# Modeling platform shows environmental impact of retrofitted buildings

April 1 2015

A new modelling platform can create scenarios designed to show the environmental impact of retrofitted buildings. It also helps calculate the expected reductions in energy consumption and the related costs of refurbishing. This is possible thanks to a web platform called Epesus, developed by the Turkish environmental engineering consultancy Ekodenge, based in Ankara. The consultancy is also one of the partners in the European project R2Cities.

Emre Yöntem, project manager with expertise in energy modelling and data management at Ekodenge, explains how the return on investments can be achieved through energy savings in the long run.

## What innovation brings your team in the construction industry?

Under this project, our team is working on its capabilities to study the district areas and has embedded the Life Cycle Assessment (LCA) and Life Cycle Cost (LCC) analysis methods. LCA comprises all the life cycle phases of a product, from the acquisition of the raw materials to the waste phase. It assesses its environmental impact. In a similar way, the LCC analyses the cost of a product. We do these calculations with specific software tools. LCA is compulsory under recent international green building certification systems. To be more specific, the green certification system uses a database of construction materials and their environmental scores provided by Life Cycle Assessment. Only the use

of those materials is allowed, in order for such a certificate to be issued. Future sustainable cities and buildings definitely need to focus on LCA scores. The Epesus platform we developed makes it possible, to compile the life cycle inventories in retrofitted buildings. Specifically, we can thus analyse the cost of the materials used in the retrofitting works. And it also helps make hourly simulations of the energy demand of the refurbished building. By making possible to analyse different kinds of retrofitting approaches at the preliminary stages of the project, they help the project owner to select the scenario that fits his needs and budget. It is in fact the approach of the urban methodology concept, which is implemented in smart, green cities.

## What is the potential benefit of an LCA before starting a retrofitting work?

It is possible to show that the complete cost of the refurbishing work could be lower than for other constructions, if specific materials are used. It is like evaluating the cost of leasing an expensive car. The purchasing price can be high, but this car provides better returns over time than a cheaper one because of its longer and more efficient life cycle. At city level, an LCA can show that a building can have less carbon emissions and healthier indoor air quality, despite a high construction cost at the beginning of its life cycle. So, the tools helps the decision makers to quantify these benefits within the first 60 years of the life of the building, including its possible demolishing and waste treatment phases.

## What is unique about your approach?

By adding to our evaluation model data other than traditional LCA, we provide holistic analysis of the cost of the ownership of the building throughout 60 years. For example, we account for the raw materials used

for retrofitting work; not only do they provide energy savings when the building is in use, but also the cost savings at the final demolition and waste treatment phase. Besides, the material inventories include information about the embedded energy or carbon dioxide. We also add the unit cost of all those materials, which we analyse as material flows in the city ecosystem. But the real novelty of our LCA methodology consists of adding a dynamic structure to the data. Instead of using the average energy consumption value for an average building, we run simulations based on real-life data and make incremental calculations. We use the data from the location of the site. For example, we use a different energy mix, because the energy mix in Turkey is different from that in a Scandinavian country, for instance. We take into account the type of the energy, whether it is hydraulic, fossil fuel or renewable etc.

## When will the project's retrofitted showcase building in Istanbul reach its target 60 percent energy savings?

In most cases, whether they are a residential or social housing building or even an office, retrofitted buildings perform the least well in their first year after commissioning. This is because such buildings need to be optimised. And the occupants need to change behaviour. When we talk about energy savings in buildings, the behaviour of the dwellers is very important. Indeed, the building can be very energy efficient, but if the inhabitants want to have 27 degrees indoors during winter or even open windows, the building will no longer be energy efficient. Instead, the residents are expected to accommodate with certain comfort standards; for example, 21 degrees in Southern countries and 18 degrees in Northern countries. Normally, a mechanical system provides the comfort temperature and also a healthy environmental indoor air quality standard. Besides, our project showcase building in Istanbul is a social house for old people. It has only one year monitoring phase, which is not the time

of its highest performance. They are not permanent inhabitants, and they have a changing behaviour. Our project team hopes to cope well with this risk by maintaining a very close relationship with the buildings occupants and operators to maximise the first year performance.

Provided by Youris.com