

# Material recovery and safe reuse

Cellulose recovery from sewage



SMART-Plant



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**CIRTEC**

# About CirTec



Cellulose recovery from sewage



Screening and filtration



Evaporation and scrubbing



Sludge dewatering



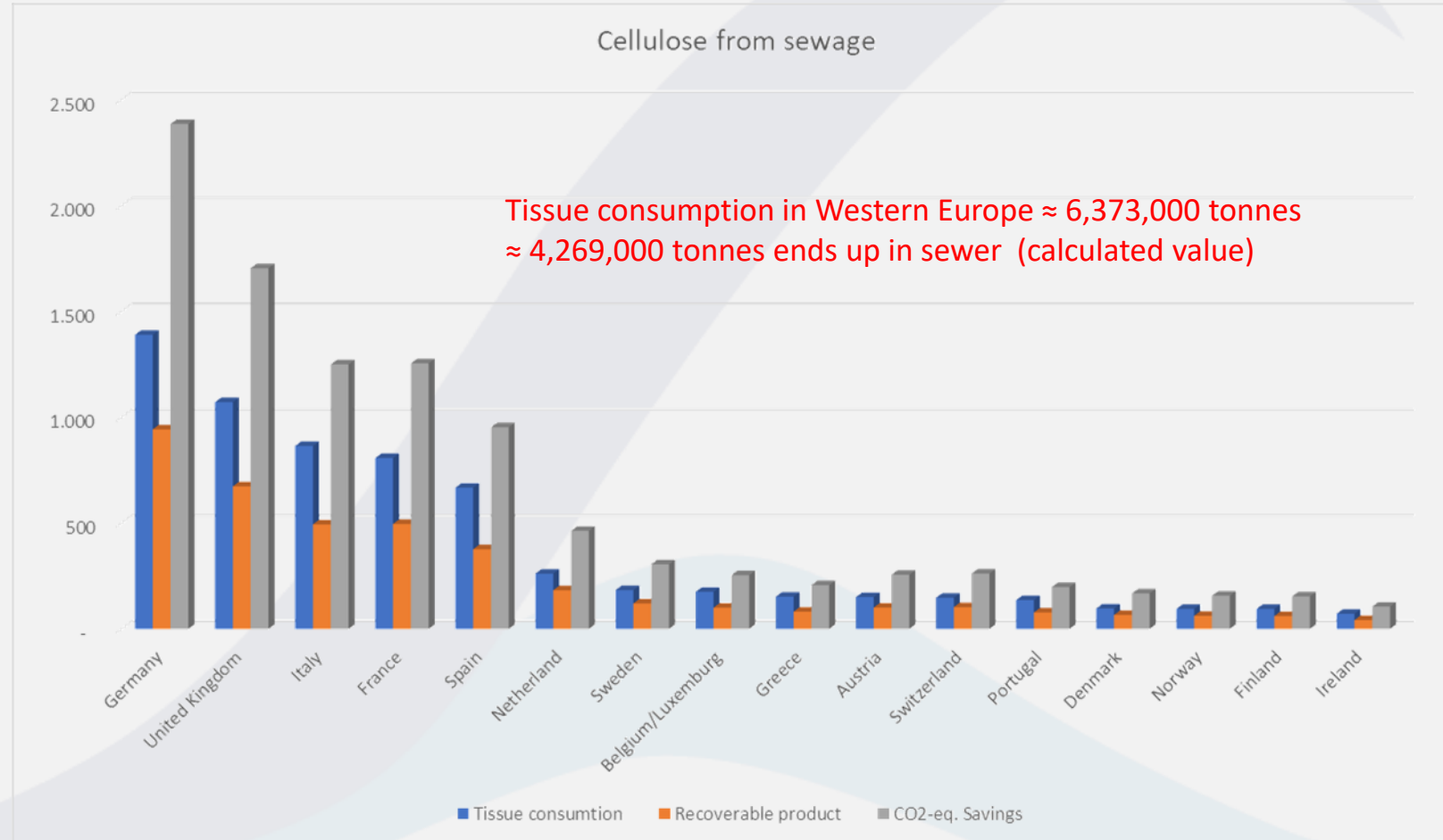
Sludge drying



# Recovery and valorisation of cellulose from sewage

What is it about?

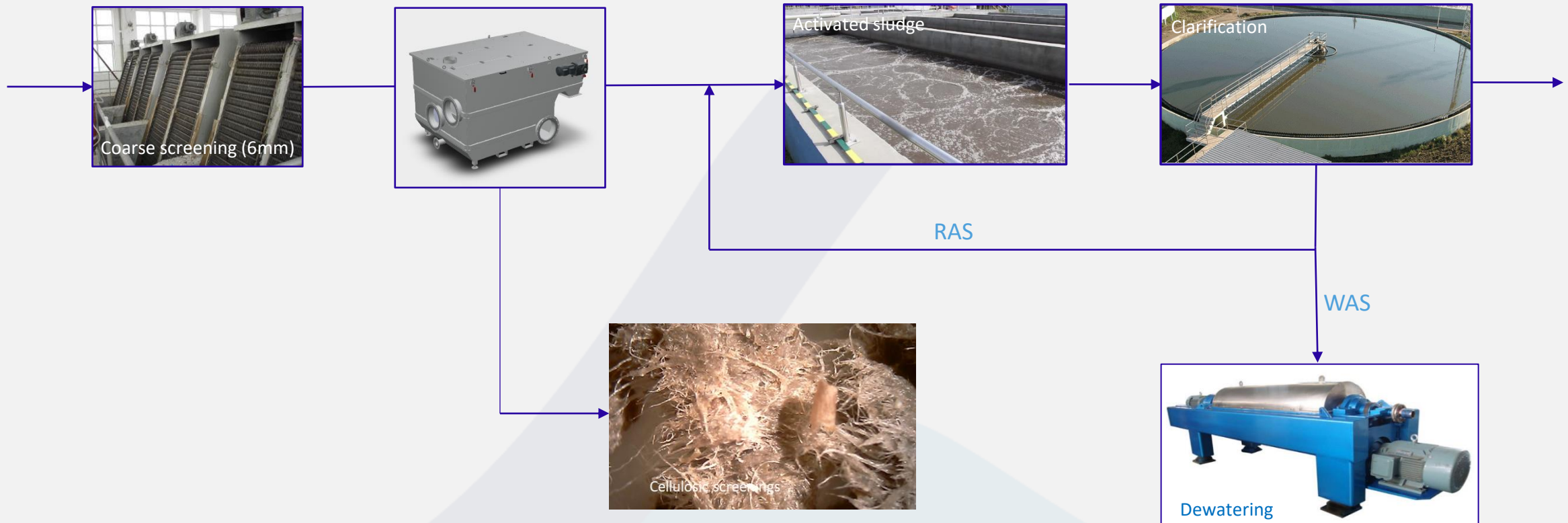
X 1.000 tonnes





# Dynamic rotating belt finescreens for primary treatment

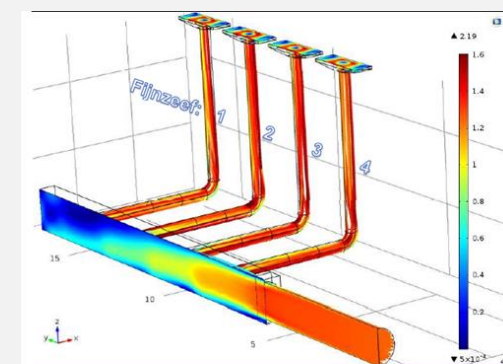
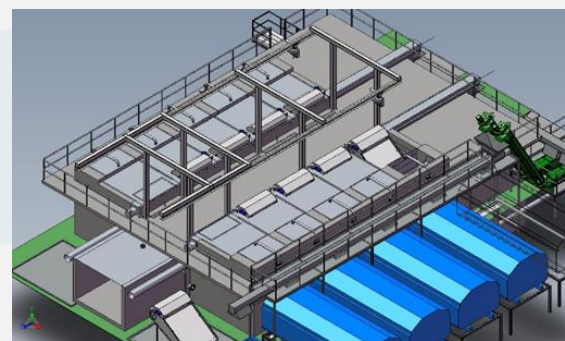
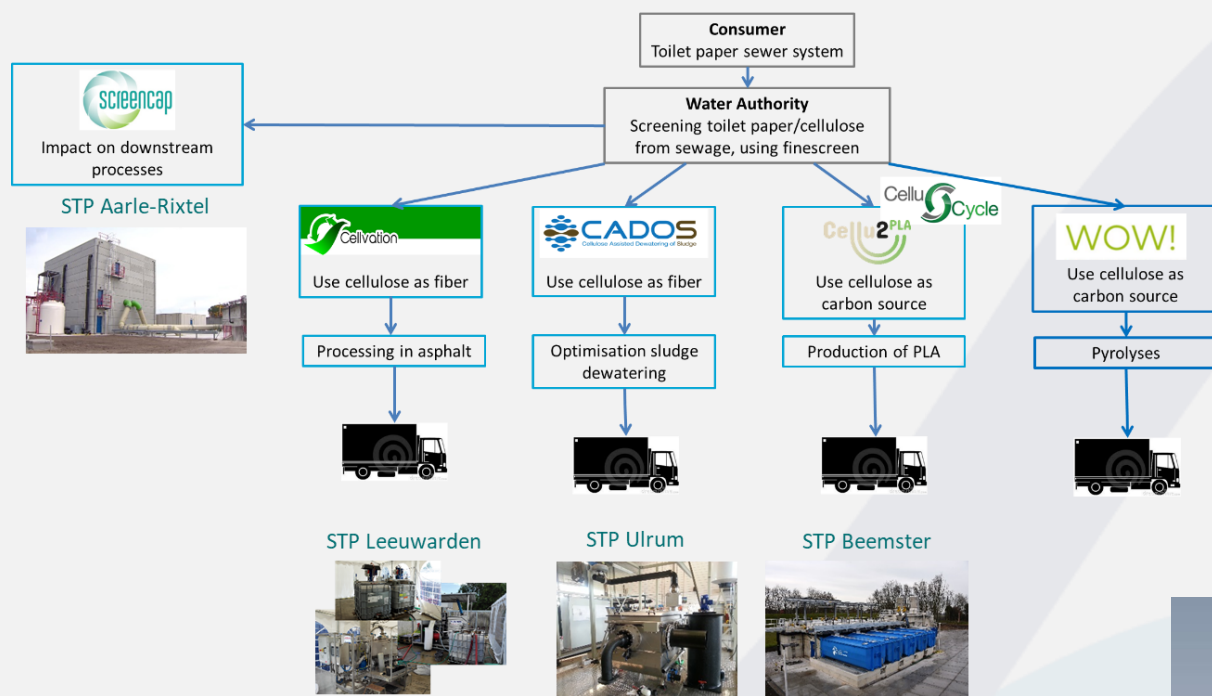
Saving energy by removing solids





# knowledge development through small and large-scale research SMART-Plant

Impact on dewaterability, denitrification, control, flow distribution, etc



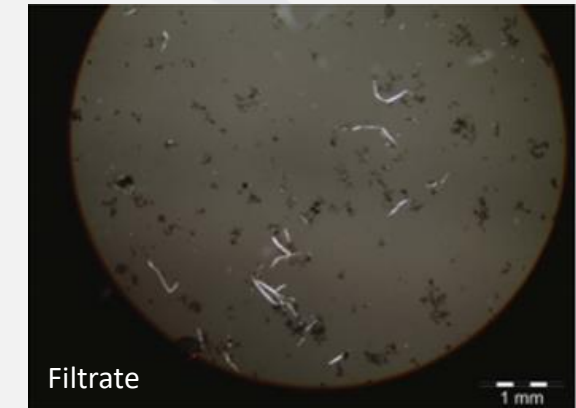
CFD analyses



# Impact of dynamic rotating belt finesieves

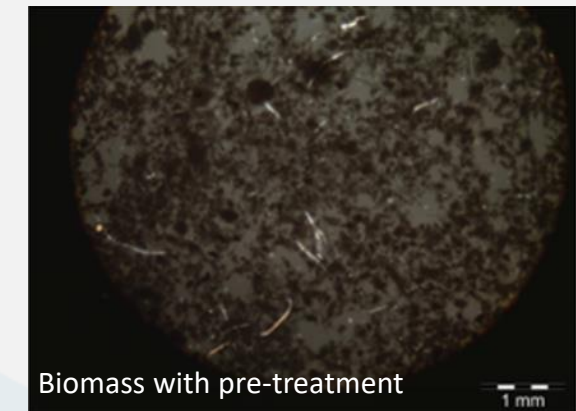
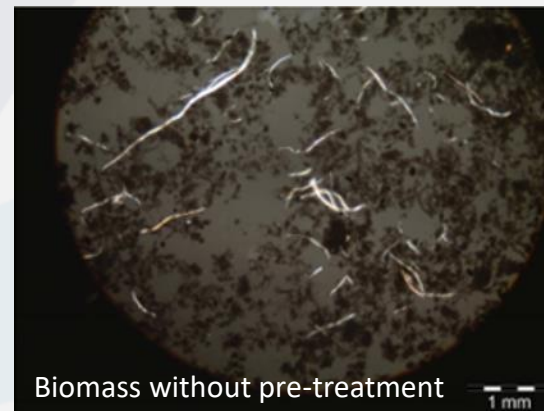
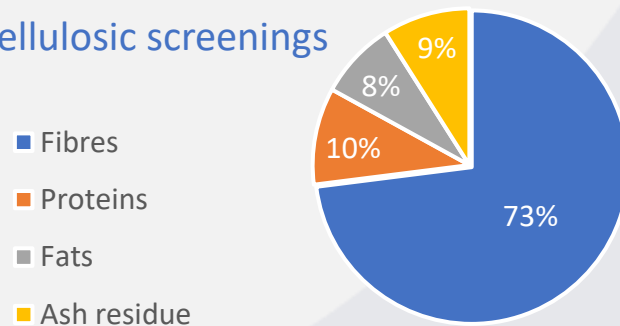
## Application of dynamic rotating belt fine sieves for primary treatment

- Reduction of energy requirement (15 to 20%);
- Less sludge (20%) = less sludge dewatering;
- Reduction of chemical use (approx. 20%);
- Lower maintenance costs;
- a marketable recovered raw material;
- Reduction of the CO<sub>2</sub> footprint



Visible reduction of fibers in raw influent

### Cellulosic screenings

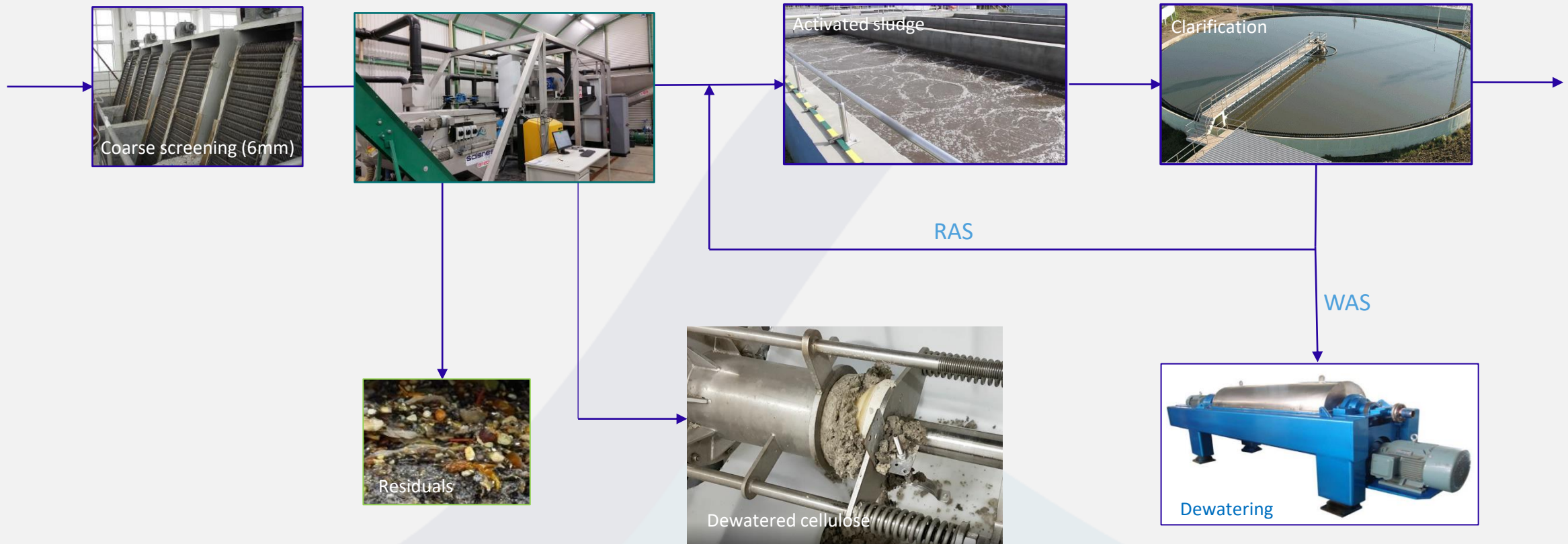


Difference in fiber content in activated sludge (after 12 months)



# In-line cellulose extraction

Screenings are not salable (too many polluting components)









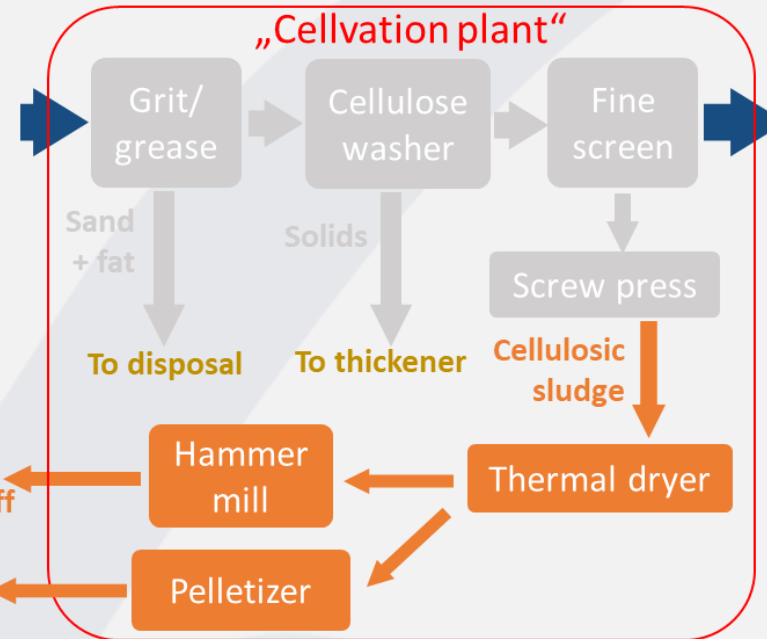
# In-line cellulose extraction

Screenings are not salable (too many polluting components)



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TSS	360,00	mg/l
COD	604,00	mg/l
BOD	289,00	mg/l
Ntot	37,20	mg/l
PO <sub>4</sub> -P	9,40	mg/l



TSS	198,72	mg/l
COD	477,16	mg/l
BOD	228,31	mg/l
Ntot	35,67	mg/l
PO <sub>4</sub> -P	9,11	mg/l

Recell®

TSS	44,80%
COD	21,00%
BOD	21,00%
Ntot	4,10%
PO <sub>4</sub> -P	3,10%

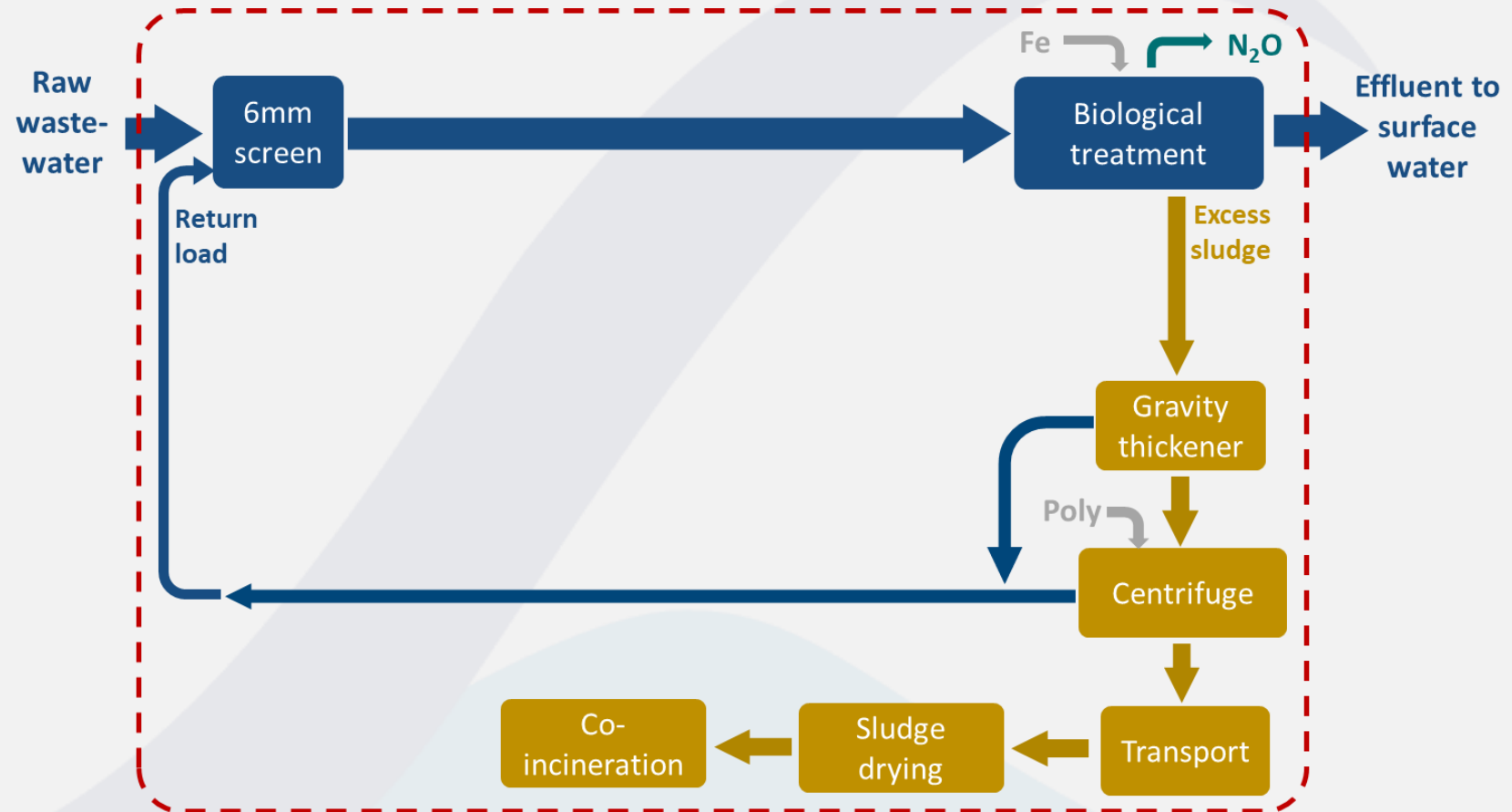


# LCA of SMARTech1 - cellulose recovery

System boundaries



SMART-Plant



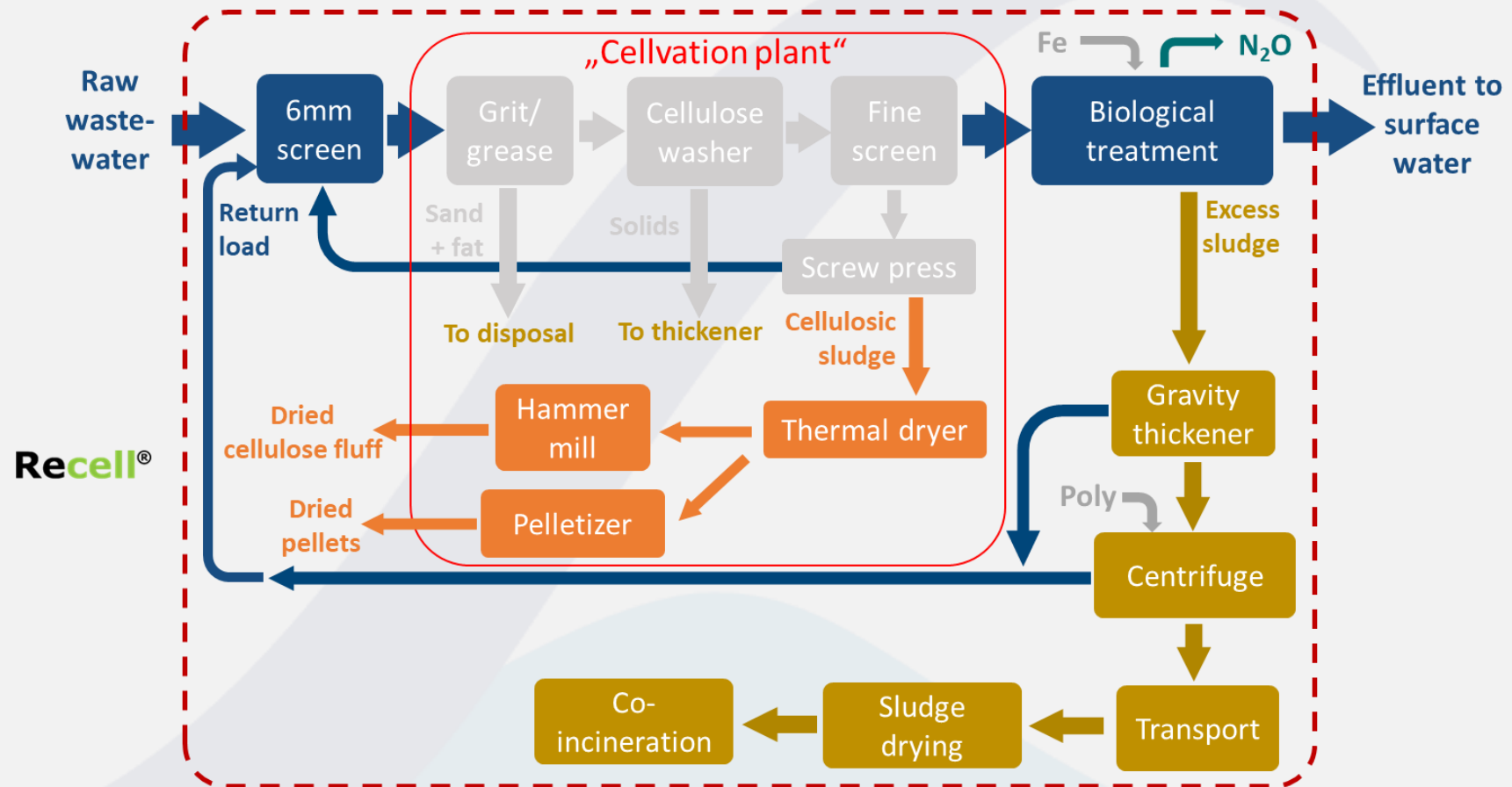


# LCA of SMARTech1 - cellulose recovery

System boundaries



SMART-Plant



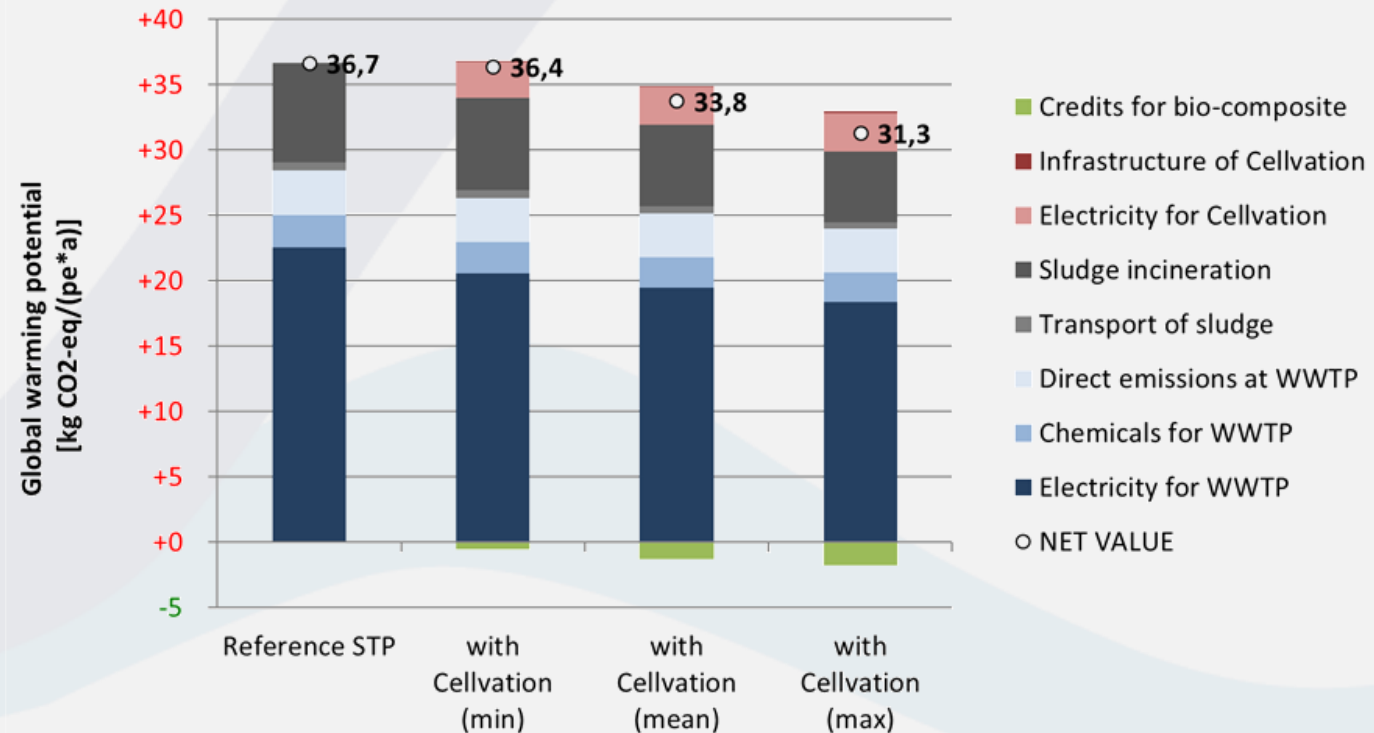
# LCA of SMARTech1 - cellulose recovery

## Conclusions



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Parameter	Unit	Minimum value	Mean value	Maximum value
Removal of total suspended solids	%	-25	-40	-55
Removal of chemical oxygen demand	%	-10	-20	-30
Excess sludge to disposal (as dry matter)	%	-10	-20	-30
Savings in aeration energy	%	-10	-15	-20
Savings in polymer for sludge dewatering	%	-5	-10	-15





# Conclusions



**Why use Cellvation?**

- Increase the STP capacity
- Reduction in produced sludge
- Reduction in energy consumption
- Reduction in STP costs
- Production of a high-quality product

**1 Cellulose washer**  
The water that flows from the grit removal passes through a cellulose washer, which takes out the hair and other organic contaminants.

**IntenSieve® Rotating belt Filter**  
After the cellulose washer the sewage flows through to a rotating belt filter, which is a rotating belt filter.

**Hygienization**  
The screenings are hygienized to reach the EPA class A rating, ensuring that the product produced is clean and safe to use.

**3 CellPress**  
The screenings filtered out of the wastewater by the Rotating belt filter installation are dewatered by the CellPress.

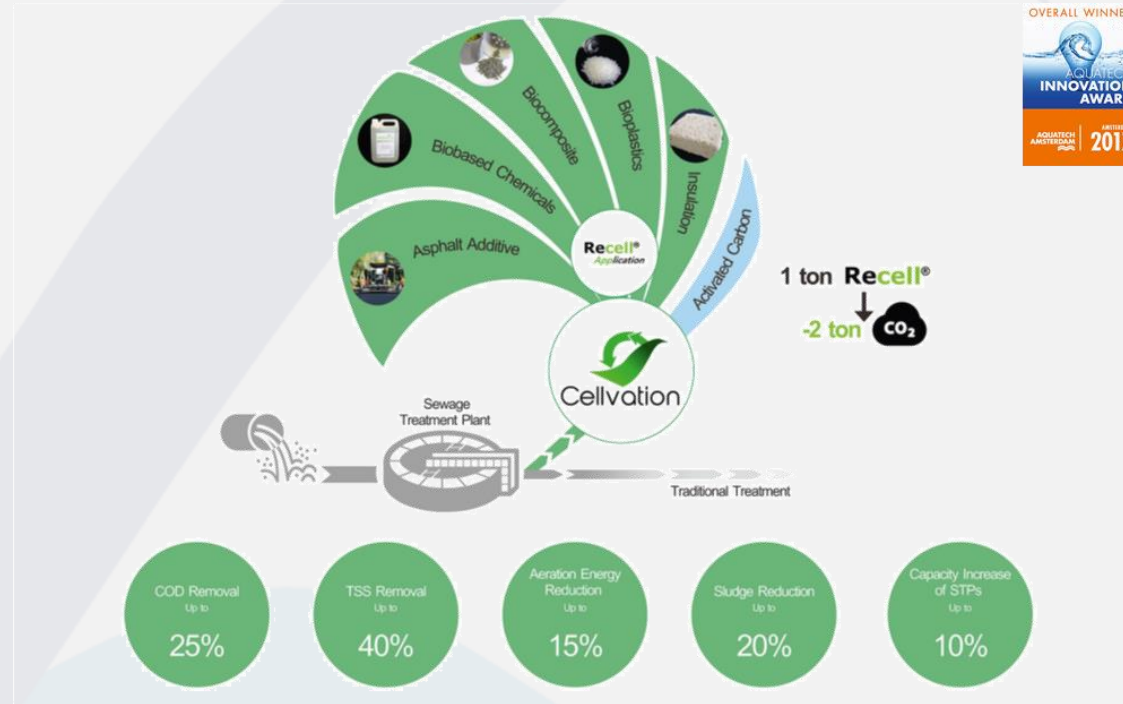
**5 CellDry dryer and polisher**  
When the product is dried, the larger chunks of cellulose are broken down to smaller parts. From there, the cellulose is turned into fluffy cellulose or compacted into pellets, depending on the customer's demand.

**High Quality Cellulose Fibers**

- Cellulose fiber fraction
- High grade material
- Consistent quality
- Suitable for sectors: civil engineering, construction, agriculture, chemicals, energy, paper & cardboard
- Use as reinforcing filter, carbon source or fuel



**Recell®**



# Recell-based products

# Recell®



Asphalt Additive



Biocomposite granulate



Biocomposite board



Blown-in Cellulose Insulation floccs



Insulation boards



Mycelium board



Building blocks chemical industry



Road constructor KWS uses recycled toilet paper to improve asphalt pavement in Amsterdam



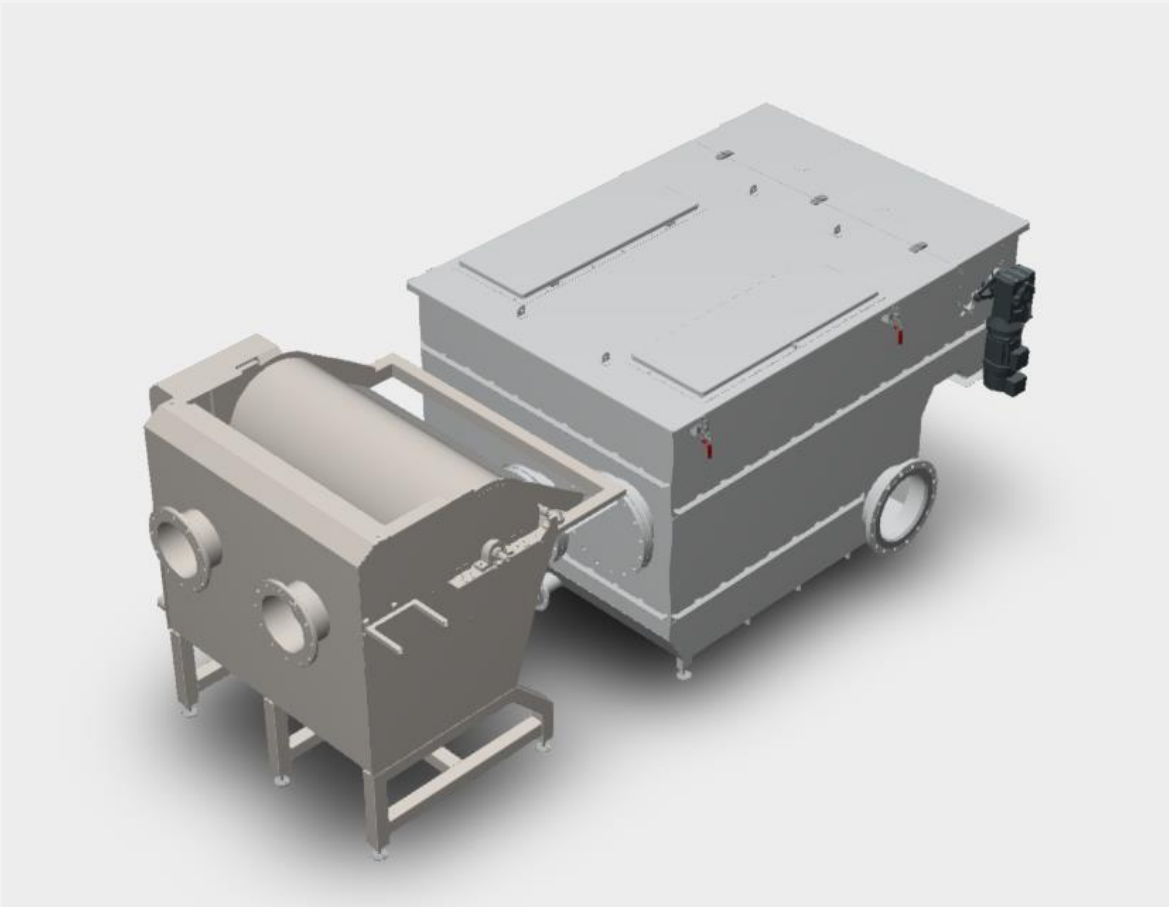
A cycling path in Utrecht with asphalt containing Recell®!





# Further development

## Current state of the technology



### CellCap

two-stage sieving technique consisting of, a cellulose washer and a dynamic rotating belt finesieve.

The pre-separation consists of a fine-meshed drumtype sieve where, through an inventive feedsystem, the cellulose fibers can escape, where hair, leaves, seeds and other components are caught.

Both process components are fully tuned to each other:

- No additional pumping;
- A cellulose washer can easily be fitted in (if space is provided), even when the RBF is already installed.
- The hydraulic profile hardly changes by installing the Cellulose Washer.

## CELLULOSE TERUGWINNEN UIT RIOOLWATER MET CELLCAP

Kansen voor West

Cellulose recovery from sewage with CellCap





WWW.CIRTEC.NL



Met CellCap wordt cellulose teruggewonnen uit rioolwater en omgezet in de biobased grondstof Recell®. Het terugwinnen van cellulose verlaagt de CO<sub>2</sub>-footprint van een zuivering. 1 ton Recell® = 2 ton verminderd CO<sub>2</sub>-eq emissie

With CellCap, cellulose is recovered from sewage and converted into the biobased raw material Recell®. The recovery of cellulose reduces the CO<sub>2</sub> footprint of a sewage treatment plant. 1 ton Recell® = 2 ton avoided CO<sub>2</sub>-eq emissions

Kansen voor West is het gezamenlijke investeringsprogramma van de vier Randstadprovincies en de vier grote steden. Het met ERDF-subsidie in voor projecten die het innovatieve MKB ondersteunen, die bijdragen aan een kwalitatieve economie of duurzame stedelijke ontwikkeling bevorderen. Co-fac ontvangt cofinanciering van de Provincie Noord-Holland.




*"We cannot solve our problems with the same thinking we used when we created them"*

*- Albert Einstein -*

## Towards a cleaner circular future

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