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Hotmaps

Evaluation of future heat demand and supply with the Hotmaps toolbox: Case study for Donostia - San Sebastián methodology, input parameters, scenarios and sensitivities

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(2) Methodology

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Section 1

Motivation and research questions

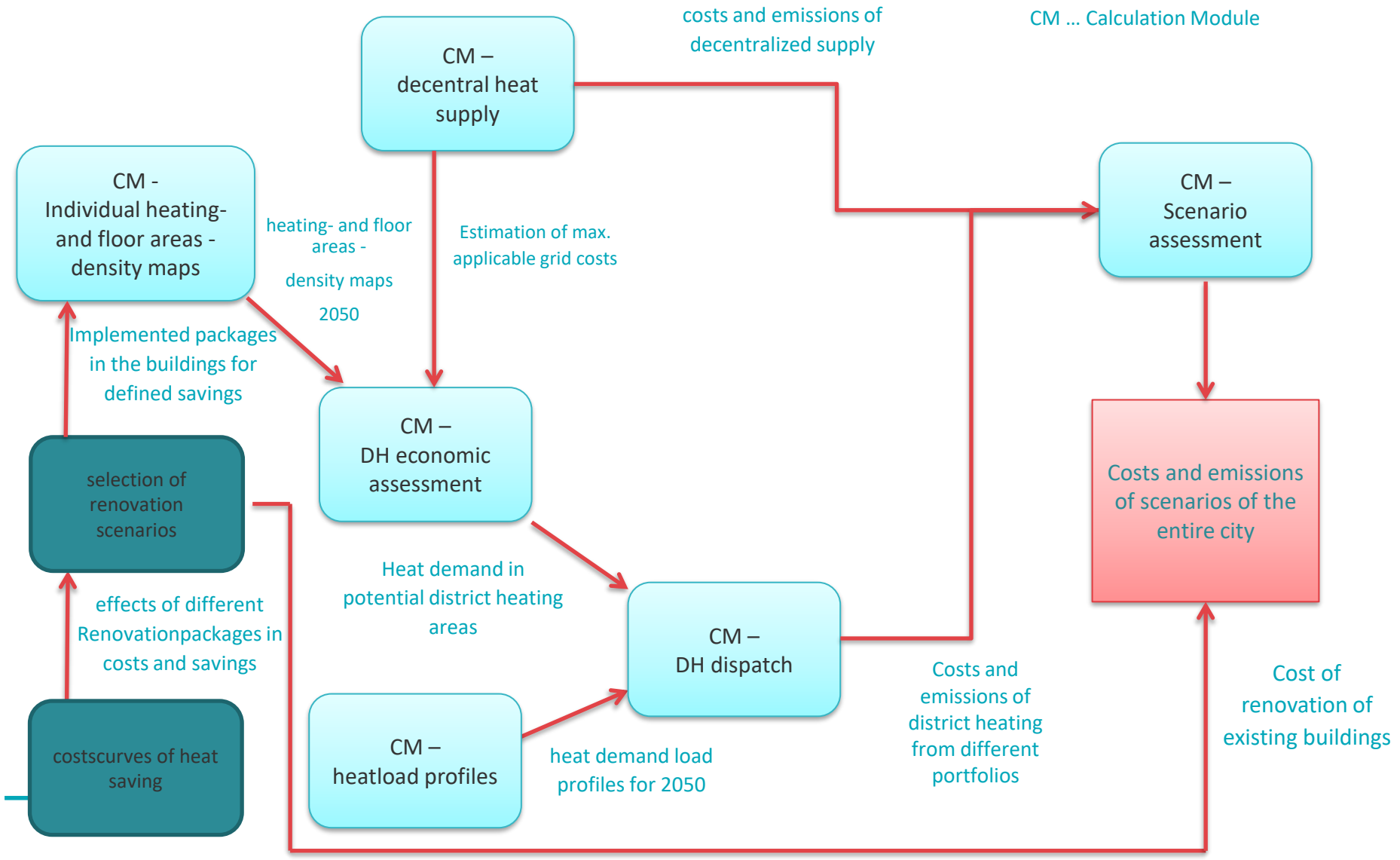
Motivation and research question

- Motivation
  - climate change
  - CO2 savings / neutral heat supply
- research question
  - What could the heat supply look like in 2050?
- Background:
  - Hotmaps project
  - The analyses within the framework of strategy development in hotmaps = demonstration of the newly developed hotmaps tool

Section 2

Methodology

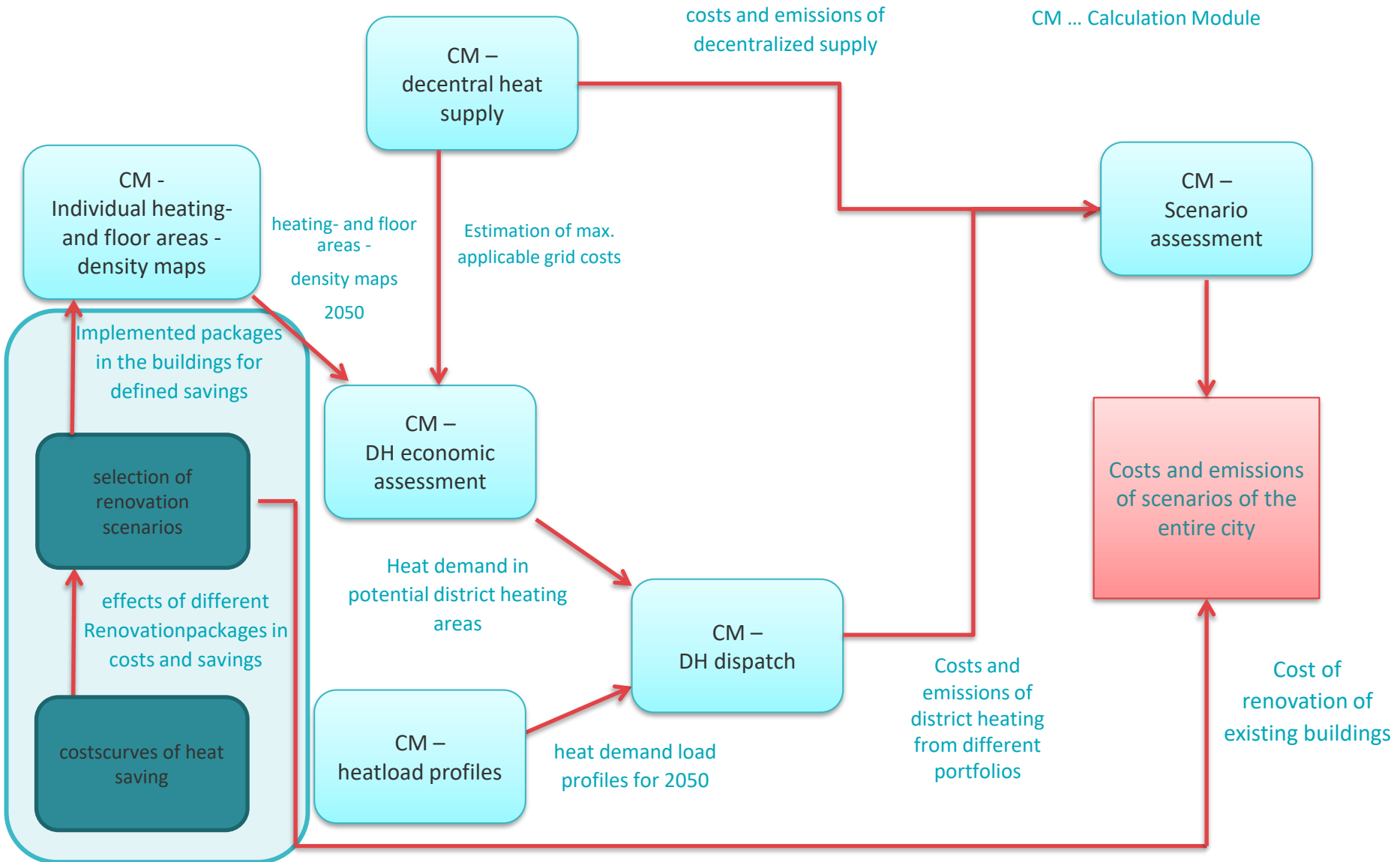
Scenario Toolchain Hotmaps



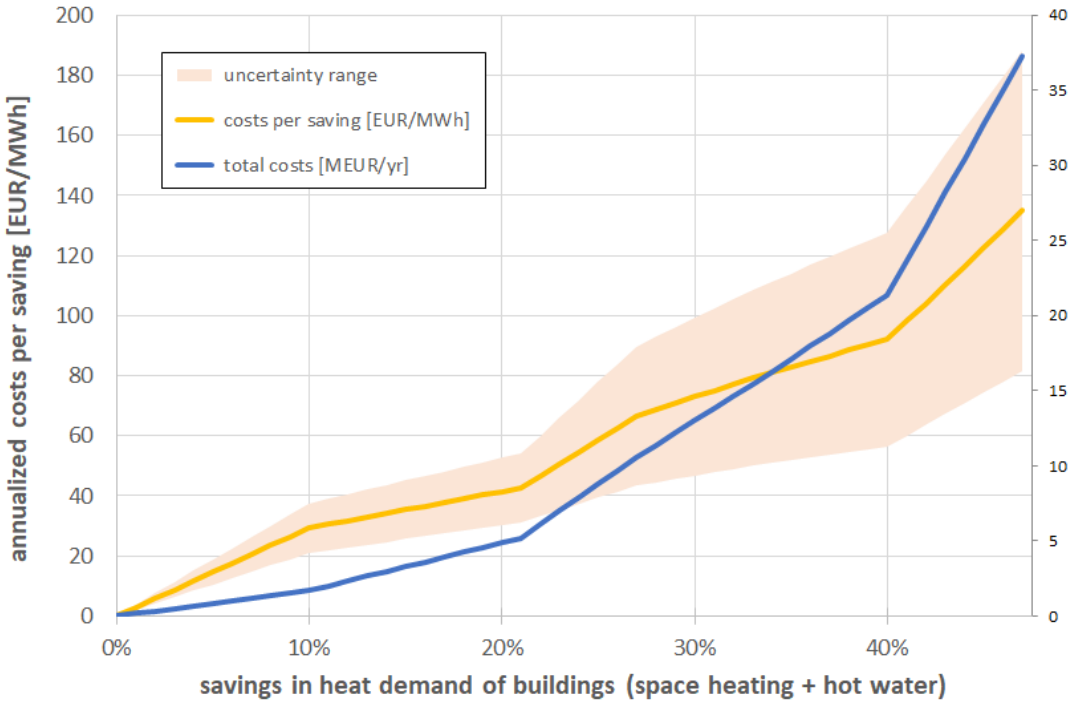
Scenarios

Main parameters varied	*range of variation of parameter*
Energy demand for space heating and hot water generation	
target of savings in heat demand for space heating	10% - 60% in steps of 10%
Decentral heating supply costs	
savings in heat demand for space heating	10% - 60% in steps of 10%
District heating (DH) distribution costs	
savings in heat demand for space heating	30%, 40%, 50%, 60%
share of heat demand connected to DH in areas with DH grid	50%, 70%, 90%
maximum grid costs [EUR/MWh] in regions connected to DH	9 - 26 in steps of 1 EUR/MWh
District heating (DH) supply costs	
total heat demand supplied by DH	30, 100, 150 and 200 GWh/yr
capacities of installed technologies	4 different portfolia; see respective chapter for more details
electricity wholesale and CO_2 prices	4 different prices scenarios, see chapter 4.3.5
supply line temperatures in the district heating grid	3 different temperature profiles from 55 - 86 °C (median Temperature)

Scenario Toolchain Hotmaps

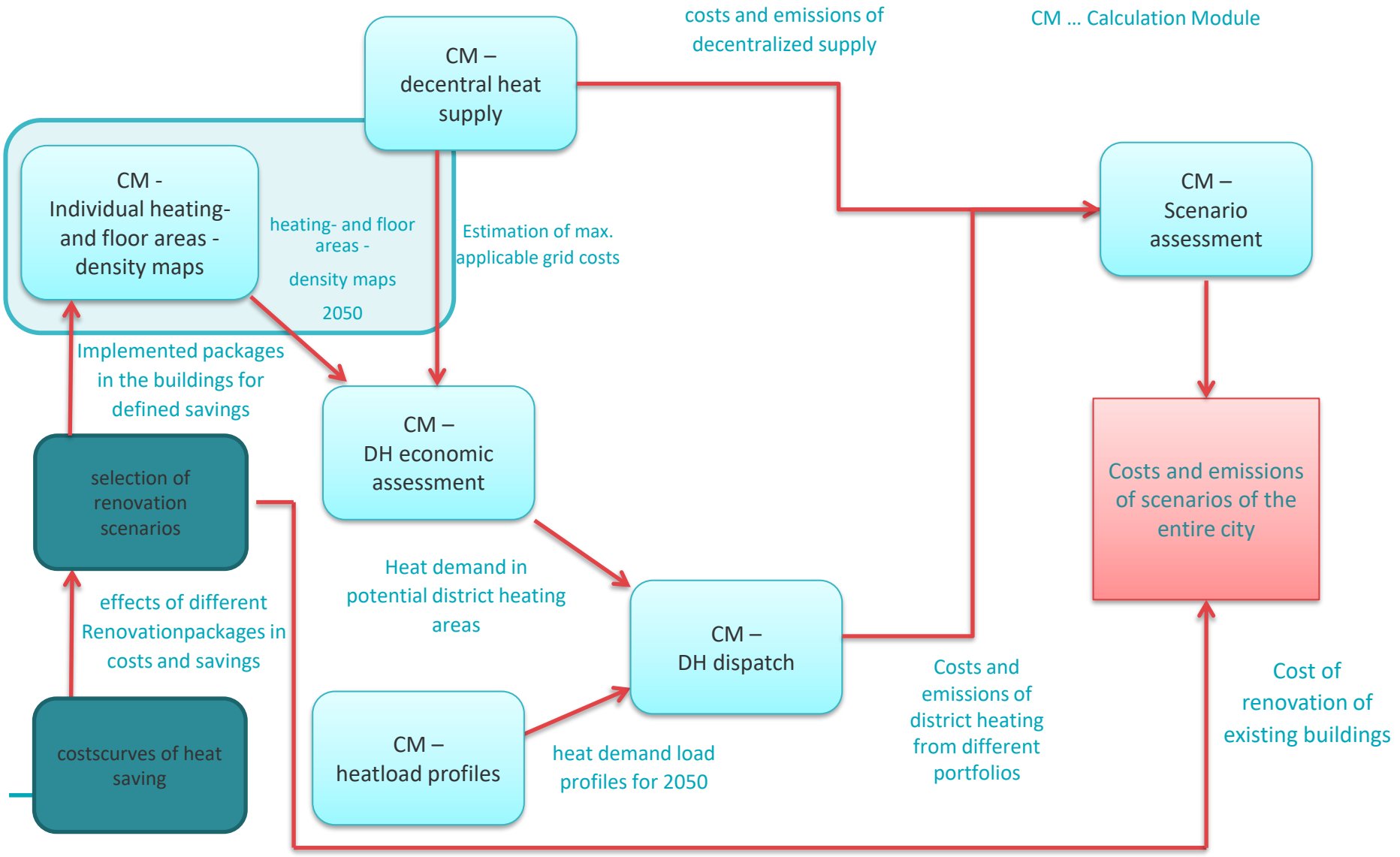


costcurves

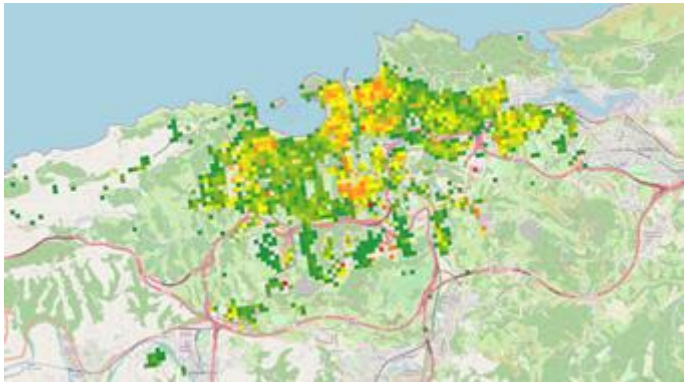


- Clustering:
  - 7 construction periods
  - 14 building categories
- 10 renovations
- interest rate 3%
- depreciation period 40 years

Scenario Toolchain Hotmaps



heat density maps



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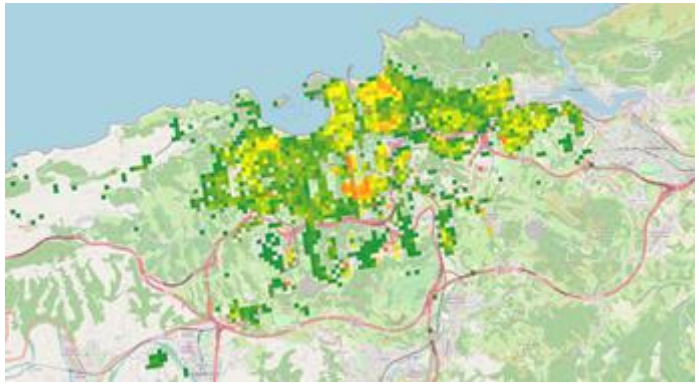
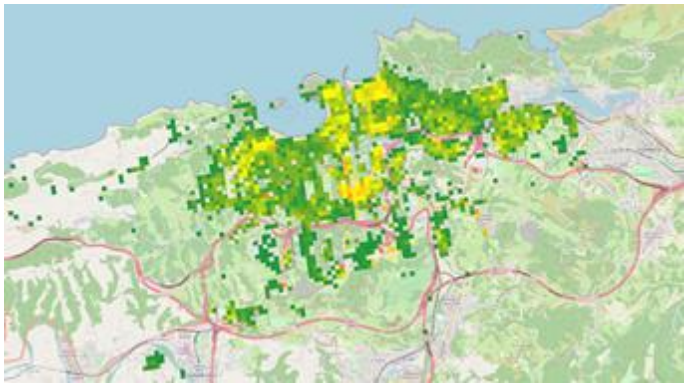


24%



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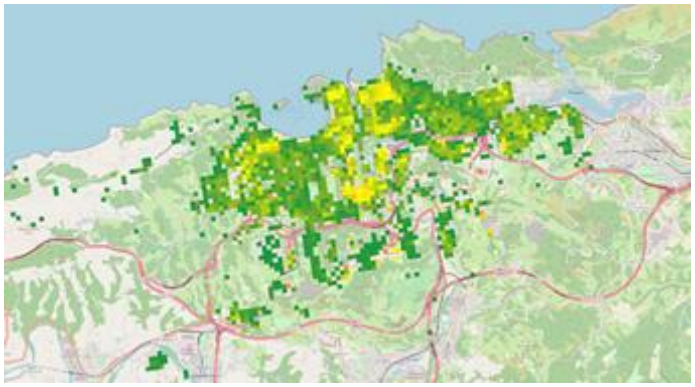
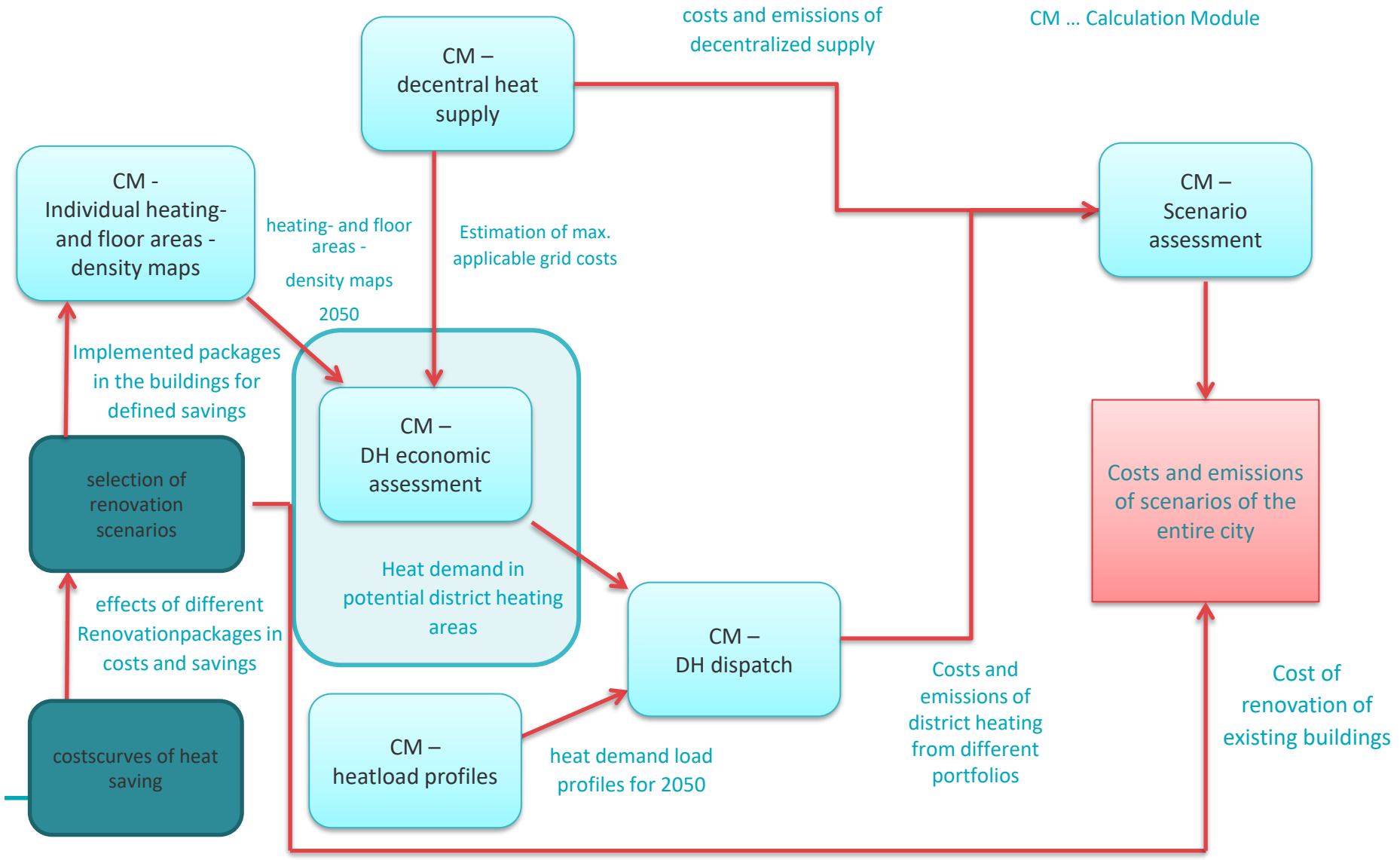
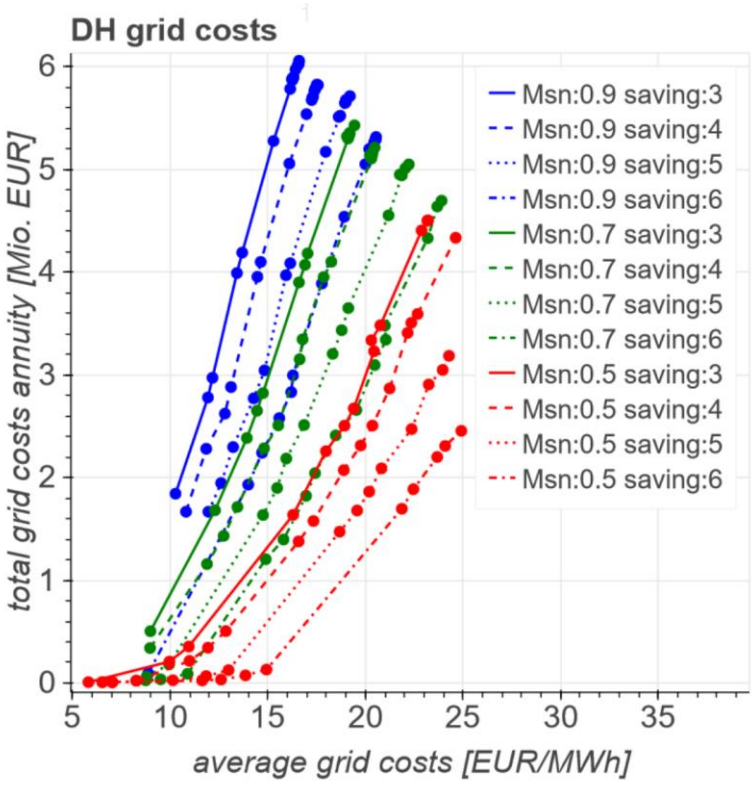


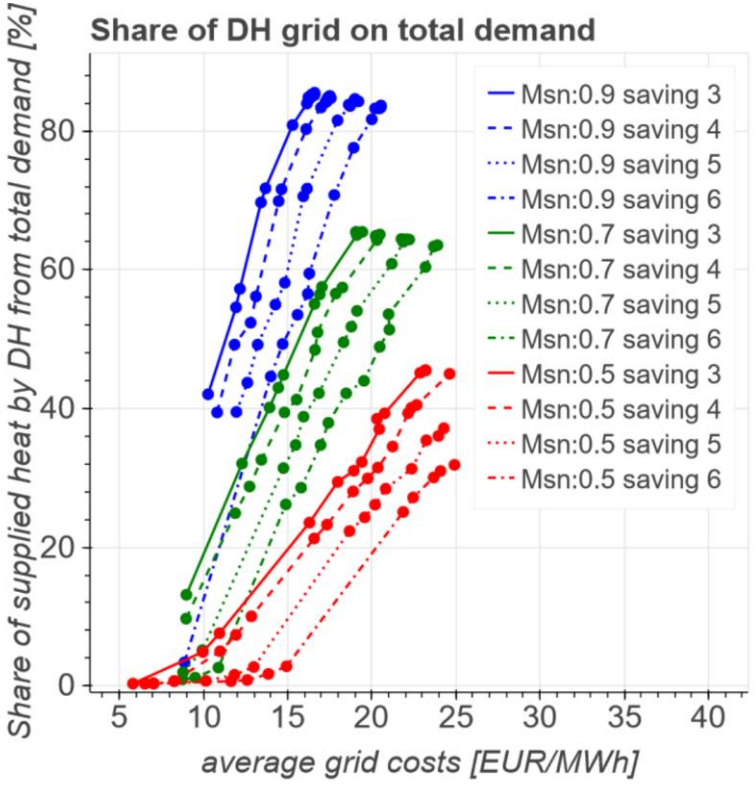
46%

Scenario Toolchain Hotmaps



Expansion of district heating





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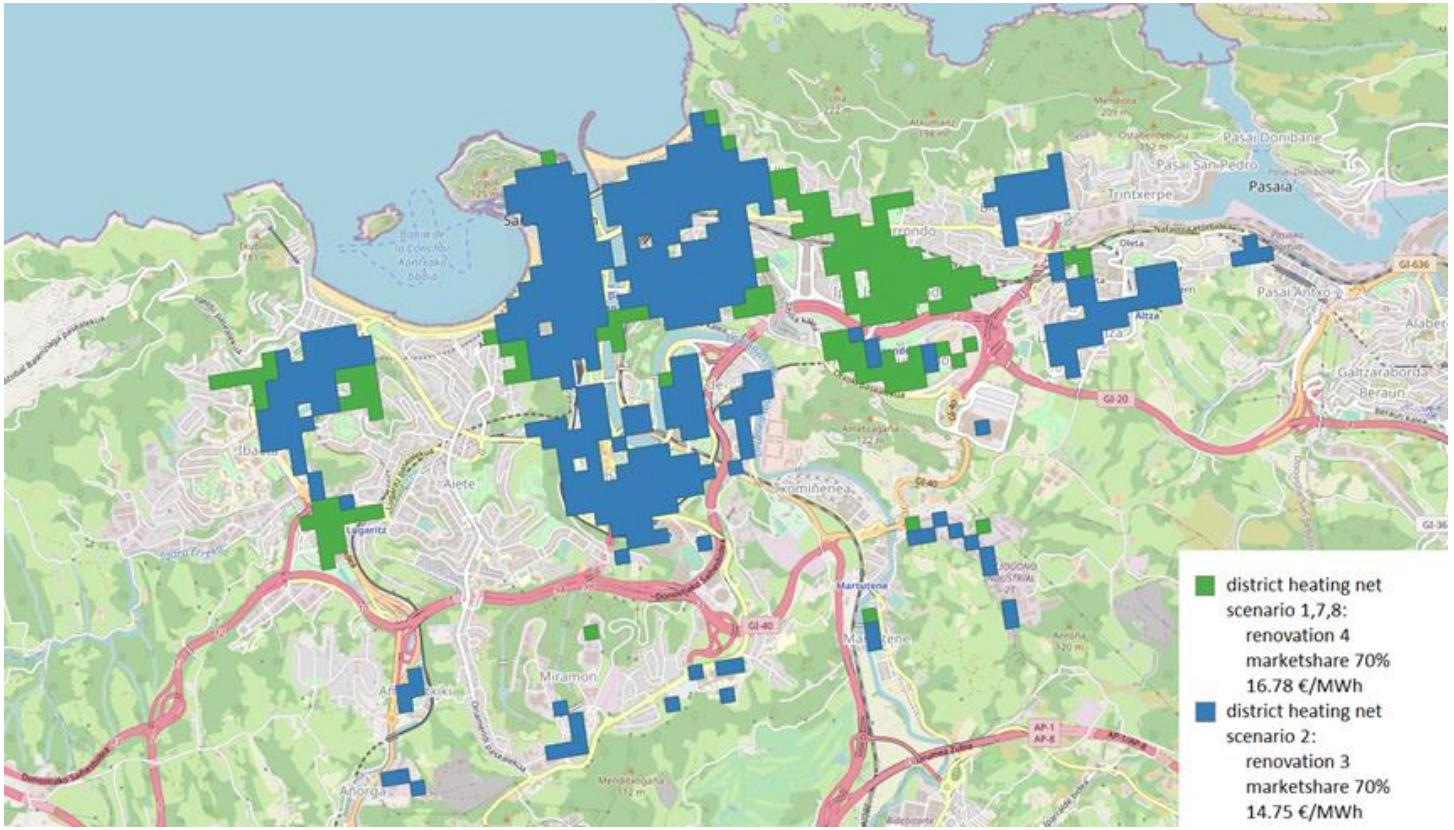
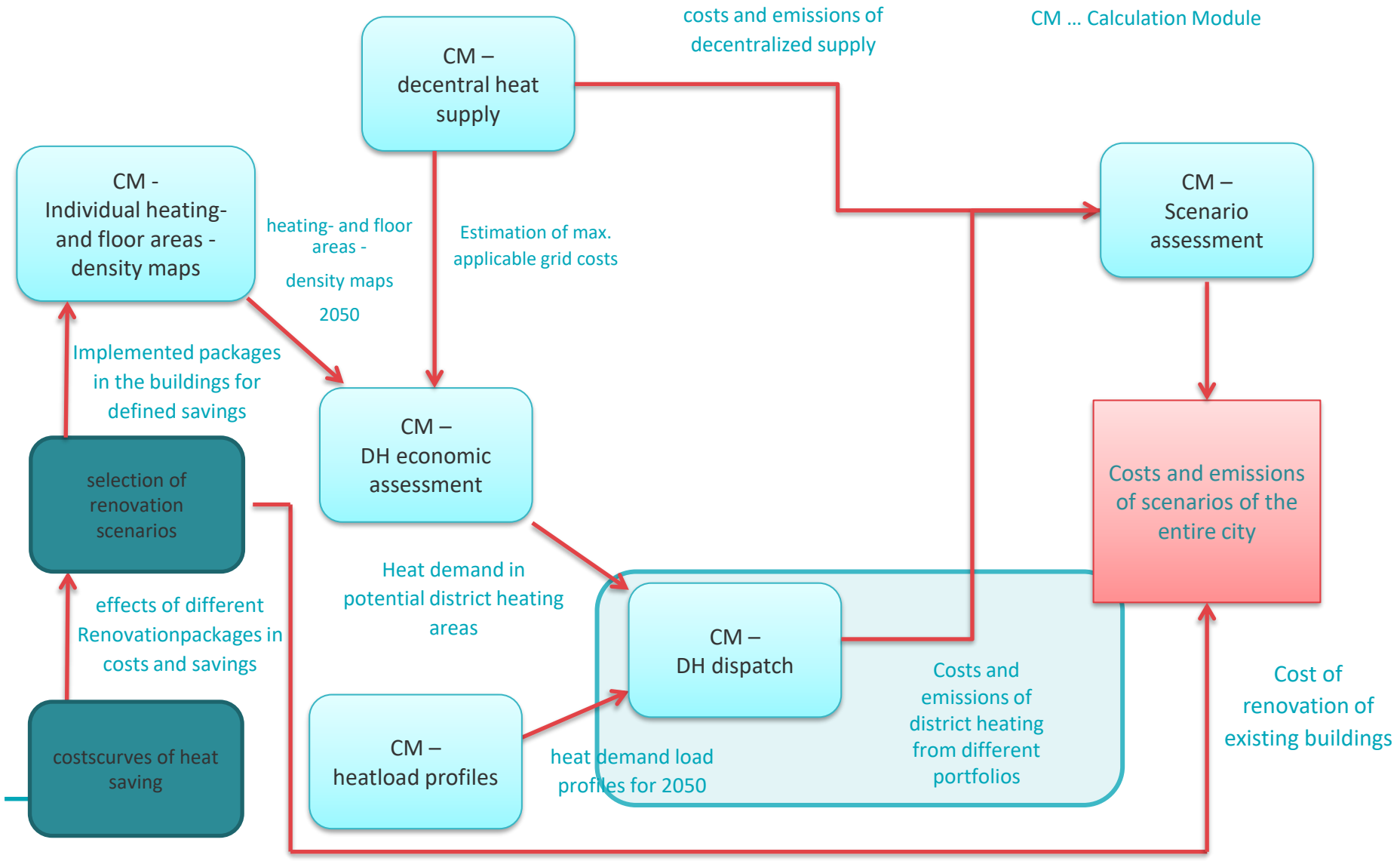
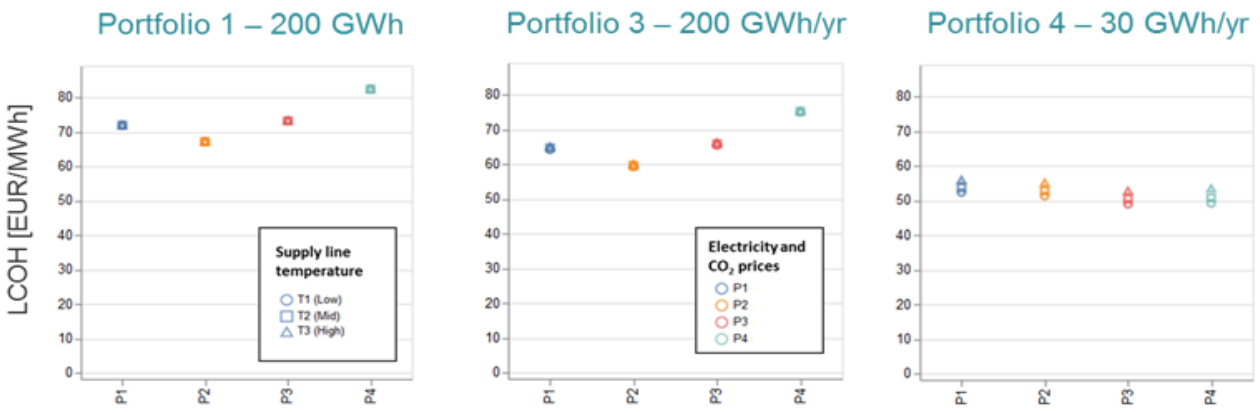


Scenario Toolchain Hotmaps



District Heating dispatch

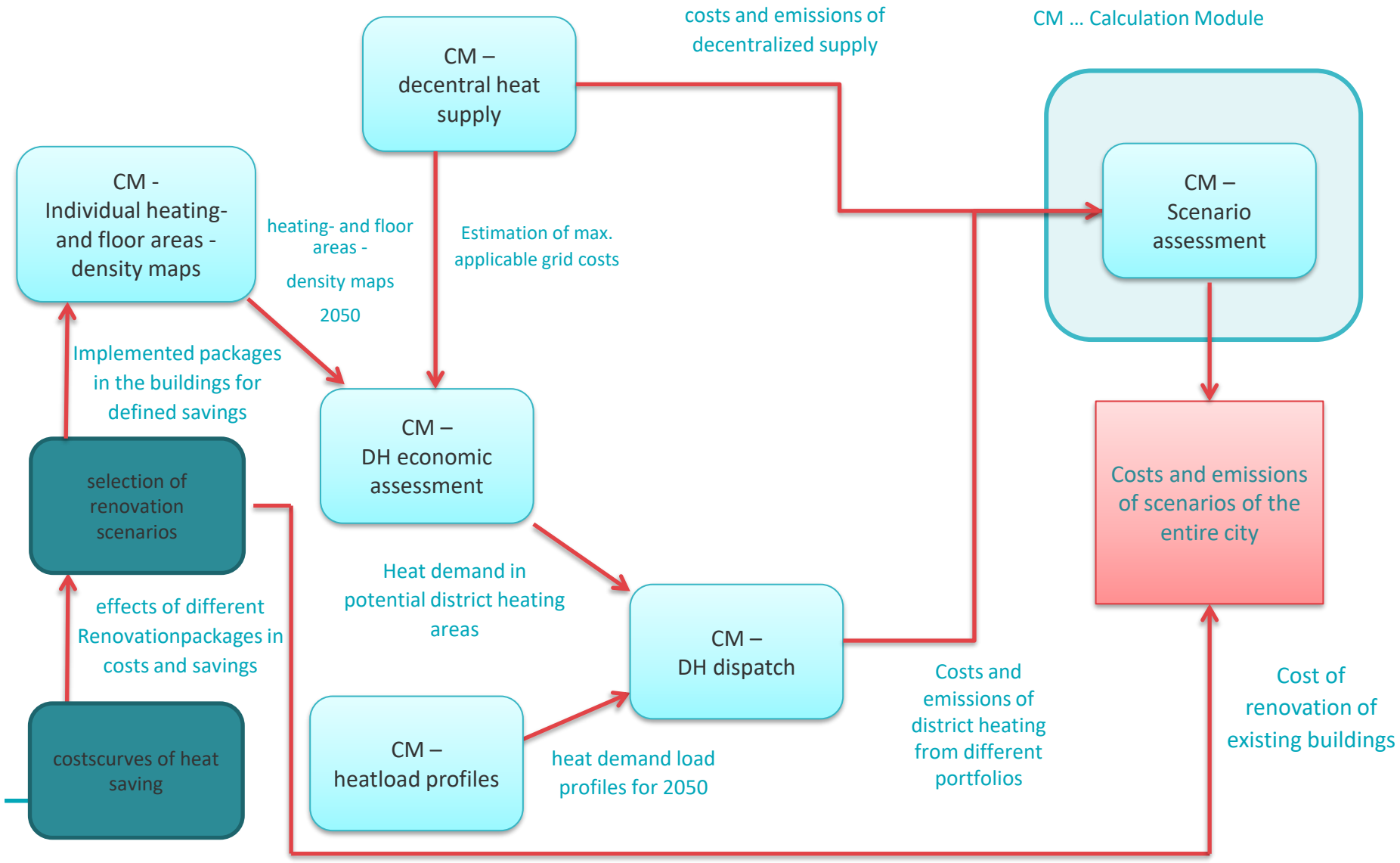
Portfolia	Installed capacity [MW]	Yearly Supply [GWh/yr]
Portfolio 1: - Biogas back-pressure CHP - Waste incineration (HOB) - Biomass boiler for peak load	 2.5, 2.6 20, 28 30, 40	150, 200
Portfolio 2: - Biogas back-pressure CHP - Waste incineration (HOB) - Heat Pump in the waste water treatment plant - Biomass boiler for peak load	 2.5, 2.7 20, 28 8, 9.2 22, 30	150, 200
Portfolio 3: - Biogas back-pressure CHP - Waste incineration (HOB) - Heat Pump in the waste water treatment plant - Biomass boiler for peak load - Heat storage	 3, 4.2 20, 28 8, 8 0, 1.8 28, 28	150, 200
Portfolio 4: - Biogas back-pressure CHP - Heat Pump in the waste water treatment plant - Biomass boiler for peak load	 2.5 8 0.1	30



Section 3

Results and conclusions

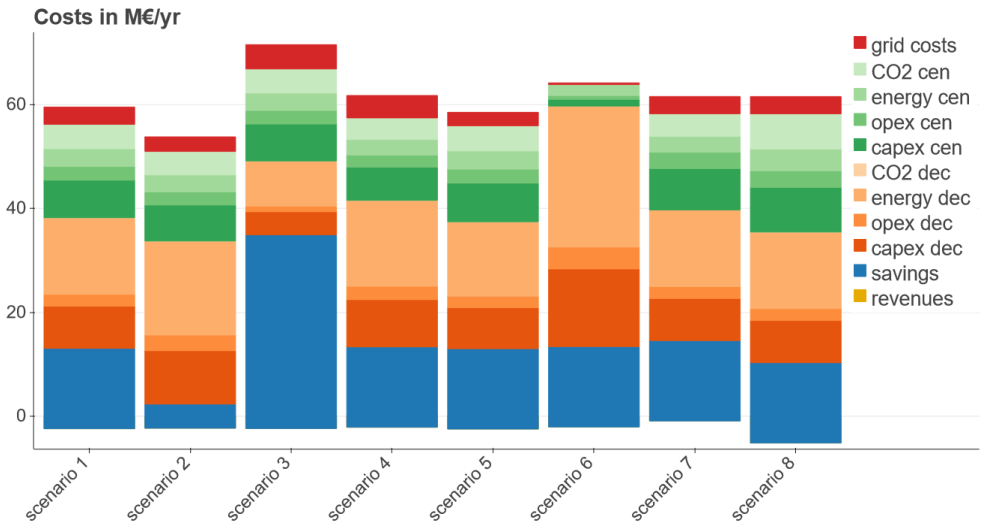
Scenario Toolchain Hotmaps



Scenario Assessment

	Main scenario	Low savings of heat demand	High savings of heat demand	Low District Heating market share	High District Heating market share	Low District Heating share	Simplified District Heating Portfolio	High Electrictiy and CO2 price
	scenario 1	scenario 2	scenario 3	scenario 4	scenario 5	scenario 6	scenario 7	scenario 8
Savings in heat demand of the buildings	33%	24%	46%	= main	= main	= main	= main	= main
Decentral supply	default technology mix (heat pumps, electrict heaters, solar thermal and biomass)	= main	= main	= main	= main	= main	= main	= main
District heating network	market share in district heating areas (MS) = 70%, yearly district heating demand (YD) = 200 GWh/yr	= main	= main	MS = 50%, YD = 200 GWh/yr	MS = 90%, YD = 200 GWh/yr	MS = 70%, YD = 30 GWh/yr	= main	= main
District heating supply	Portfolio 3, price scenario P3, distribution temperature T2	= main	= main	= main	= main	Portfolio 4, P3, T2	Portfolio 1, P3, T2	Portfolio 3, P4, T2

Scenario Assessment



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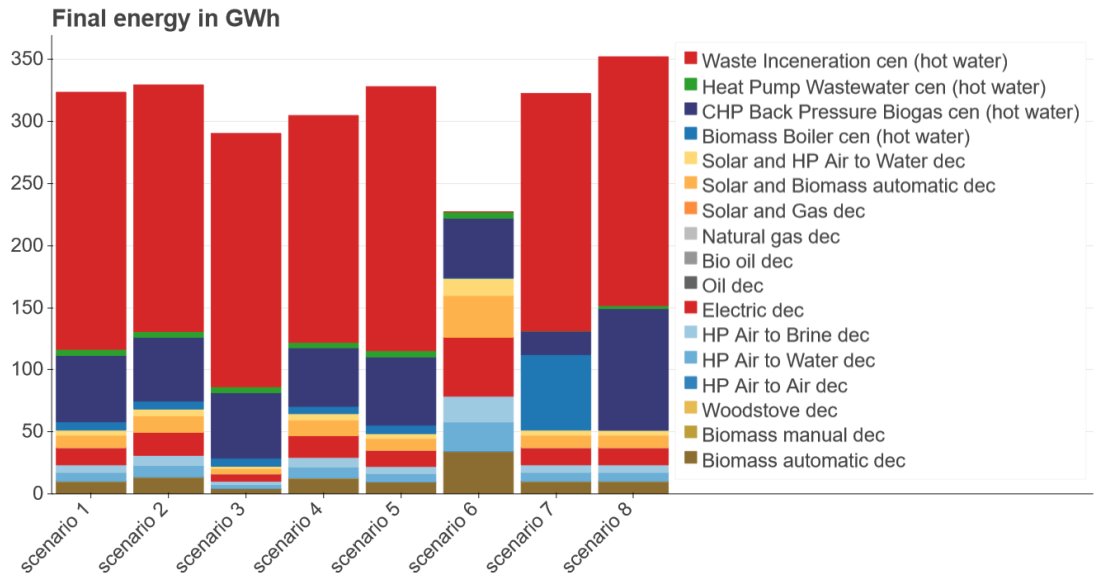

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Results

- Renovations:
  - Savings of around 25 - 40% leads to smallest costs (between 40 and 74% of buildings gross floor area has to be renovated)
- District Heating:
  - with waste incineration: Großes Potential (40-60%)
  - without waste incineration: around 10%
  - marketshare has strong sensitivity

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Section 4

Heating roadmap

Heating roadmap

- Further analysis of heat savings (occupation, Feasability studies, already renovated,…)
- Feasability study of using excess heat of waste incineration
- Development of step-by-step plan for transforming of individual to district heating

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