ELLEN MACARTHUR FOUNDATION

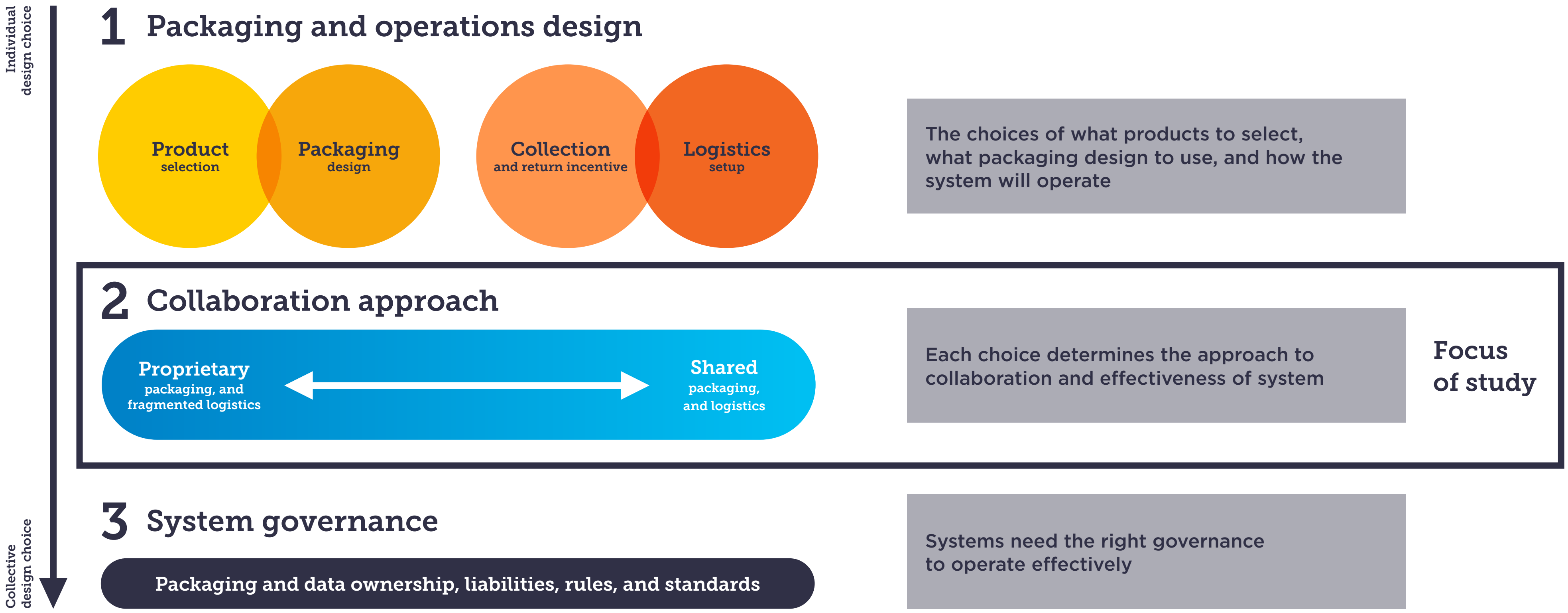
Modelling and analysis by SYSTEMIQ eunomia

# Unlocking a reuse revolution: **scaling returnable packaging**

## Design pathways appendix

# Appendix
# The design pathways to returnable packaging

Unlocking a reuse revolution: scaling returnable packaging focuses on the role of collaboration, through shared infrastructure and standardised pooled packaging, in scaling returnable packaging systems. However, during our research, we have gathered numerous insights about other key considerations for return systems' design and implementation, especially on product selection, packaging design, and collection and logistics setup. This appendix summarises key insights on these topics and is an invitation for the readers to pursue further research on these questions.


Individual design choice
Collective design choice
1 Packaging and operations design
Product selection
Packaging design
Collection and return incentive
Logistics setup
The choices of what products to select, what packaging design to use, and how the system will operate
2 Collaboration approach
Proprietary packaging, and fragmented logistics
Shared packaging, and logistics
Each choice determines the approach to collaboration and effectiveness of system
Focus of study
3 System governance
Packaging and data ownership, liabilities, rules, and standards
Systems need the right governance to operate effectively

# Packaging design and product selection

**One of the first design choices when developing return systems is selecting appropriate products and designing packaging accordingly. Together, product selection and packaging design must meet technical and marketing requirements to enable packaging to flow efficiently in return systems and aid customer understanding of how the systems works.**

**Product** selection

### Product specific factors

- Easiness to clean
- Small volume
- High safety regulations
- UV sensitive
- Sealing requriements
- ...

### Purchase frequency

- Weekly
- Monthly
- Infrequent

**Packaging** design

### Material

- PET
- PP
- PE
- Stainless steel
- Aluminmum
- Glass
- ...

### Design

- Neck diameter
- Shape
- Dimensions
- Wall thickness
- Scuff zones
- ...

### Closure and labelling

- Material
- Number and size
- Adhesives
- Reusability/recyclablity
- ...

Although upstream innovation strategies apply to all product types (see our Upstream Innovation Guide for further information), certain product types are a better fit for reuse, and might be easier to shift from single-use to return systems, especially in the short and medium term. The key considerations when selecting the product to switch to return are:

- **Product-specific requirements** e.g. UV sensitivity, corrosion, sealing requirements) which influence the suitability of these products for return
- **Purchase frequency**, which depends on the product consumption time and brand loyalty.

Taking into account the product requirements, packaging design looks at different elements and components, including:

- **Materials**, for example choosing between glass, stainless steel, aluminium, plastic (e.g. PET, PP, PE)
- **Shape**, including body dimensions, shape, and neck size
- **Closures**
- **Labels**

| Packaging structure | Packaging decoration |
|---|---|
| **Packaging body**<br>• Material, weight, and durability<br>• Shape and format<br>• Dimensions<br>• Neck size<br>• % of recycled content<br>**Closures**<br>• Closure type and shape<br>• Closure material<br>• Dispensing volume<br>• Tamper-proofing | • Label format, number, and shape<br>• Label placement<br>• Label substrates and glues<br>• Engraving / embossing / direct printing<br>• Colour / translucency<br>• Additional components<br>• Reuse identifier |

**Together, product selection and packaging design must meet technical and marketing requirements.** Technical requirements ensure the combination of product and packaging is suitable for return systems and runs smoothly and efficiently within it. These technical requirements for the packaging include:

- **Product suitability**
- **Durability**
- **Cleanability**
- **Transportability**
- **Safety**
- **Material environmental impact**

In addition to these technical requirements, marketing requirements exist to both market the product and ensure customers understand the return system process.

**Taken together, the right product choices (e.g. fast-cycling products) and the right packaging design (e.g. a container that is easy to clean), set a return system up for optimum performance.** Businesses should optimise for maximum efficiency of cleaning, minimum material use for maximum loops (optimising for the likely number of loops determined by the return rate), and optimised transportation. These return optimisation choices need to be balanced with other safety, marketing, and transition cost considerations.

# Collection and Return incentive selection and reverse logistics design

**As return systems require closing the loop, key design choices include selecting packaging return incentives to get the packaging back, and designing reverse logistics to sort and clean packaging before it is reused. Together, return incentive selection and reverse logistics design must meet efficiency and experiential objectives to achieve optimal and inclusive systems with high degrees of customer adoption.**

**Collection**
& return incentive

### Collection method

- From retailer
- From home (kerbside)
- From home (with grocery delivery)
- Neigbourhood collection point

### Return incentive

- Deposit
- Deposit & coupon on return
- Reward for return only
- Monetry penalty
- ...

**Logistics**
setup

### Tracking

- Barcode
- QR code
- RFID
- No individual packaging tracking

### First-leg logistics

- Back-haul with retail trucks
- Direct collection from retail

### Sort and cleaning setup

- Centralised automated faciltities
- Small and localised facilities
- Co-located with sorting
- Co-located with filling

Incentivising return is crucial to achieving economic and environmental benefits. While some applications, such as beverage bottles in Germany, already achieve return rates close to 100% (>98%), the habit of returning packaging is still to be established in many geographies and product categories. To reach sufficiently high return rates, a fine balance must be found between **the right level of incentives** (deposit/penalty not too low) while not compromising on **accessibility and customer experience** (not putting off customers with a deposit/penalty that is too high). Many different ways to incentivise return exist, including:

- **Upon return**
  - Financial deposit and financial reimbursement
  - Financial deposit and coupon reimbursement
  - No deposit and discount reward for return
- **If not returned**
  - Financial 'penalty'
  - Non-financial 'penalty' (e.g. loss of loyalty points)

In addition to selecting how to incentivise returns, a number of design decisions must be made to collect, track, and sort and clean packaging efficiently.

First, potential collection methods include:

- **Return from retailers:** the customer brings back packaging to the retail store via an RVM, collection point, or hands the packaging over to store staff
- **Return from neighbourhood collection point:** the customer brings back packaging to a drop-off point or RVM near their home
- **Return from home:** a third party or the municipality collects empty packaging from the customer's doorstep.

Taking into account the return incentive mechanism selected and the collection methods, a data tracking system must be implemented to track packaging along the value chain. This serves to ensure packaging traceability and safety, and to guard against deposit fraud. Potential tracking tools include:

- Bar codes
- QR codes
- Radio-frequency identification (RFID) chips

Finally, return logistics can be developed in a number of ways and the design should be tailored to geographies and packaging applications. These choices include:

- **Use of existing logistics** (reverse logistics to backhaul packaging to distribution centres) versus building new logistics
- **Aggregating packaging** to central, large sorting and cleaning centres versus using smaller, more local sorting and cleaning centres
- **Co-locating cleaning facilities with sorting** versus co-locating cleaning facilities with filling (common in the beverage industry).

**Together, return incentive selection and reverse logistics design must create systems that:**

- **Achieve high return rates**
- **Are inclusive and fair. This means systems that:**
  - are inclusive of the 'unbanked' population, i.e. without banking access and debit/credit card or those without digital technology access, especially without smartphones
  - don't involve high upfront costs for the customers
  - Include, and are not detrimental to, the people working in the waste-picking informal sector.

- **Offer a compelling and convenient constumer experience. This can be achieved through:**
  - offering a large range of product assortment
  - communicating clearly on return incentives mechanism (via pre-store and in-store communication)
  - building a dense network of collection points
  - designing drop-off points to be intuitive and easy to use
  - offering auxiliary services that ease return, for example, crates to ease packaging return and reminder notifications.

Designing the reverse logistics involves balancing a number of factors to avoid compromising on the **performance, efficiency, convenience, and inclusivity** of return systems at the detriment of the economics or other objectives. Examples of these balancing challenges at each step of the return loop include:

- **Return incentives:** while deposits can be adapted to many local constraints and be implemented without digital technologies, they might involve an important upfront cost for customers and put off lower-income customers. Conversely, penalties wouldn't require upfront costs but often require advanced technologies to function, and could exclude customers without access to banking systems or technology.
- **Collection points:** the more dense the network of collection points, the greater the customer convenience — but the higher the investment and operation cost.
- **Tracking technology:** the more advanced the tracking technology, the more granular the collected data is, offering high levels of packaging safety and opportunities for customer engagement (e.g. gamification) — but the more expensive the physical and digital infrastructure is to establish and run.
- **Return infrastructure:** a large central sorting and/or cleaning centre will likely involve high CAPEX but lower OPEX per unit thanks to economies of scale. Conversely, small centres will likely involve lower CAPEX but will unlock fewer economies of scale meaning higher OPEX per unit.

The Ellen MacArthur Foundation is an international charity that develops and promotes the circular economy in order to tackle some of the biggest challenges of our time, such as climate change, biodiversity loss, waste, and pollution. We work with our network of private and public sector decision makers, as well as academia, to build capacity, explore collaborative opportunities, and design and develop circular economy initiatives and solutions. Increasingly based on renewable energy, a circular economy is driven by design to eliminate waste, circulate products and materials, and regenerate nature, to create resilience and prosperity for business, the environment, and society.

Further information:
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Systemiq, the system-change company, was founded in 2016 to drive the achievement of the Sustainable Development Goals and the Paris Agreement, by transforming markets and business models in five key systems: nature and food, materials and circularity, energy, urban areas, and sustainable finance. A certified B Corp, Systemiq combines strategic advisory with high-impact, on-the-ground work, and partners with business, finance, policymakers and civil society to deliver system change. In 2020, Systemiq and The Pew Charitable Trusts published "Breaking the Plastic Wave: A Comprehensive Assessment of Pathways Towards Stopping Ocean Plastic Pollution", an evidence-based roadmap that shows how industry and governments can radically reduce ocean plastic pollution by 2040. Systemiq has offices in Brazil, France, Germany, Indonesia, the Netherlands, and the UK.

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Eunomia Research & Consulting has been working to address triple planetary crisis of climate change, biodiversity loss, and pollution since 2001, through supporting the transition to a circular and regenerative economy. Combining real world practical experience and deep technical knowledge with an active role in policy, Eunomia provides appliable, science-led solutions and insights that drive a positive, regenerative impact on the planet. Eunomia's role in reuse is providing market and technical analysis, sophisticated modelling and advice to policymakers, cities, businesses, and civil society.

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