

# Packaging – between ideology and reality

Packalicious

March 22<sup>nd</sup> 2023, Ulphard Thoden van Velzen

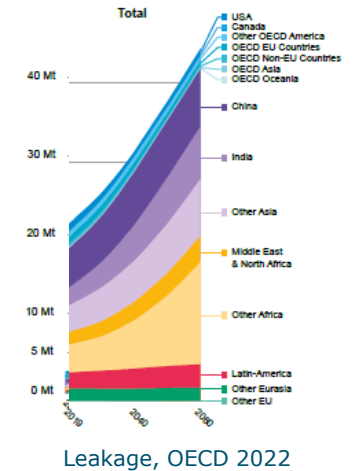
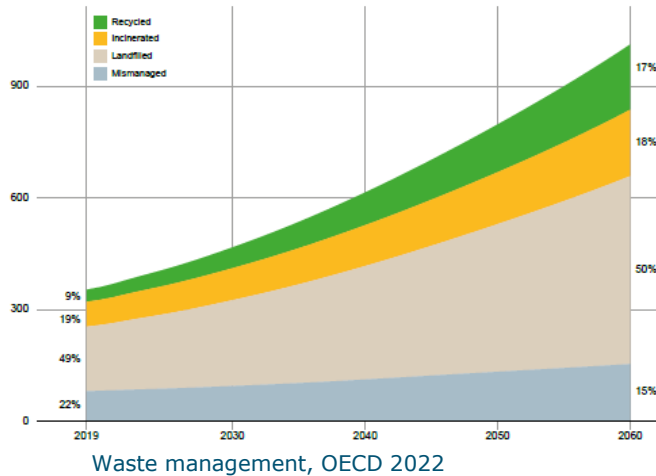
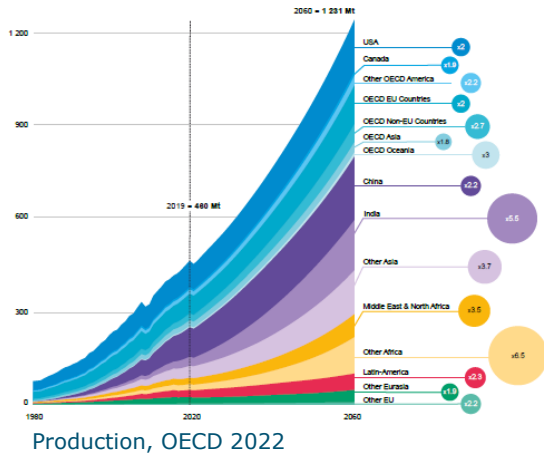


# 3 planetary crises

- Climate change
- Pollution of our planet with persistent chemicals and plastics
- Loss of biodiversity
  
- We exceed the planetary boundaries
  - Use of fossil resources (energy / materials)
  - Overfishing, land use...
    - Global use and disposal of plastic articles

# Global picture of plastics

- The production growth rate exceeds the growth rate of recycling capacity – *performance of plastics is often unparalleled*
- But plastics are still leaking and we remain dependant of crude oil





Today we will focus on plastic packages



# No quick fixes

- Austerity / rationing doesn't fit in our political and economic system
- Many applications of plastics are useful or even essential
  - Alternatives are often heavier or worse
- Many barriers in improving the plastic system
  - Sustainability has many dimensions that do not run parallel
  - Systemic barriers...

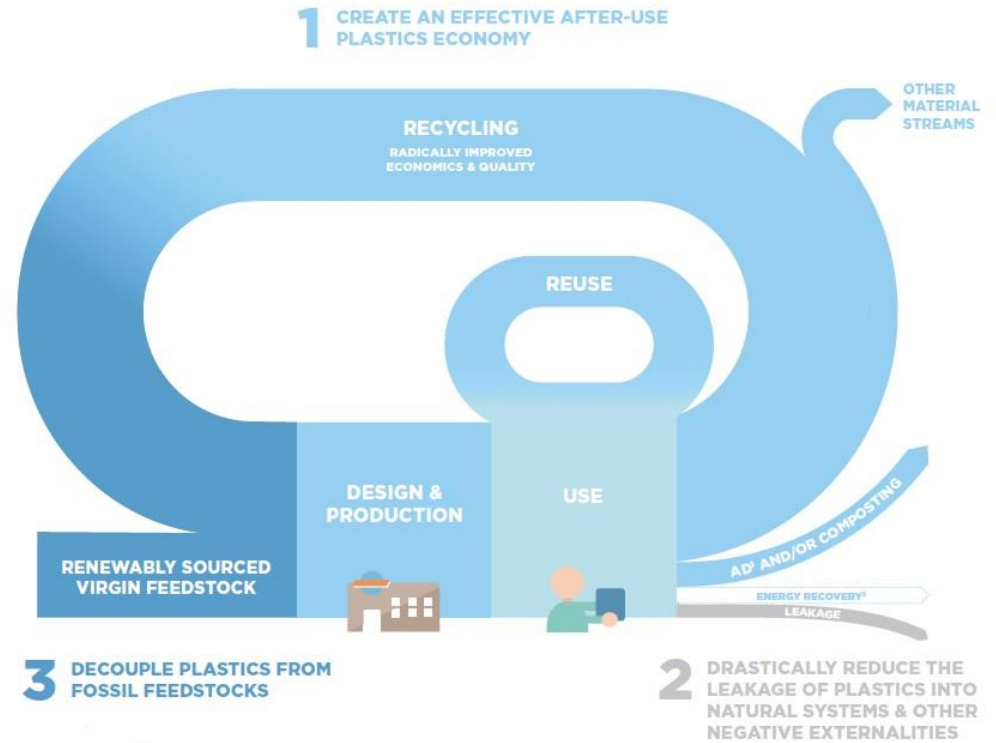
# Circularity as a means to achieve sustainability

2016: EMF,

“New Plastic Economy”

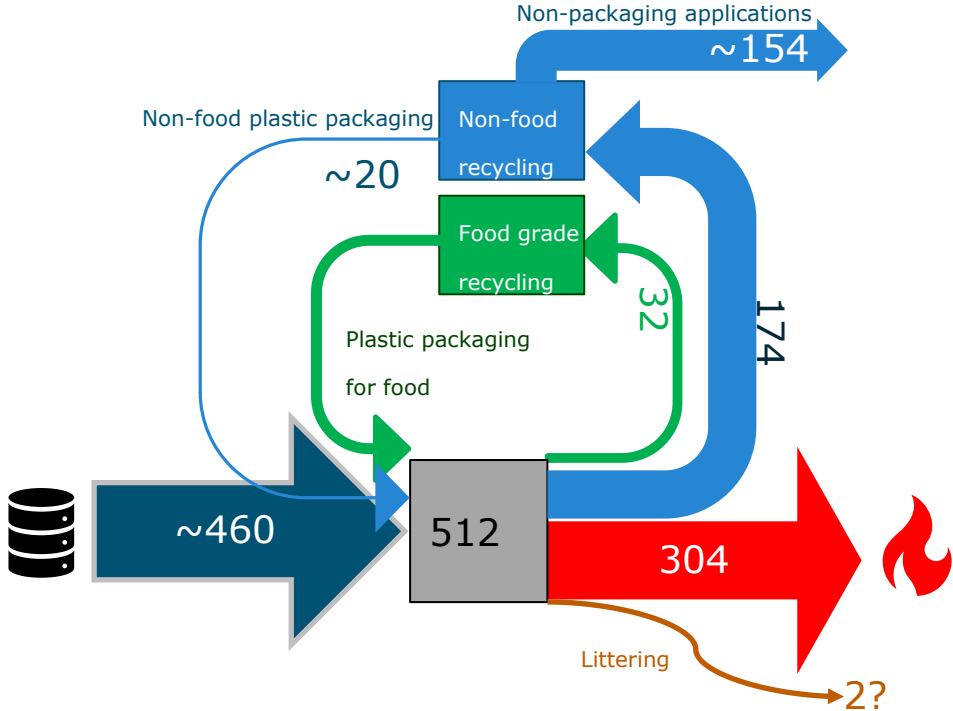
Very attractive &  
deceptively parsimonious

but also often partially  
or falsely understood



# Plastic packages in NL, 2017

kiloton



Brouwer et al. Technical limits in circularity for plastic packages. Sustainability, 2020, 12, 10021, doi:10.3390/su122310021

# Why is our plastic system not circular?

- Most packages are currently not yet *designed-for-recycling*
  - Polymer contamination -> opaque, brittle
  - Molecular contamination -> odour, safety
- Lack of effective and cost efficient sorting- and decontamination technology
- Much too conservative interpretation of legislation

Producers

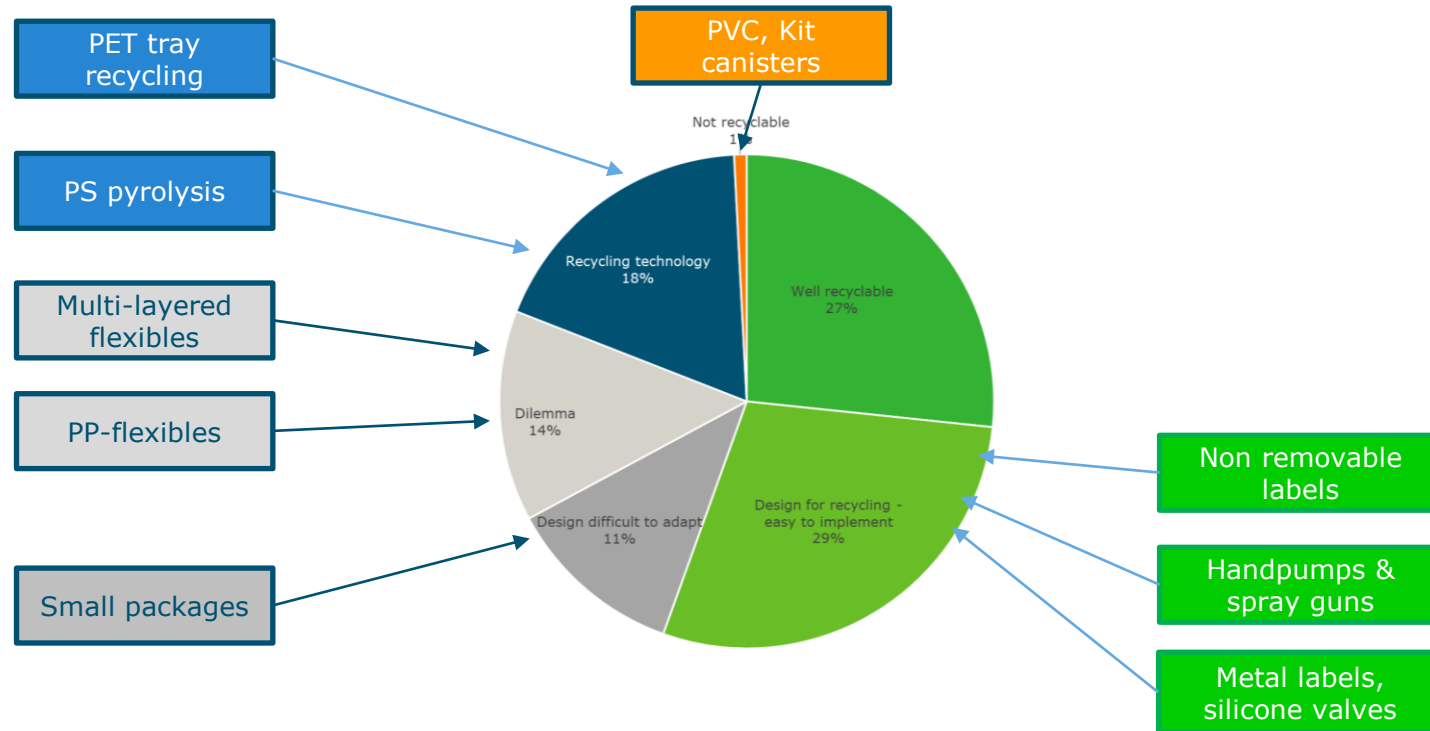
Recyclers

EFSA

R. Franz, F. Welle. Recycling of post-consumer packaging materials into new food packaging applications - Critical review of the European approach and future perspectives. Sustainability, 2022, 14(2), 824. doi: 10.3390/su14020824



# Status design-for-recycling NL, 2021



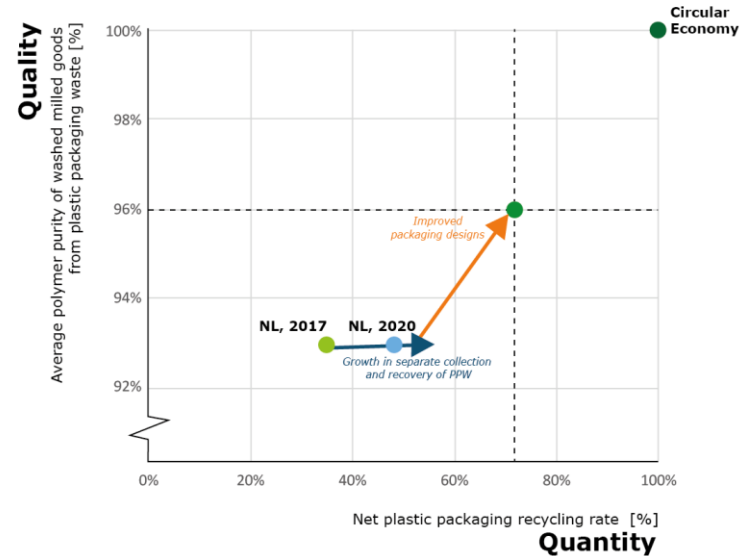
Brouwer et al. 2020 Recyclebaarheid van Nederlandse kunststofverpakkingen. doi: 10.18174/546479

What if all packages were *designed-for recycling* and what if we would only use the best available sorting and recycling technologies?



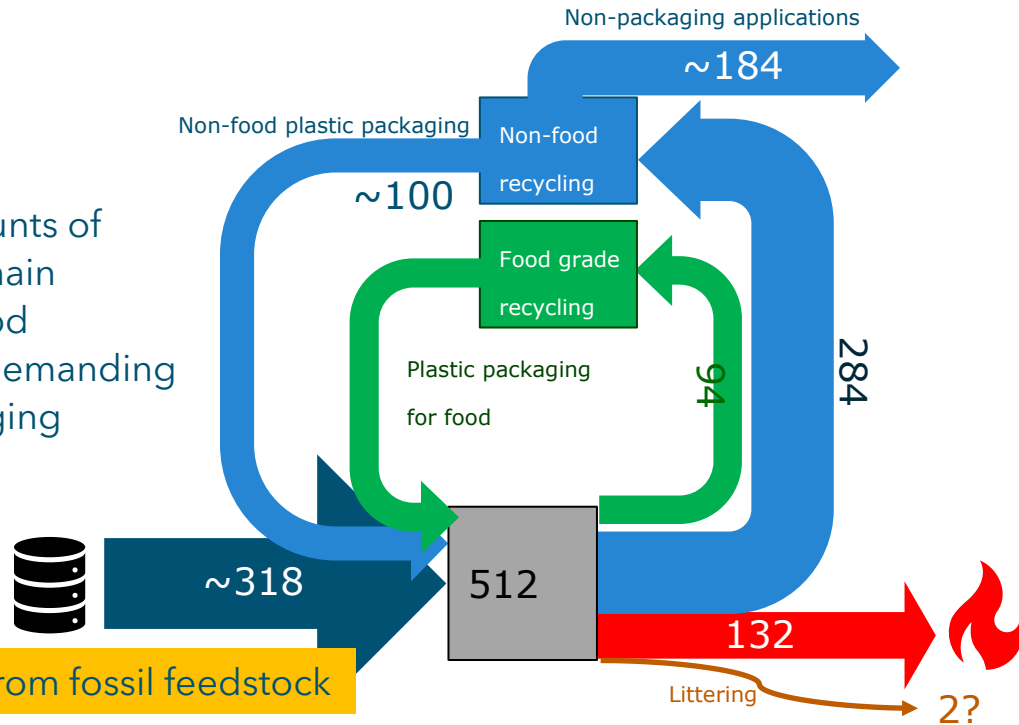
# Technical limit for plastic packages

- We would not only have more recycled plastics but also on average more pure recycled plastics



# The technical limit of our plastic system

Substantial amounts of virgin plastic remain necessary for food packaging and demanding non-food packaging



No decoupling from fossil feedstock



No solution for leakage

Brouwer et al. Technical limits in circularity for plastic packages. Sustainability, 2020, 12, 10021, doi:10.3390/su122310021

# Double system failure

- Pollution of the planet with persistent plastics
  - Loss of biodiversity
  - Food security
- Leakage can be limited but not stopped by recycling, reuse, etc.
- No decoupling of fossil feedstock
  - Climate change
  - Geo-political dependencies
- Recycling and reuse limit the need for crude oil marginally

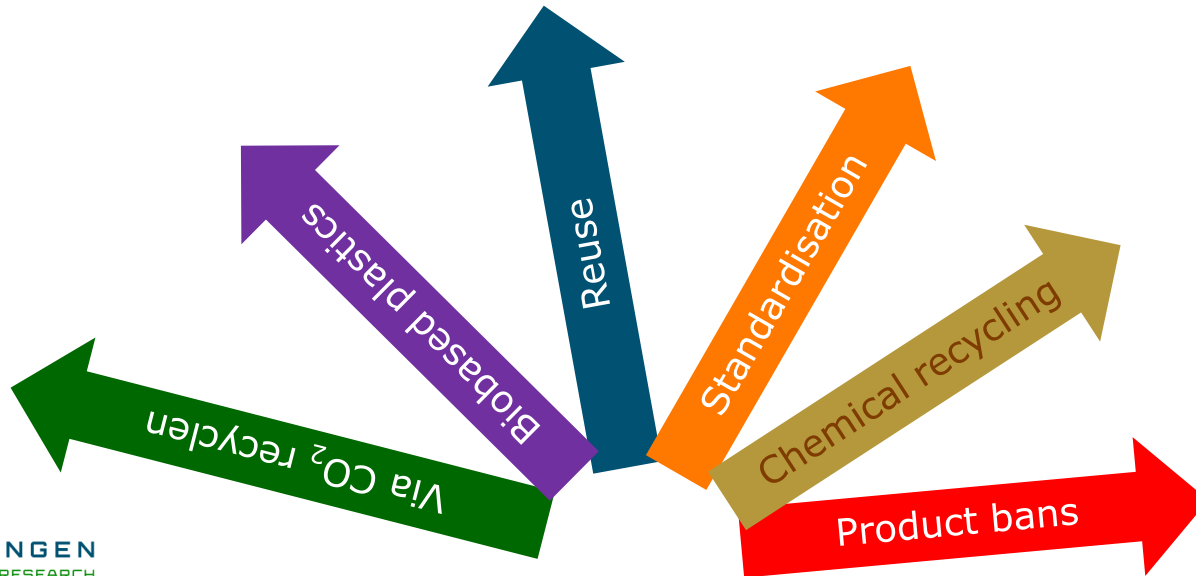
# The current quest for more circularity

- With the current technologies and regulations
- Is not a solution for :
  - Climate change 
  - Plastic pollution of the natural environment 
- Growing awareness: recycling ≠ circularity ≠ sustainability



# Which direction to take?

- There is no consensus among stakeholders how to proceed. There are multiple options with different barriers and dilemmas





EC  
strikes  
back

2019 / 904 / EC  
SUP

2022 / 1616 / EC  
Food safe recycled plastics

Nov 30 2022  
New PPWR proposal

# 2019/904 SUP-directive

- Ban on several single-use plastic articles (SUP)
- Levies on other SUP
- Reporting obligations for all member states
  
- Every member state is separately busy to write “guidance documents” on what SUPs are and what not
- Several member states have decision trees that differ in details

# EU directive 2022/1616 – *the good news*

- The mechanical recycling of PET bottles can proceed
- All (>200) combinations of process and resource with a positive opinion of EFSA will get a formal approval of the EC
- Internal recycling of PET material within companies can proceed
- Recycling of crates from closed loops can proceed

# EU directive 2022/1616 – *the bad news*

- All other (new / old) combinations of processes and feedstocks will have to be subjected to the extended assessment
- Collection: only separate collection is allowed
- Sorting: Feedstock has to contain only food packages
- Recycling: Efficiency of the decontamination technique must be proven with challenge tests
- Functional barriers: proof of efficiency needs to be offered again

The risk assessment protocol of EFSA remains 3x conservative

# Expected impact of EU 2022/1616

PET bottle to bottle mechanical recycling

PET tray to opaque tray LQ mechanical recycling

PET tray to tray HQ recycling (enzymatic depolymerisation)

PE / PP LQ to cosmetics, automotive....



PE / PP HQ to food packaging....

D4R, marking, decontamination



PE / PP chemical recycling (pyrolysis) food packaging

EPR policy / calculation method

2023



2033



# Proposed Packaging & Packaging waste regulation

- Packages should be reusable and/or recyclable in 2030
- Use of compounds of high concern should be restricted further
- Recycled content targets in new packages
- Reduction targets for packaging waste on national levels
- Packages should be minimal (empty space minimised)
- Reuse targets for several packaging formats
- Bans for several packaging formats

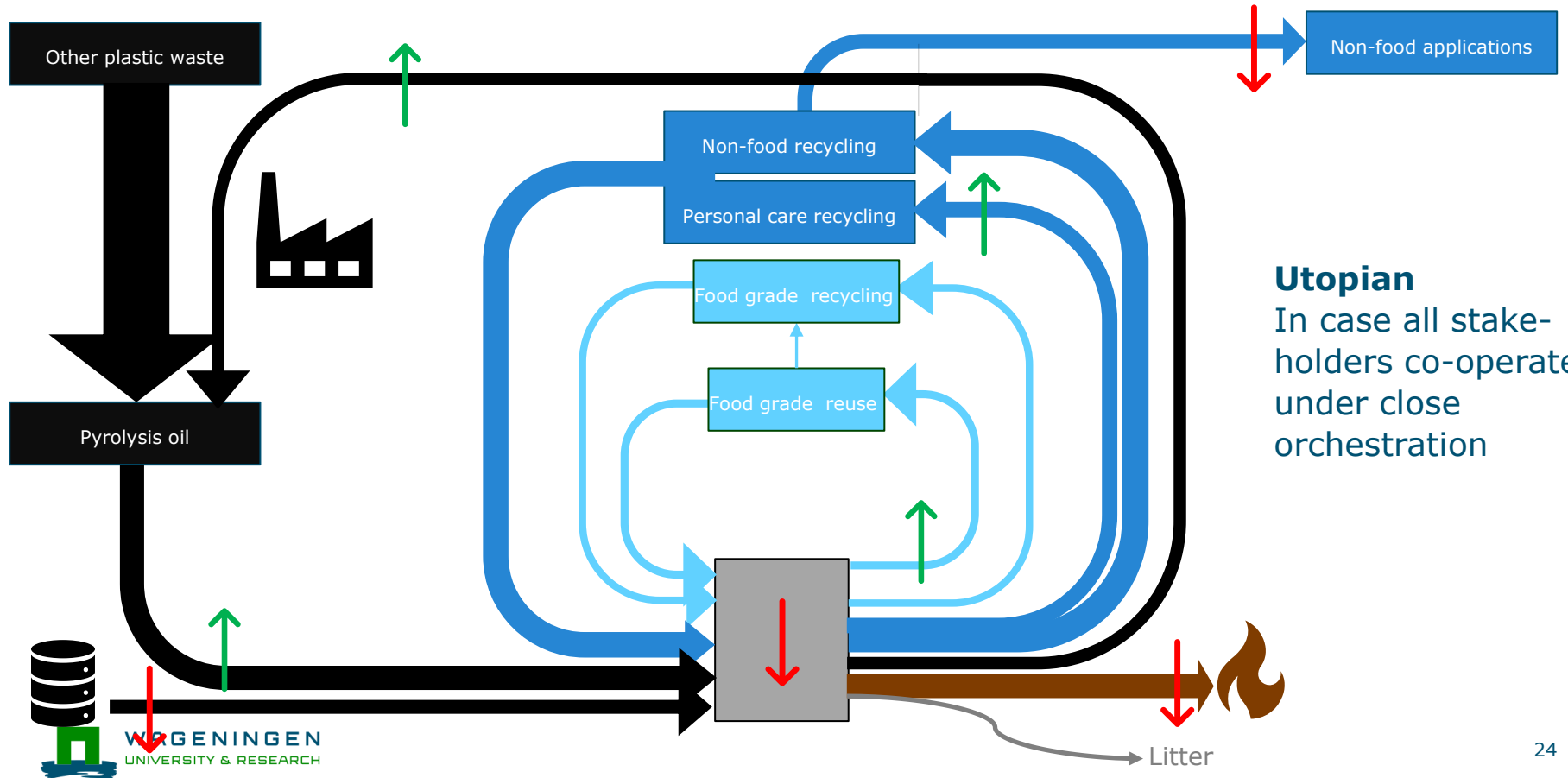
# First reflection

- 1 Very ambitious
- 2 Major restructuring of the complete supply chain / industry
  - Massive investments required
  - Who will orchestrate this all?
- 3 Can it be executed and enforced at all?
- 4 25% reuse of PET bottles and 65% RC in CS-packages contradicts
- 5 Will it actually result in reduced CO<sub>2</sub> emissions?
- 6 Enormous bureaucracy in each member state

# How do we get 65% RC in CS packages?

- Maximise PET bottle collection and recycling
  - But the obliged reuse system will limit this
- Develop PET tray recycling to produce transparent food grade rPET
- Mechanical recycled PE and PP to personal care and cosmetics packages
- Chemical recycled plastic waste to food-grade PE and PP
  - We will need a lot of plastic waste to produce sufficient amounts of food-grade PE and PP

# A glance of the new intended system...



# Will such a new system solve the issues?

- **Climate change**
  - A small reduction in emissions is feasible, but so is a steep increase
- **Limit leakage**
  - No, plastics will remain to leak into the natural environment
- **Decouple from fossil oil**
  - Dependency of crude oil will be reduced slightly
  - We will become dependant of the import of plastic waste
  - We miss biobased plastics

# Scientific perspective on PPWR

- We need **orchestration**
- We need **science** to find the fine balance between looping strategies and global warming
- When looping strategies prevail we need
  - **coercion** to achieve design-for-recycling
  - new **improved sorting systems** to achieve grade-selective sorting to enable closed recycling loops & inclusion of biobased materials
  - new recycling and **decontamination** technologies



# Scientific perspective on solving the issues

- Limit leakage
- Articles that still end up in the natural environment will have to be bio-degradable.
- Bio-degradable plastics will have to be integrated in the newly developed sorting- and recycling system
- Decouple from crude oil
- Integrate biobased plastics
- Food-to-Food recycling is essential
  - Risk assessment by EFSA should be less conservative and more realistic

# Thank you

Circularity is inherently complex

Sustainability remains to be the overarching goal

Scientists needs to safeguard that good intentions do not derail

