THE COST - EFFECTIVENESS OF CLIMATE ADAPTATION

The cost - effectiveness of climate adaptation

Starting point

- Climate adaptation is expensive
- Costs are unevenly spread out over the country/ municipality/ neigbourhood
- A financial analysis can help to find the right strategy

The cost-effectiveness of climate adaptation in our everyday work

Heavy rainfall in the south of the Netherlands in May 2018.

- 7 houses flooded

- Damage ~ 400.000 euro’s
  - ~300.000 euros covered by insurance
  - ~100.000 euros damage for home owners

- Heavy rainfall which takes place once every 30 years

- Costs to prevent this:
  - ~600.000 euros

Cost-effectiveness of climate adaptation in our everyday live

Heat stress last summer in Utrecht:

- Bridges were cooled with water to make sure they can close
- Costs:
  - ~ 100 euro per time
- Prevents:
  - ?

Cost-effectiveness of climate adaptation in our everyday live

Drought in the summer of 2018:

- Tree bunkers keep the water around the trees. Trees are watered every two weeks.

- Costs:
  - Tree bunker: 1.200-2.000 euro’s
  - Water: 50 euro’s every second week

- Prevents:
  - Planting a new tree: ~1.500 euro’s

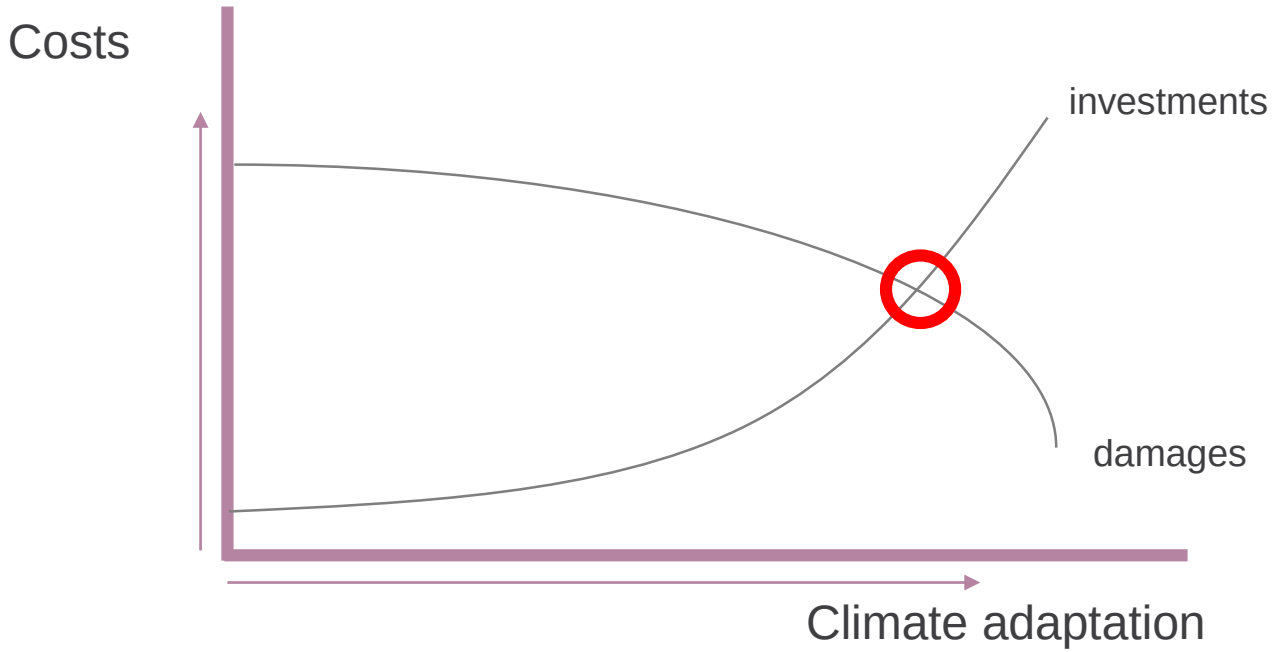
Cost-effectiveness of climate adaptation

Accept?

Optimum?

Prevent?

Reaching an optimum



Whitepaper

What are the costs of climate adaptation in the Netherlands?

- expected damages
- expected costs of prevention

Focus on urban areas, for the period 2018-2050.

Damage mechanisms

Direct and indirect costs of houses, streets and railroads

Pluvial flooding

Drought

Direct costs of damaged foundations

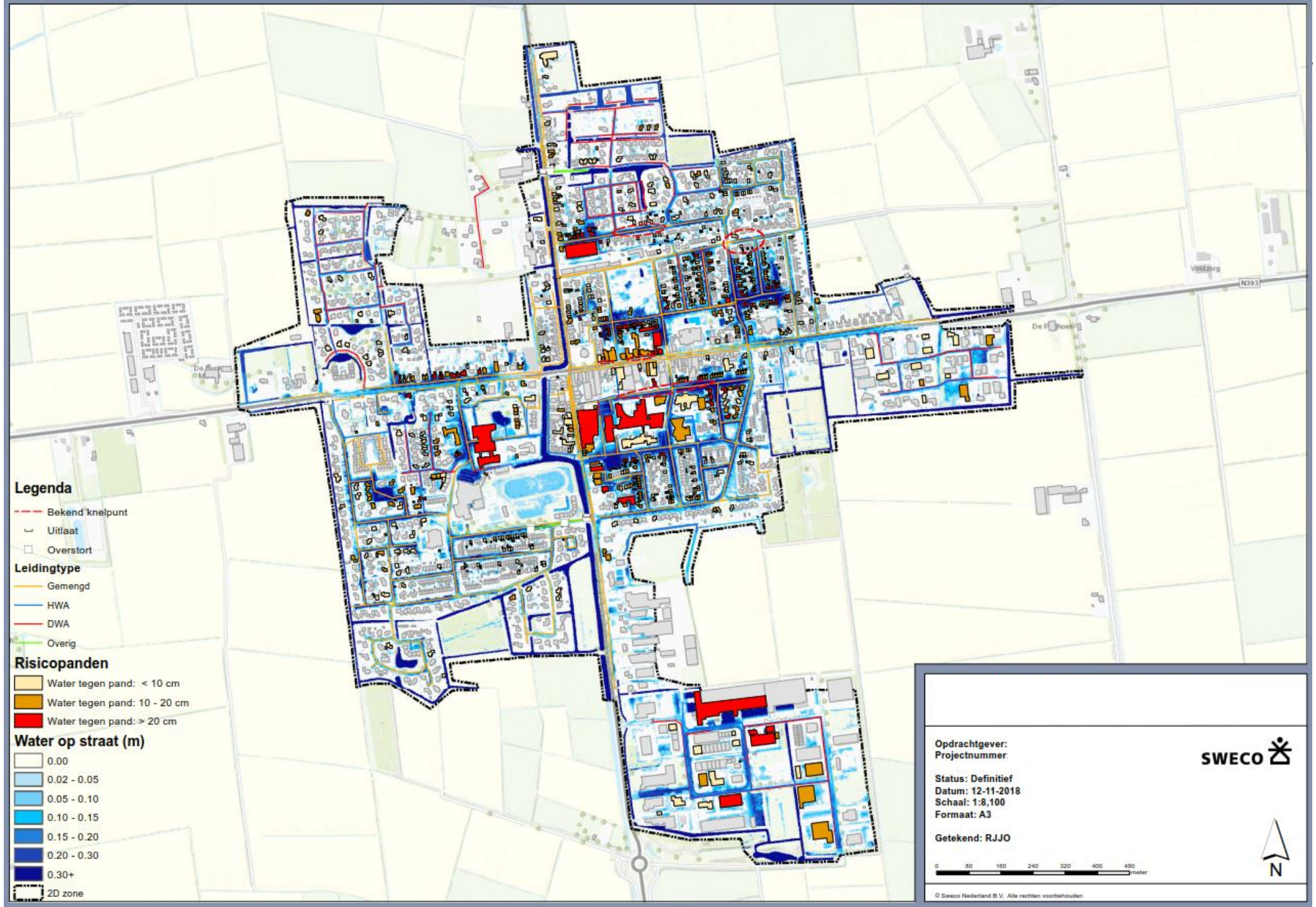
Fluvial flooding

Heat

Direct and indirect costs of more mortality and morbidity, and lower productivity

Design criteria

	Pluvial flooding	Drought	Heat
used to be	20 mm/hr	-	-
current	60 mm/hr	-	-
future?	63-75 mm/hr	No problems when 0-25cm lower ground water level	Prevent a higher temperature


Legenda
Bekend knelpunt
Uitlaat
Overstort
Leidingtype
Gemengd
HWA
DWA
Overig
Risicopanden
Water tegen pand: < 10 cm
Water tegen pand: 10 - 20 cm
Water tegen pand: > 20 cm
Water op straat (m)
0.00
0.02 - 0.05
0.05 - 0.10
0.10 - 0.15
0.15 - 0.20
0.20 - 0.30
0.30+
2D zone
Opdrachtgever:
Projectnummer:
Status: Definitief
Datum: 12-11-2018
Schaal: 1:8,100
Formaat: A3
Getekend: RJJO
SWECO
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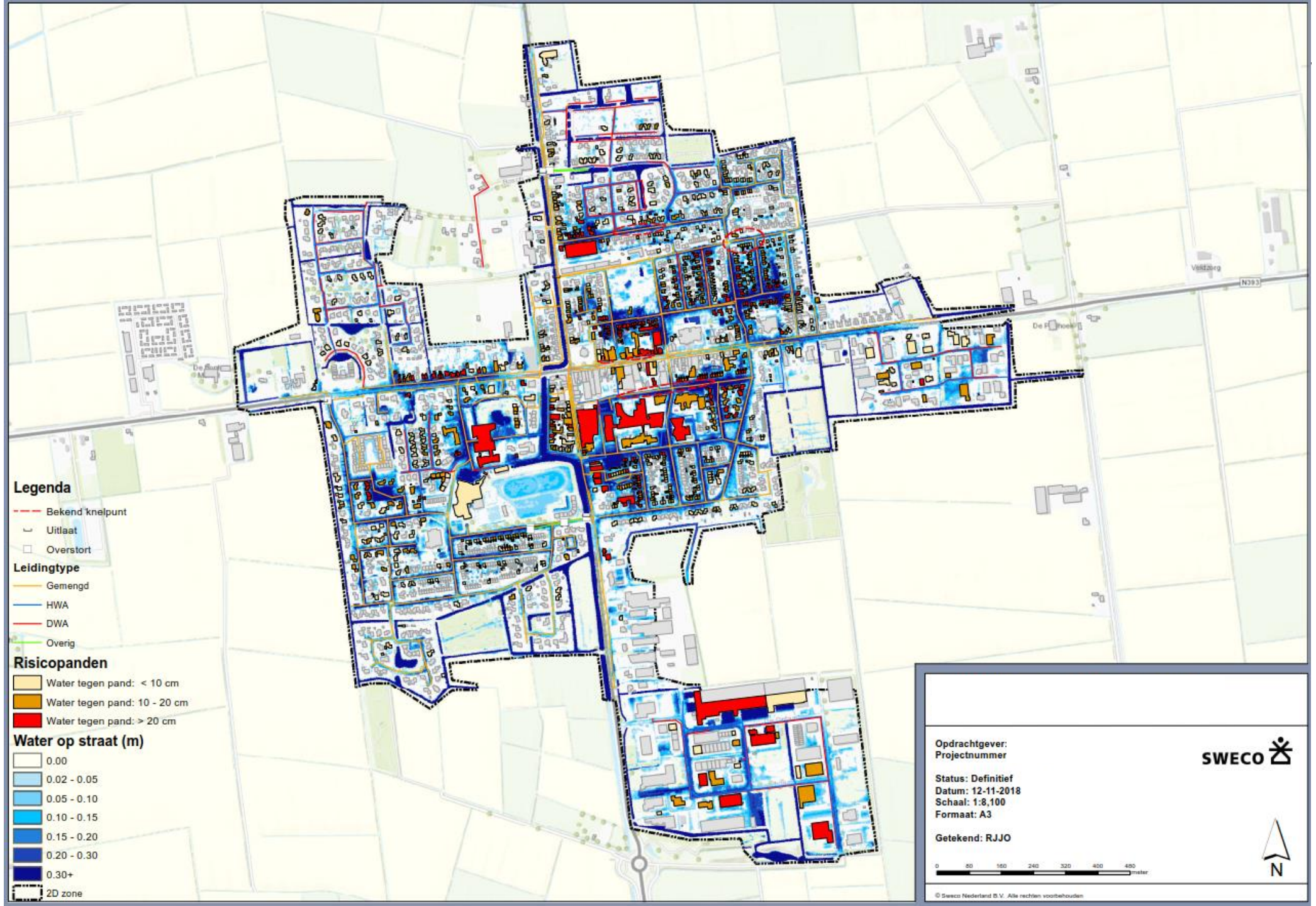
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0 80 160 240 320 400 480 meter
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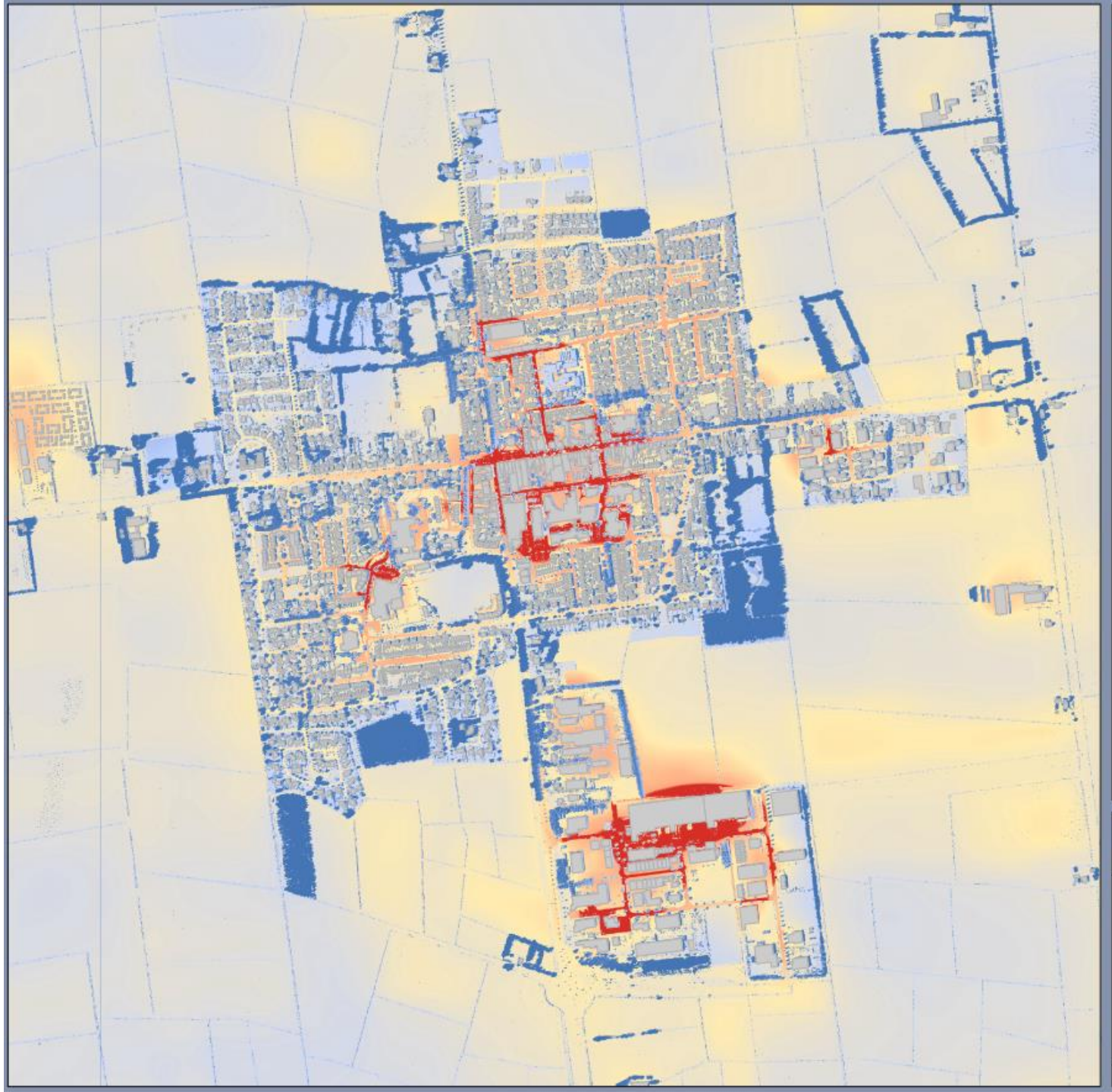


Legenda

- Veel koeler
- Koeler
- Normaal
- Warmer
- Veel warmer

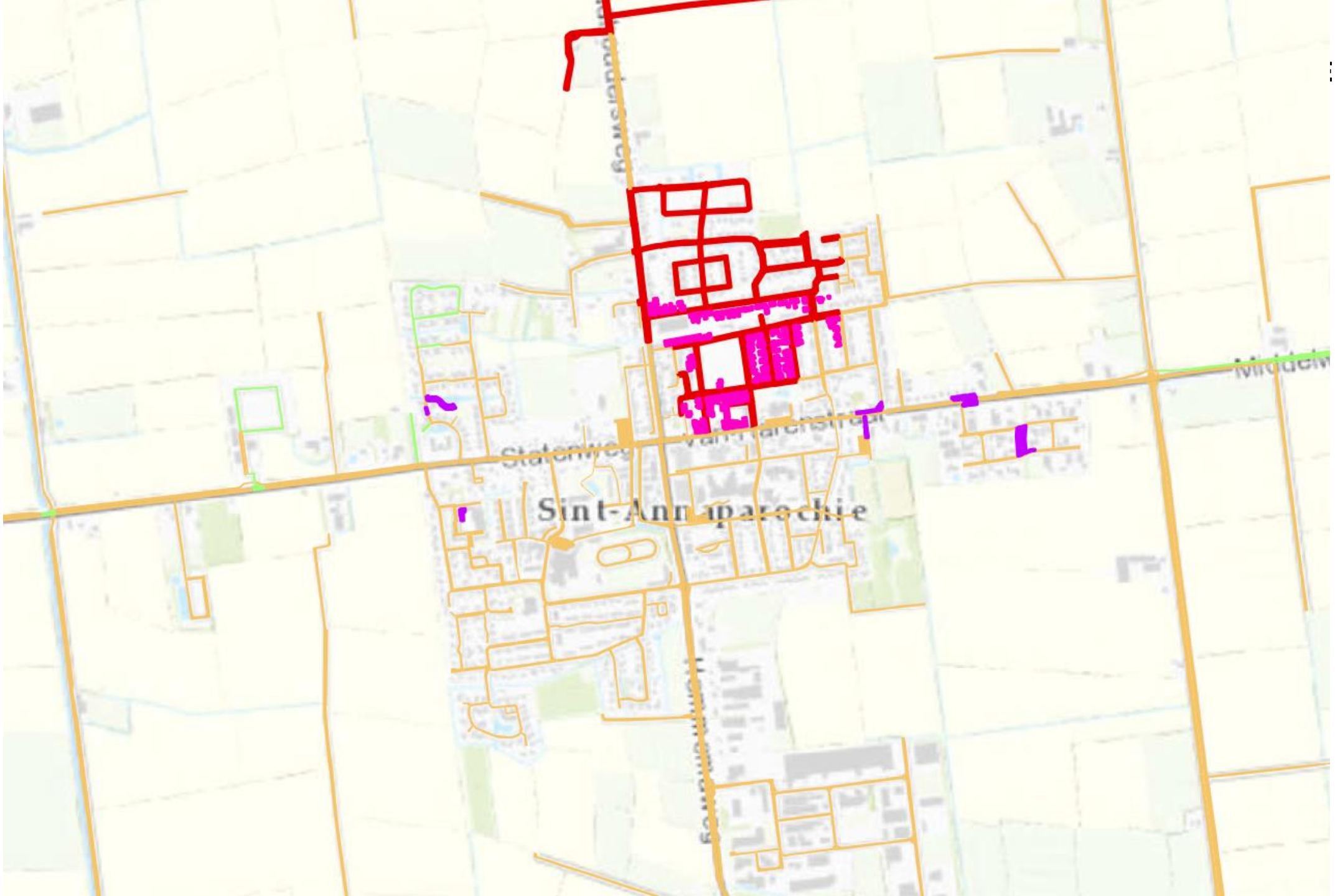
Opdrachtgever:
Projectnummer:

Status: Definitief
Datum: 12-11-2018
Schaal: 1:9.100
Formaat: A3

Getekend: LN - Gecontroleerd: RJJO

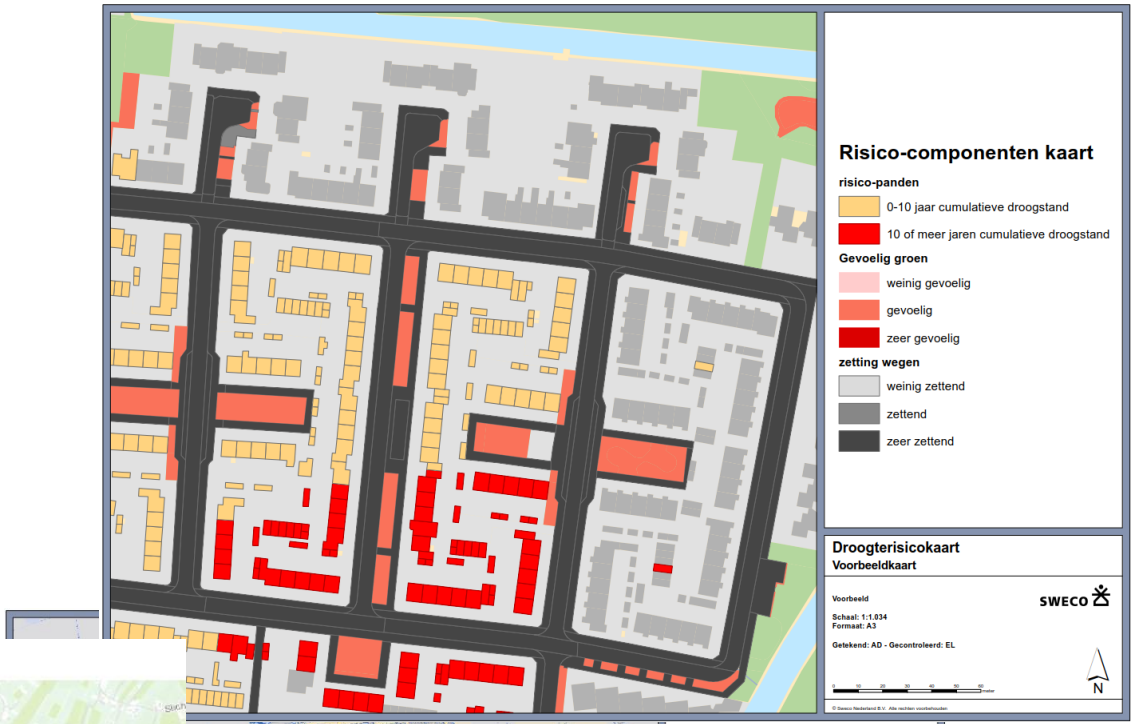
0 90 180 270 360 450 540 meter

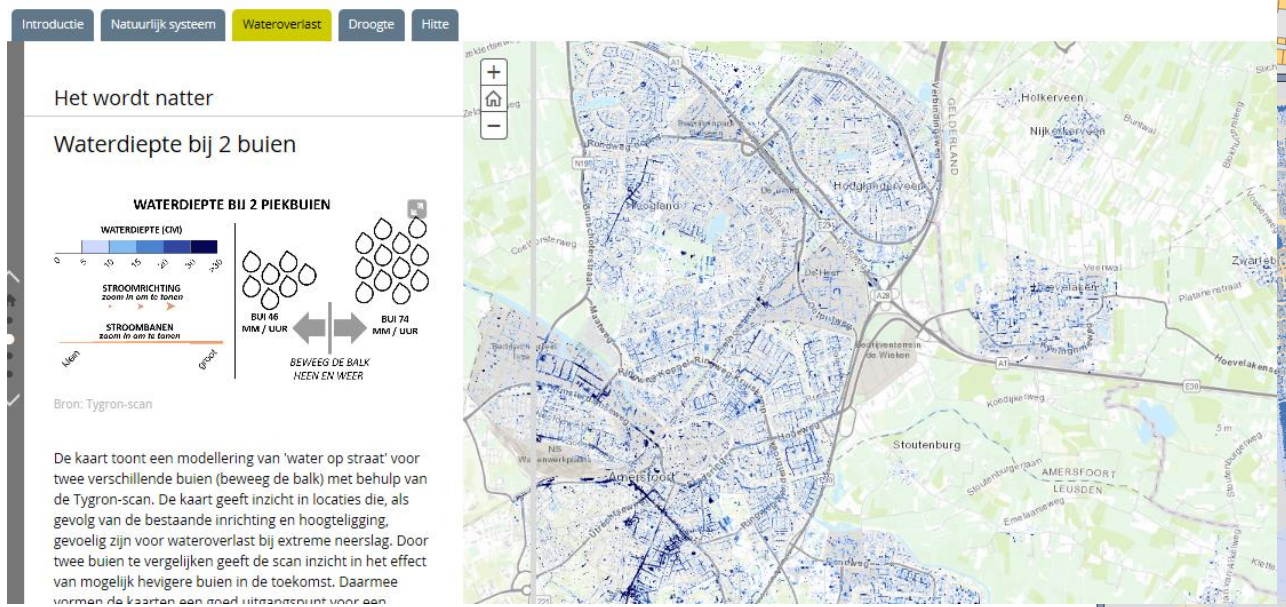
N


Sint-Anna parochie

Climate maps

Affected area X damage = costs





Damages

	Pluvial	Heat	Drought
Autonomous	23		6
Extra	2-12	5-11	0-10
Total	25-35	5-11	6-16

Total costs

36-62 billion euros for the Netherlands

Costs of prevention

Pluvial flooding	*costs*	Heathstress	*costs*	Drought	*Costs*
Green gardens	*0 euro*	Plant tree	*1.500 per tree*	Foundation repair	*54.000 euro per house*
Higher curbs	*175 euro per m3*	Paint roof white	*15 euro per m2*	Drainage	*350 euro per m1*
More open water	*75 euro per m3*	Green roof	*45 euro per m2*		
More green areas	*100 euro per m3*				
Lower road sides	*40 euro per m3*				
Stormwater sewers	*290 euro per m3*				

Prevention

	Pluvial	Heat	Drought
Autonomous	25	0	6
Extra	11-48	0-2	0-2
Total	36-73	0-2	6-8

Total costs

42-83 billion euros for the Netherlands

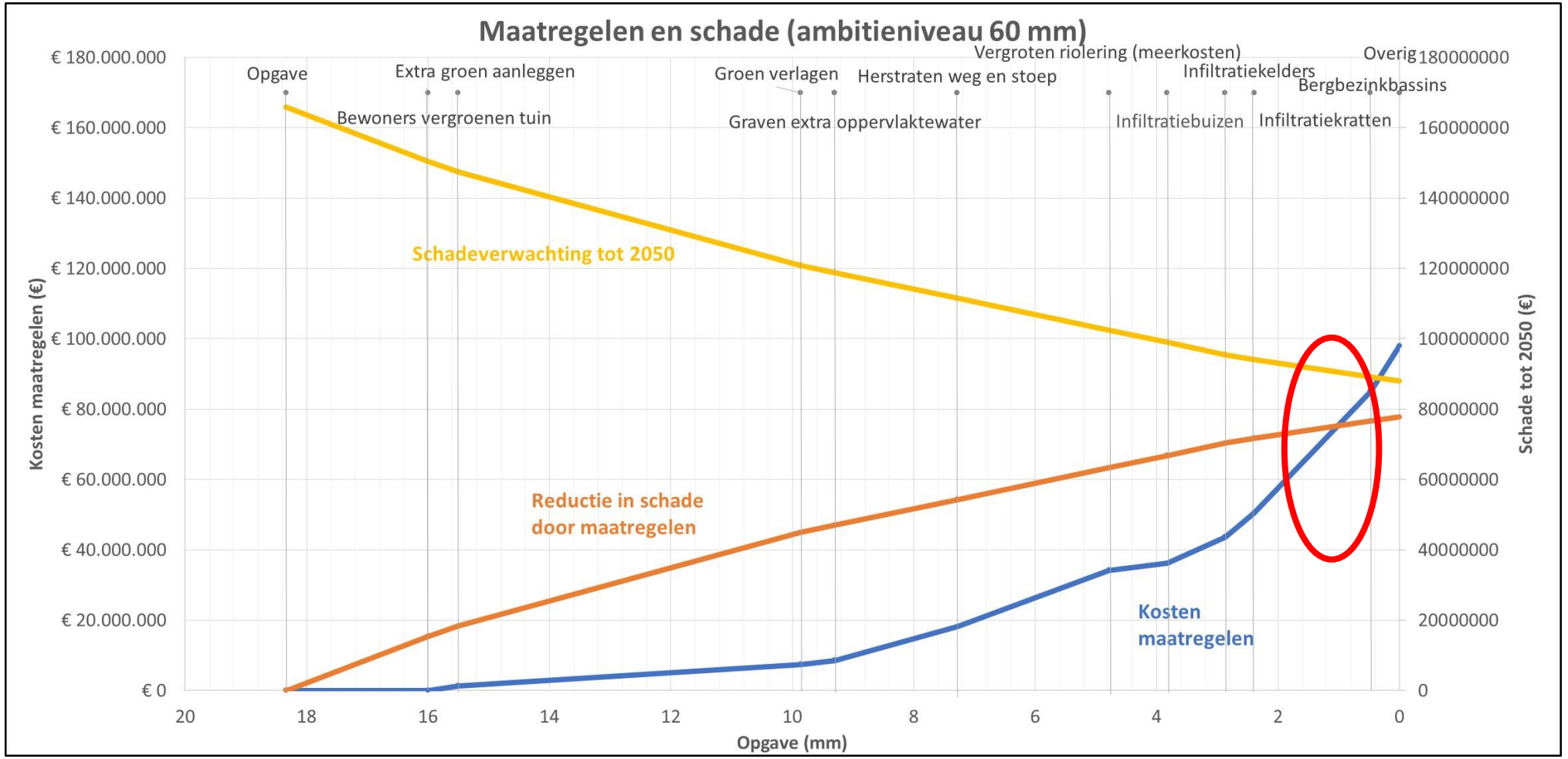
Optimum?

	Pluvial		***Heat***		***Drought***	
	Damage	*Prevention*	*Damage*	*Prevention*	*Damage*	*Prevention*
Autonomous	23	25		0	6	6
Extra	2-12	11-48	5-11	0-2	0-10	0-2
Total	25-35	36-73	5-11	0-2	6-10	6-8

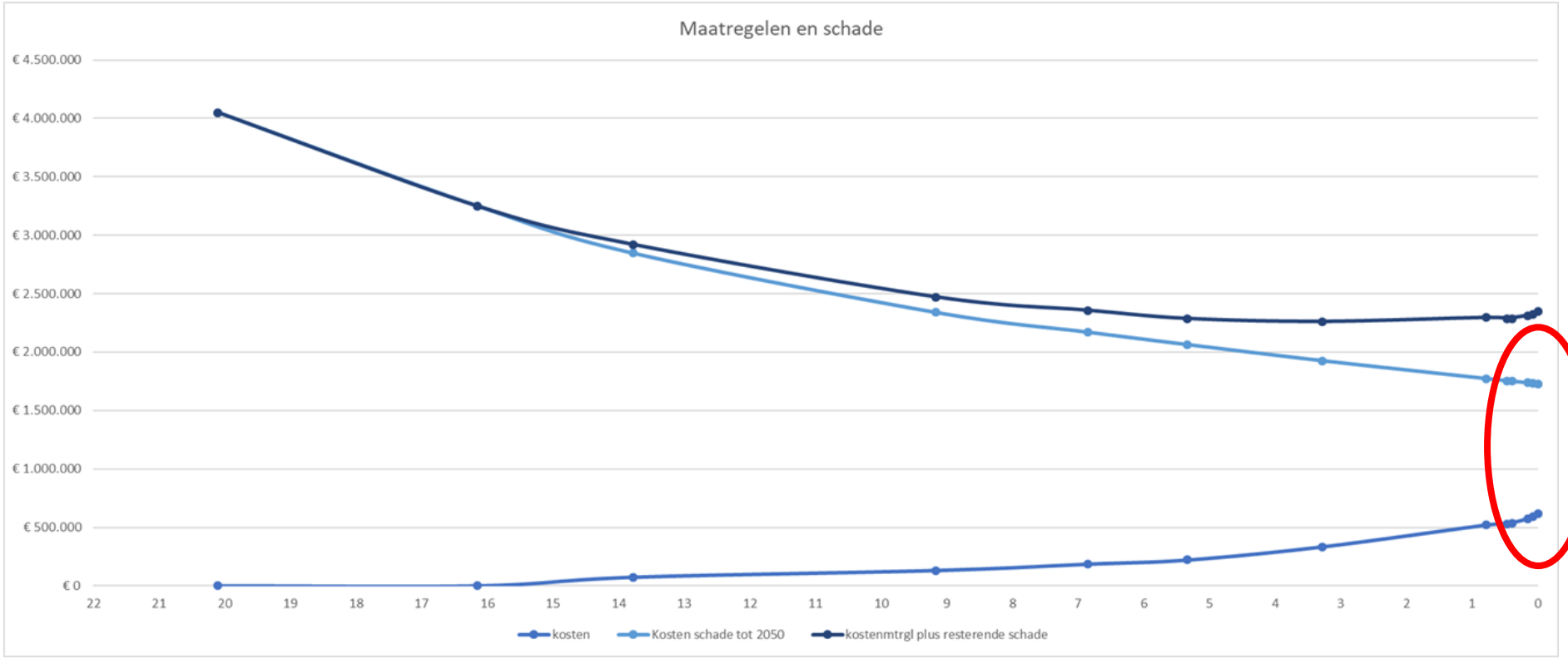

3-ZSV-62


reisburo Schoenmaeckers
BLOKKER
Albert Heijn

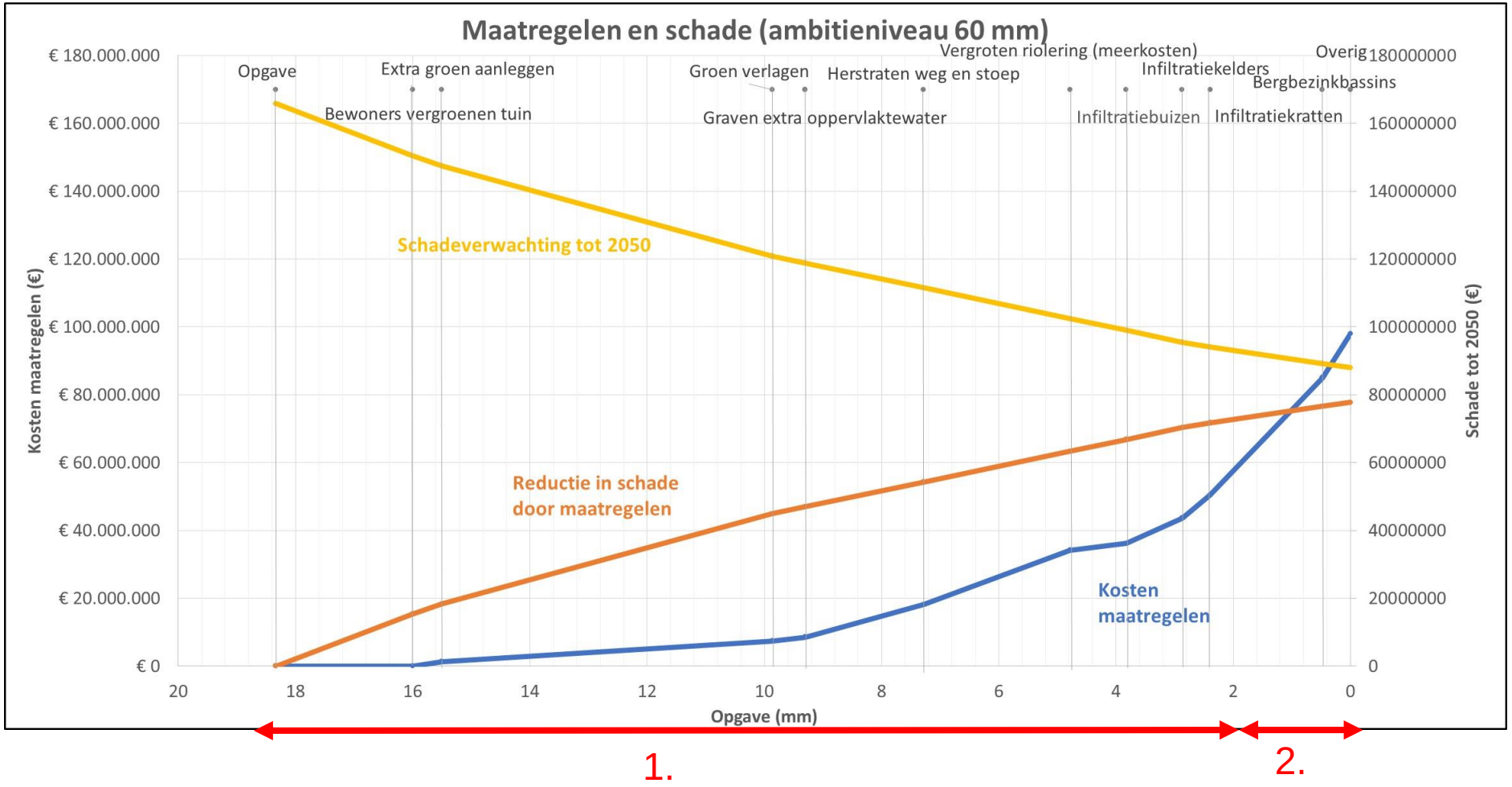
CELSIUS: a strategy for every neighbourhood



CELSIUS: a strategy for every neighbourhood

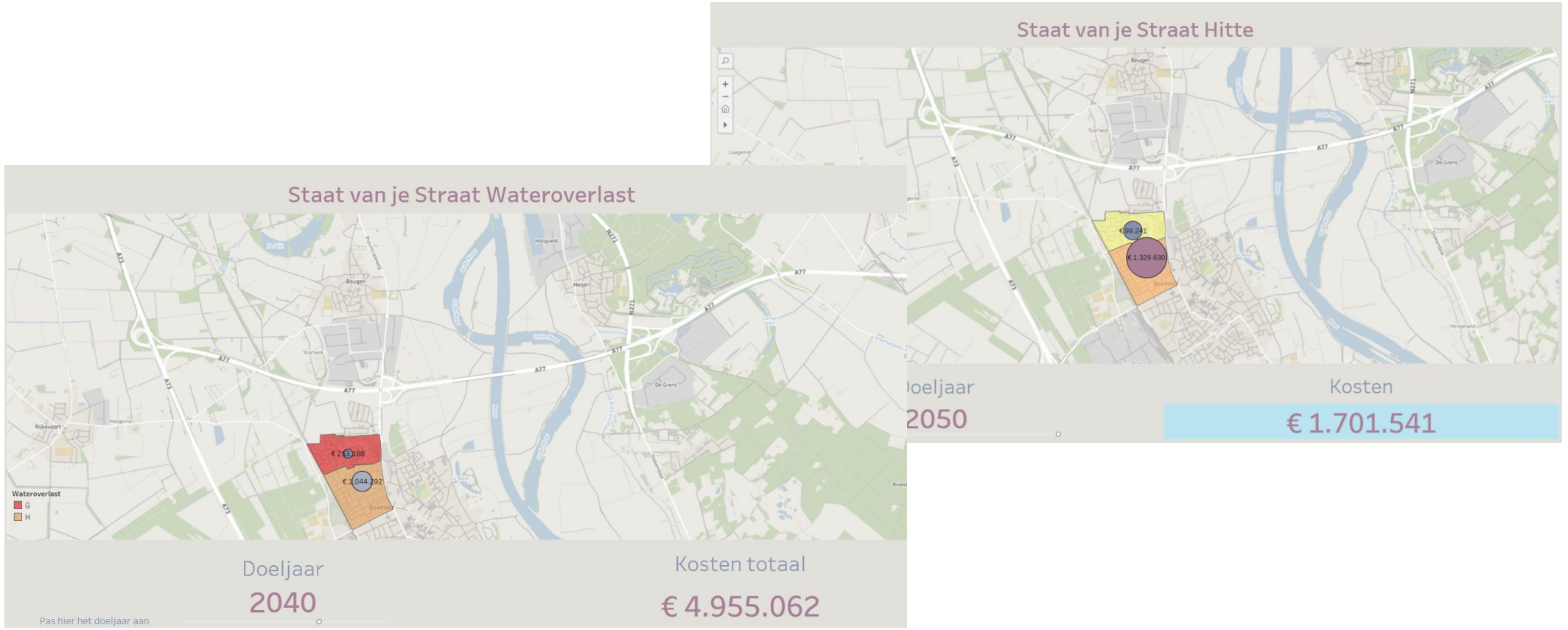


CELSIUS: how to use this information?



1. Prevention
2. Recovery?

Priorities, financial planning



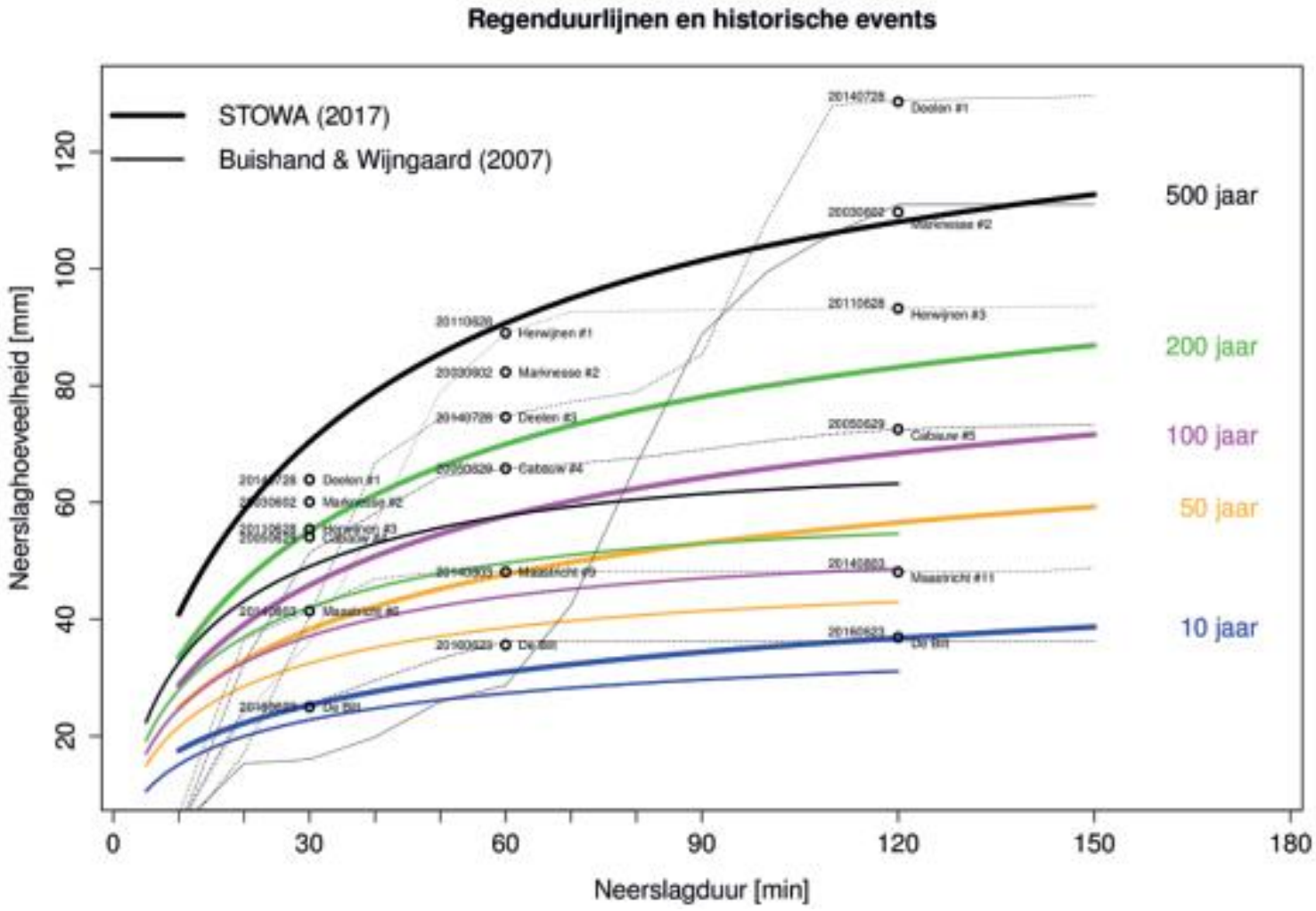
Uncertainties

1. There is more than financial calculations

Uncertainties

1. There is more than financial calculations

2. The climate changes, but forecasting is still difficult


Regenduurlijnen en historische events
STOWA (2017)
Buishand & Wijngaard (2007)
500 jaar
200 jaar
100 jaar
50 jaar
10 jaar
Neerslaghoeveelheid [mm]
Neerslagduur [min]
0
30
60
90
120
150
180
20
40
60
80
100
120

Uncertainties

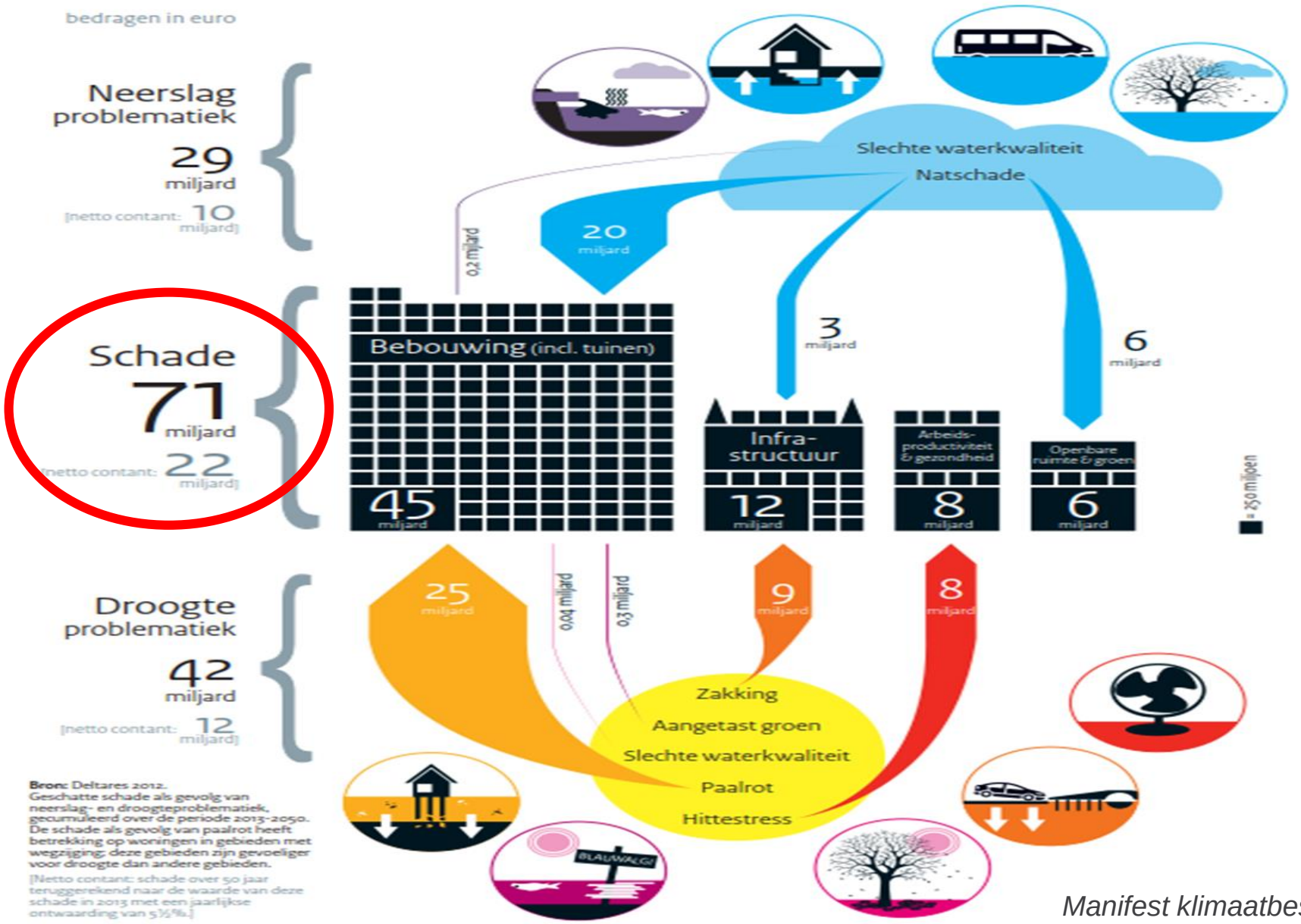
1. There is more than financial calculations

2. The climate changes, but forecasting is still difficult

3. Costs of climate change
   - Costs of damages
   - Costs of new technologies

De Klimaatbestendige stad

Opgaven



Bron: Deltares 2012.
Geschatte schade als gevolg van neerslag- en droogteproblematiek, gecumuleerd over de periode 2013-2050. De schade als gevolg van paalrot heeft betrekking op woningen in gebieden met wegzijging; deze gebieden zijn gevoeliger voor droogte dan andere gebieden.
[Netto contant: schade over 50 jaar teruggerekend naar de waarde van deze schade in 2013 met een jaarlijkse ontwaarding van 5½%.]

Manifest klimaatbestendige stad, 2012

In conclusion:

- There will be costs for climate adaptation
- These costs can be related to:
  - Prevention, or
  - Damages
- The total costs of climate adaptation sum up to billions
- But, they are unevenly spread out over the country
- So climate adaptation-strategies can be different
- A more financial look can help with this

Questions?

SWECO