suggested to account for temporal variation, however this approach has never been applied at the urban scale.

INNOVATION

DAEDALUS is a postdoc project AFR financed by the Fonds National de la Recherche Luxembourg (FNR). The objective of DAEDALUS is to evaluate the effect of distributed retrofitting of buildings on their environmental impact at the urban scale. To this goal an innovative approach integrating DLCA, energy demand modelling and Geospatial Information Systems (GIS) will be developed. The Luxembourg context is relevant to this topic and will provide the test site for the case study.

A GIS database for the residential buildings of an entire municipality will be generated combining geo-referenced information on geometry, materials, technological systems and building usage. The energy demand will be calculated for every building implementing an automated energy model. The information about materials, operations and energy use will then lead to identify the Life Cycle Inventory and the environmental burdens associated to the building stock. Finally, DLCA will be performed to evaluate the environmental impact reduction driven by several retrofit policy scenarios. The whole methodology will be implemented into the web-based platform iGUESS, developed at LIST to support sustainable urban planning.

Impact

The project will contribute to advance the current environmental assessments of building stocks, where a LCA perspective is rarely taken into account to predict energy and environmental impacts. Modelling the dynamics of retrofit over time and space will improve the accuracy of the prediction, allowing public authorities to better assess the effect of policies over a temporal horizon.

The major expected outcome of the project is a tool to estimate the energy savings and environmental impact reduction of the residential sector at the urban scale to support decision on sustainable policy.

Partners
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