Recyclable solutions for everyday packaging

PACK FOR THE FUTURE

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Design-for-recycling, relevance and evolution

Ulphard Thoden van Velzen

Senior Researcher Packaging Technology,
Wageningen University & Research

Why is recyclability important?

- Only with well-recyclable packages we can:
  - Reduce our climate impact
  - Reduce the leakage of plastics into nature
  - Become less dependant of import of fossil feedstocks
  - Become less dependant on foreign regimes

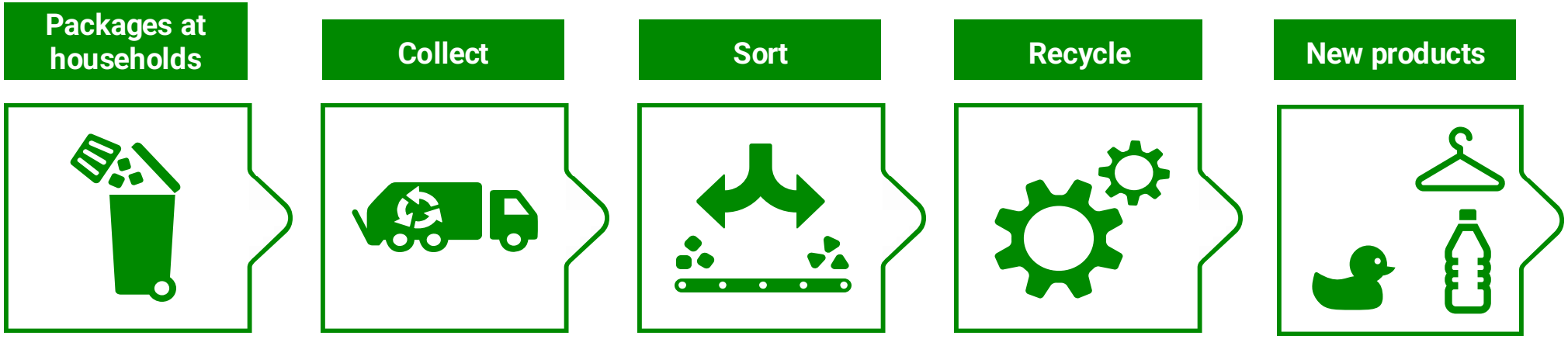
- However, currently many packages are not-well recyclable
  - Cannot be sorted adequately, or
  - Reduce the quality of the recycled plastic

Recyclability

- The ability to be recycled (of plastic packages)
- Its practical meaning depends on:
  - The objectives of the recycling system - the goal
  - The infrastructure that is in-place - the means
- Consequently, its practical meaning
  - has varied between countries, but is converging within the EU
  - and will change in time due to
    - new infrastructure
    - new political objectives
    - new scientifical insights

Early principles of recyclability (PRE 2021)

1. Plastic packages are collected for recycling
2. Plastic packages are sorted into sorted products which are traded to recycling companies
3. Sorted products are recycled
4. The recycled plastic is used to make new products



The 2 most pressing pitfalls

- Packages cannot be sorted efficiently
- Packages contain other materials & substances of concern that reduce the quality of the recycled plastic

Typical sorting issues with plastic packages

- Small packages
- Large labels & sleeves that obscure the main material
- Non-targeted main materials
- Metallic components in the package
- Not or insufficiently emptied packages
- Black plastics

Typical recycling issues

- Incompatible materials that are inseparable
- Use of substances of concern
  - carbon black
- Use of precursors of substances of concern
  - inks, pigments, PUR-tie-layers

Today at Pack for the Future we work to improve some of the most common issues

- The improvements shown are relevant and make direct impact

- These are first important steps in our shared journey towards more circularity

The PPWR will be the next step

Designed for recycling

2030 Market access exclusively for recyclable packages

2035 Packages must be recycled at scale

2038 Market access Exclusively for best Recyclable packages

Allowed materials

2026 PFAS limitation

2027 Further restrictions substances of concern

2030 Mandatory use of minimal shares of recycled content

Restrictions on the use of compostable materials

2040 Raised levels of shares of recycled content

Reuse & refill

Various targets for reusable packages

- E-commerce
- Take away
- Transport…

Waste reduction

Minimalization packages (weight, head space)

Reduction packaging waste per member state
2030: -5% i.r.t. 2018
2035: -10%
2040: -15%

Ban on packaging types
-Grouped
-Vegetables & fruit
< 1,5 kg
-Horeca

Harmonising legislation

Regulation

Declarations of conformity with exchangeable data

Align labelling for waste collection between member states

Recyclability in the PPWR

- The PPWR demands amongst other things that:
  - Member states reach recycling rates for plastic packages of:
    - 50% by 2025 & 55% by 2030
  - Producers will only bring recyclable packages on the market
    - In 2030 those that fulfil categories A, B or C
    - In 2038 only those that fulfil categories A or B
  - Producers will use recycled content in newly produced packages

- This requires clear rules on what is recyclable

Article 6 of the PPWR

- From 2030 on all packages must be designed-for-recycling
- The final EU definition will somehow be based on mass-shares of targeted material
  - A > 95% target material is encouraged
  - B > 80% target material is tolerated
  - C > 70% target material is discouraged and forbidden from 2038
  - D <70% target material is discouraged and forbidden from 2030
- Packages must be separately collected, sorted efficiently and recycled at scale in the whole EU
- Packages of medication, medical devices, infant formula, dangerous goods are excluded, as are innovative packages

Recycled content

Minimum recycled content targets

Any plastic part of packaging will have to contain a minimum percentage of recycled content.

Exemptions

- for compostable plastic packaging
- packaging whose plastic component represents less than 5% of the packaging's total weight
- for infant food, medicinal products and medical devices.

➔ The targets are set per packaging type and format and will be calculated as an **average per manufacturing plant** and year.

	2030		2040
SUP bottles	30%		65%
Contact Sensitive Plastic (PET as major component)	30%		50%
Contact Sensitive Plastic (PET not as major component)	10%		25%
All other Plastic Packaging	35%		65%

Mirror clause | Safeguard clause

Benefits from well-designed packages

- Well-designed packages are attractive feedstocks
  - Sorted products of these packages command income
  - Facilitates to attain the recycling rate target

- It facilitates to close the material loop
  - Less leakage of plastics into nature
  - Less dependant of the import of fossil feedstocks
  - Less dependant of foreign regimes
  - Is some cases also less climate change

Recyclability: goals & means

Objectives

- 1: Plastic lumber
  - Almost all plastic packages will be recyclable
- 2: Food-grade recycling
  - Only PET bottles and PET trays are currently recyclable

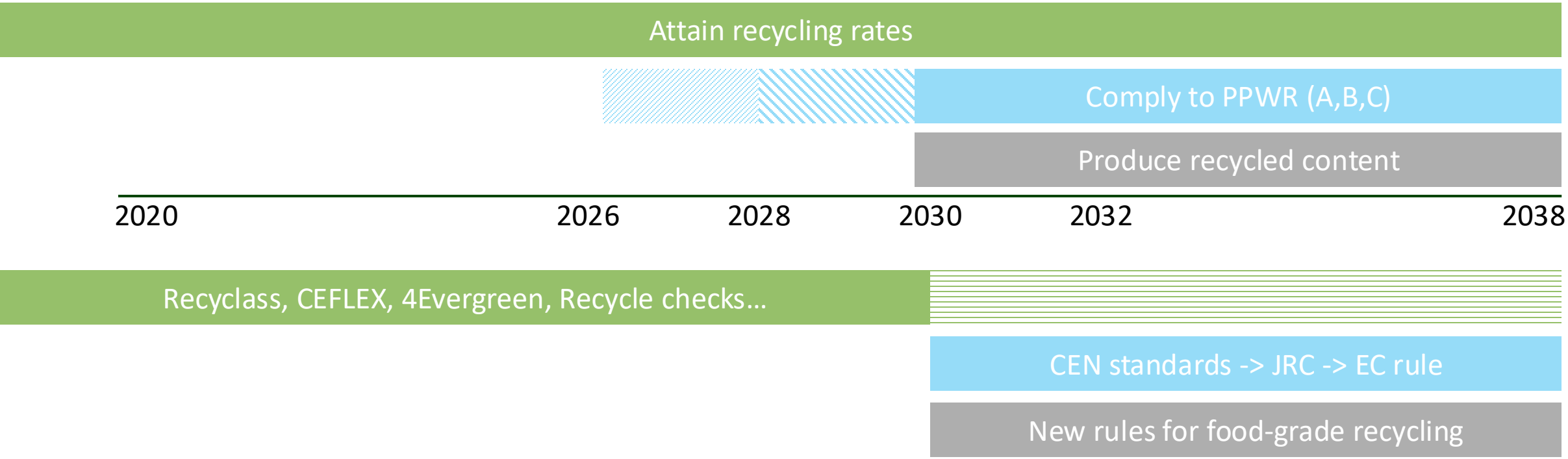
Infrastructure

- 1 Mechanical recycling
  - Substances of concern should be absent
  - All non-targeted components should be removable
- 2 Pyrolysis
  - Preferably no PVC, PET, PA, printing inks…

Reflection on objectives

- Hitherto multiple stakeholders provided recycling guidelines
  - Recyclass –European recyclers (predominantly mechanical recyclers)
  - CEFLEX –Flexible packaging producers & FMCG industry
  - 4Evergreen –Paper industry
  - Recycling checks (NL) –EPR organisation …
- With the PPWR we get a new objective: the production of recycled content and we will have to redefine from guidelines to rules
- Moreover, we must redefine them again to make the production of food grade recycled polyolefins feasible

New objectives results in new D4R guidelines



Perspective in time

- Today we can improve our recycling system by addressing the challenges in the Pack for the Future convention
- We can also continue to improve the designs of all our packages with the existing guidelines
- From 2028 on and before 2030, we must accommodate the new European design-for-recycling rules
- But simultaneously, in 2030, we will need recycled content that can only be produced from packages that comply to much more stringent design-for-recycling rules

Consequences of the use of recycled content

- Substances of concern cannot be present in the targeted material

- All non-targeted components that contain substances of concern and their precursors should be fully removable, and these should also not migrate
  - That is why there is focus on the removal of labels, sleeves…

- Well-designed packages suited for contact sensitive recycling should be recognisable and separately sortable

Most PET beverage bottles are exceptional

- High shares of PET ~90%
- All components are relatively easy to separate and remove
  - HDPE-caps and cap-rings are loose
    - Removed via milling and density separation
  - PP-labels are glued on only a small strip, which melts and dissolves > 60°C
    - Removed via milling, air classification, washing and density separation
    - Substances of concern remain in the labels
  - Most residues are removed by flake sorters
- Degradation of the PET resin is restored with SSP
- Volatile contaminants are removed with SSP

Key lessons from food-grade PET recycling

- To make >99.9% pure, food-grade recycled plastic, recyclers need:
  1) well-designed packages,
  2) a feedstock that is exclusively composed of these well-designed packages,
  3) multiple, complementary, highly effective separation technologies

Food-grade recycling of polyolefins?

- The main component (bottle, tray…) should be composed of only one type of polyolefin resin,
- All other packaging components (labels, caps, top-films…) should be completely removable
- There should be NO (precursor of) substances of concern in the package
- The package should be uniquely recognisable and sortable
- The sorted product should only be composed of well-designed packages
- To reduce incidental contamination & residues of used anti-oxidants, the material must be decontaminated

Prime substances of concern in recycled polyolefins

SoC	Example	Origin	CMR
Polycyclic aromatic hydrocarbons	Pyrene	Carbon black pigment	C
Primary aromatic amines	2-methyl aniline	Degradation of aromatic PUR tie-layer & azobenzene pigments	C
Nitrosamines	Diphenyl nitrosamine	Degradation of nitrocellulose ink resin	M
Phthalate esters	Bis(2-ethylhexyl) phthalate	Migration from printed labels	R
…what will be next?			

The list of precursors of substances of concern grows annually with new insights

Conclusion

- Today we can and must start with the first steps in improving packaging designs

- By 2030, the PPWR will change the current design-for-recycling guidelines into rules

- Simultaneously, the need for recycled content will create much stricter design-rules for food-grade recyclable packages

Thank you for your attention.

Time for questions!