The project is connected to the Long Term Energy Research Strategy (EOS-LT) project, Climate Adaptive Glastuinbouw: Inverse Modelling (CAGIM).

Technische Universiteit Eindhoven University of Technology

Inverse Modeling for Design & Operation :

Low-e Climate Adaptive Greenhouses

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Sponsor	Agentschap NL, Ministerie van Economische Zaken, Landbouw en Innovatie

Subject

The project is connected to the long term energy research strategy (EOS-LT) project, climate adaptive glastuinbouw: inverse modelling (CAGIM). The ultimate goal of the EOS-LT project CAGIM is to deliver a substantial contribution towards meeting the targets that are set out in energy transition paths for the horticultural sector. This will be achieved by developing innovative greenhouse concepts with adaptable properties via an inverse modeling approach (IMA) that aims at maximizing energy efficiency while also respecting optimal growing conditions for crops.

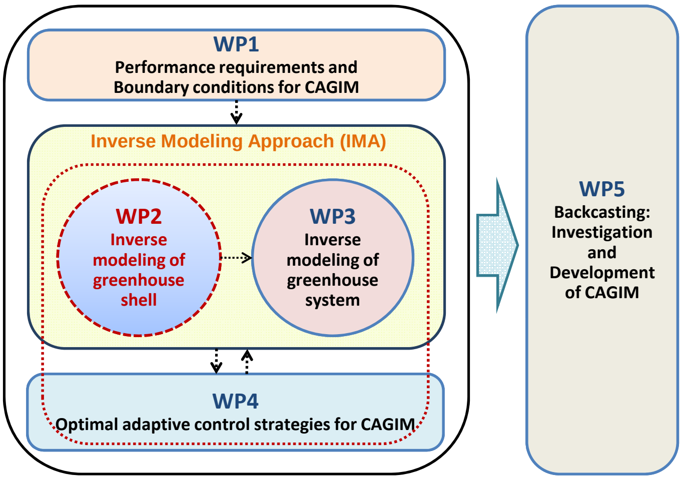

Figure 1. *Overview of the CAGIM project.*
*(**Partner - WP1:** Wageningen University, **WP2:** TU/e, **WP3:** Hague University, **WP4:** TNO, **WP5:** The Hague University, **Participant :** Kenlog, TU Delft, Priva)*

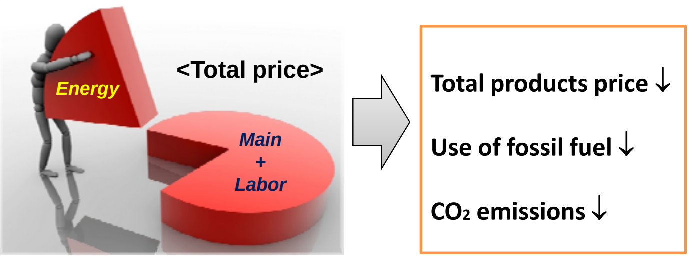

Figure 2. *Ultimate goal of CAGIM project.*

Objective

The objective of this study is to determine the optimal dynamic thermophysical and optical properties of the greenhouse shell and optimal operational strategies of mechanical systems, by taking into account the changing climatological boundary conditions and variable performance requirements.

Methodology

The project starts with establishing the performance requirements (growing conditions for crops), boundary conditions and most significant parameters of the shell, which together serve as input for IMA. Each adaptation will be made, based on the present state and future desired state of the building, disturbances in boundary conditions and dynamic performance constraints. The determination of the best possible solution for a certain time-slot will be based on a process called multi-objective time-horizon optimization in combination with risk vs. opportunity assessment methods. In a subsequent step, the energy-supply side of the greenhouse will be introduced in IMA to be able to optimize the energy chain of the greenhouse as a whole.

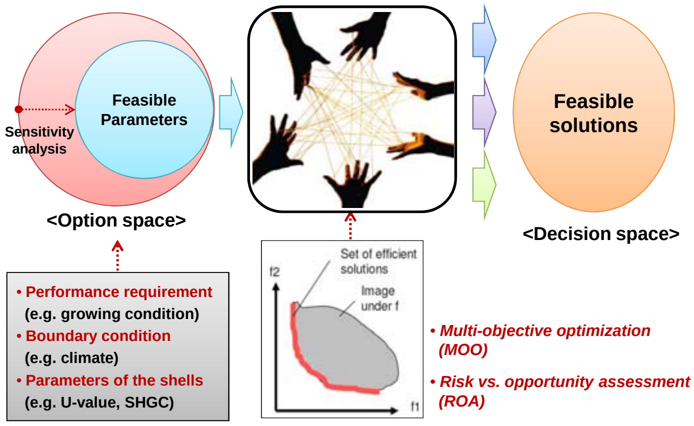

Figure 3. *Overall envisaged approach.*

Expected result

- Feasible parameters for greenhouse shell and mechanical systems.
- Optimal optical and thermophysical greenhouse shell and optimal mechanical systems at each time-horizon.
- The set of feasible solutions for the each performance requirement and boundary condition.

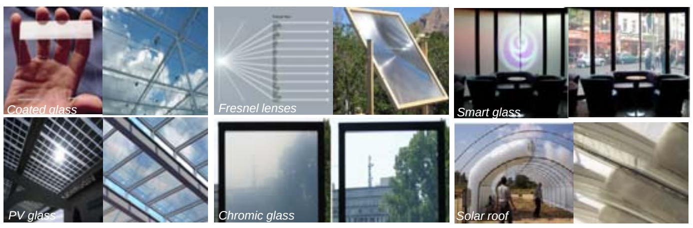

Figure 4. *Available technologies for greenhouse shell.*