

Actual Energy Performance of a Zero-Carbon Neighbourhood

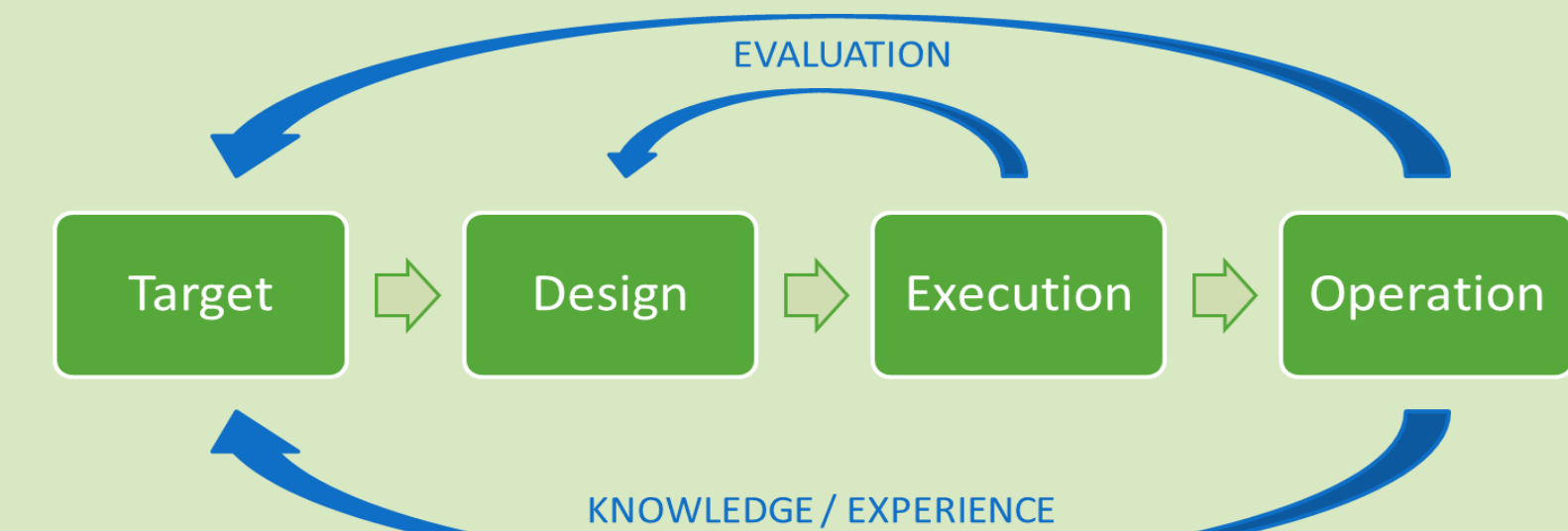
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ECO-Life

The evolution towards zero-energy buildings and districts brings along uncertainties about the **operational performance, strengths and weaknesses** of these technologies, that are often new and unfamiliar to both the designers, owners and users. In Kortrijk, an **exemplary zero-carbon neighbourhood** is designed, built and evaluated in the framework of a European demonstration project *ECO-Life 'Sustainable zero-carbon ECO-town developments improving quality of life across EU'*. The neighbourhood counts about 200 dwellings in highly energy-efficient buildings with different ventilation technologies and collective RES based on solar, biomass or aero-thermal energy. During the building process and the first years of operation, the energy performance of the neighbourhood is evaluated after intensive **monitoring and testing** by Ghent University's research group of building physics, construction and services. This paper presents two focal points of the research: the **energy demand** of the buildings and the **interaction with the occupants**, and the energy performance of the neighbourhoods **low-temperature district heating** system.

Modelling & Monitoring

The quality of the buildings and services is controlled during the building process by use of quality assurance tests such as blower door, thermography, duct leakage tests etc. The buildings and systems are equipped with meters and sensors to enable an intensive long-term monitoring of the energy and energy-related parameters and personalised energy feedback to the users and managers. During the first years of occupancy the monitoring is assisted by short-term measurements and surveys of the occupants. Specific parts of the buildings and the district heating system are simulated using dynamic models, to support the investigation of the observations.



Energy use & Feedback

On one hand of the zero-carbon balance is the energy demand in the neighbourhood for various energy uses such as heating of the buildings, hot tapwater, lighting... Knowing that the gap between the theoretical and actual energy demand can be large, the **actual energy demand** is investigated and the main **building and behavioural parameters** influencing this gap. Are the **building technologies** working properly and are they understood, accepted and well-operated by the users? For example the strengths and weaknesses of different **ventilation system** types are observed in terms of indoor air quality, user behaviour, energy use, comfort, robustness and maintenance. Since buildings use energy due to the people using them, the effects of active **energy feedback** are investigated, to inform and activate people about their energy use.



District heating & RES

On the other hand of the zero-carbon balance is the RES. The renewable energy production and the **temporal balance** between the energy demand and supply are mapped. Since in low-energy buildings the hot water demand becomes as important as the space heating demand, **heat load curves** are a useful outcome. A point of interest is the performance of the low-temperature district heating system: how high are the actual distribution heat losses? is the required temperature available in the individual dwelling? what are the strengths and weaknesses of this technology? can the control of the network be optimised?

