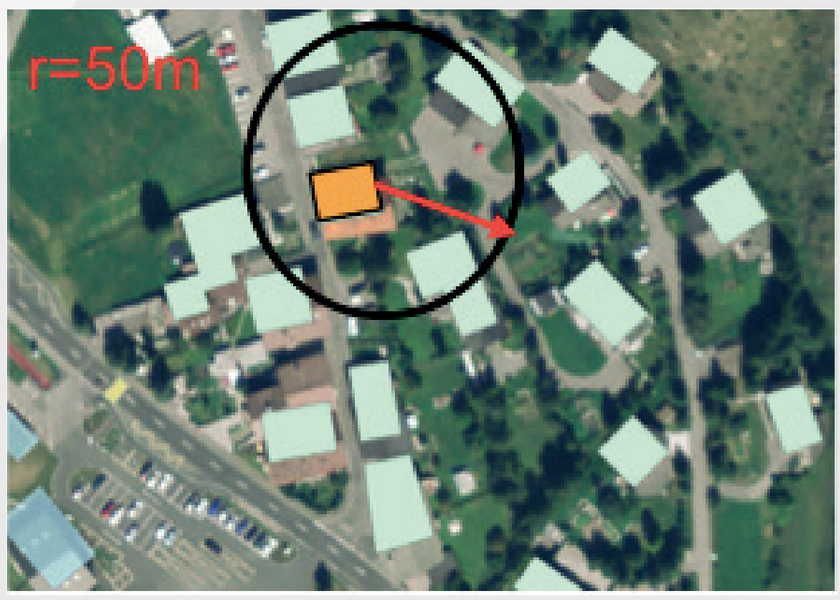
BUILDING AND URBAN ENERGY

DYNAMIC URBAN ENERGY DEMAND MODELLING AND SIMULATION INTERFACE TO ASSESS BUILDING RETROFITTING ALTERNATIVES IN SWITZERLAND

APPROACH

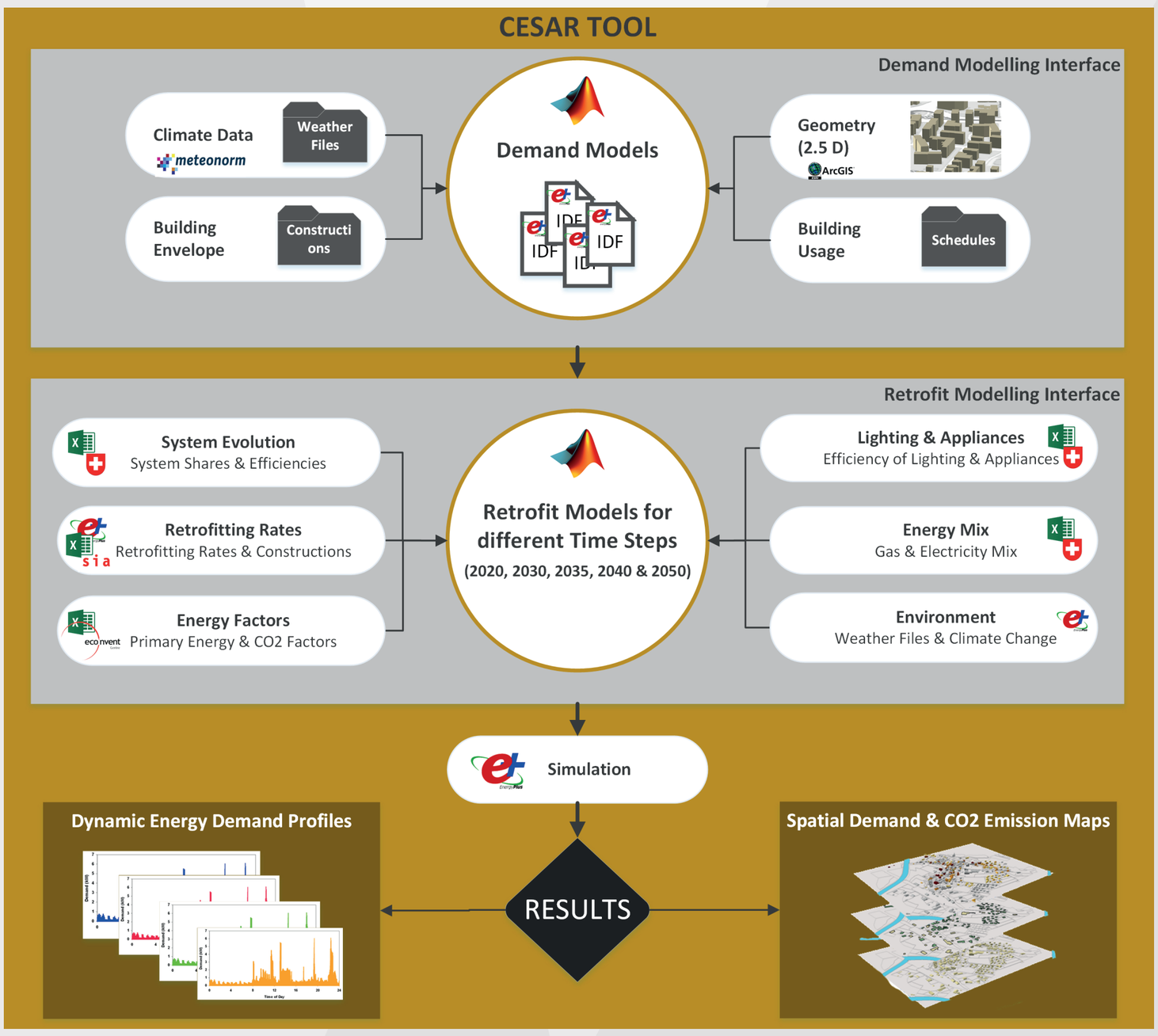
An automated tool called the “Combined Energy Simulation and Retrofitting-[CESAR]-Tool” is developed in Matlab. CESAR is mainly composed of two interfaces: Demand Modelling Interface and Retrofitting Modelling Interface.
The demand modeling interface employs the EnergyPlus dynamic simulation tool for urban scale building energy modelling and simulation. The method is based on an automated process which can use building 3D geo data and available building characteristics to generate bottom up building energy models at a large scale.
For each individual building, two major categories of building information are accounted for and represented.
The tool can be used to evaluate different retrofitting strategies and climate scenarios, in order to support decision makers for future energy policy plans.



2D Footprint of center Building Bi and neighbouring buildings Bi+n

MOTIVATION AND PROJECT GOAL

The goal is to have better knowledge of the current building energy profiles and to address future energy saving potentials and CO_2 emissions reductions by assessing retrofitting strategies at a large scale in Switzerland.

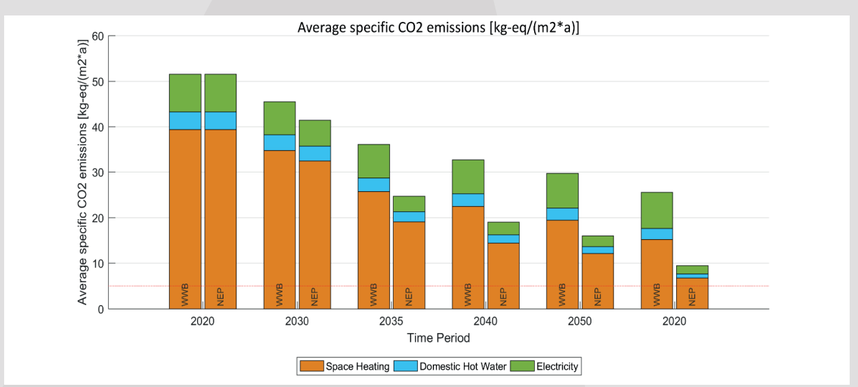


CESAR TOOL Flowchart

CASE STUDY

Zurich Altstetten: apply retrofitting strategies to a case district

The demand modelling interface is applied to a district in Zurich consisting of 100 residential buildings covering a variety of age categories.



Average specific CO_2 emissions. The red dotted line represents the 2000 Watts society target of yearly emissions of 5 kg/m² for the operation of the building. The NEP scenario has a significantly higher impact on the reduction of energy consumption and emissions.

Perceptuel reduction in primary energy consumption in 2050 compared to status quo (2015) on building level for the two scenarios WWB and NEP. In the NEP scenario, the majority of buildings could reach the targets of the 2000 Watts society.

Zernez

Urban scale heat map representing space heating and domestic hot water demand for typical summer and winter months in a small village in Switzerland

January *April* *August*

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