PROJECT FACTSHEET

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SemanticLCA

A new value proposition in the life cycle assessment of buildings and districts, that factors in multi-aspects real-time data to attenuate the environmental impacts of our built environment.

INSPIRATION

While the population of cities is predicted to grow to 68% by 2050, cities are currently responsible for 75% of global energy consumption and greenhouse gas (GHG) emissions, with over 40% of total energy consumption attributed to buildings. Moreover, the building sector is recognised as a key consumer of natural resources, also responsible for one-third of European waste and 22% of European hazardous waste production.

Our vision is that humans can attenuate and control positively the impact of their buildings on the environment and mitigate the effects of climate change. This can be achieved by a new generation of life cycle assessment methods and tools that are model-based (based on BIM), continuously learn from real-time data, while informing effective operation and management strategies of buildings and districts.

INNOVATION

The research project addresses the challenge of leveraging digital built environment resources, including Semantics (BIM, GIS), Internet of Things, and Artificial Intelligence to deliver life cycle assessment solutions to our built assets. The overarching hypothesis is that: life cycle assessment underpinned by semantics (beyond BIM) and informed by dynamic data paves the way to more accurate life cycle impact assessment while supporting life cycle decision making and active control of buildings and districts.

The consideration of the time dimension in product system modelling is becoming essential to understand the resulting pollutant emissions and resource consumption. A further combination of Life Cycle Impact Assessment (LCIA) models using time-dependent characterisation factors can, therefore, lead to more comprehensive and reliable LCA results. Thus, SemanticLCA proposes the concept of semantic-based real-time LCA which addresses temporal and spatial variations in the local built and environmental ecosystem, and thus promotes more effectively a ‘cradle-to-grave’ environmental sustainability capability”.

IMPACT

LCA is an important instrument to help reduce the overall environmental burden of our buildings and provide insights into upstream and downstream trade-offs associated with environmental pressures, health & wellbeing, and the consumption of natural resources. As such, LCA can inform policy-making by providing valuable information on environmental performance of our built assets.

Driven by two complementary teams of recognized researchers, namely from Cardiff University and LIST, SemanticLCA will be one of the first projects to leverage building to district semantics to streamline LCA and devise corrective actions, informed by real-time data. Moreover, the team will use machine learning to address data incompleteness and uncertainty as well as delivering actionable plans to manage the life cycle assessment of buildings and districts.

Partners

Cardiff University (UK)

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Contact

5, avenue des Hauts-Fourneaux
L-4362 Esch-sur-Alzette
phone: +352 275 888 - 1 | LIST.lu

Enrico BENETTO (enrico.benetto@list.lu)
Sylvain KUBICKI (sylvain.kubicki@list.lu)

LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY | LIST