Waterschap Aa en Maas

Helmonds Energie Convenant

Duurzaamheid bij het waterschap

23 november 2016

Werken met water. Voor nu en later.

Inhoud

Waterschappen in NL, WSAM

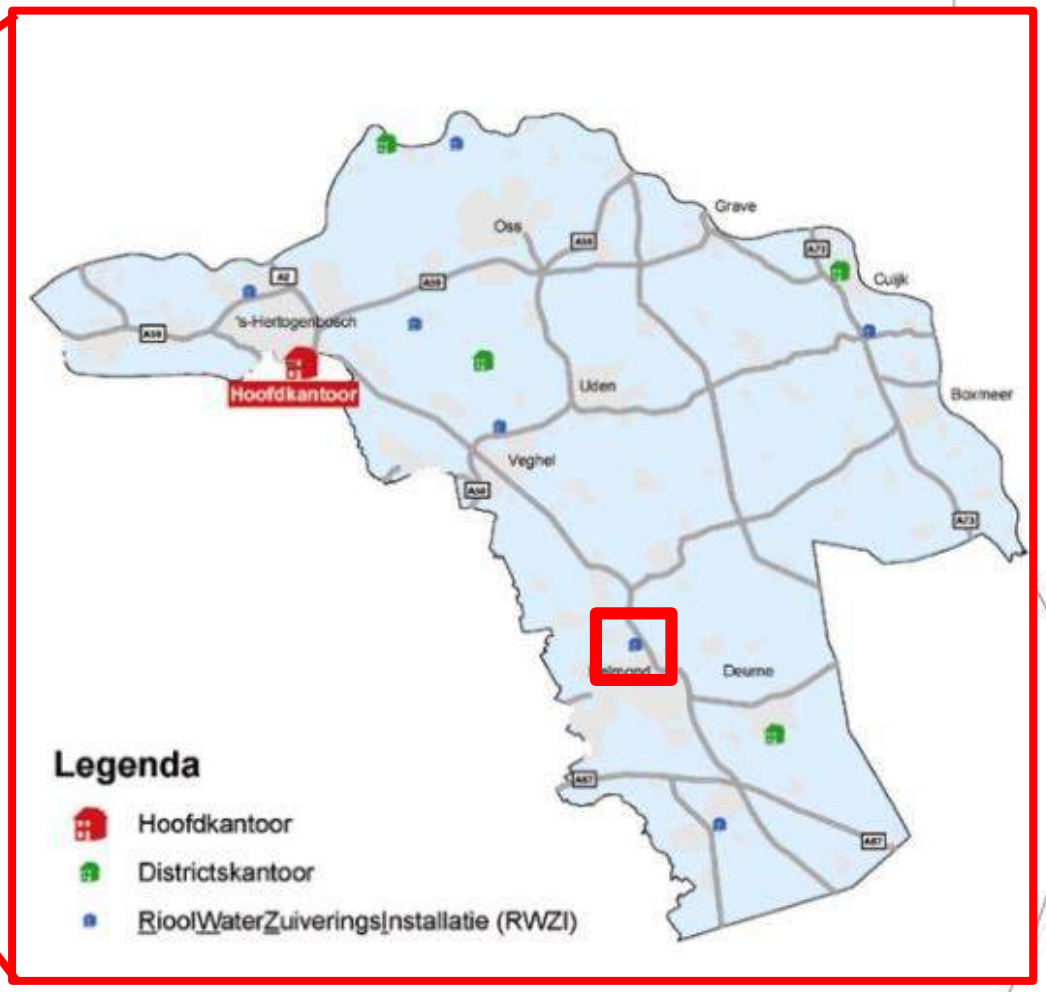
Energie en Grondstoffen

Cellulose terugwinning op rwzi Aarle-Rixtel

Waterboards care for…

WATER

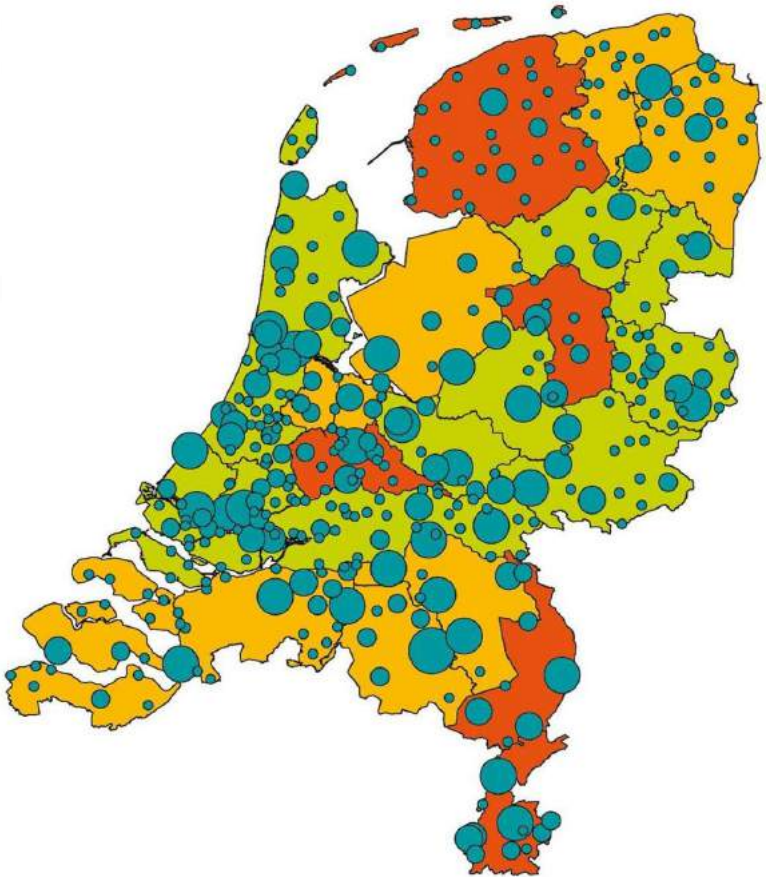
Waterboards Aa en Maas



- 160.000 hectare
- 700.000 inhabitants
- 7 WWTP’s
- 100 pumping stations
- 420 km sewarage pipelines

…dus veel potentiële biomassabronnen

…dus veel potentiele biomassabronnen….



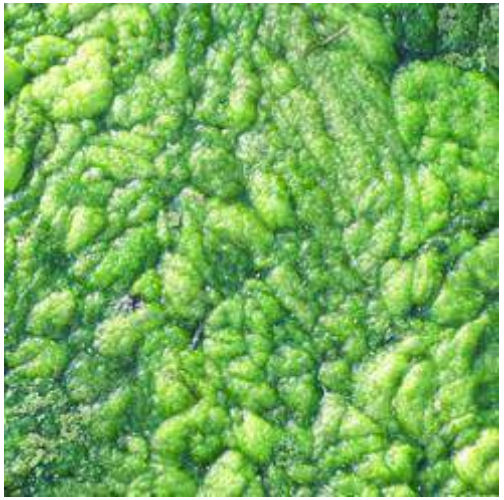
350 Energie- of Grondstoffenfabrieken!

Bron: Topografische Dienst Kadaster.

Biomassaproducent van formaat!

Resources in waste water

Biomass



Water

Energy

Inorganics

Waste water as a resource

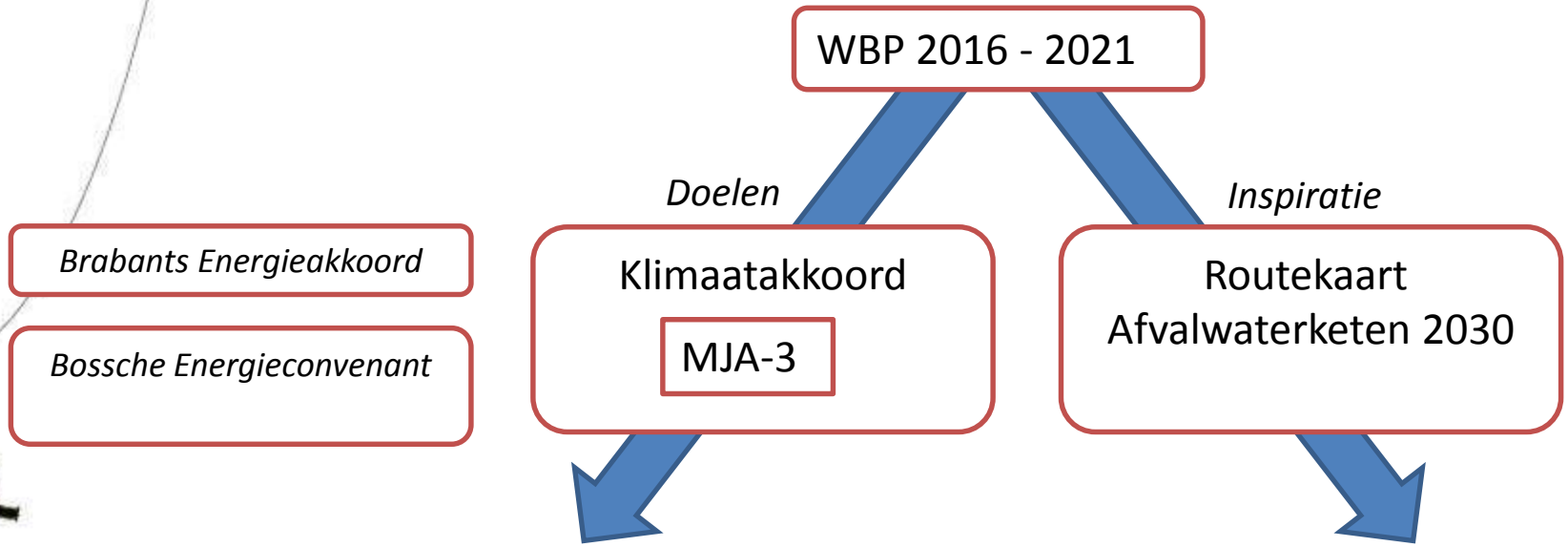
ENERGY FACTORY

There is no waste water,
only water that is wasted

Grondstoffenfabriek

Grondstoffenfabriek

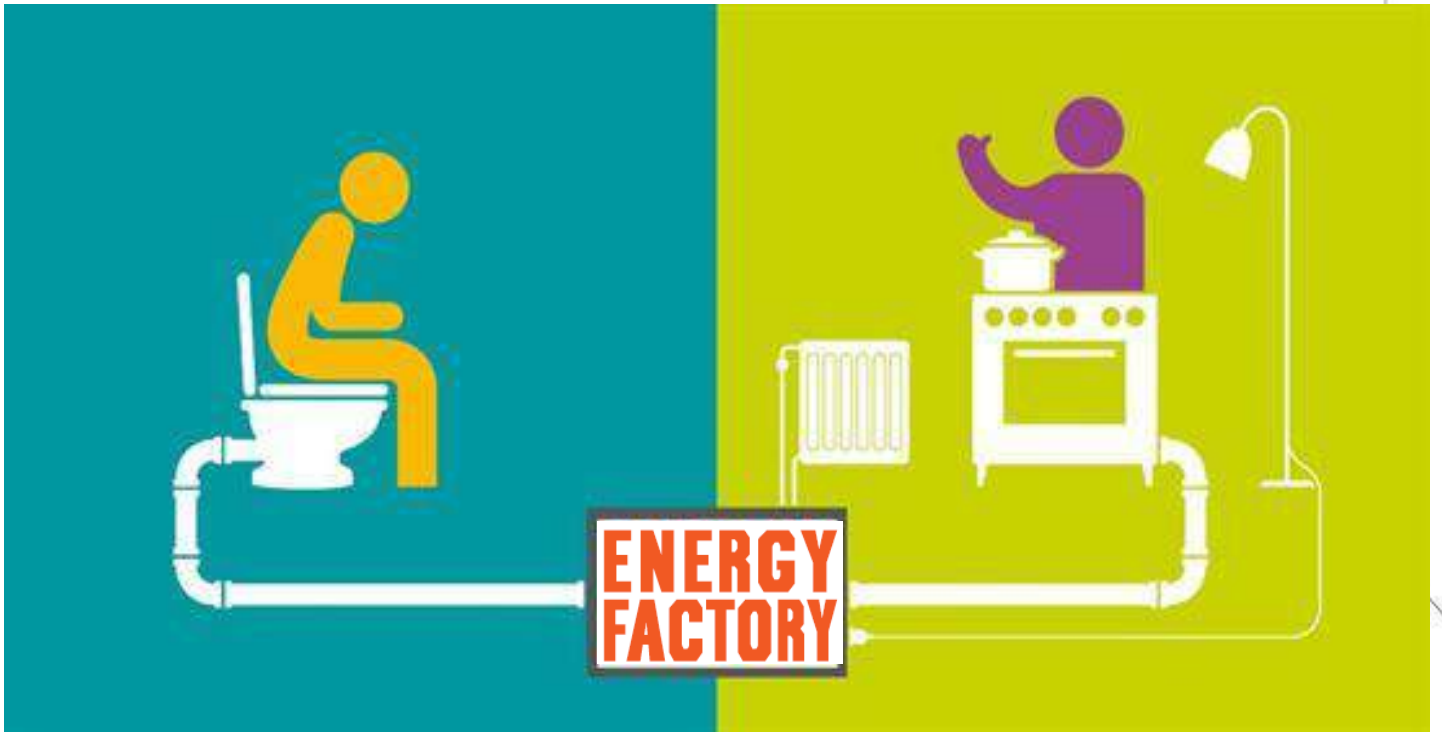
Duurzaamheidsdoelstellingen Aa en Maas



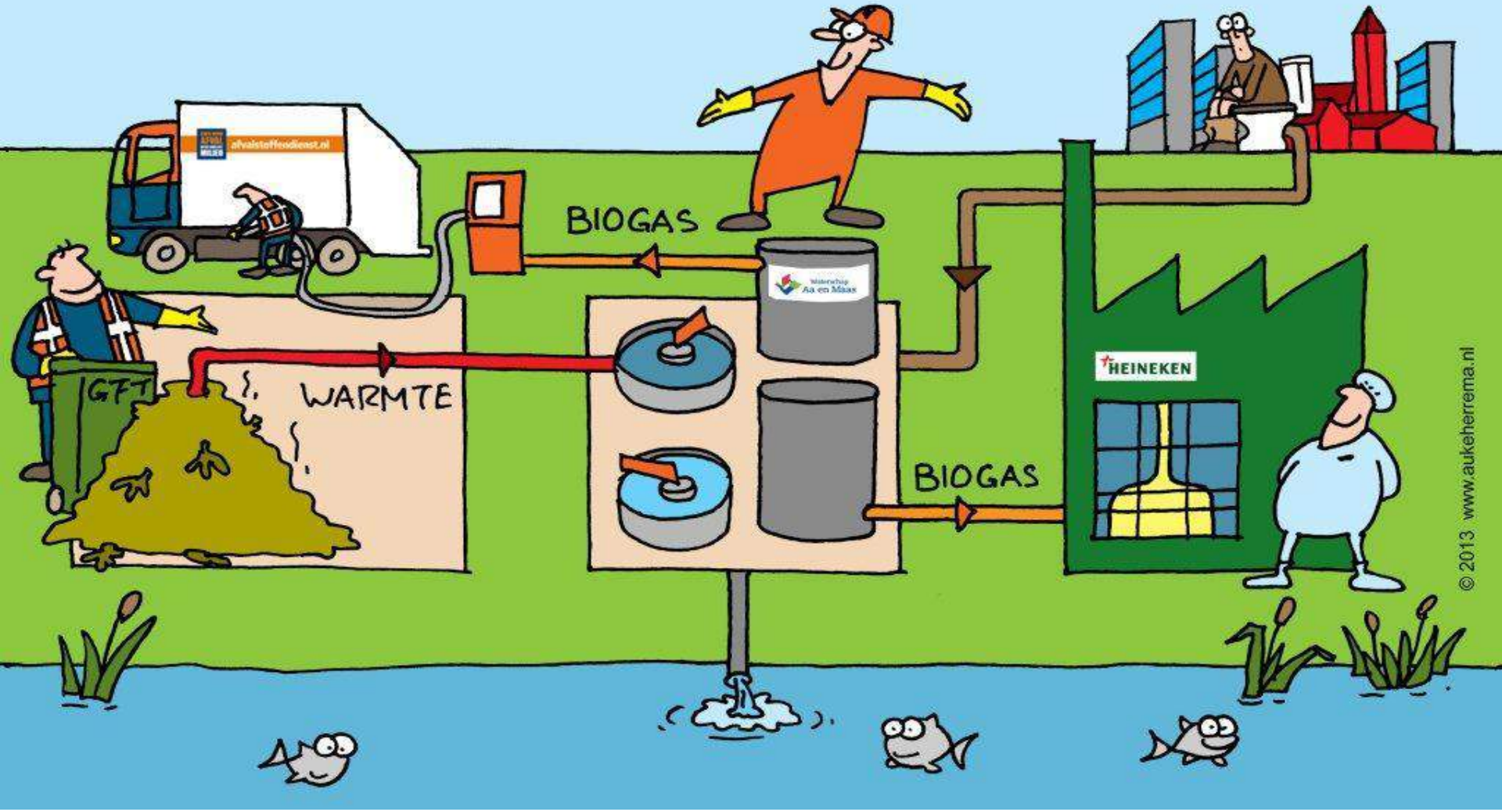
30% energiebesparing in 2020 t.o.v. 2005
40% aandeel duurzame energie
30% reductie CO_2-emissies
Streven energieneutraal in 2050
100% duurzaam inkopen in 2015

- Afvalwater als bron van
  - Energie
  - Grondstoffen
  - Schoon water
- Circulaire economie

De energie fabriek



Energiefabriek ‘s-Hertogenbosch



Waterschap Aa en Maas

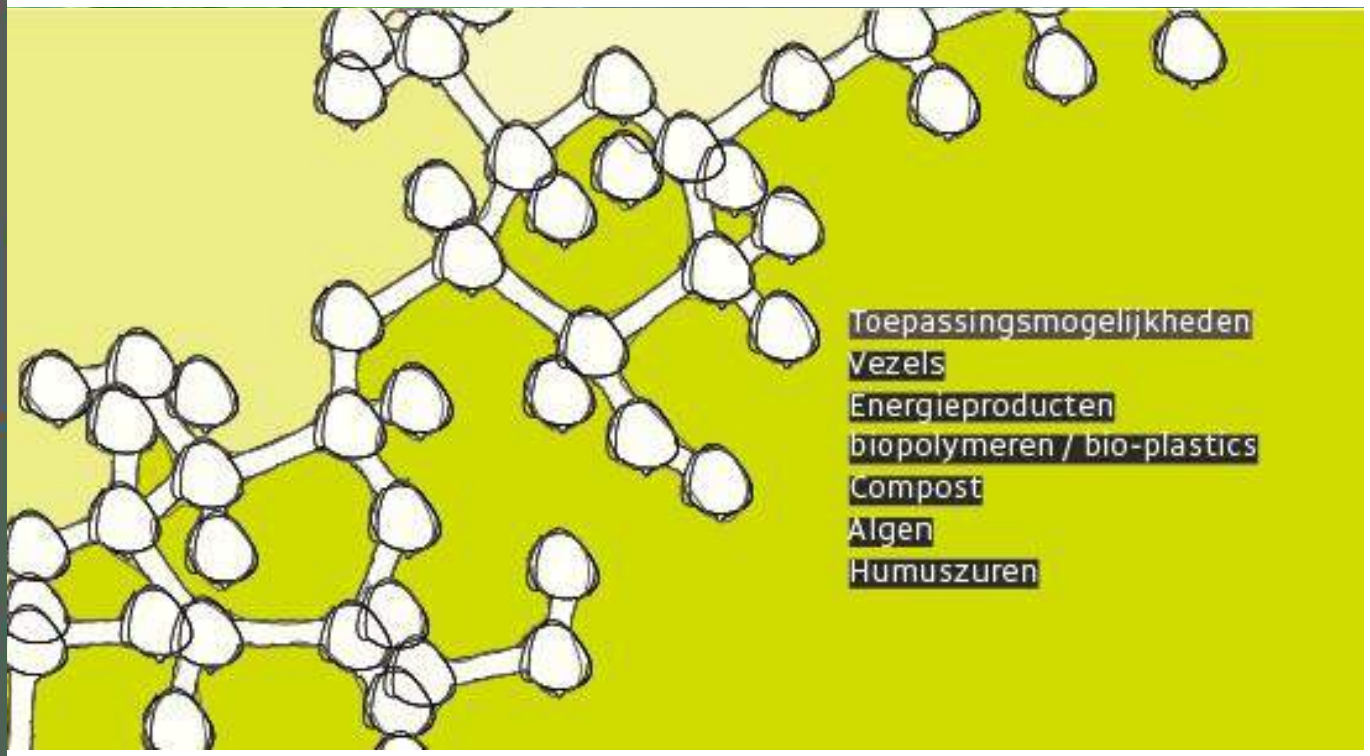
Grondstoffenfabriek

RWZI ‘s-Hertogenbosch, Energie fabriek

- **Now 2.2 million m3 biogas/yr**
- **Future: centralised digestion of sludge**
- **Production: up to 5.6 million m3 biogas/yr**
- **Or liquid biogas for 40 million km’s by car per year!**

Resource Factory

ENERGY FACTORY



Grondstoffenfabriek

Raffinage van maaisel

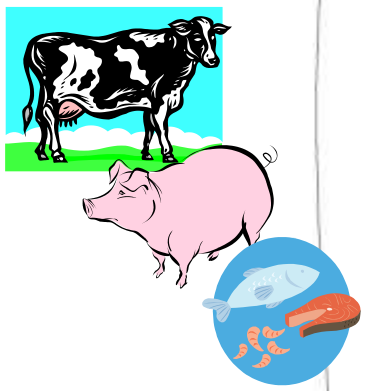
Pilotproef bioraffinage in de Peel: 8 -12 september

Bioraffinage pilot

Mobiele bioraffinage unit

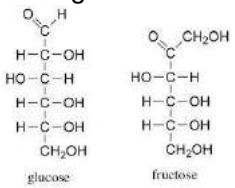
Vezels

Eiwit producten



Meststof fosfaat

Biogas

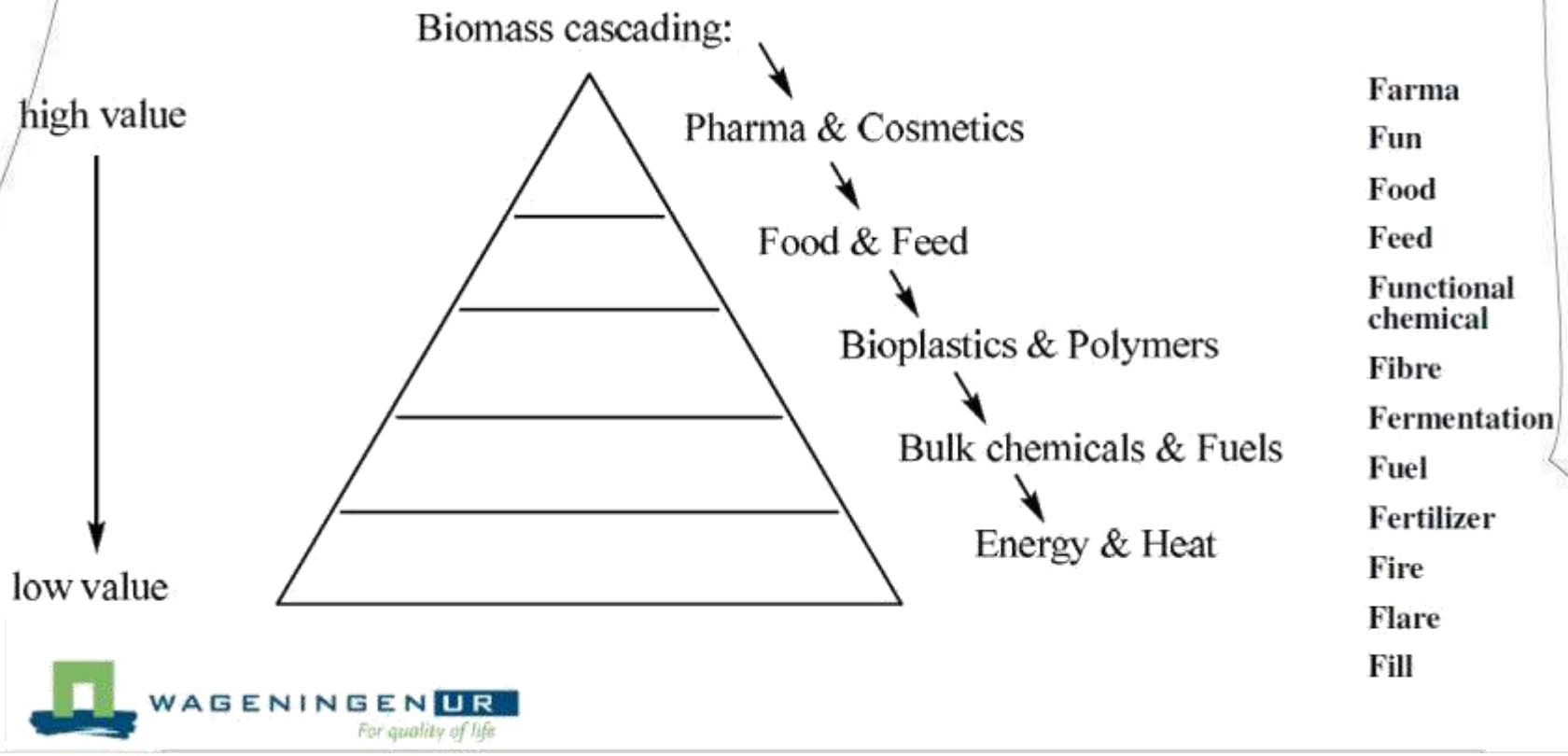


Suikers -> chemicals

Sheet: Wim van Doorn

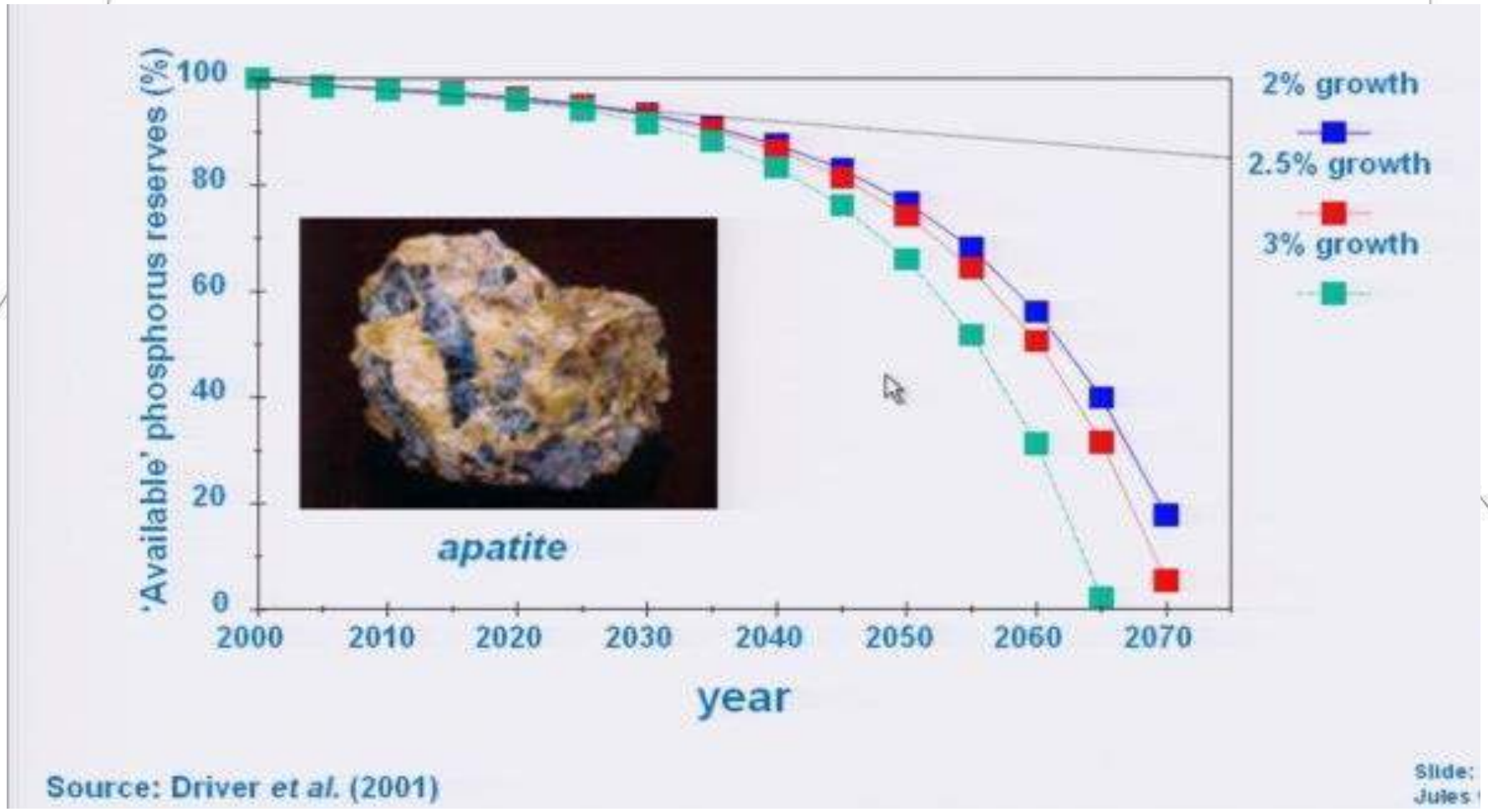
Grondstoffenfabriek

Biomass cascading



WAGENINGEN UR
For quality of life

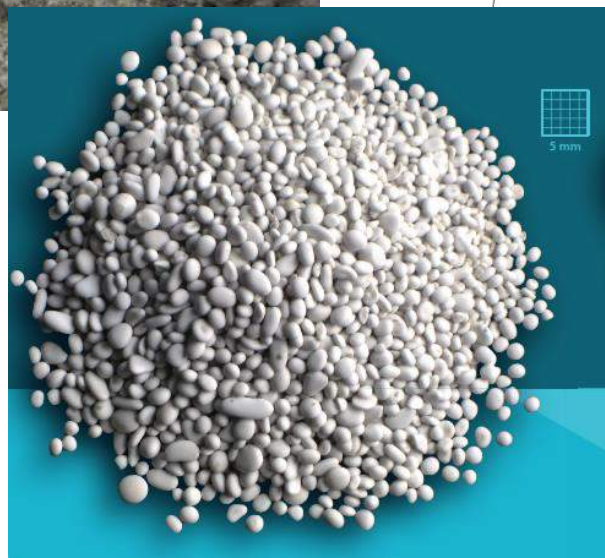
Phosphorus reserves are running out



Resource factory

WWTP Cuijk – raw material for fertilizer

Recovery of phosphate in the form of struvite



Grondstoffenfabriek

Resource recovery in Dutch practice

Already:

- 5 WWTPs that recover phosphorus
- 2 WWTPs that produce green gas
- 2 Energy Factories (E production > E usage)
- 5 WWTP that recovers cellulose as a resource
- 1 WWTP with Nereda technology that can produce alginate

Opportunities

- 350 possible biomass hubs
- Bioplastics initiative on sludge

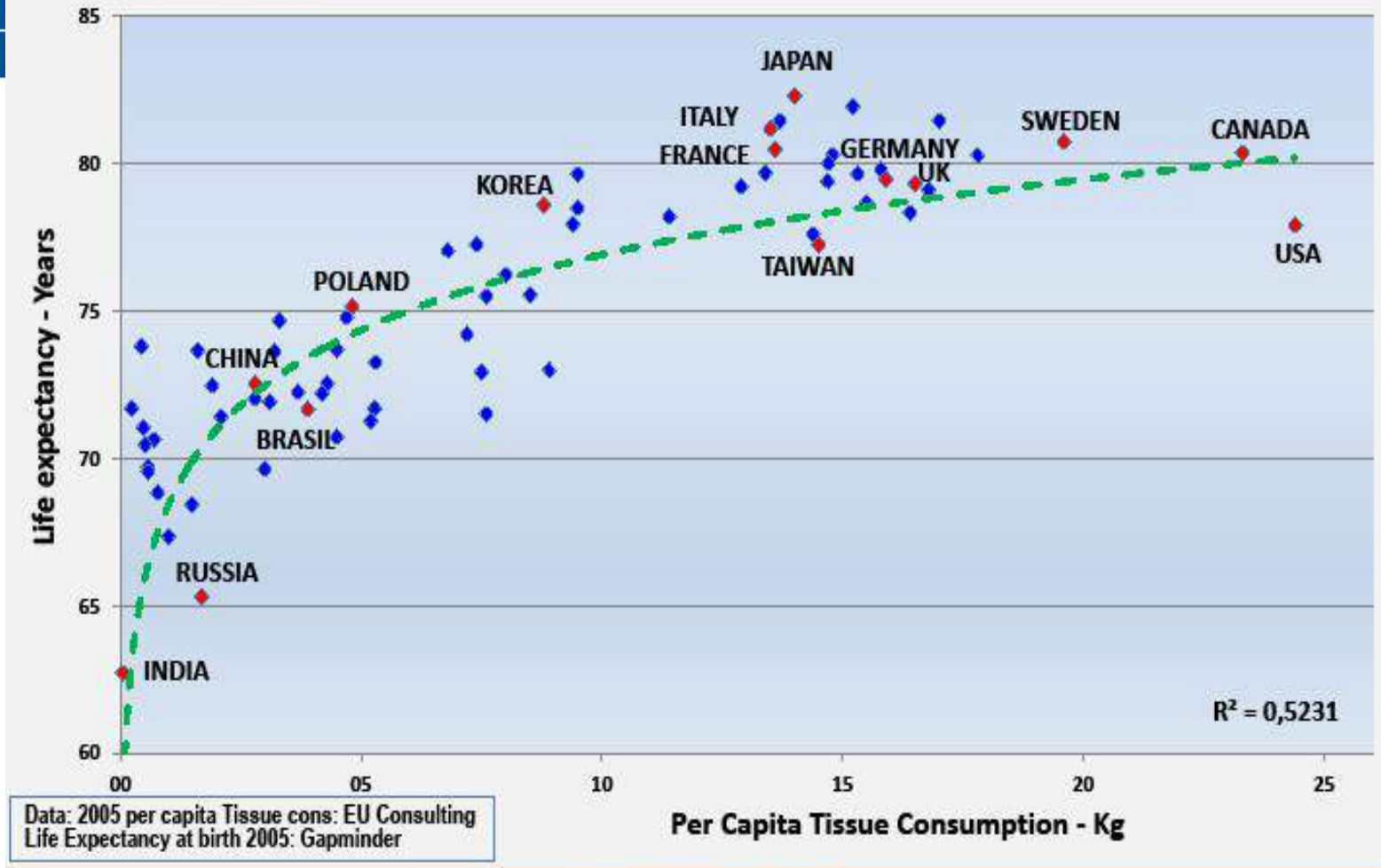
Cellulose in riool water

Zwevende bestanddelen in rioolwater, circa 30% cellulose

Cellulose herkomst is vooral toiletpapier

Hoeveel toiletpapier naar de rwzi?
Toiletpapier verbruik per persoon?

Comparison Tissue Consumption - - Life expectancy



Data: 2005 per capita Tissue cons: EU Consulting
Life Expectancy at birth 2005: Gapminder

Cellulose vracht

10-15 kg toiletpapier / (persoon * jaar)

Nederland: 150.000 ton/ jaar

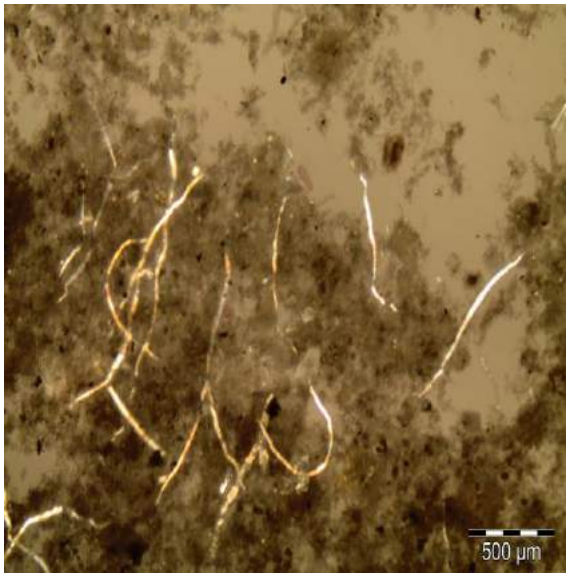
RWZI Aarle Rixtel: 300.000 i.e.

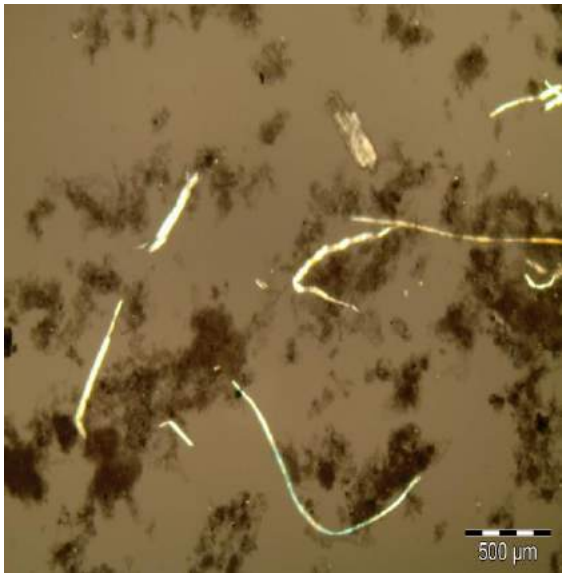
→ 2.000 ton DS/ jaar (= 5 ton DS/dag)
→ met 20 % DS → 25 ton “slib” (= 5 trucks / week)

Cellulose in de RWZI

Microscopische analyse: rwzi Aarle-Rixtel

Influent

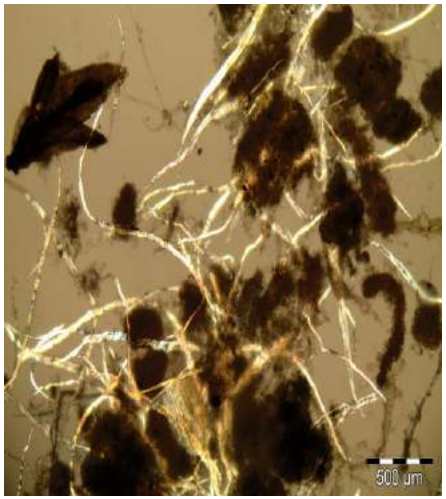
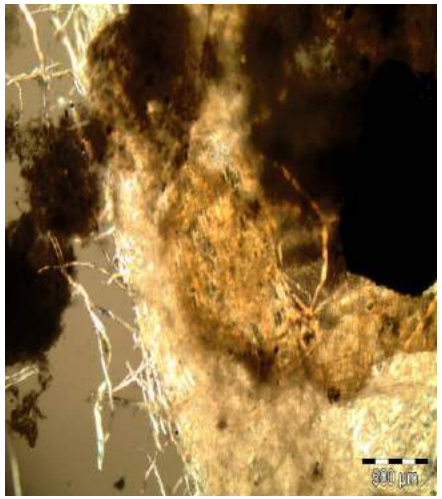




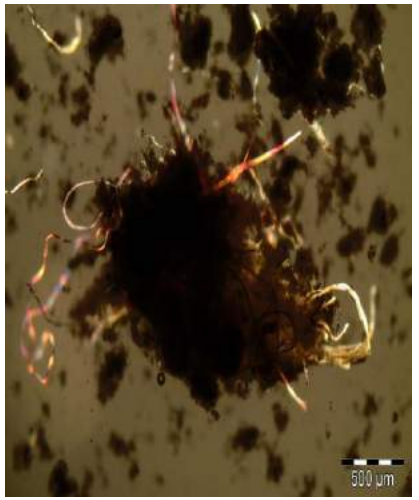
Activated sludge

Cellulose in the WWTP

Microscopic analysis: (wwtp Aarle Rixtel, aerobic)

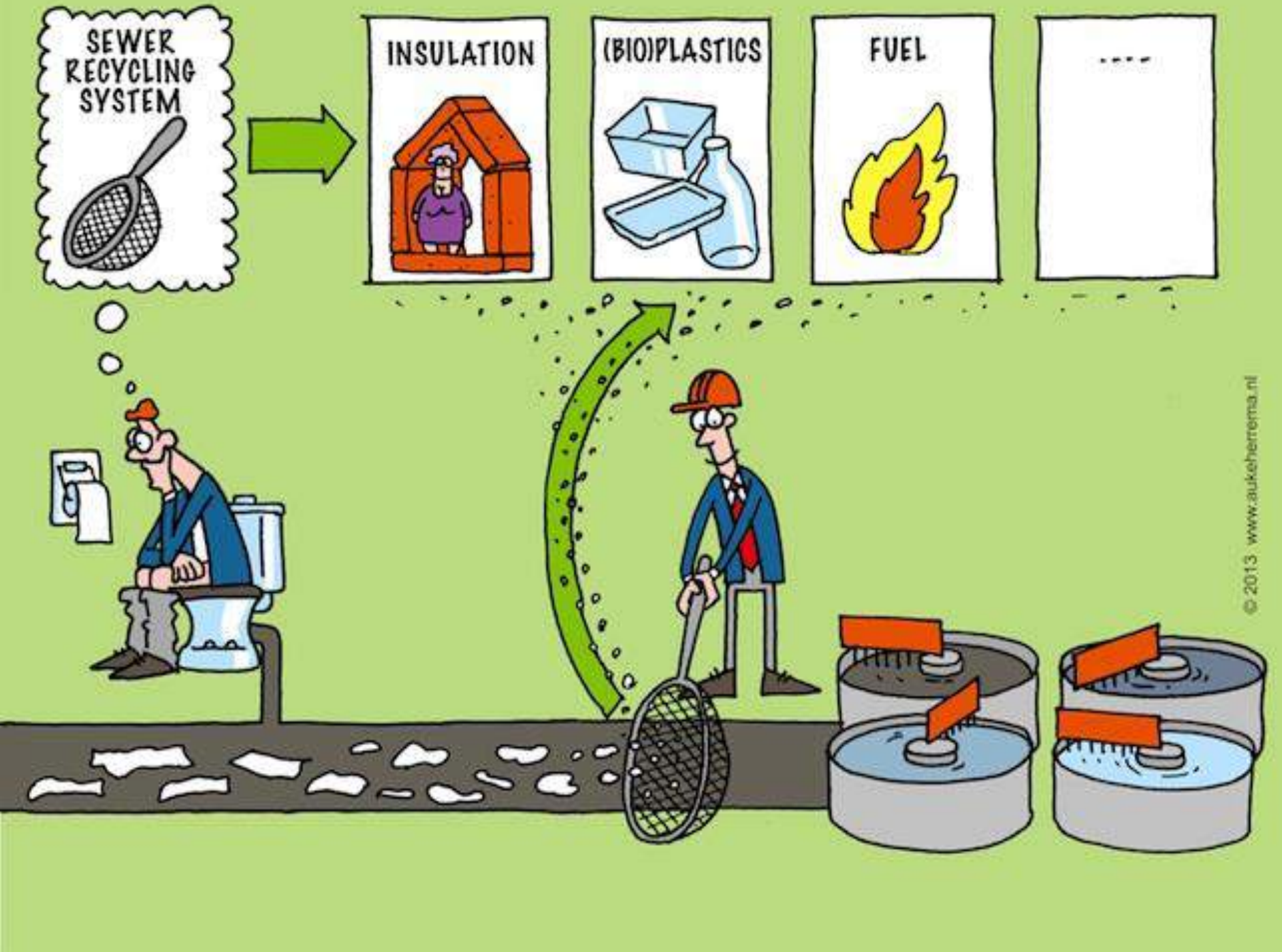



Thickened sludge

Dewatered sludge

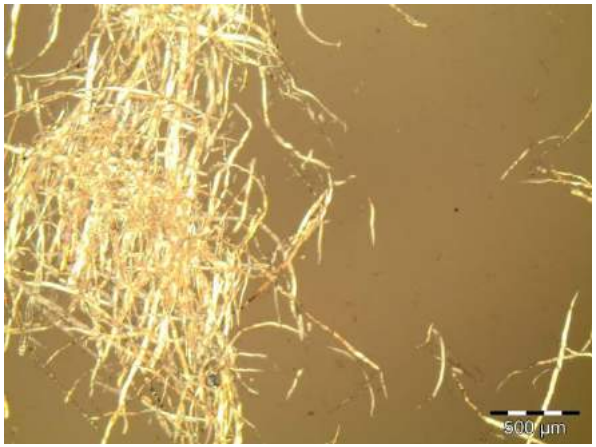
Conclusion: bad bio-degraded in aerobic → cellulose ends up in dewatered sludge, to be incinerated


SEWER RECYCLING SYSTEM
INSULATION
(BIO)PLASTICS
FUEL
....
© 2013 www.aukeherrema.nl

Cellulose recovery from influent

Advantages:

- Capacity improvement wwtp (reduction load, more active sludge)
- Reduction waste sludge load (costs!)
- Resource recovery

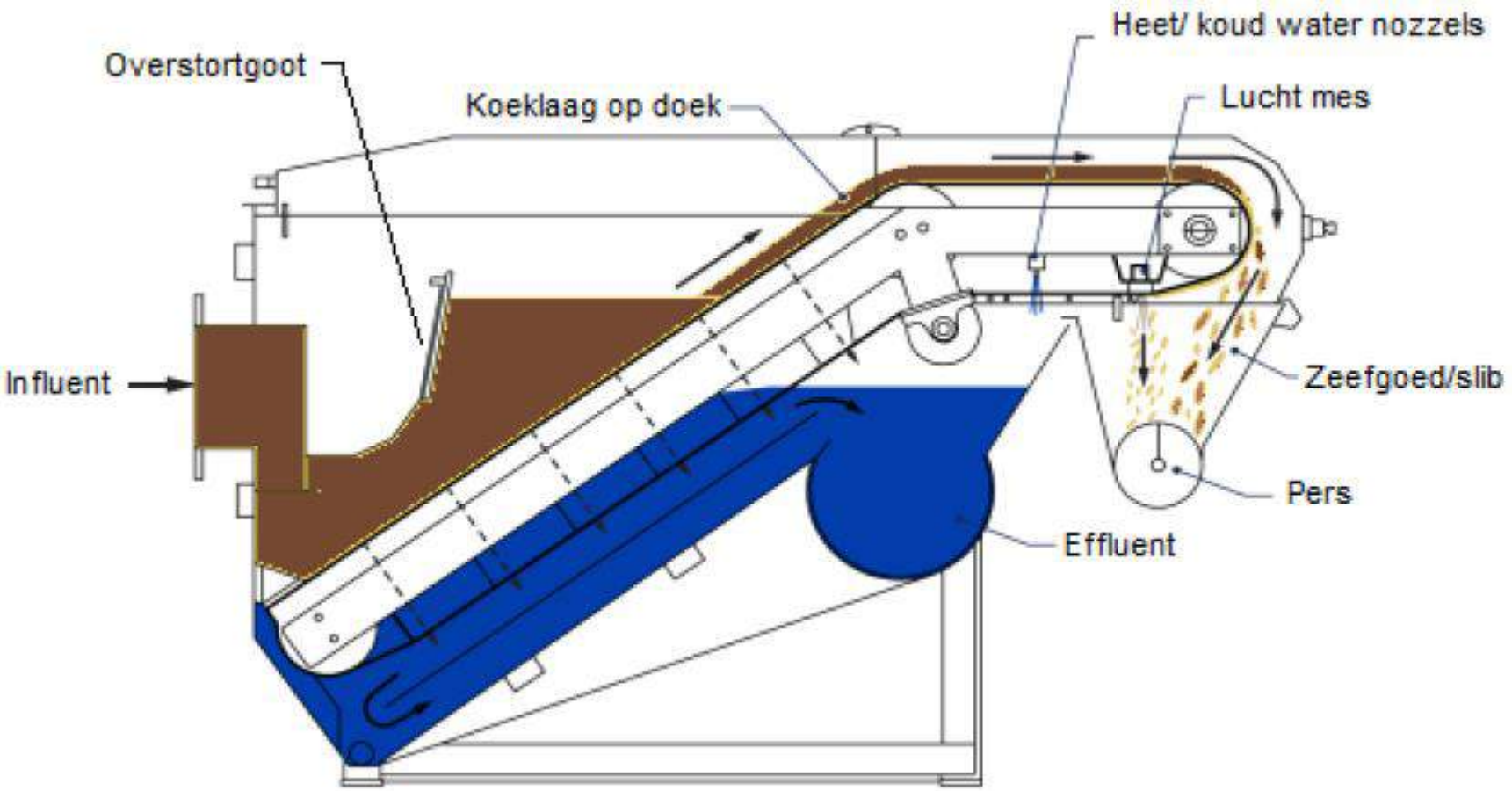


Techniques/ Methods:

- **Fine screens**
- Other screening techniques
- DAF
- Flocculation
- Lamellae separation
- Membranes
- Pre settlers

Fijnzeef rwzi Blaricum

Fijnzeef schematisch



Fine screen-projects in Netherland

Blaricum	2010	1 FZ	Onderzoek
Ulrum	2015	1 FZ	CADOS: zeefgoed als hulpstof slibontwatering
Uithuizermeeden	2015	2 FZ	Capaciteitsuitbreiding
Beemster	2016	8 FZ	Cellucycle: enzymatische omzetting naar suikers, PLA Capaciteitsuitbreiding
Aarle-Rixtel	2016	8 FZ	Screencap: onderzoek impact fijnzeven op rwzi proces Capaciteitsuitbreiding

Cellu Cycle

CADOS
Cellulose Assisted Dewatering of Sludge

screencap

Removal efficiency

OB	50 %
CZV	20 %
BZV	15 %
Nkj	1 %
P	1 %

Impact on wwtp process ?

- Impact on biologic processes
  - N-removal (COD/N)
  - P-removal (COD/P, reduction surplus-sludge)
- Surplus (waste) sludge production
- Sludge composition (inerte components, bacterea)
- Sludge activity
- Settling characteristics sludge
- Dewaterability sludge (DW%, PE-consumption)
- Energy consumption (aeration, pump, screen…)
- Maintenance

Screencap

Aim: determine the impact of fine screens on wwtp process

WWTP Aarle-Rixtel, 300.000 pe
CIP ECO grant

8 finescreens
Start up : october 2016
Capacity 4.000 m3/h (DWA+)
2 identical paralell wwtp-lanes
During research: fine screens in operation at one wwtp-lane
Compare fine screen-lane with conventional lane
Investigation period: approx. 1 year

Co-funded by the Eco-innovation Initiative of the European Union

screencap

Composition screenings

- Water…. (DM%)
- Fibers
  - cellulose
  - hemicellulose
  - lignine
- Fat
- Protein
- Ash/ inorganics
- Other…..

Toepassing zeefgoed (cellulose)

Application:

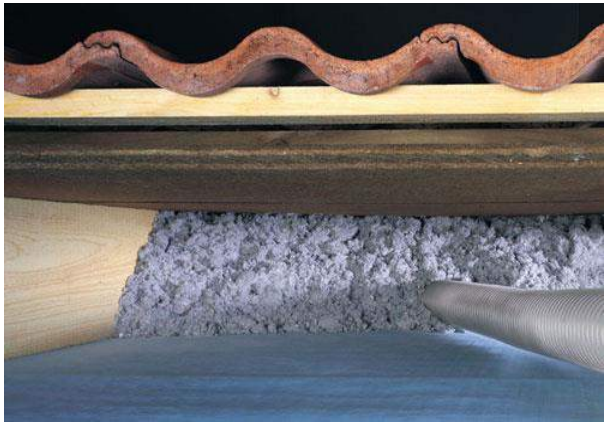
Fibres ?

or

chemical composition ?

Application fibres

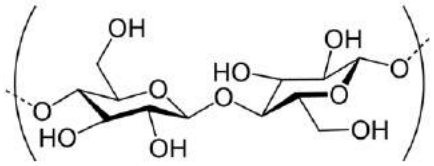
- Paper
- Insulation material
- Fibre reinforced plastics, bio-composite
- Component/ additive in tarmac
- Concrete additive



Application: chemical

Fuel:

- Digestion → biogas
- Incineration (pellets)



Pyrolysis: (gas, bio-oil, organics, carbon)

Enzymatic degradation

- Sugars
- Fatty acids (f.i. paint industry)
- (Bio) ethanol
- PLA (bioplastic)
- PHA (bioplastic)

Applications, other

- Additive sludge dewatering (Cados, wwtp Ulrum)
- Drift fighter
- Improve soil composition, composting
- Mushroom production
- Feedstock goats
- Cementous (ash, after incineration)

WWTP Aarle Rixtel