Experiences with energy and nutrient recovery from the water cycle of Amsterdam

Anne Marieke Motelica

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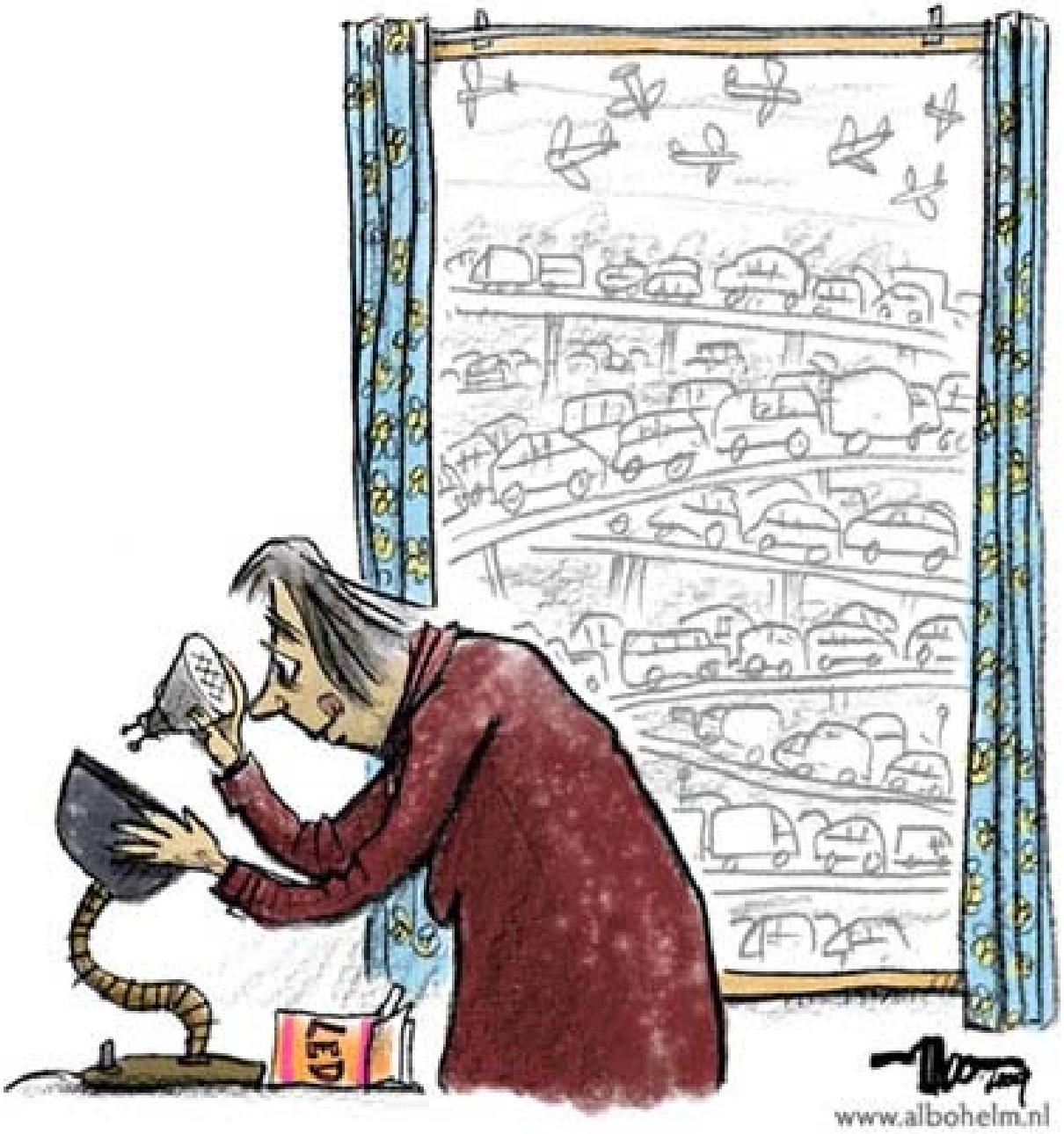
waternet


LED
www.albohelm.nl

Outline

- Waternet
- Recovery from the water cycle
  - Nutrients
  - Thermal energy
  - Chemical energy
- Conclusions

Waternet as a mutual organization

City of Amsterdam
- Sewerage system
- Groundwater
- Drinking water
- Shipping and inland waterways

Amstel, Gooi and Vecht Water Board
- Dykes
- Water level
- Water surface area
- Cleaning waste water

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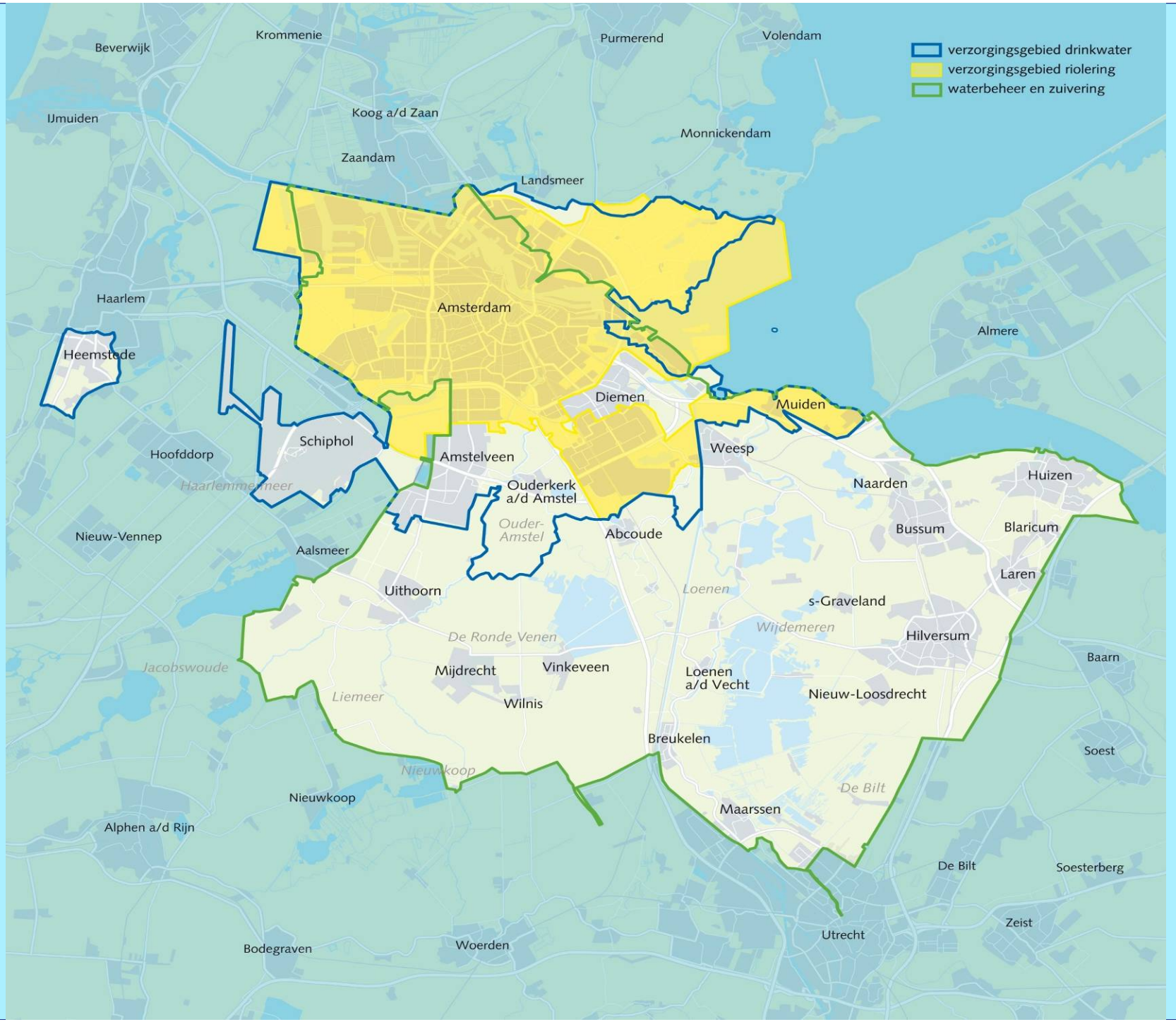
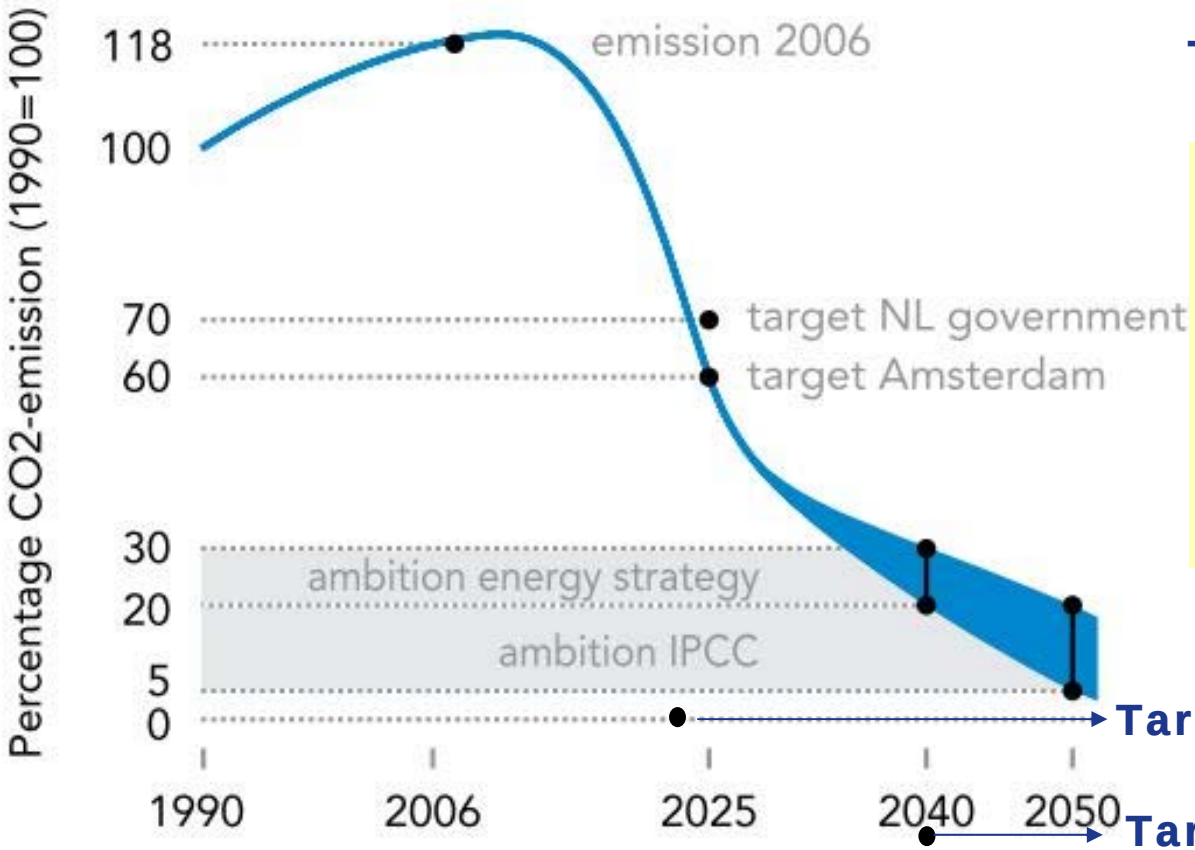
Waternet foundation


verzorgingsgebied drinkwater
verzorgingsgebied riolering
waterbeheer en zuivering
Beverwijk
Krommenie
Purmerend
Volendam
IJmuiden
Koog a/d Zaan
Monnickendam
Zaandam
Landsmeer
Haarlem
Amsterdam
Almere
Heemstede
Diemen
Muiden
Schiphol
Hoofddorp
Amstelveen
Weesp
Haarlemmermeer
Ouderkerk a/d Amstel
Naarden
Huizen
Ouder-Amstel
Abcoude
Bussum
Blaricum
Nieuw-Vennep
Aalsmeer
Laren
Uithoorn
Loenen
s-Graveland
De Ronde Venen
Wijdemeren
Hilversum
Jacobswoude
Mijdrecht
Vinkeveen
Baarn
Loenen a/d Vecht
Liemeer
Wilnis
Nieuw-Loosdrecht
Breukelen
Soest
Nieuwkoop
De Bilt
Nieuwkoop
Maarssen
Alphen a/d Rijn
De Bilt
Soesterberg
Zeist
Utrecht
Bodegraven
Woerden

Why energy and nutrients from water?

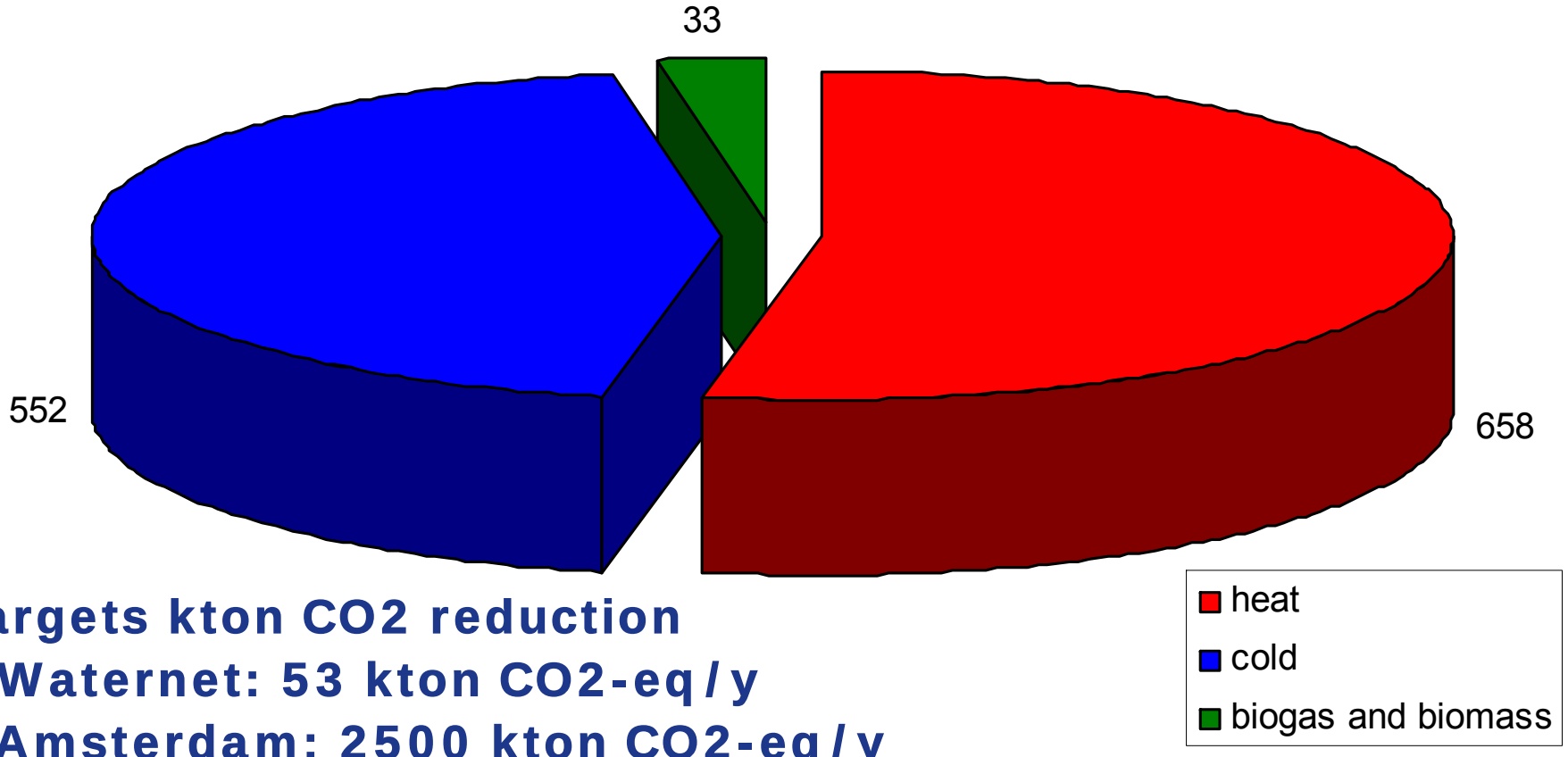


Transformation to circular economy

Target Waternet 2020

Target Amsterdam: Reuse of all waste

kton CO2 reduction potential



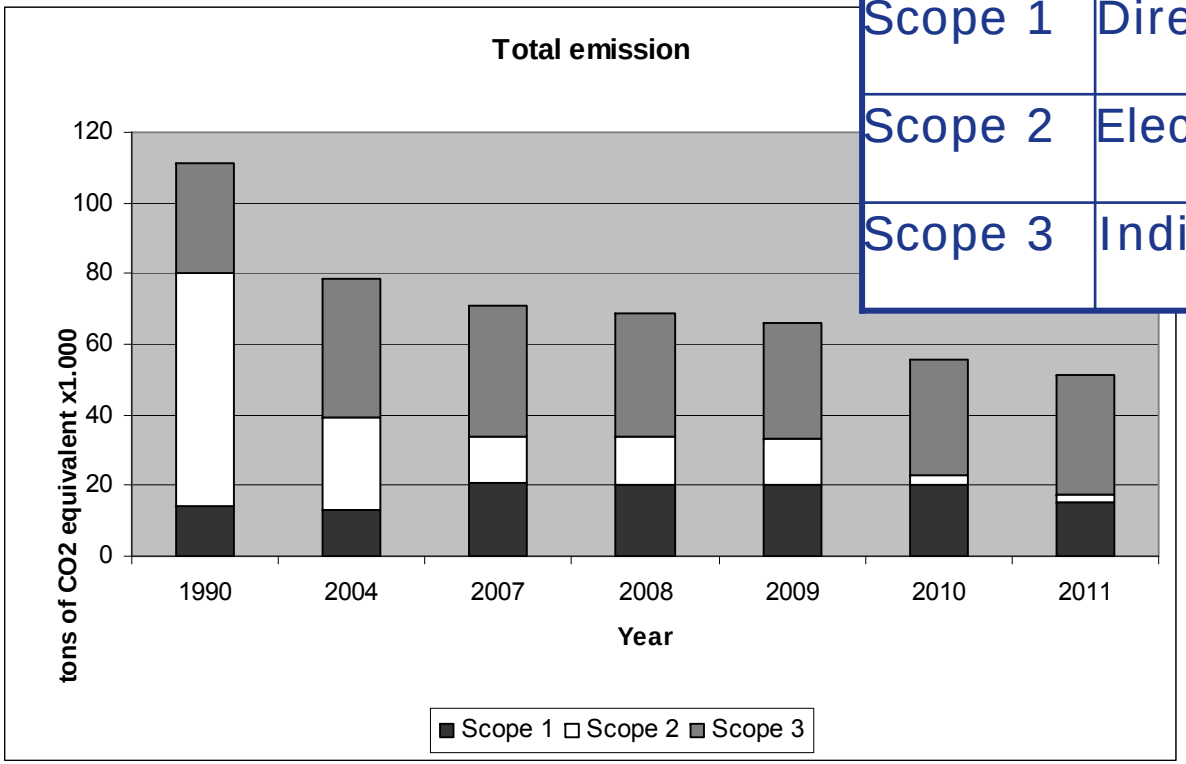
Targets kton CO2 reduction

→Waternet: 53 kton CO2-eq/y

→Amsterdam: 2500 kton CO2-eq/y

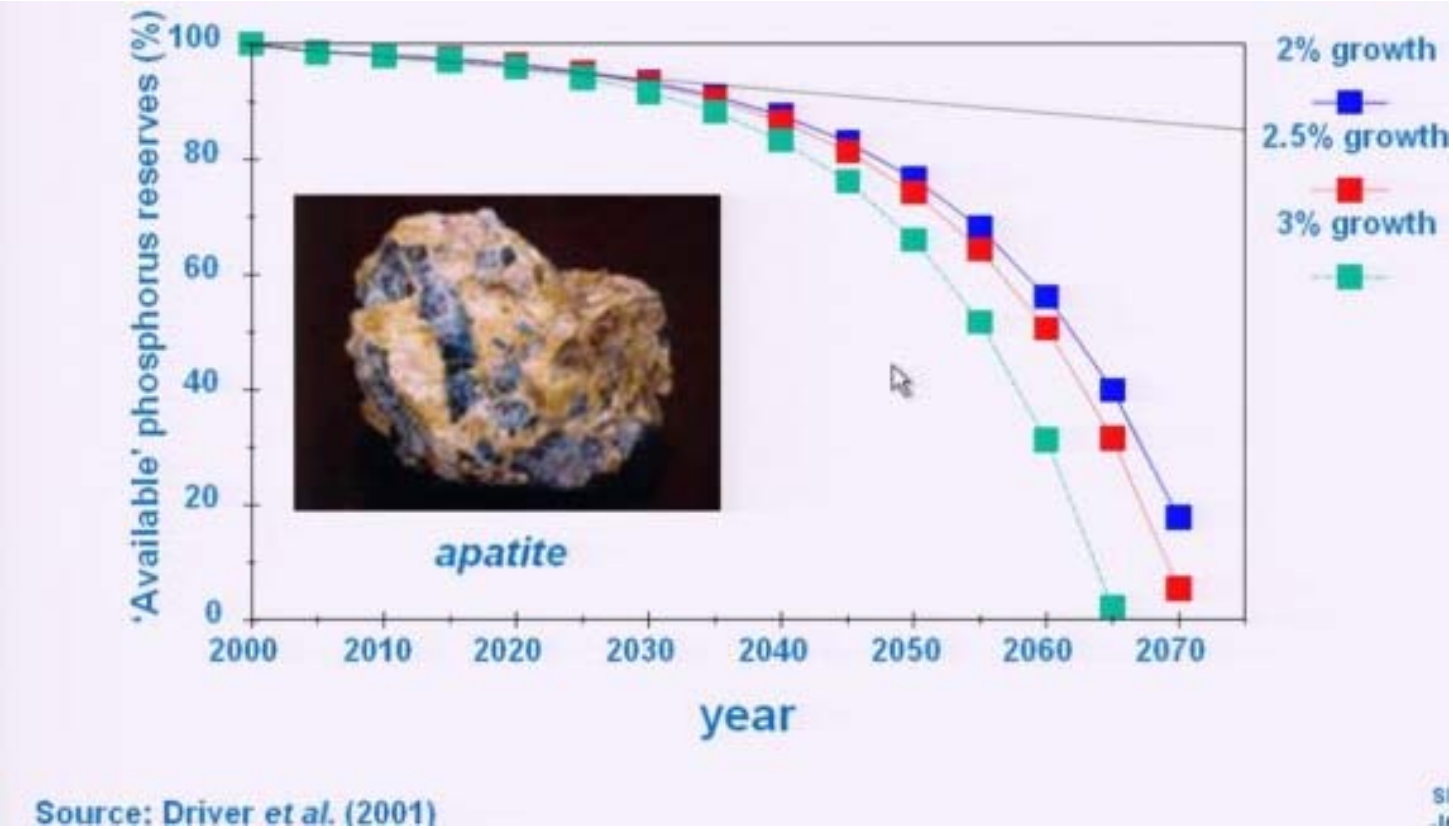
Energy recovery from water cycle Amsterdam ~40%

Waternet Carbon Footprint



	Emission Type
Scope 1	Direct Emissions
Scope 2	Electricity
Scope 3	Indirect Emissions

Phosphorus reserves are running out!




Struvite will be produced
in Amsterdam in 2013


About 1000 ton struvite/year

Dutch toilet paper consumption:
1 kg/person/month

Cellulose

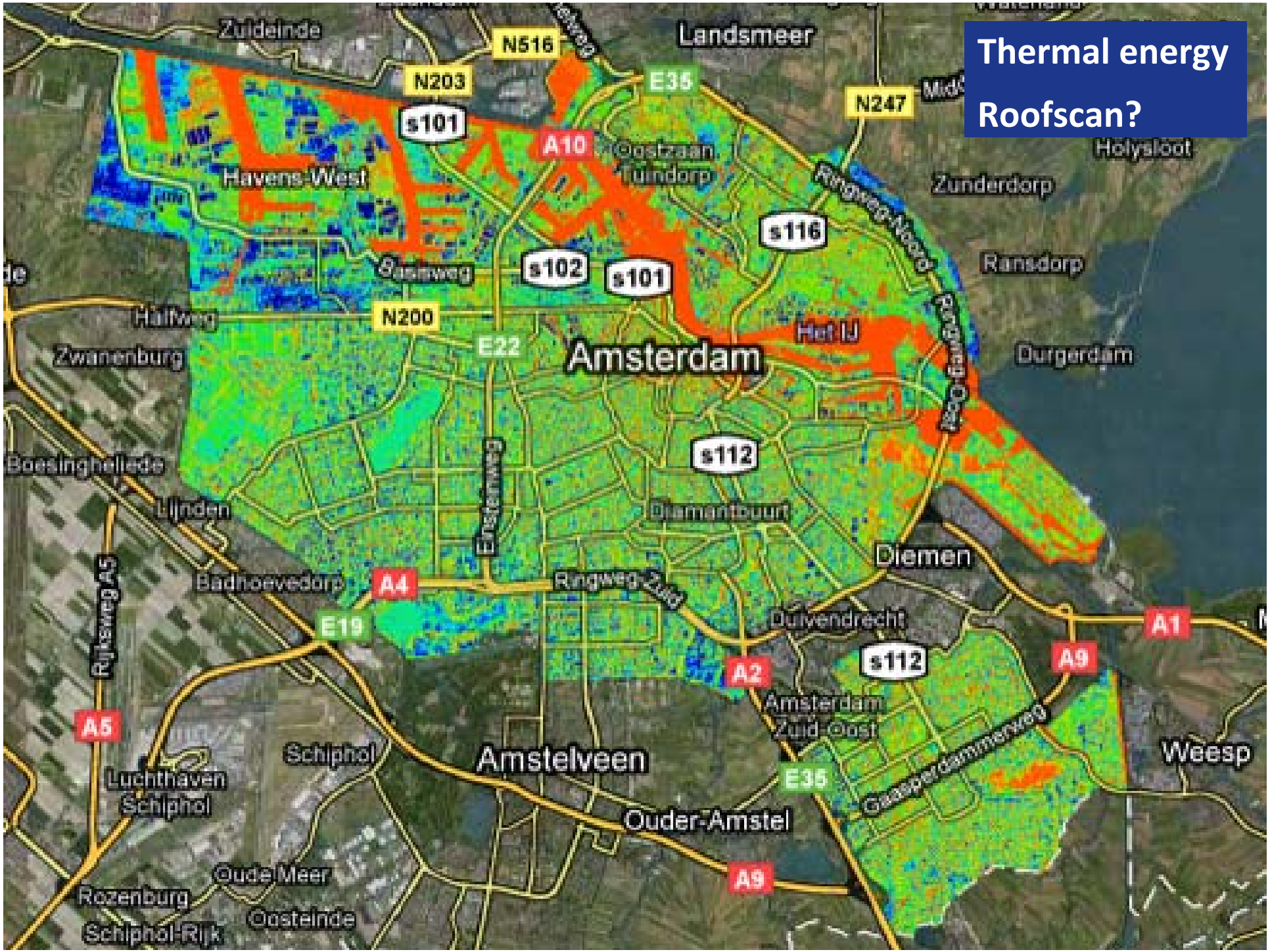
Sieve wwtp Blaricum (30.000 pe)
treats 70% of influent

dried sievings 80% cellulose

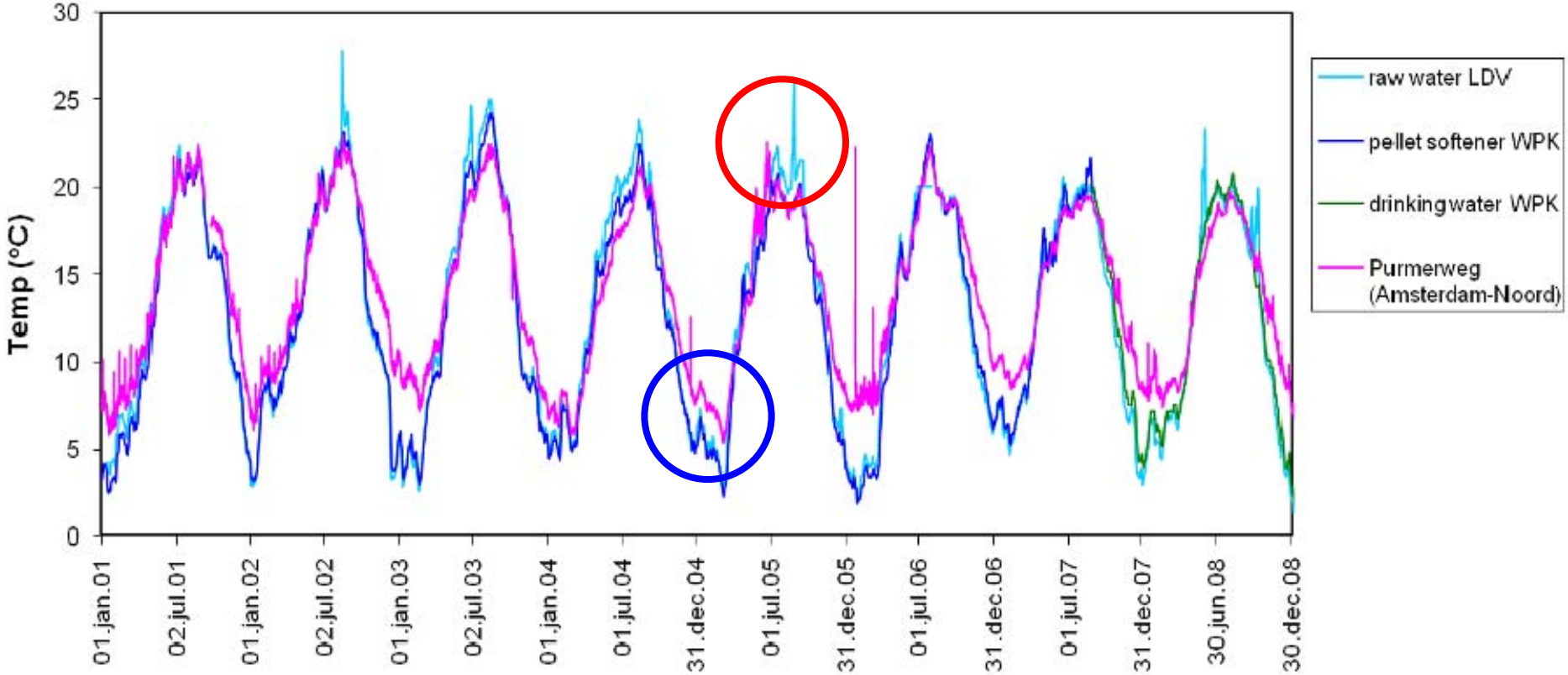
FeCl drinking water sludge

→Anaerobic digestion preventing H2S formation

→Surface water Removal PO4


Thermal energy
Roofscan?
Zuideinde
N516
Landsmeer
N203
E35
N247
s101
A10
Oostzaan
Tuindorp
Havens-West
Zunderdorp
Holysloot
s116
Ringweg-Noord
Ransdorp
Saenweg
s102
s101
Halfweg
N200
Het IJ
E22
Amsterdam
Zwanenburg
Durgerdam
Ringweg-Oost
Boesingheliede
s112
Ijnden
Diamantbuurt
Diemen
Badhoevedorp
A4
Ringweg-Zuid
E19
Duivendrecht
A1
A9
s112
A2
Amsterdam
Zuid-Oost
A5
Schiphol
Amstelveen
Weesp
E35
Luchthaven
Schiphol
Ouder-Amstel
Gaasperdammerweg
A9
Oude Meer
Rozenburg
Oosteinde
Schiphol-Rijk

Drinking water temperature



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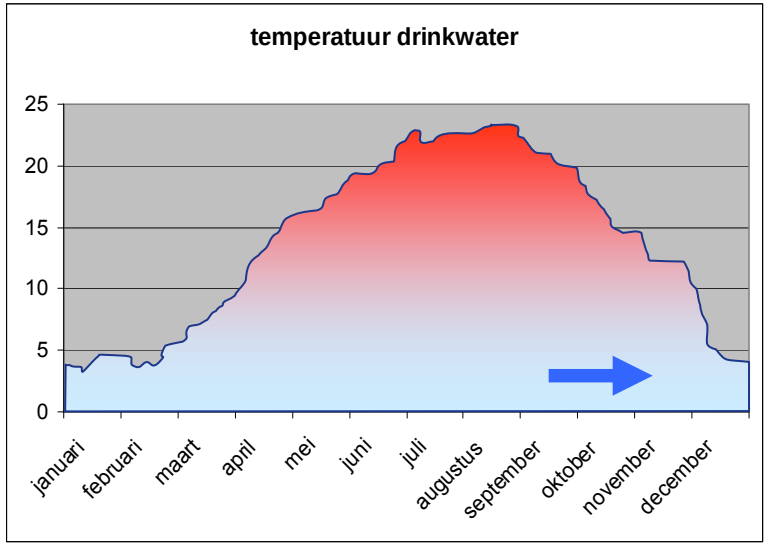
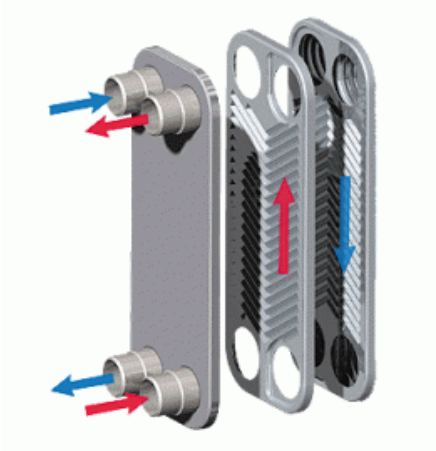
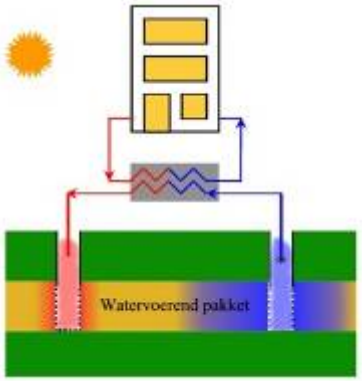
WRK water: Schiphol

Regeneration ATES from raw water

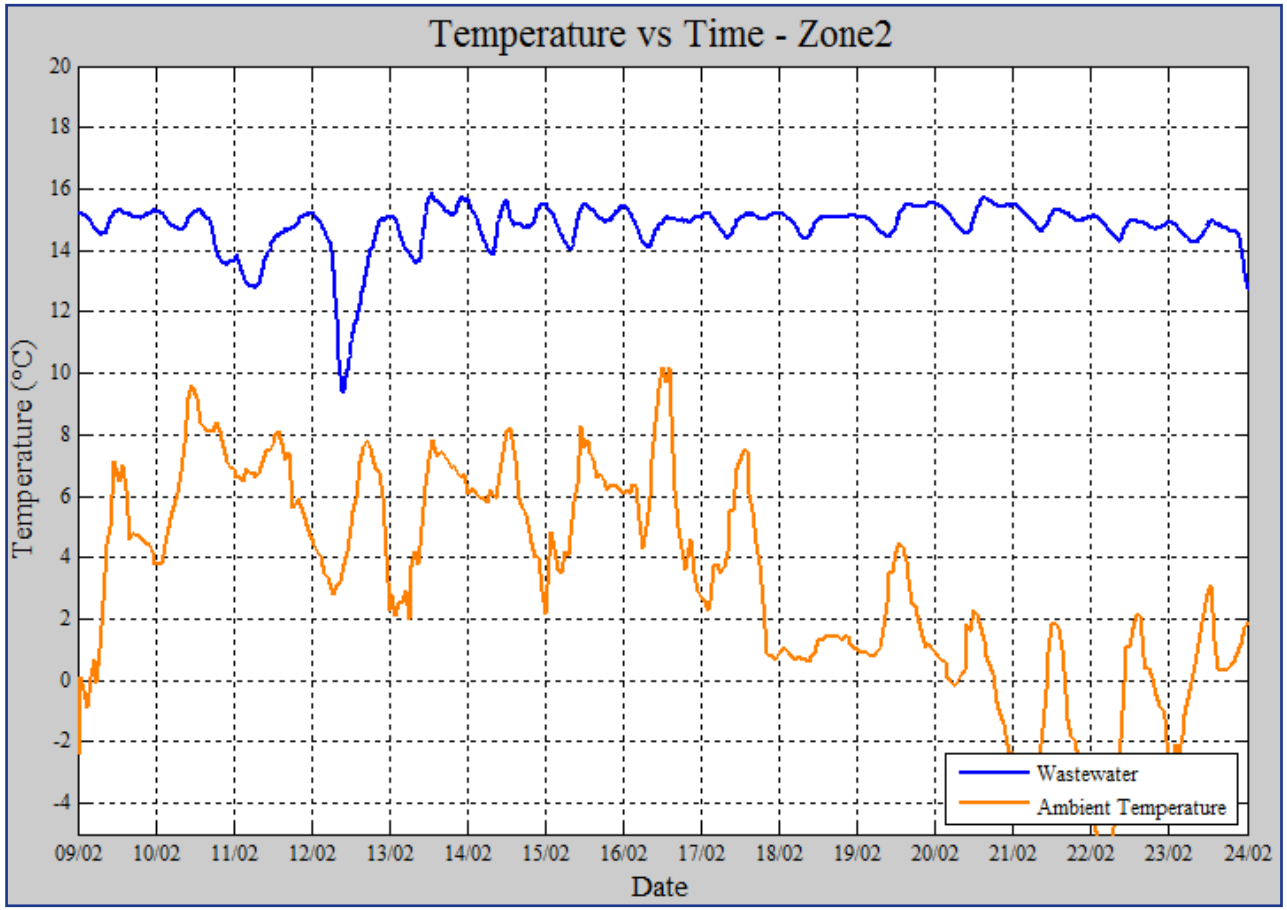




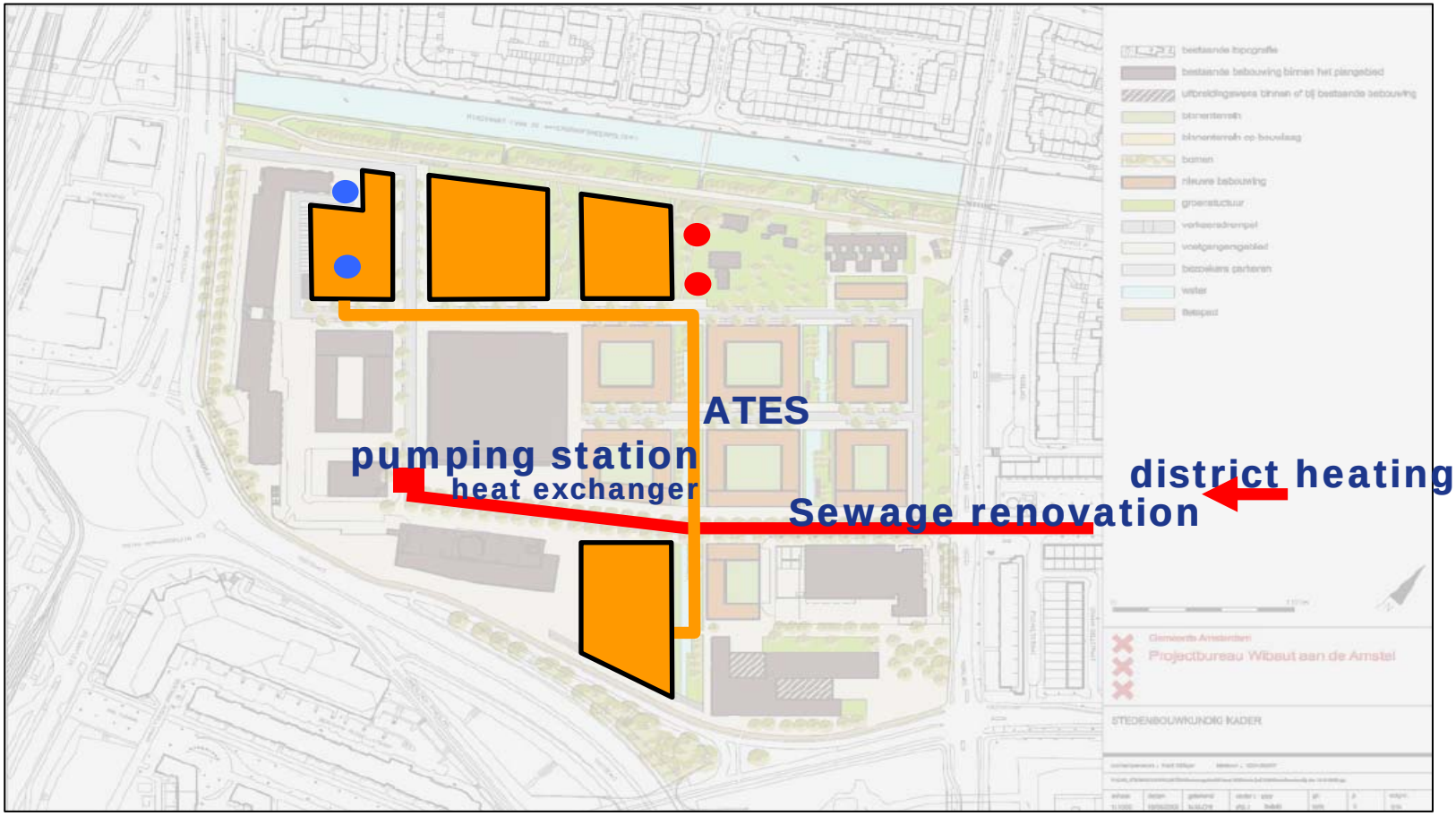


- WRK water in winter ↑ upto 12 °C

Sewerage


Temperature vs Time - Zone2
Temperature (°C)
20
18
16
14
12
10
8
6
4
2
0
-2
-4
09/02
10/02
11/02
12/02
13/02
14/02
15/02
16/02
17/02
18/02
19/02
20/02
21/02
22/02
23/02
24/02
Date
Wastewater
Ambient Temperature

Example: James Wattstraat



Chemical energy

Sewerage
Clogging material

520 ton/y clogging material

~156 ton/y fat
→ Anaerobic digestion

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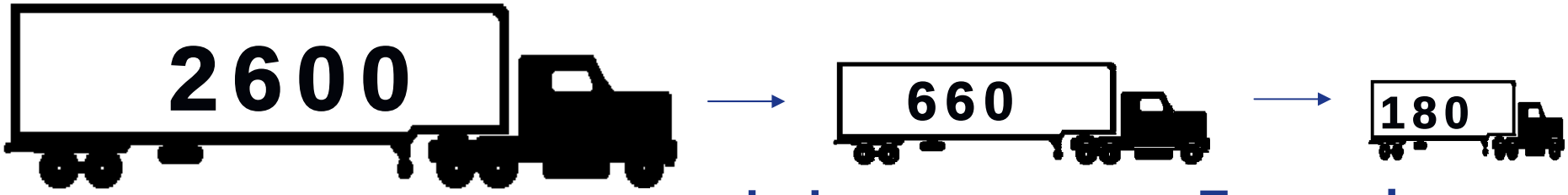
Waterplants

Explosive growth
Removal problem

→ Energy recovery



→ Nutrients
Cattle feed, proteins, etc

ECN

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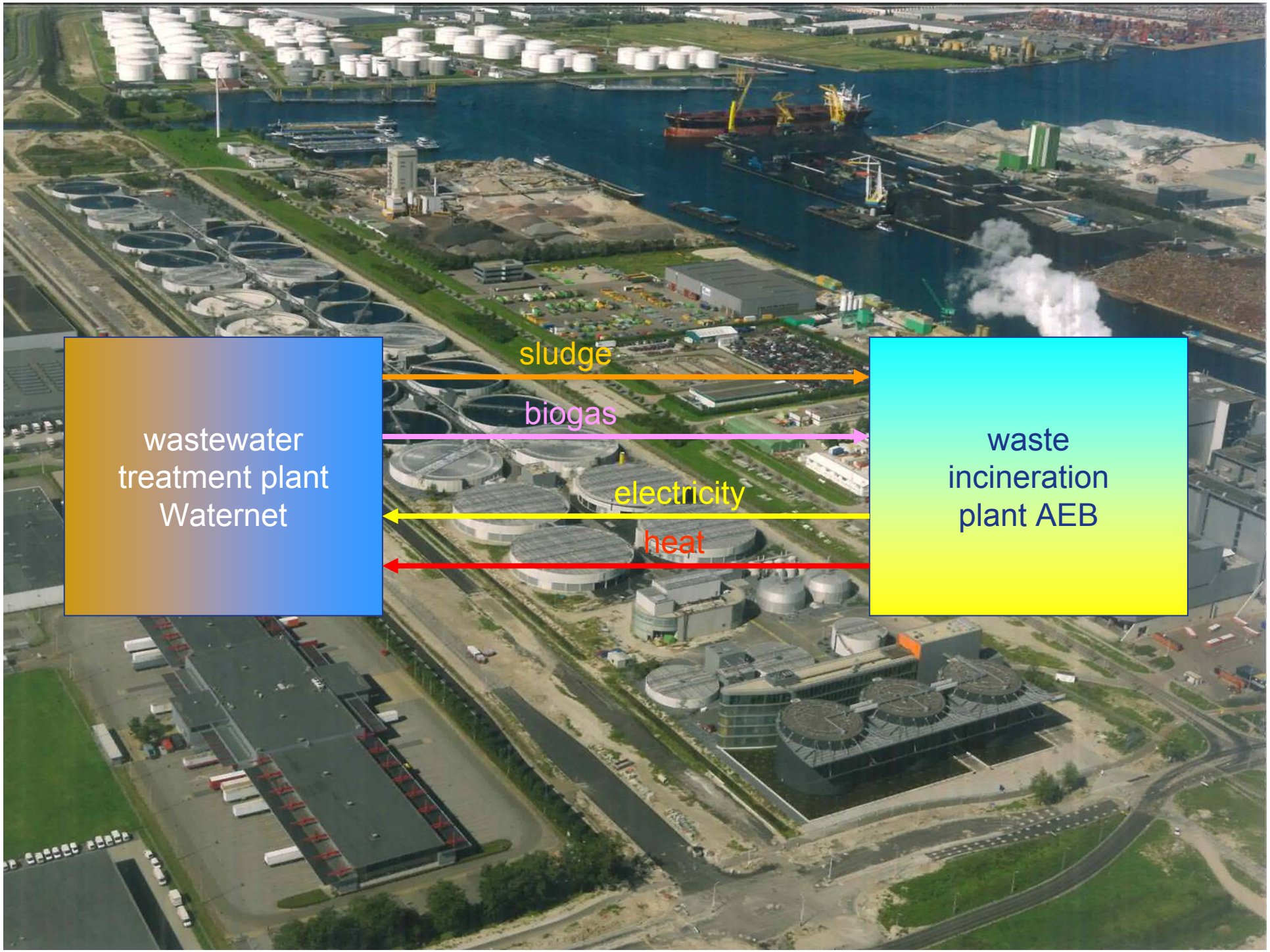
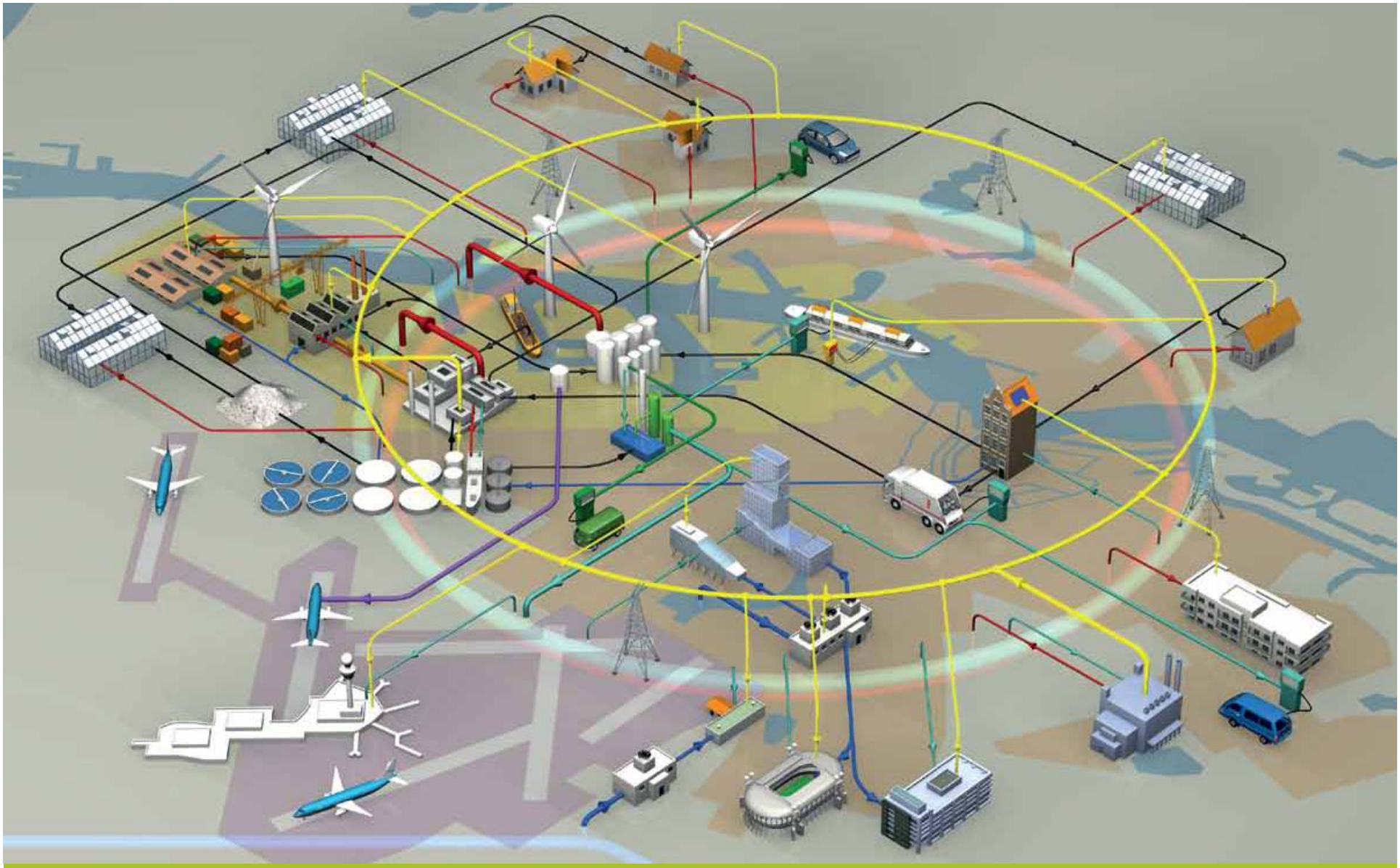
Biogas as transport fuel

60 company cars of Waternet


wastewater treatment plant Waternet
sludge
biogas
electricity
heat
waste incineration plant AEB



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Conclusions

- There are several nutrient and energy recovery options from the Amsterdam watercycle
- The goal of Waternet to become climate neutral in 2020 is a challenge
- Energy recovery potential from the Amsterdam watercycle
  - is enough to become climate neutral
  - can contribute significantly to the CO2 reduction of Amsterdam
- Cooperation is important


Questions?