AALBORG UNIVERSITY

Slowing and narrowing as part of circular economy business strategies

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- Circular economy as new environmental arena
- Cooperation about ”circular economy journeys” in businesses
- Slowing and narrowing in case businesses

CIRCULAR ECONOMY AS NEW ENVIRONMENTAL ARENA

Circular economy principles

- **Slowing resource flows:**
  - Through the design of long-life goods and product-life extension
- **Narrowing resource flows:**
  - Increasing resource efficiency by using fewer resources per product and by covering needs with fewer products through sharing strategies
- **Closing resource flows:**
  - Through recycling, the loop between post-use and production is closed

Adapted from Bocken et al, 2016

Summary: *Matters of concern on the circular economy arena*

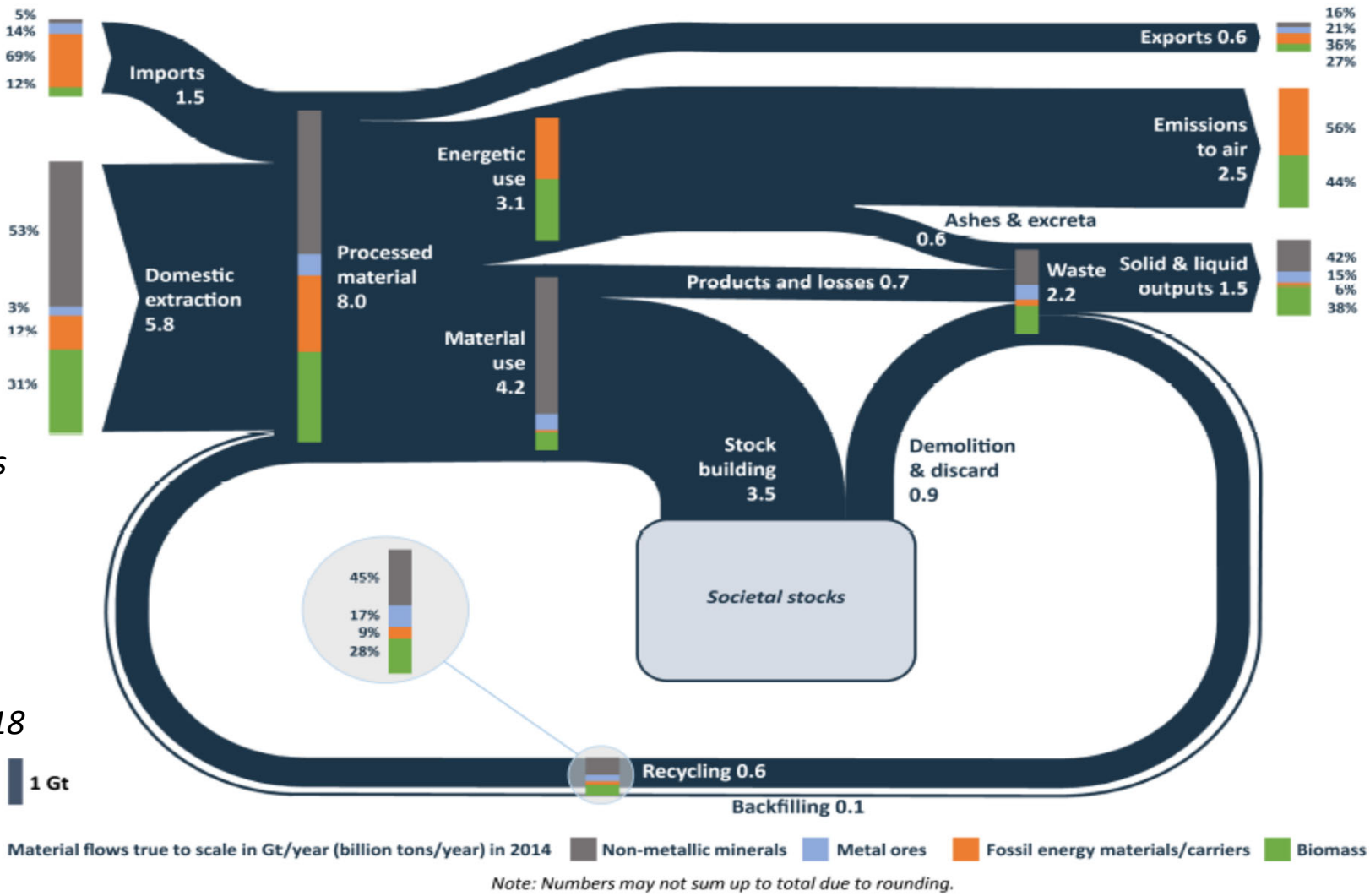
- **EU:** Less vulnerable ressource supply of European businesses through recycling and secondary raw materials
- **Governments, some businesses, consultants, ”happy researchers”:** New business opportunities from new business models based on sharing, re-manufacturing, etc.
- **Cities:** City branding as sustainable, innovative, etc.
- **NGOs, green start-ups, ”critical researchers”:** Careful about business-as-usual, eco-system metaphor of mass consumption society misleading, focus on slowing and narrowing of ressource flows

Resource flows of EU countries 2014:

Different ressource types and sourcing, stock and wastage

Unit:
billion tonnes

Sources:
European Commission, 2018
Eurostat, 2018



Resource flows of EU countries 2014:

Different ressource types and sourcing, stock and wastage

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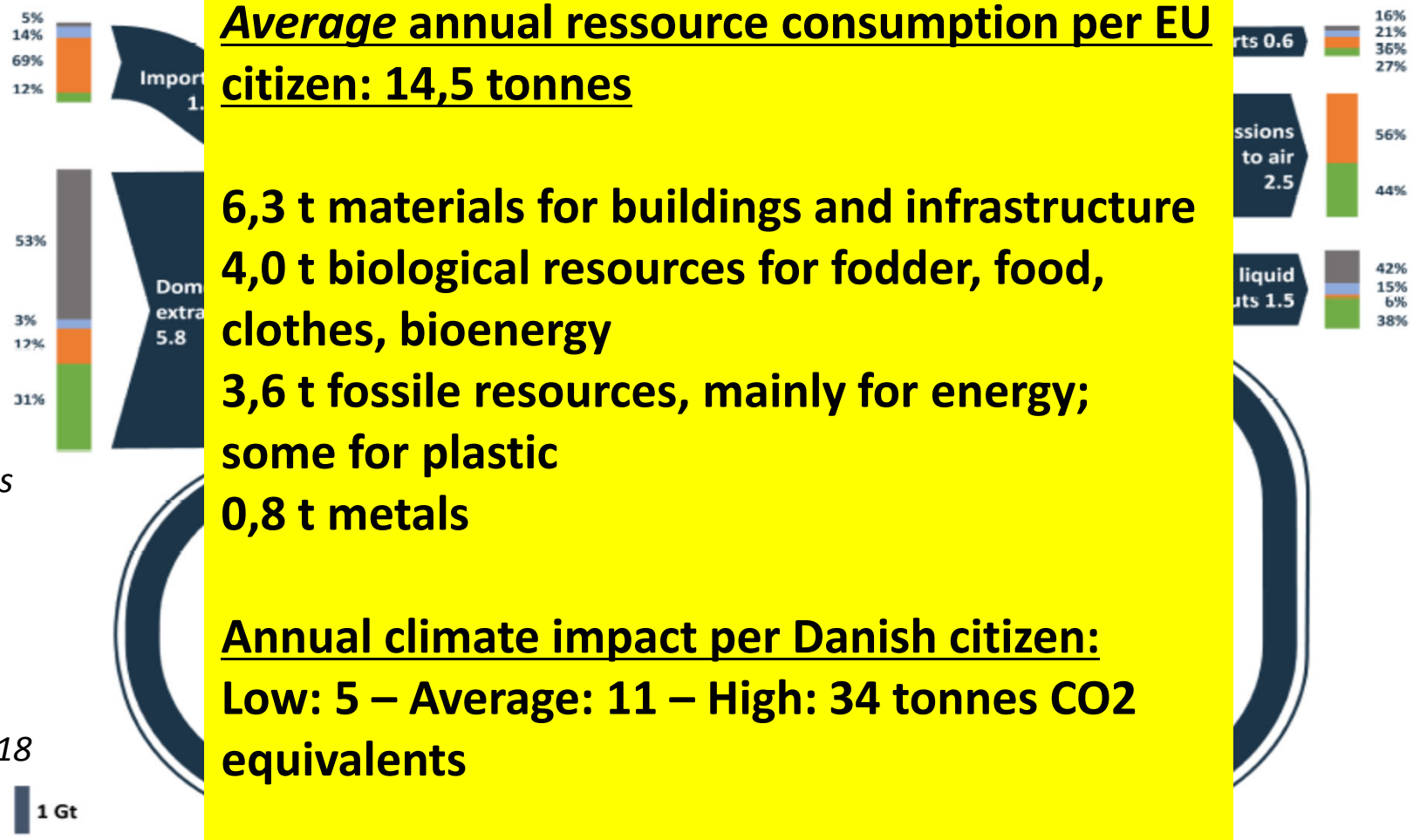
<u>*Average* annual ressource consumption per EU citizen: 14,5 tonnes</u>

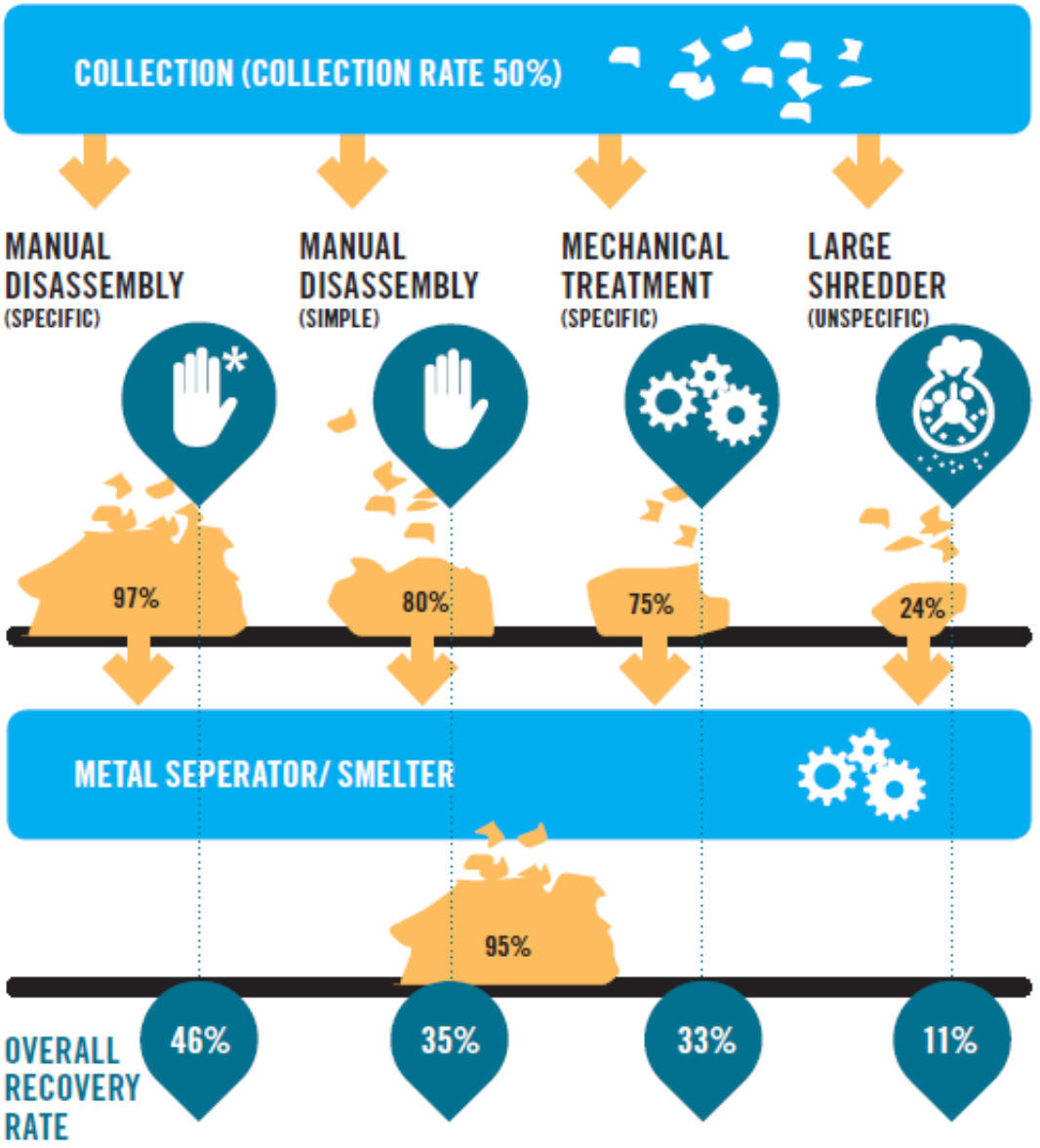
6,3 t materials for buildings and infrastructure
4,0 t biological resources for fodder, food, clothes, bioenergy
3,6 t fossile resources, mainly for energy; some for plastic
0,8 t metals

<u>Annual climate impact per Danish citizen:</u>
Low: 5 – Average: 11 – High: 34 tonnes CO2 equivalents



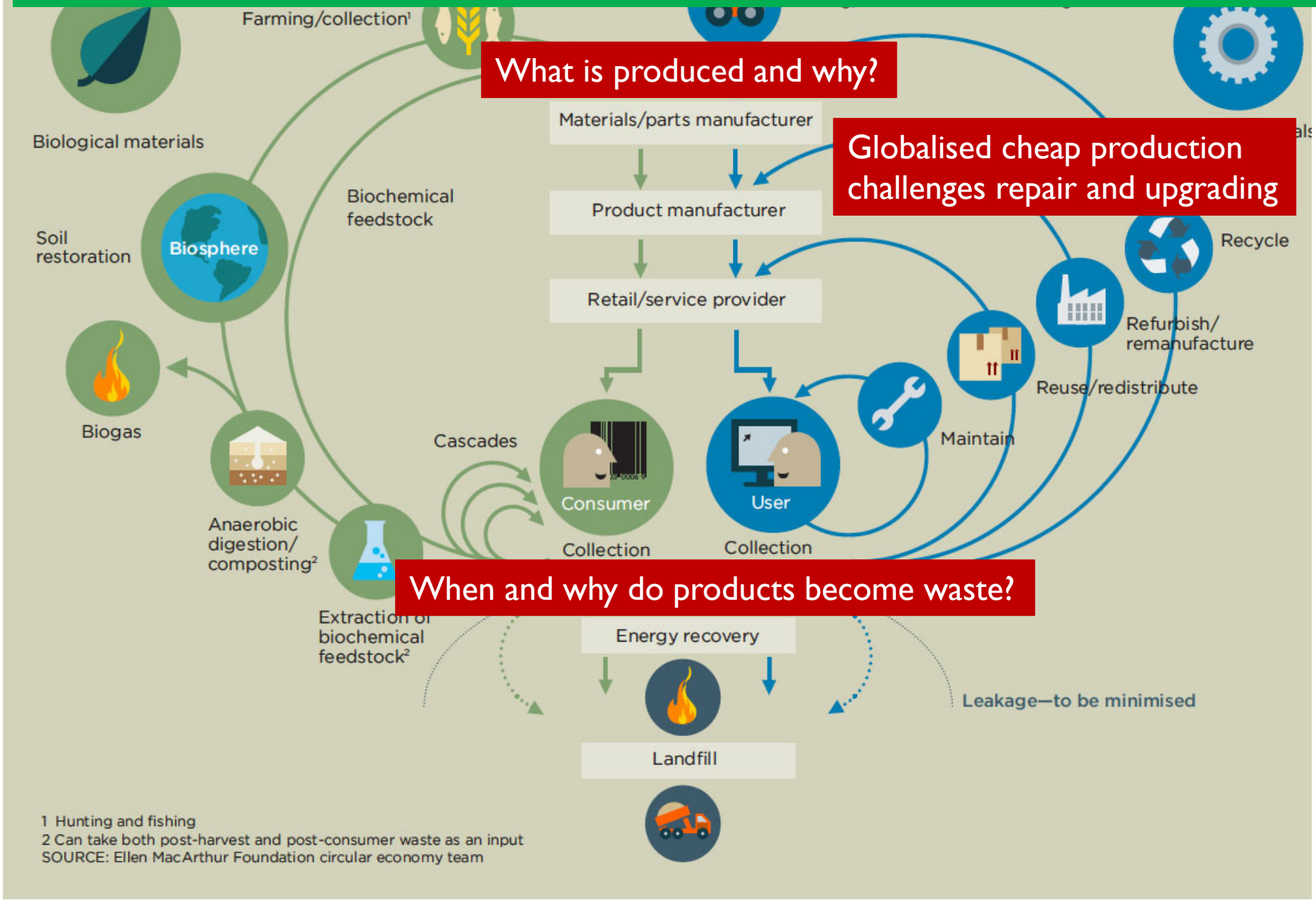
Limits to material recycling => Long product lifetime important

Figure 24: Influence of different pre-treatment steps on the overall recovery of gold from circuit boards[86]



Source: European Environmental Bureau, 2015

Limits to material recycling => Longer product lifetime important
=> *Understand linear production and consumption dynamics*



Understanding the linear economy: Business strategy shaping social practices: *clothes*

Production and sale

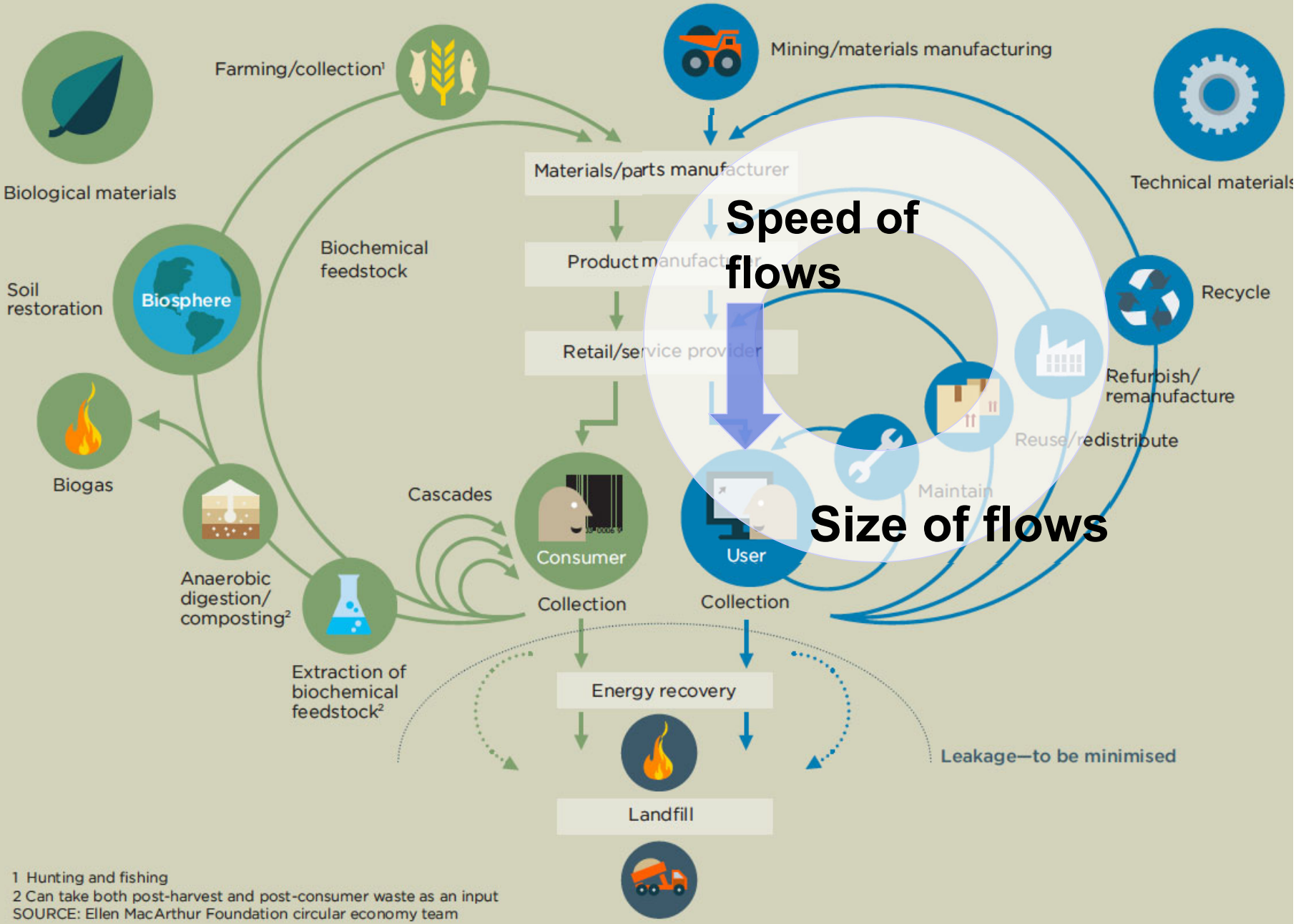
- Fast fashion => shorter time from fashion show to shop
- 2 => 4 => 8 => 50 seasons per year
- Increasing purchase of clothes
- Will recycling speed up the product consumption?

- ***Ref.:*** *Jørgensen & Jensen, 2012*

Clothing practices of young Danish women (and men?)

- Frequently buying clothes they don't need – "it is so cheap";
- Forgotten clothes: 30-50% of clothes in wardrobe not in use
- *Imagining* expectations from social network for frequent changes of clothes
- Eco-labelling not interesting: "limiting our choices"

FIGURE 4 **The circular economy—an industrial system that is restorative by design**



1 Hunting and fishing
2 Can take both post-harvest and post-consumer waste as an input
SOURCE: Ellen MacArthur Foundation circular economy team

COOPERATION ABOUT ”CIRCULAR ECONOMY JOURNEYS” IN BUSINESSES

20 business development projects about circular economy strategy => “circular economy journeys”

- 1-2 year cooperation with each business
- Initial mapping of each business: business strategy and environmental strategy
- Assessment of **potentials** and **challenges** from circular economy principles
- Development of **action plan** aiming at integrating principles of circular economy in the business strategy
- Development of tools, guidelines and case stories
- Multiplication of the experiences through a multi-stakeholder strategy and communication group

Business characteristics	Focus in relation to circular economy
New small manufacturer of jackets from recycled materials	Business model based on product take-back with discount on next product
Mattresses and pillows of foam	Cascading use of mattresses Developing business models based on leasing and direct sale to consumers
Textiles for furniture	Recycling of residual textiles
Food packaging manufacturer	Already using recycled cardboard raw material. Recycling of used packaging not possible.
Food/non-food cooperative retail chain	Packaging strategy combining health concerns and circularity concerns.
Manufacturer of school furniture	Developing product-service system for public institutions.
Roof top windows	Dialogue about development of ”circularity narrative”
Machines for industrial laundries	Interest in Total Cost of Ownership
Mobile barriers for flooding prevention	Prolonging life time and developing material recycling
Pump manufacturer	Product take-back of pump and product-service system for business customers

Mapping:
the two dimensions of product systems:

Mat. dim.: product life cycle:

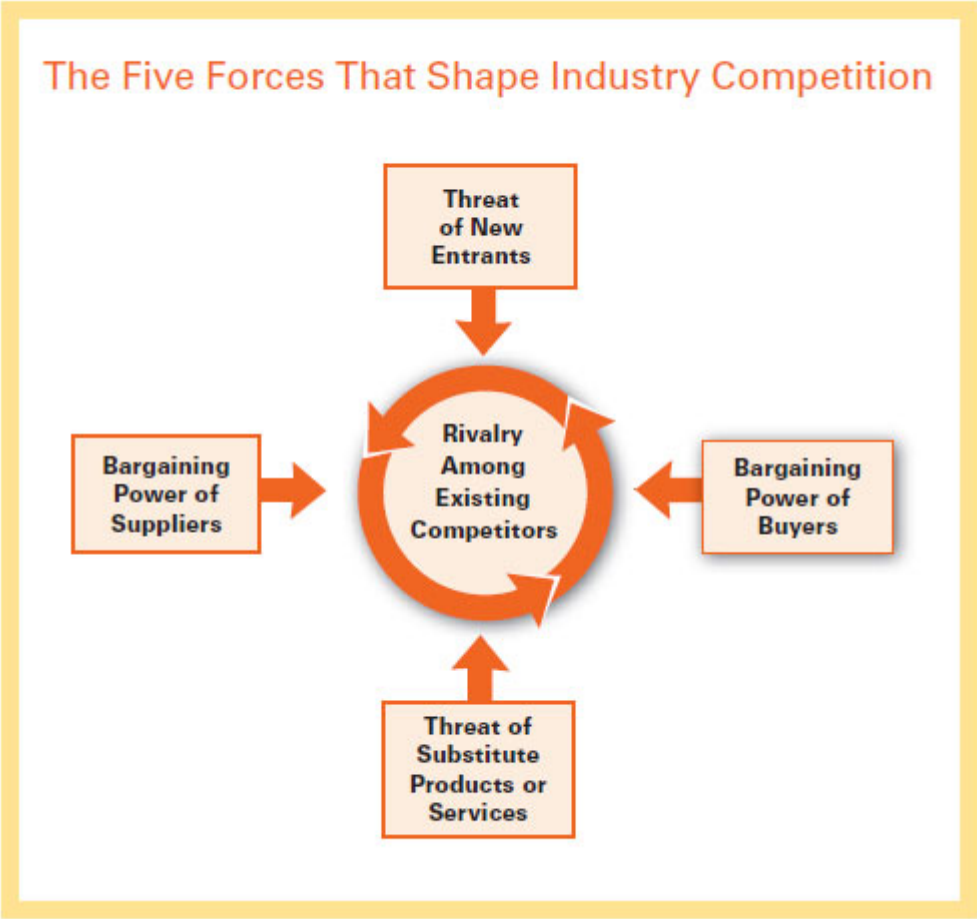
- Material extraction
- Material processing into product
- Distribution
- Retail sale
- Use stage
- Product waste disposal

Org. dim.: value chain:

- Farmers, company etc.
- Company x,y,z etc.
- Agent
- Retailer
- Consumer
- Waste handling agent

On the table during initial cooperation with the businesses: **Forces shaping the competitive position of a company**

Analysis of forces shaping the competitive position of a company
=> ”greening” as option or demand!?



Source: Michael Porter, 2008

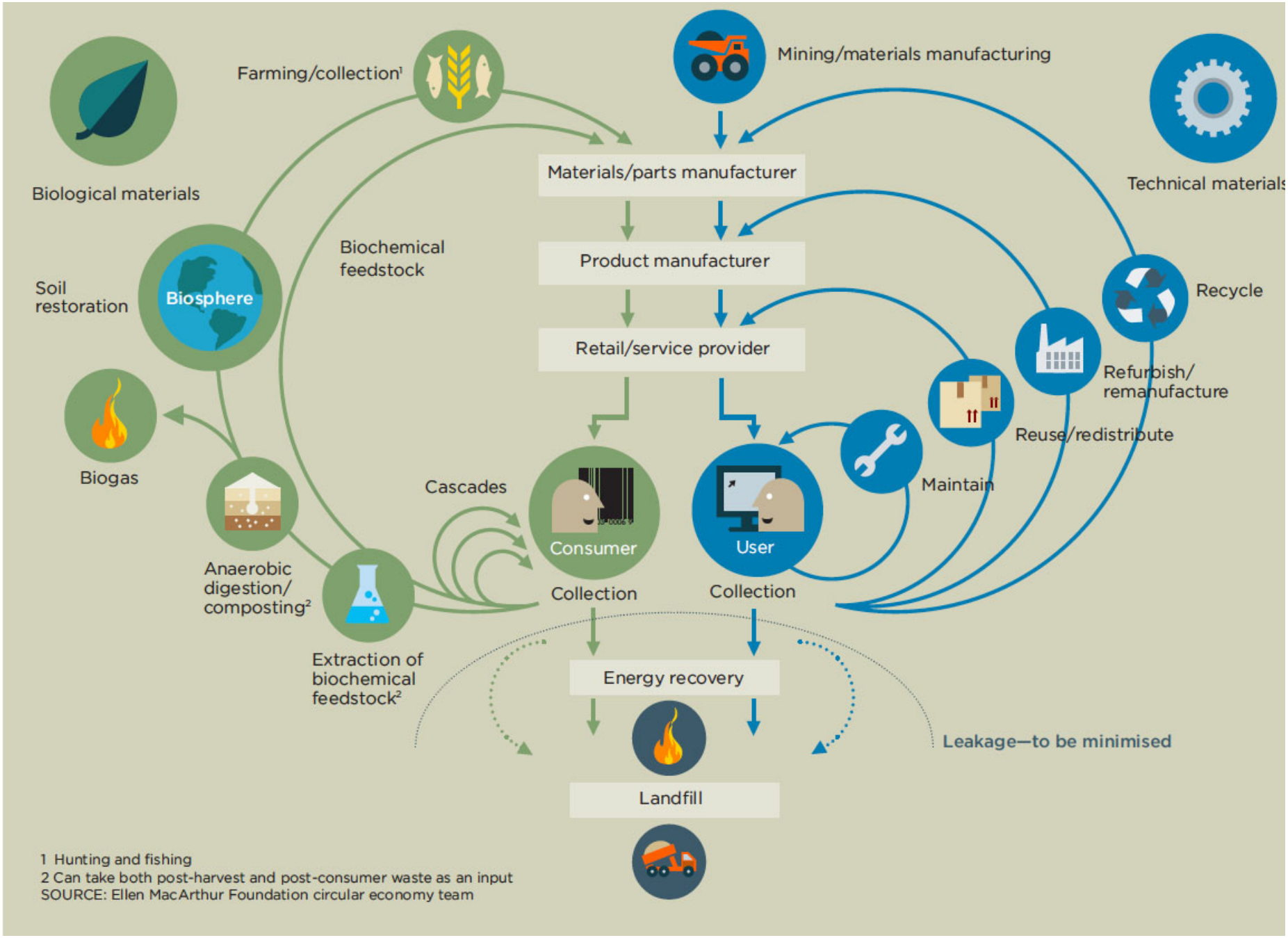
On the table during initial cooperation with businesses:

MECO analysis table

Lifecycle phases

	Extraction	Production	Use	Waste
Materials				
Energy				
Chemicals				
Other				

On the table during initial cooperation with businesses



The environmental mapping:
Speed, size and circularity of resource flows

- **Closed flows?**
- Use of recycled resources as raw material?
- Recyclability of discarded products?

- **Speed and size of resource flows:**
- Informing users about the expected use of product (through labelling, user manuals etc.)?
- Knowledge collected about the actual use of the products?
- **Actual** use corresponding to **expected** use?
- Knowledge from maintenance, service and repair of the products available and applied?

SLOWING AND NARROWING IN CASE BUSINESSES

Slowing and narrowing of ressource flows

- Three clothes manufacturers with long product life time and one of these with product repair
- Drinking water equipment: long product life time and product repair
- Prolonging lifetime of a rescue product by instructing the users in better product use and offering product take-back
- Long product life time and considerations about product take-back and refurbishment of furniture
- Use of roof-top windows for re-purposing and multi-purposing of buildings and thereby increasing lifetime and use of buildings
- Leasing and product-service-system for school furniture for schools
- Second quality grade vegetables for processed food products
- Increasing resource effectiveness of textile service through optimization of speed and size of the textile flow

Developing a circular economy value proposition about existing business practice

Inspiration from the concept of re-purposing and multi-purposing of buildings

Changing focus of circular economy journey: ***From*** *life time of skylight windows* ***to*** *life time and use of existing buildings.*

How can the use of daylight prolong the life time of existing buildings?

The old Aarup Town Hall would not immediately spring to mind as the setting for a modern kindergarten. The extensive buildings spread out like large flat blocks in the landscape and are witness to a building style that owed more to occupying square metres than letting in light and air.

Today, these buildings are home to 'Drømmebakken', Aarup's new kindergarten, with 125 children in the kindergarten section and 25 in the day care nursery. Should one of the old town hall employees suddenly find themselves back in their old workplace, they would have difficulty recognising it. The buildings have been opened up in eleven places with the installation of no fewer than forty-nine modular skylights.

Case:

Developing longer life time for mobile flooding barrier tubes - from single use to multiple use

ENVIRONMENT SOLUTIONS

Preventing hydrometerological disasters

”Flood barrier – fighting water with water”

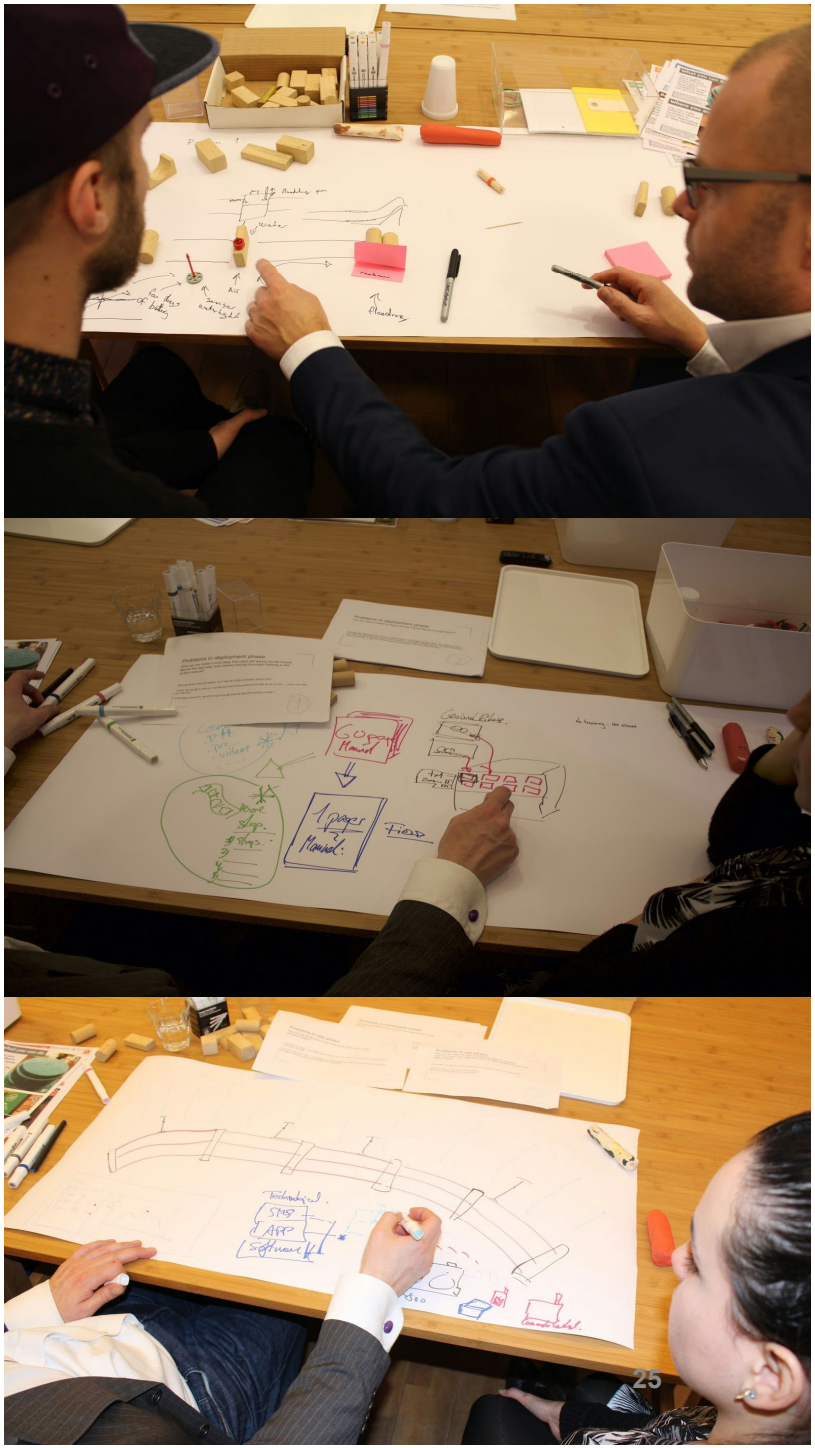
NOFLOODS SAVES GAS PLANT FROM FLOODING

Early identified design challenges

1) Possible to extend storage time of unused tubes from 5 til 8 years?
    a) Describing proper storage conditions
2) Possible to change from single-use to multiple use of tubes?
    a) Training in proper emptying, roll-up and storage
3) Possible to refurbish used tubes?
4) Possible to recycle materials from used tubes?

Understanding user practices:
Background for development of ideas for slowing and narrowing resource flows

- Dialogue with manufacturing staff
- Workshop with rescue department that have used the barriers



Strategy developed and implemented for longer product life time

The three re-designs

Types of re-design	Changes through re-design
Re-design of provided services considering changes in roles of products, users, service, infrastructure, etc.:	• Business offers to take back product after use instead of product is discarded by customer • Users informed about how to empty used product so that the product can be re-used • Product is re-used after cleaning or refurbishment • Customers buying re-used products are informed that products might be dirty but have same quality as new products
Re-design of value chain relations up-stream and down-stream	• Customers are offered discount with next purchase of product if they return used products instead of disposing them
Redesign of internal business organization:	• New tasks introduced: Disassembly, refurbishment and cleaning of used products • Development of information for customers about prices and quality of re-used products

Working with three necessary types of re-design processes as part of circular economy

1. Re-design of the provided services
   - *Considering changes in roles of products, users, service, infrastructure, etc.*
2. Re-design of value chain relations
   - *Up-stream to suppliers and down-stream to customers and users*
3. Re-design of internal business organization
   - *Considering necessary changes in tasks, competences, structures and technologies*

Conclusions from case studies

- ”Circularity” is a unique socio-material combination of *slowing, narrowing and closing material flows*
- Slowing and narrowing already developed by some companies: *circular start-ups and existing businesses*
- Slowing and narrowing some times both at high end and normal market segment
- Researchers can *identify existing* slowing and narrowing practices and initiate and *support development of new* initiatives
- If a business develops knowledge about user practices: *potential for CE strategies for prolonged product life time and more effective product use*
- Businesses can develop dialogue with public authorities about public procurement enabling slowing and narrowing:
  - *Investment => subscription to service?*

Circular economy options from interaction with businesses' strategic considerations

- **Health care equipment:** Can a public procurement model from another country be implemented in Denmark and imply higher resource effectiveness?
- **Retail chain:** How to include circularity in a new packaging strategy aiming at substituting hazardous substances in metal cans for food?
- **Environmental technology:** Can a subscription model for an environmental technology product enable re-use of the product instead of single-use of the product?
- **Professional laundry machinery:** Can customers' increasing focus on Total Cost of Ownership (TCO) as part of procurement enable higher resource effectiveness in the use of the machines and facilities and the flow of textiles?