PBL Netherlands Environmental Assessment Agency

Vesta

Netherlands energy assessment model for the built-up environment

3-5-2011 | Rob Folkert

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- ✓ There is a large profitable potential for sustainable heat with increasing energy prices in the Netherlands
- ✓ Energy savings and sustainable heat compete
- ✓ Energy prices make the difference

Content

- Purpose
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- Scenario
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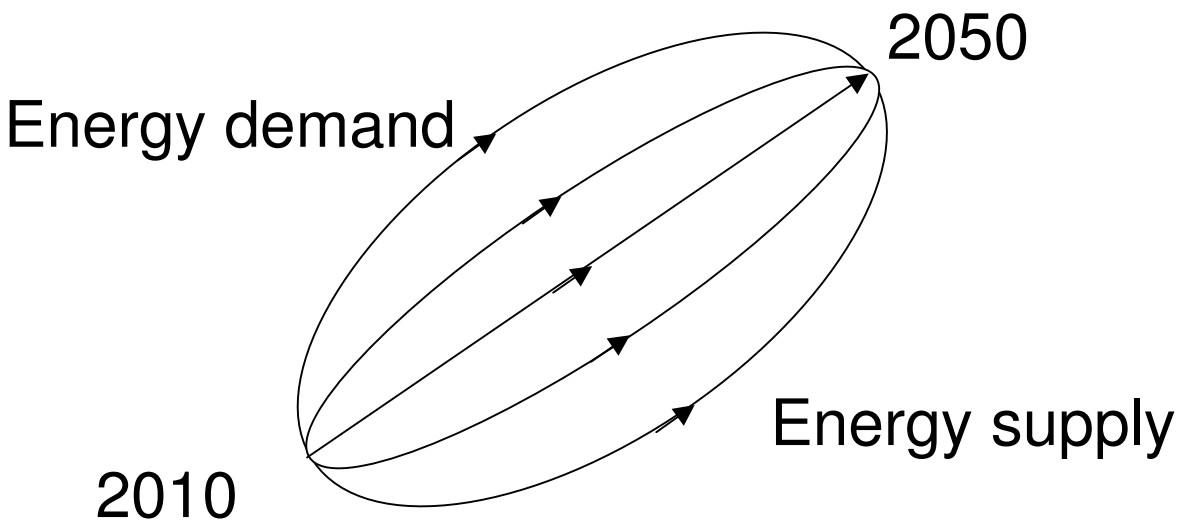
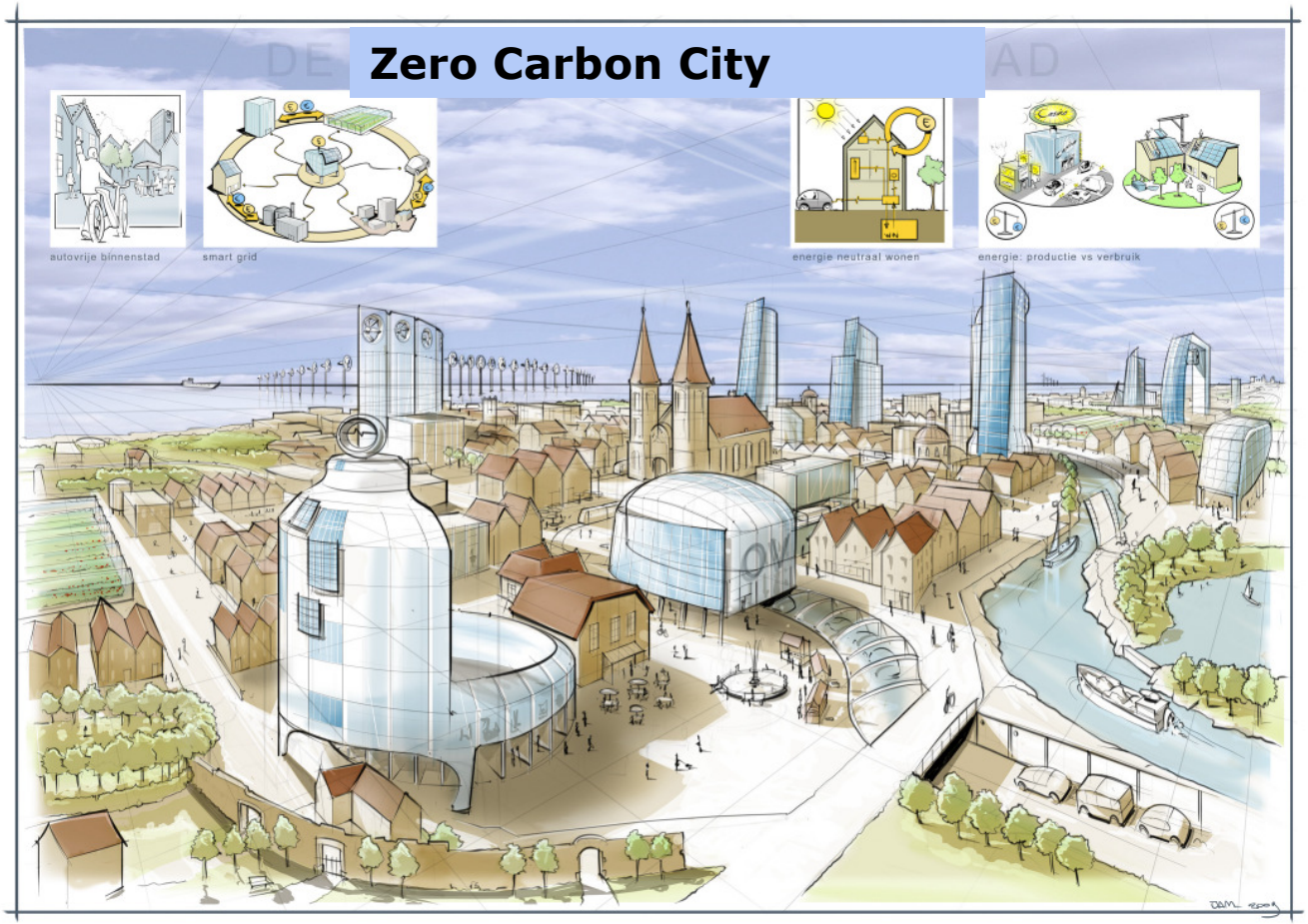
Purpose

Purspose of the model

- Explore long term low-carbon routes



Technologies for zero carbon cities 2050



Building level:
- Insulation
- Heat pump
- Sun PV
- Solar water

Local level:
- Residual heat
- Geothermal heat
- Heat & Cold storage
- CHP

Other
- Green gas
- Waste
- Wind farms

Functionality & Design

Functionality

1. **Technical CO_2-reduction potential**
   - Energy savings
   - Sustainable energy/heat

2. **Societal barriers and effect on CO_2-reduction potential**
   - Institutional: Lack of volume heat demand (social housing corporations; house owners)
   - Financial: Low incomes who cannot finance measures
   - Institutional:Lack of knowledge small companies

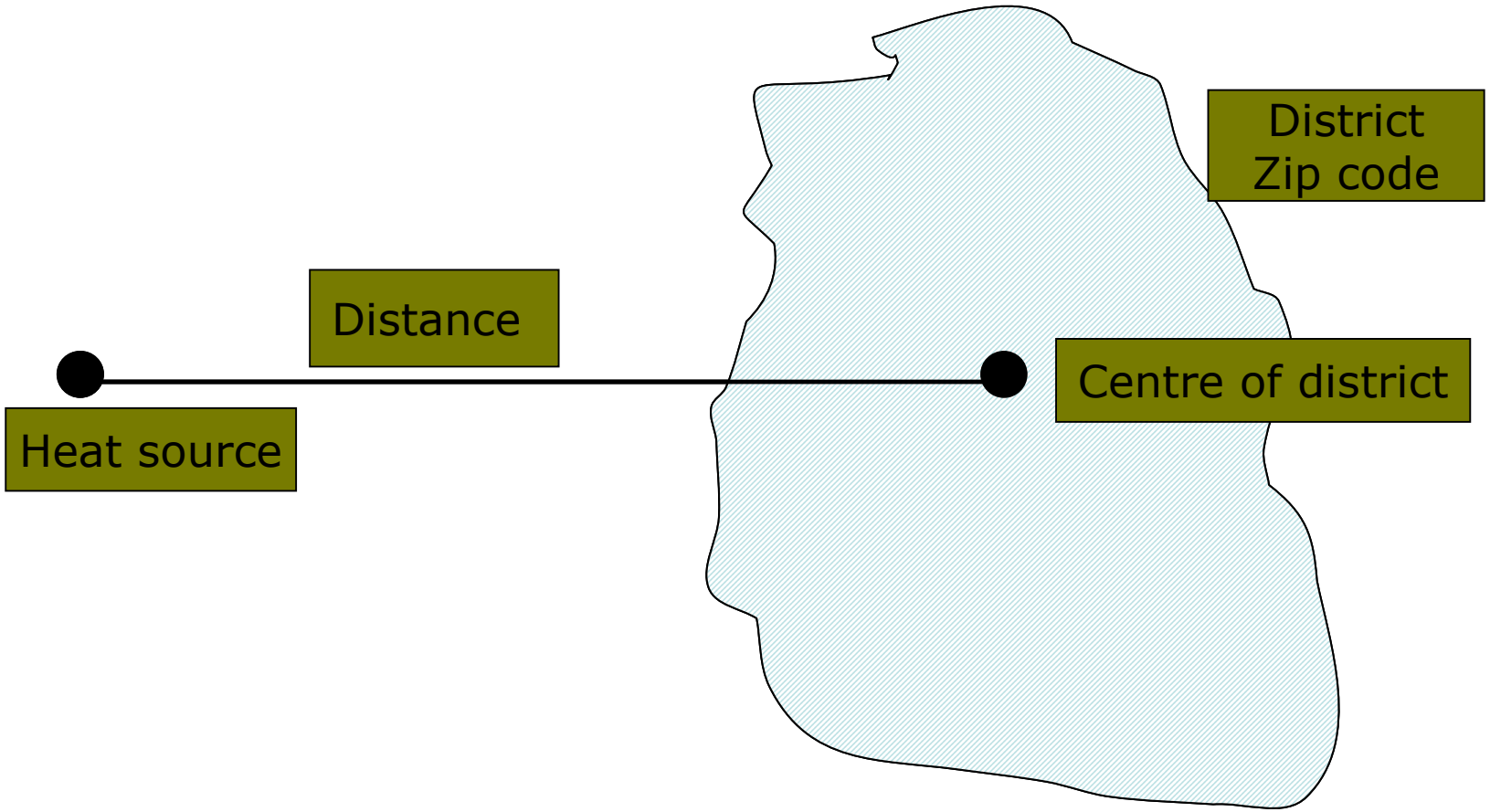
Model design: energy demand

Houses	Utility	Horticulture
(type, year of construction)	(m^2, company type)	(hectare, type cultivation)

	Space heating	Hot water	Electrical equipment
Demand energy	#	#	#
Efficiency building	X		
Efficiency equipment	X	X	X

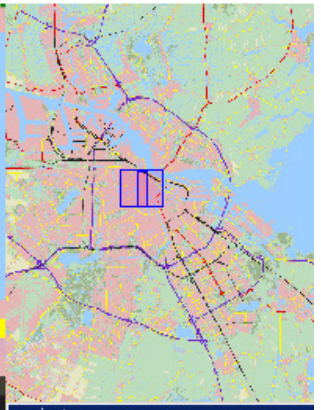
Cost of measures

Calculation rentability local heat options



Data

Houses



woningtype

[woningtype]

onbekend	0
vrijstaand/bungalows	79947
twee onder een kap	51778
rijtjeshuizen/eengezins	227900
flats 4 of minder verdiepin	33088
flats meer dan 4 verdiepir	14186
etagewoning/maisonnette	20524
etage/flats grachtenpand	1933
herenhuis grachtenpand	6014
zelfstandige bejaardenwo	7099
boerderij/tuinderij	13351

Utility

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Glass houses

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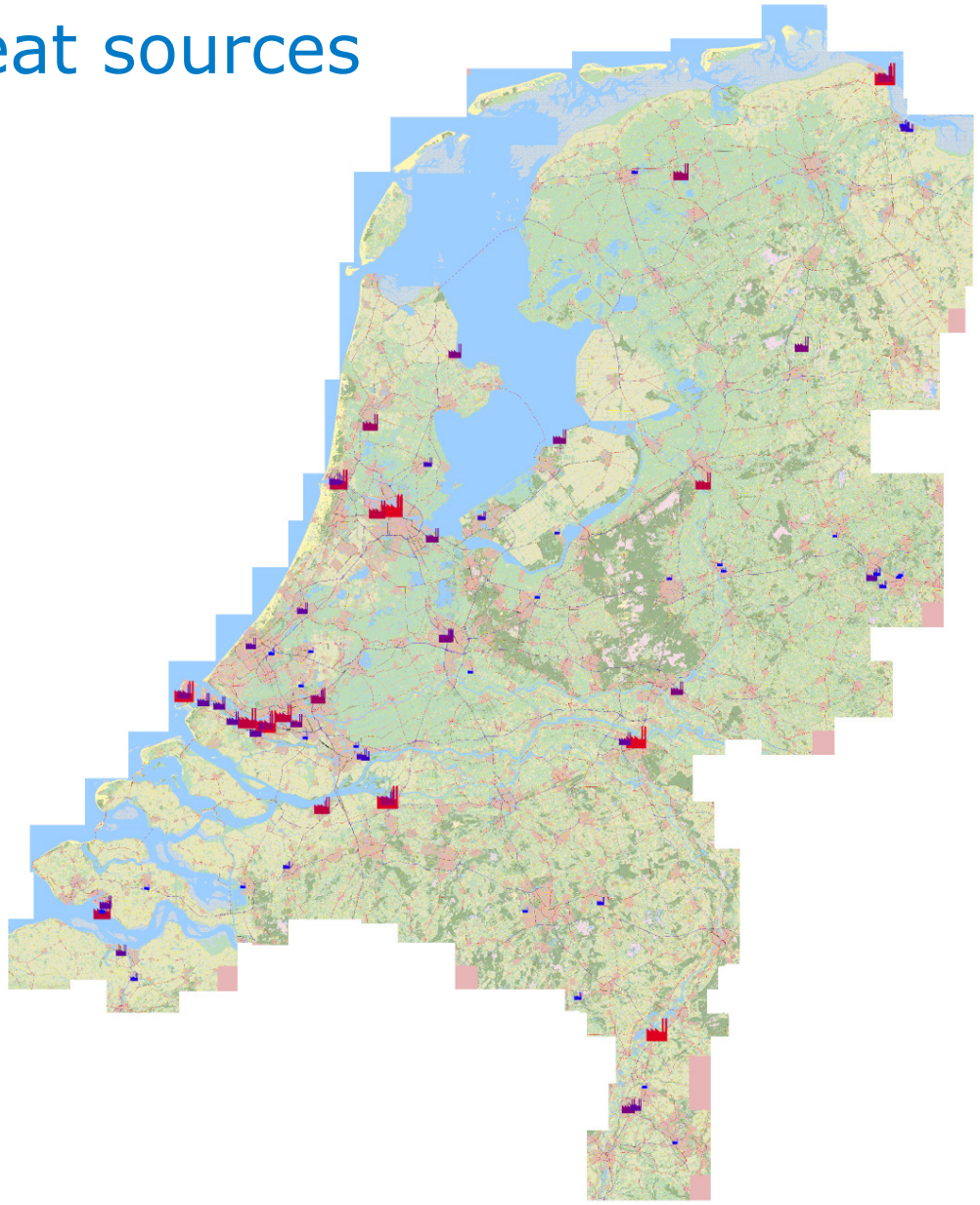
Residual heat sources



Geothermal contour

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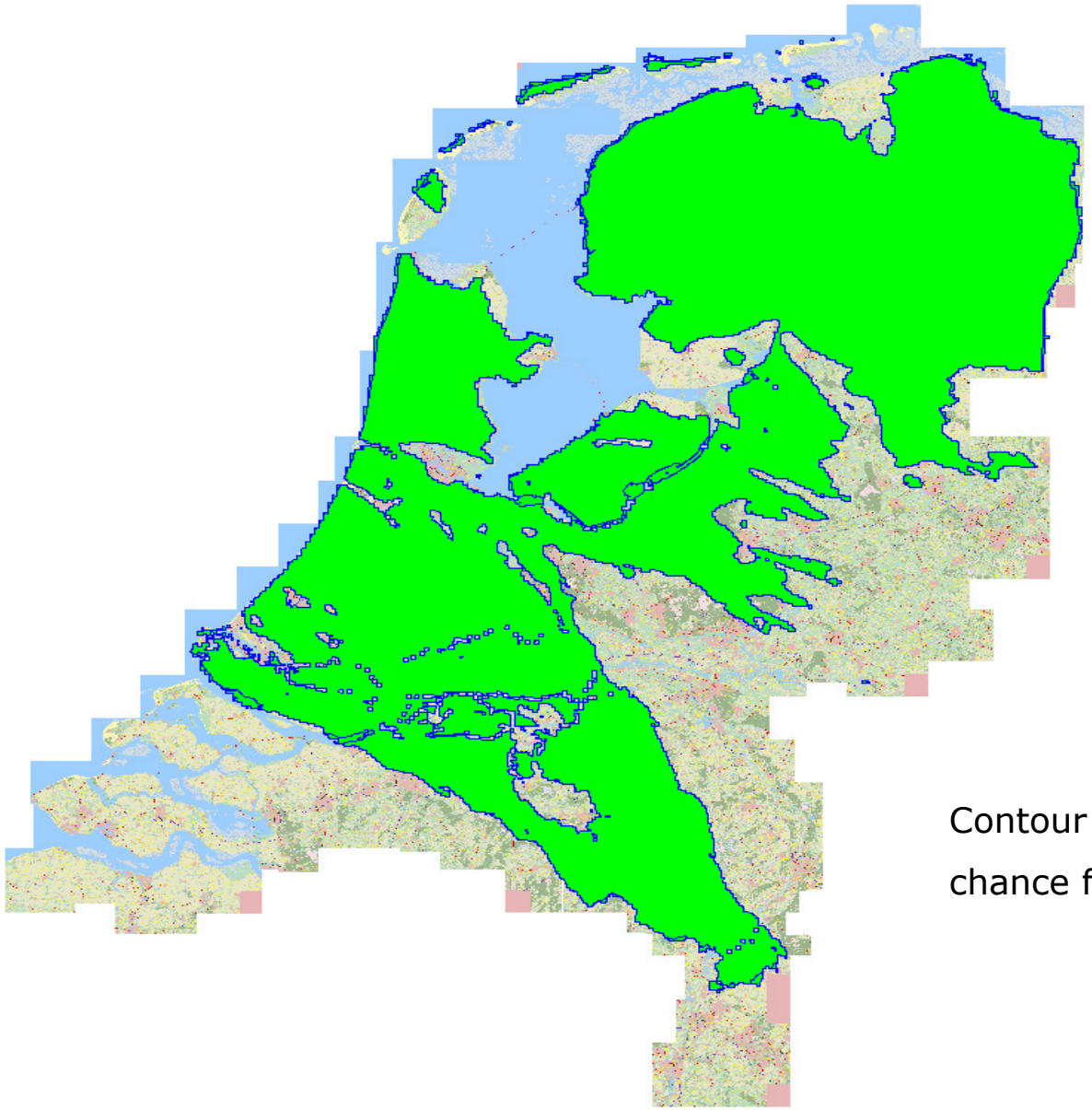
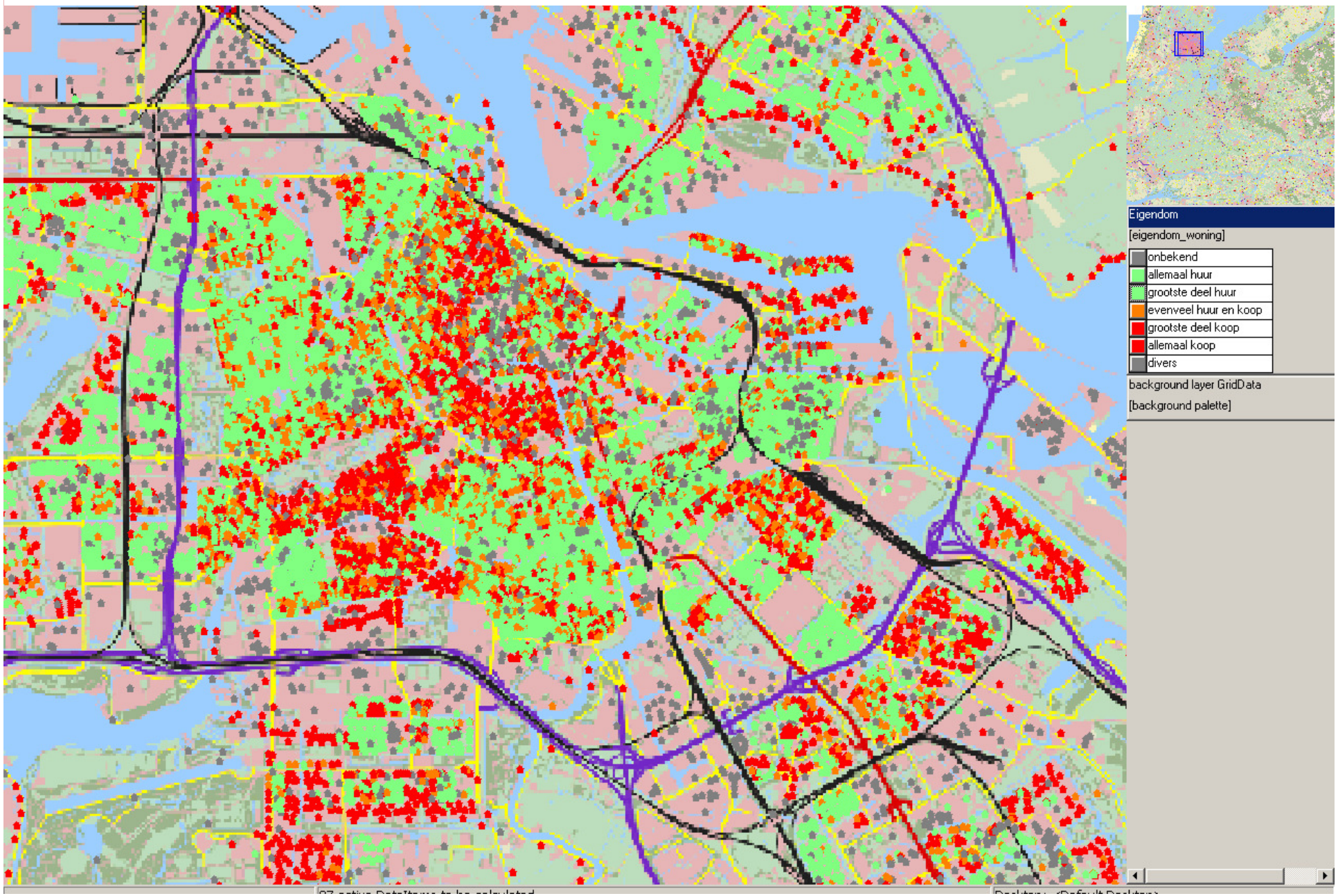


Contour based on 20% chance for a successful drilling

Selection: Owned and rented houses Amsterdam

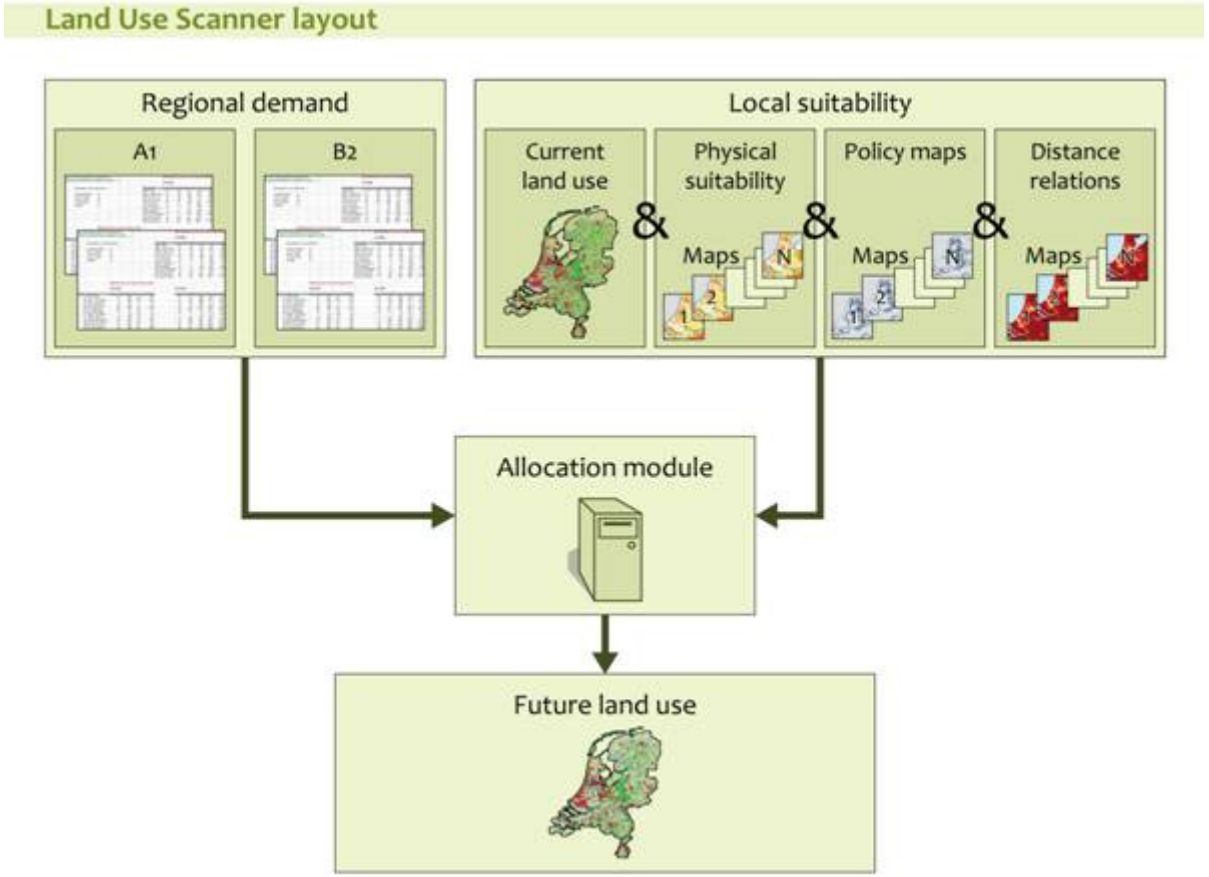


Scenario

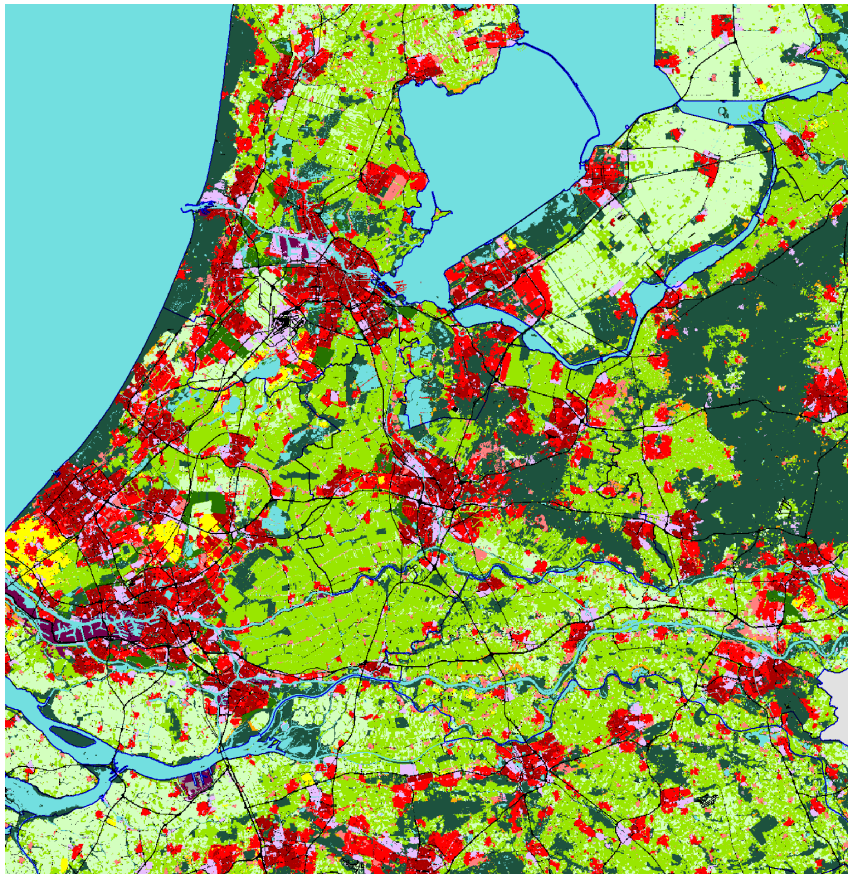
Four scenarios

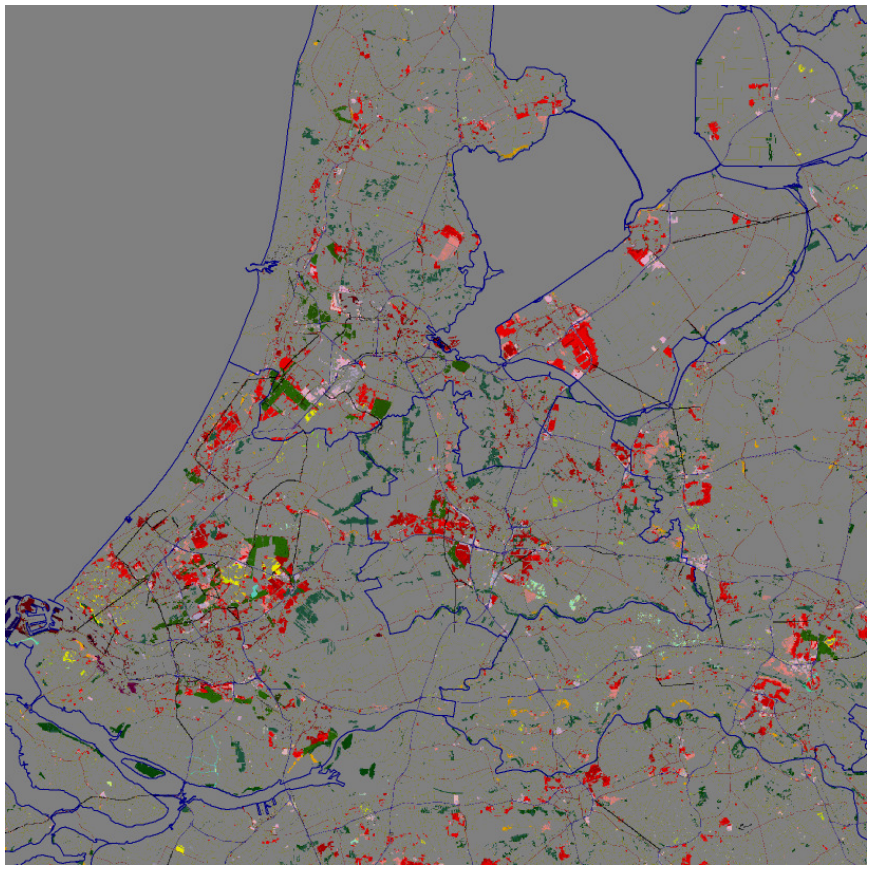
	Global Economy	Strong Europe	Transatlantic Market	Regional Communities
Inhabitants (mln)	**19,7**	**18,9**	**17,1**	**15,8**
Households (mln)	**10,1**	**8,6**	**8,5**	**7**
BBP (2001=100)	**221**	**156**	**195**	**133**
Demolition (mln)	**1,3**	**0,9**	**1**	**0,7**
Utility (commercial sites)	**+43%**	**+18%**	**+23%**	**-3%**
Horticulture	**+60%**	**-15%**	**+5%**	**-45%**
Climate change (℃)		**1.3-1.5**		

Scenarios: Land use scanner



Future land use changes urbanization: Growth

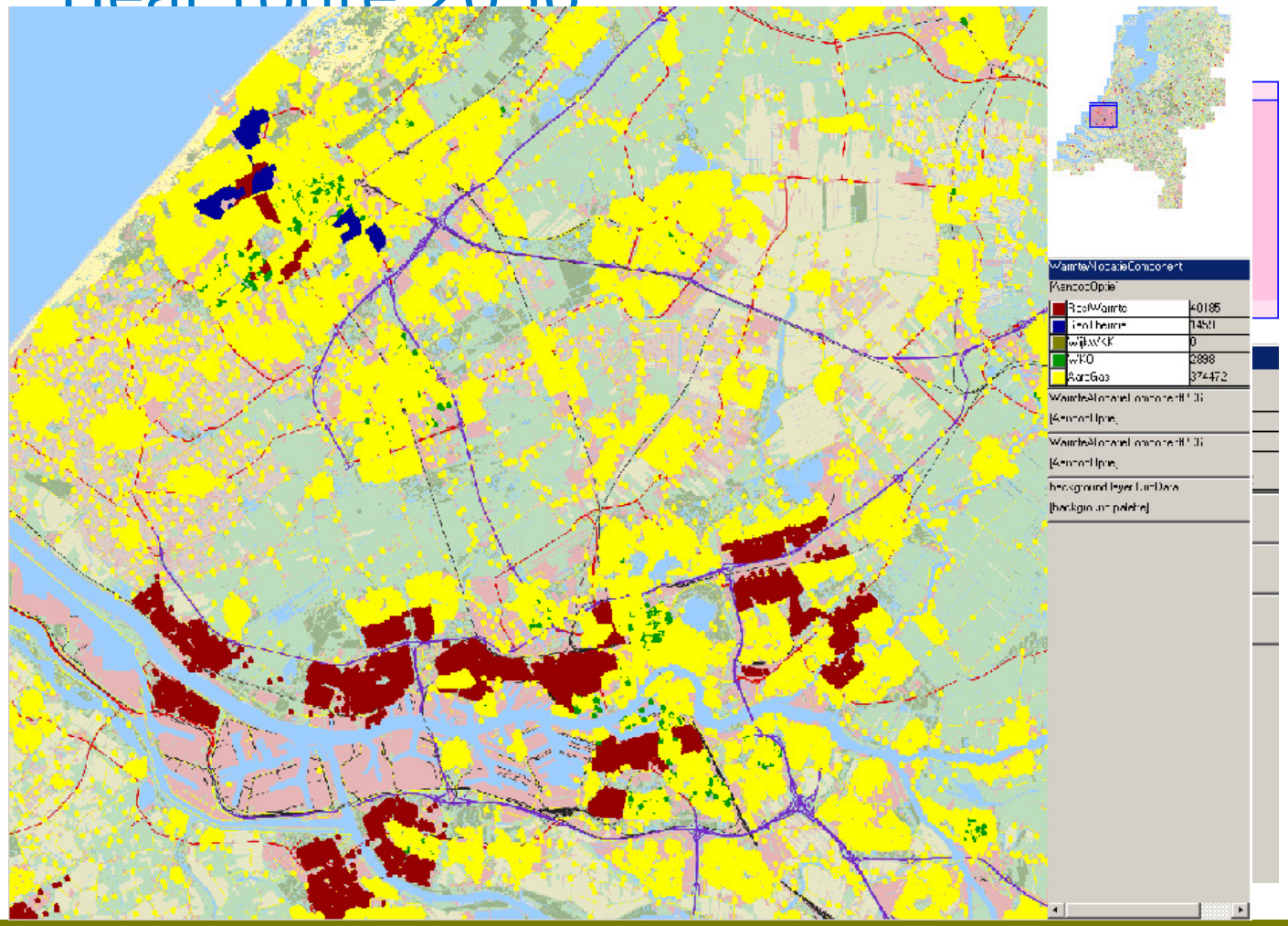




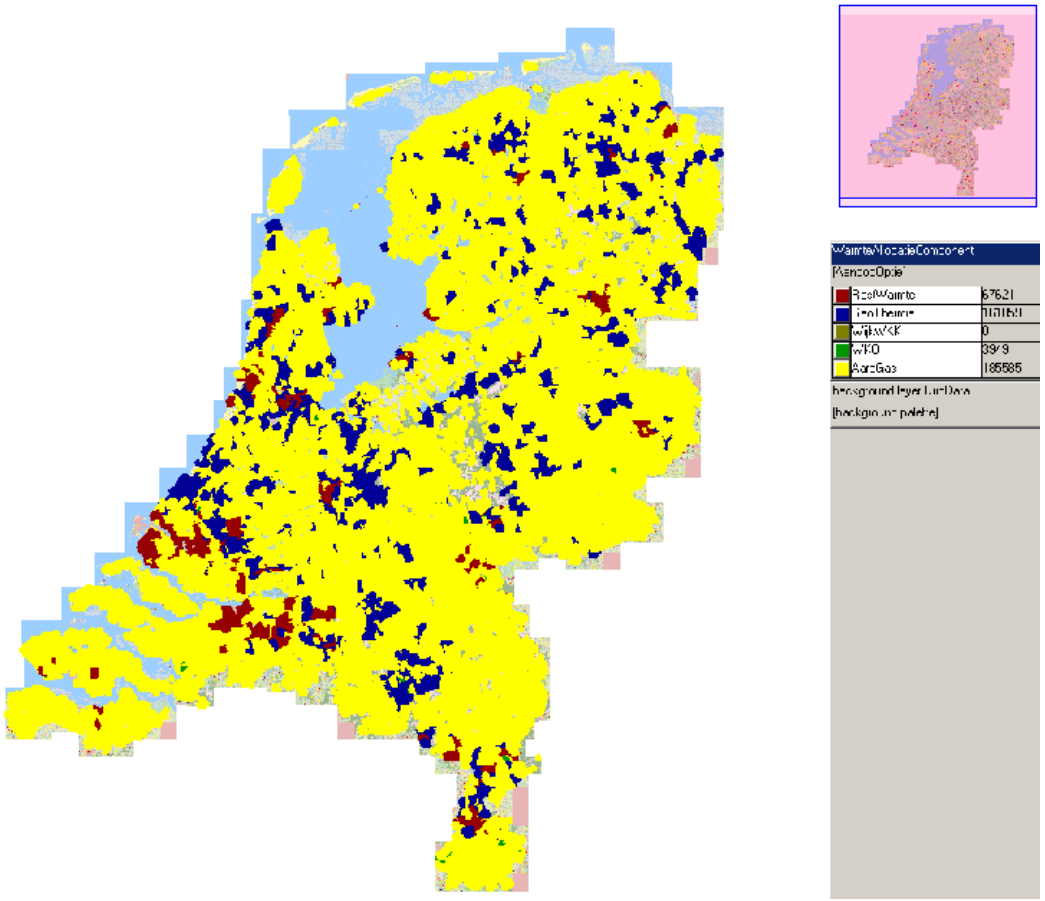
Results

•First preliminary results bases on geothermal contour map with 20% chance for a successful drilling

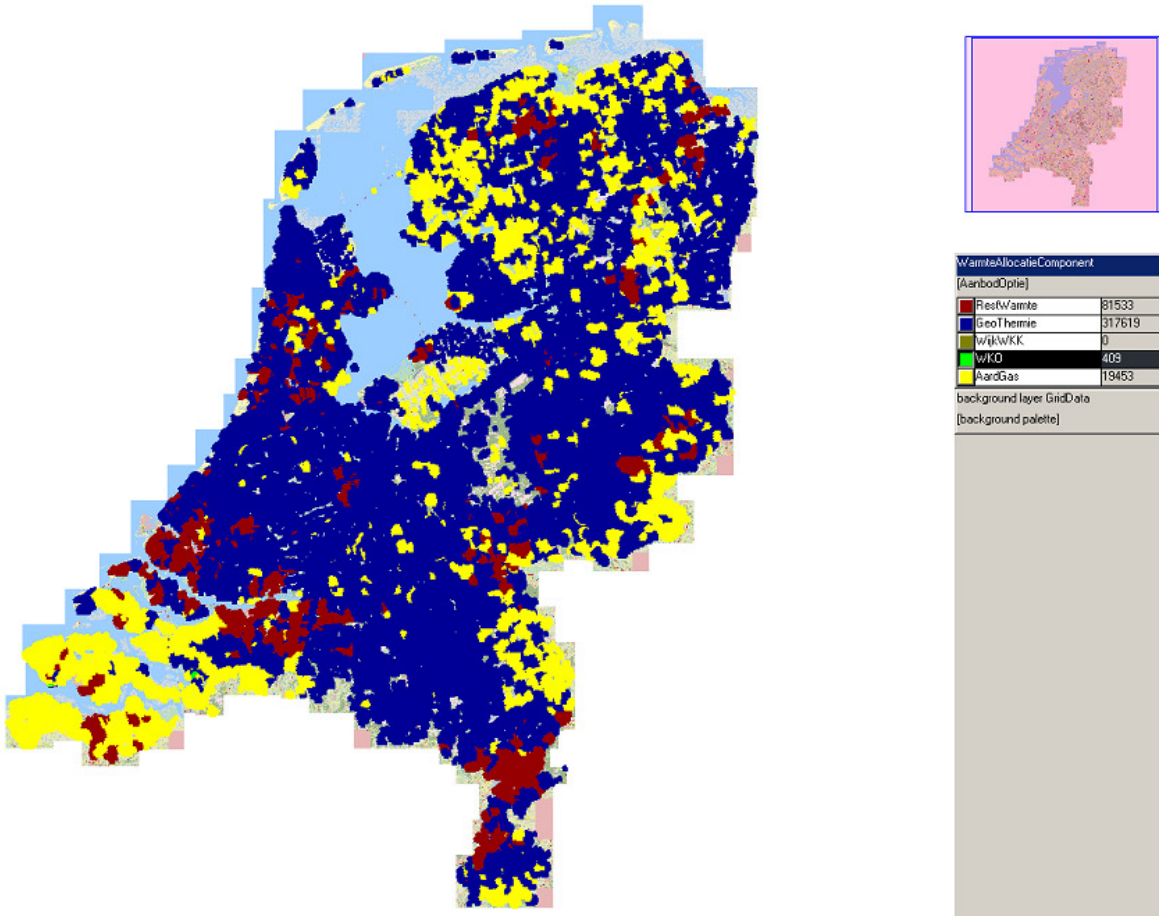
Supply: Heat route 2050

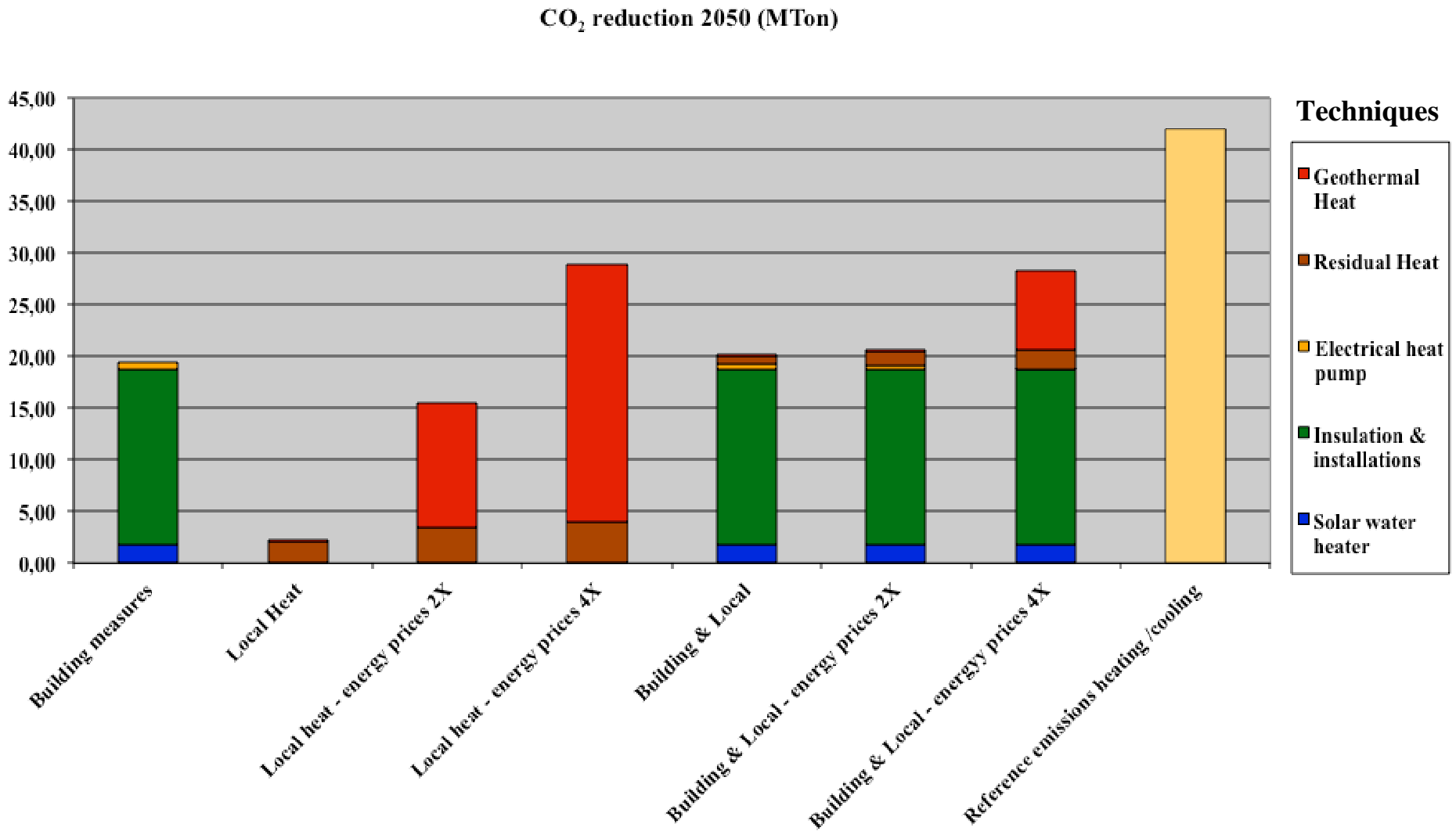


Supply: Heat option high energy prices (x2) 2050

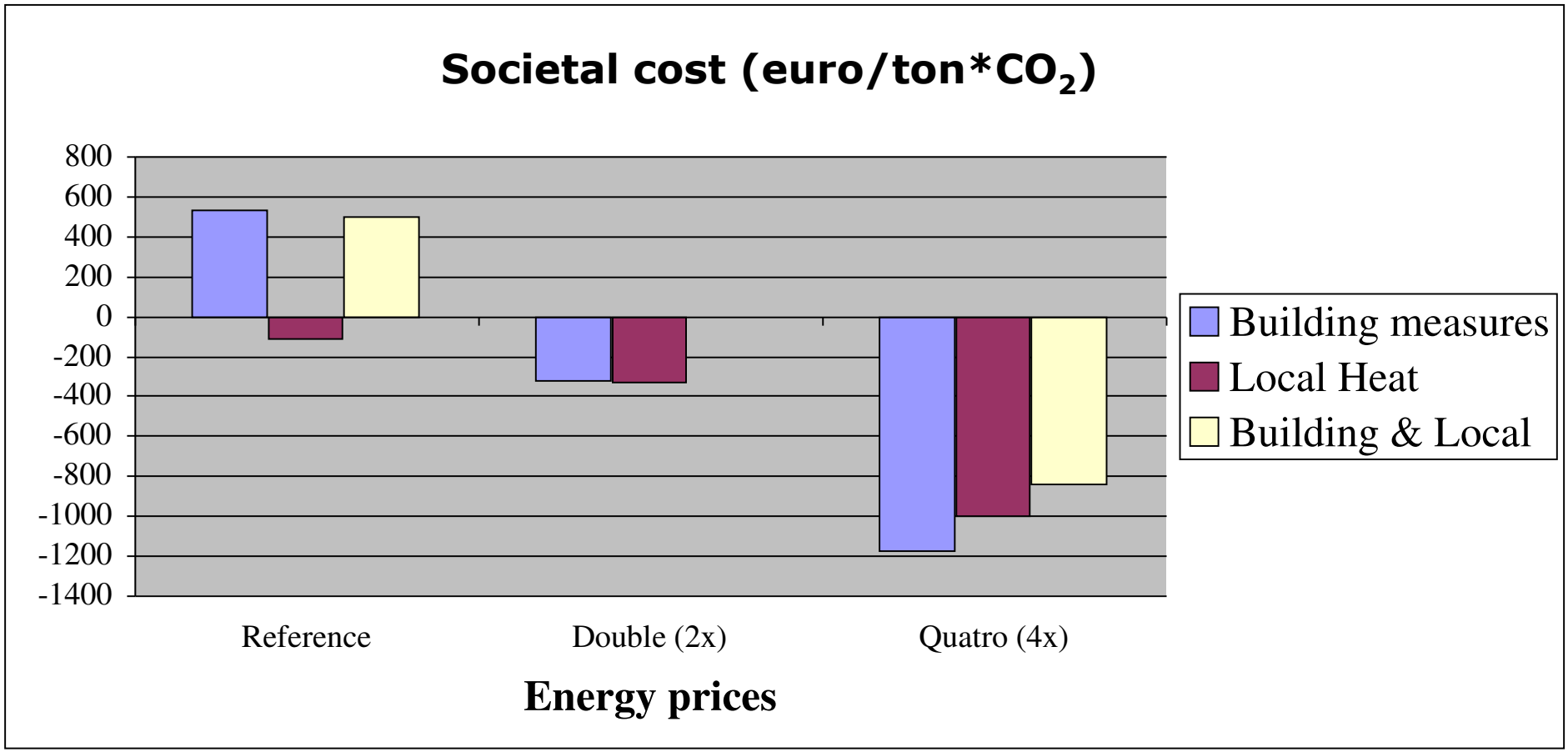


Supply route: Heat option high energy prices (x4) 2050




CO_2 reduction 2050 (MTon)
45,00
40,00
35,00
30,00
25,00
20,00
15,00
10,00
5,00
0,00
Building measures
Local Heat
Local heat - energy prices 2X
Local heat - energy prices 4X
Building & Local
Building & Local - energy prices 2X
Building & Local - energy prices 4X
Reference emissions heating /cooling
Techniques
Geothermal Heat
Residual Heat
Electrical heat pump
Insulation & installations
Solar water heater

Costs and benefits different routes 2050



Preliminary results

- ✓ There is a large profitable potential for sustainable heat with increasing energy prices in the Netherlands
- ✓ Energy savings and sustainable heat compete
- ✓ Energy prices make the difference for the profitability of measures