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Aalto University
School of Arts, Design
and Architecture

Sustainable design S3

Tools to guide product design and certify performance

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27.4.2021



Agenda

- 9.15 - 9.30** Last session. Reflections on the readings.
Workload? Diary?
- 9.30 - 10.15** Further thoughts on eco-design, product-service-systems. Intro to marketing and certification
- 10.15-10.30** Break
- 10.30-10.50** Zoom breakout groups. What labels did you choose: place them on the Flinga grid
- 10.50-11.30** Discussion
- 11.30-11.45** Next session: How do products/services communicate sustainability

Energy 'payback' time

EROI = energy generated over the life span / energy needed to produce and operate the equipment

- EROI of around 11–12 for wind and around 7 (3-8) for solar PV. *
- Payback time: for wind less than 2 years, solar more (at the moment).

* Limpens, G., & Jeanmart, H. (2018). Electricity storage needs for the energy transition: An EROI based analysis illustrated by the case of Belgium. *Energy*, 152, 960-973.



www.lumituuli.fi

The broad context of design for sustainability

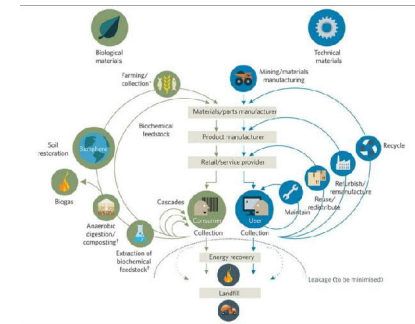
Green vs blue

Waste from another process

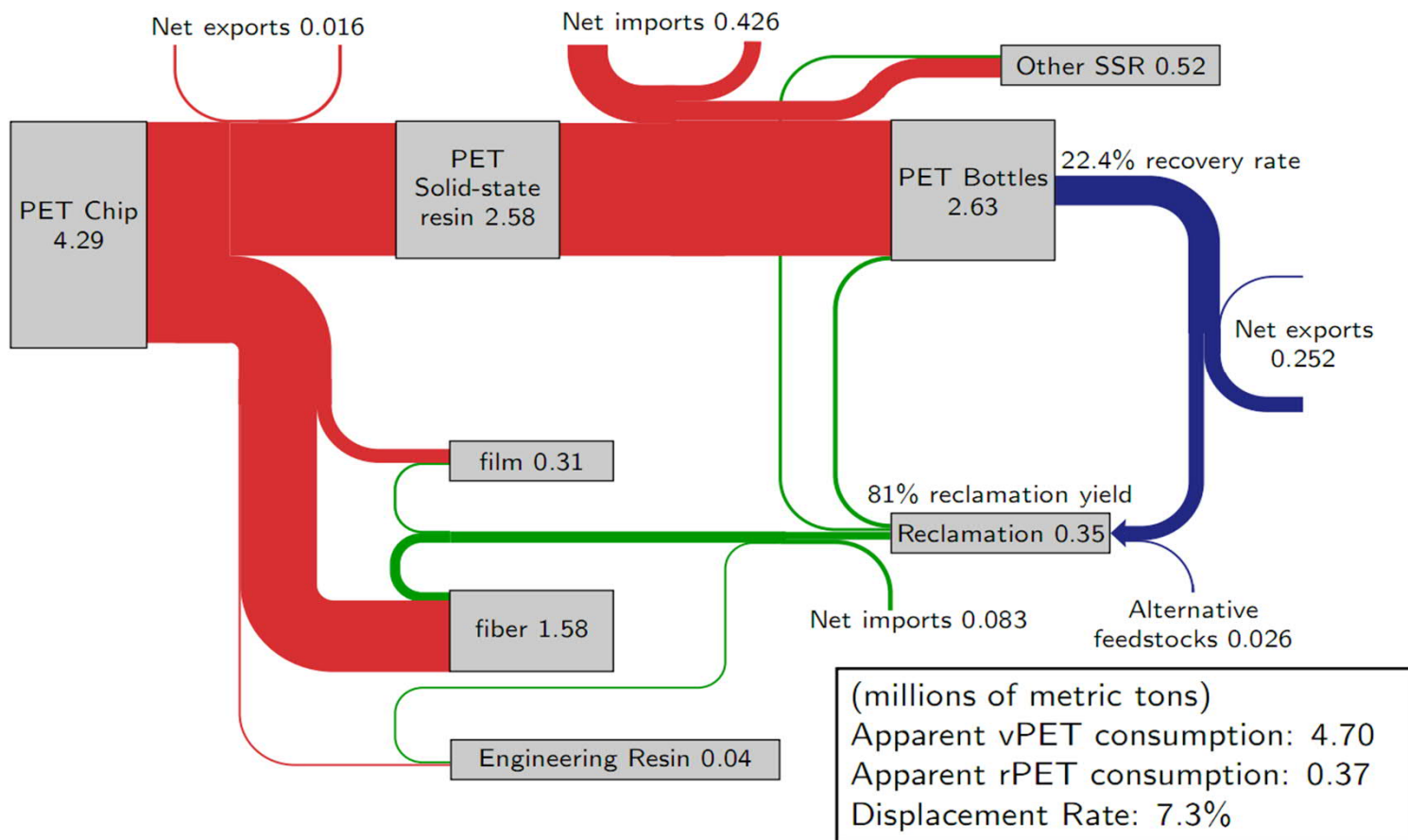
Recycled material; in the loop vs down-cycled

Recyclable

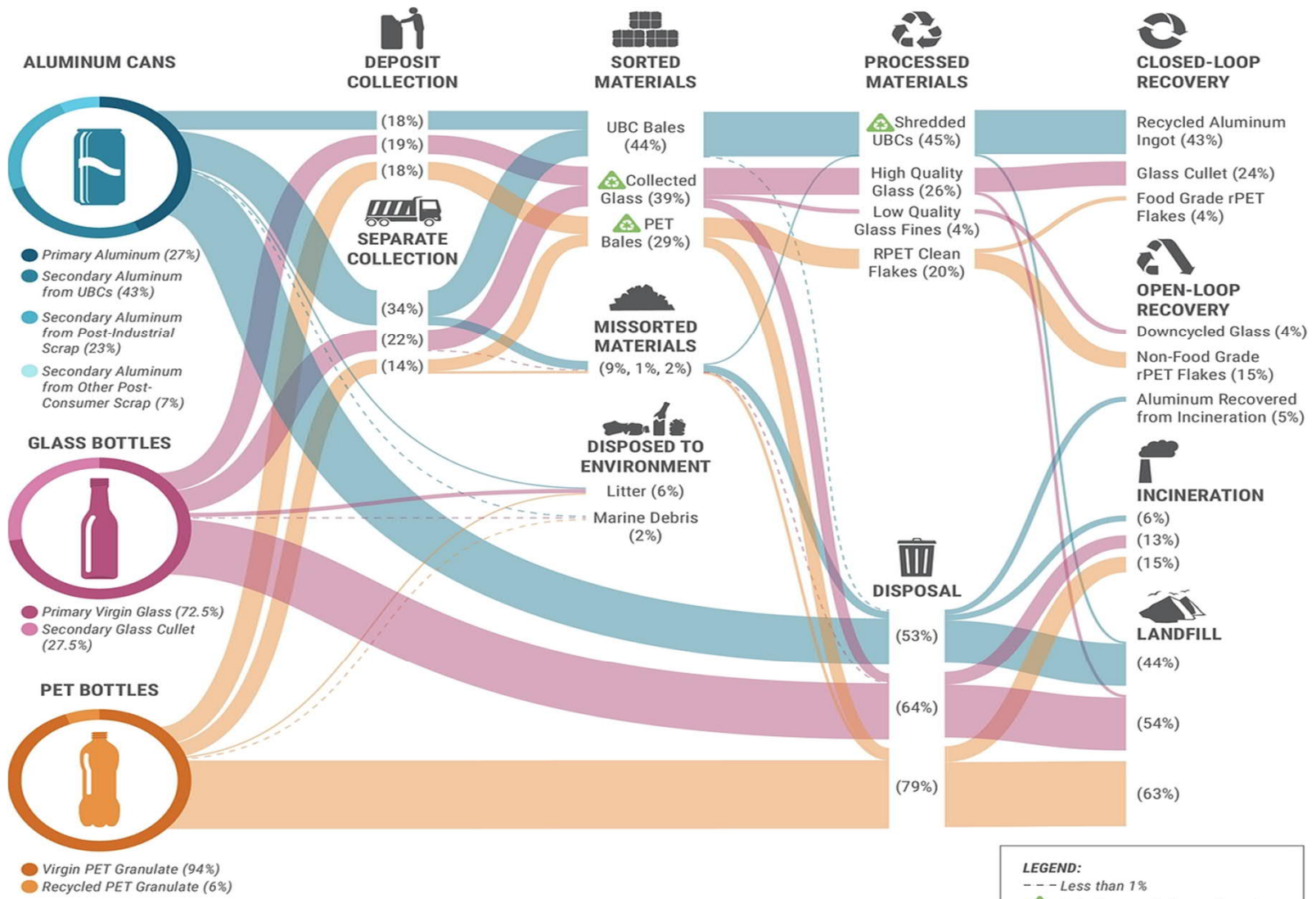
Non-toxic



PET Material Flow – US (2006)



(PET beverage bottle recycling by B. Kuczynski and R. Geyer, University of California, Santa Barbara)

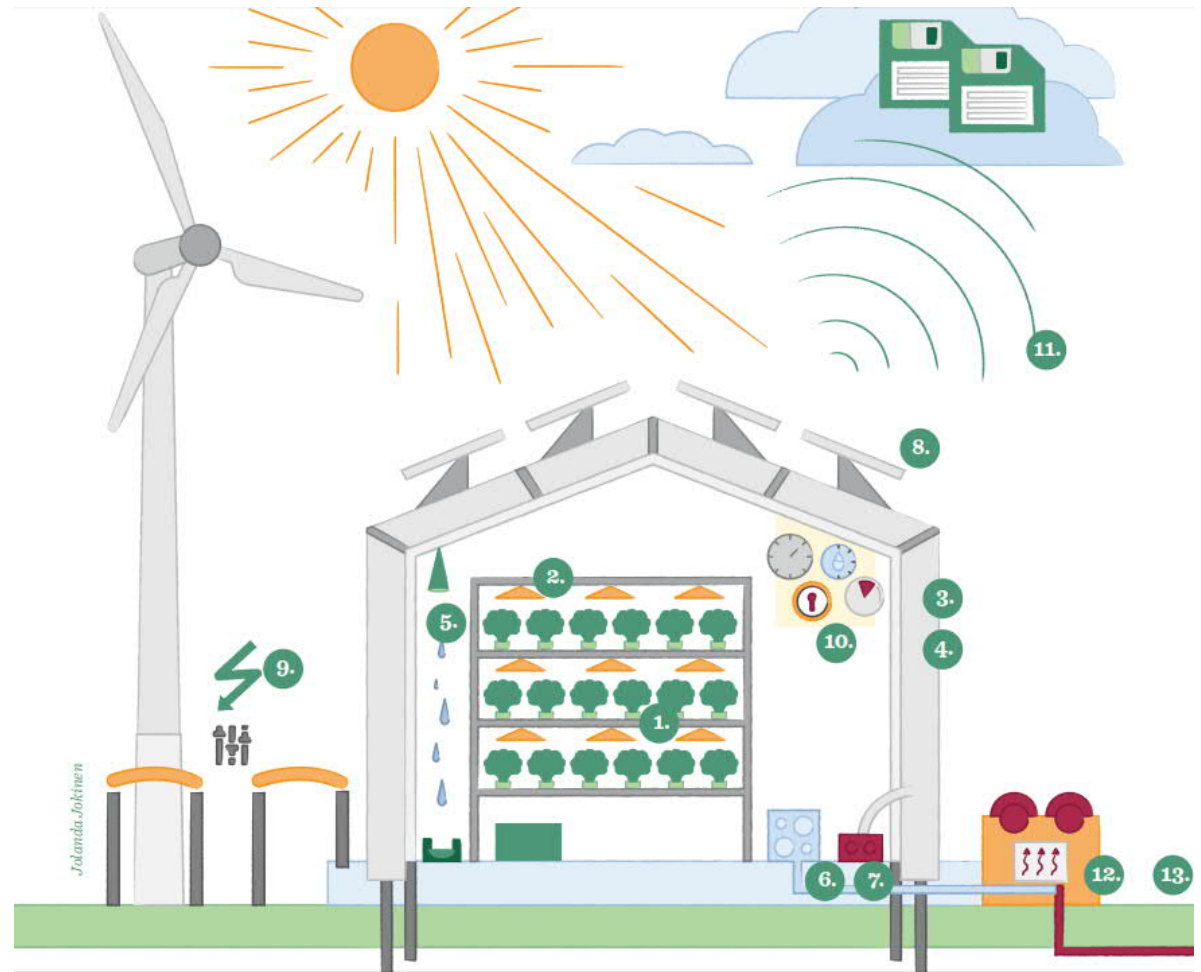


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U.S. recycling system deep dive: High circular economy potential for aluminum cans (metabolic.nl)

Plant factory

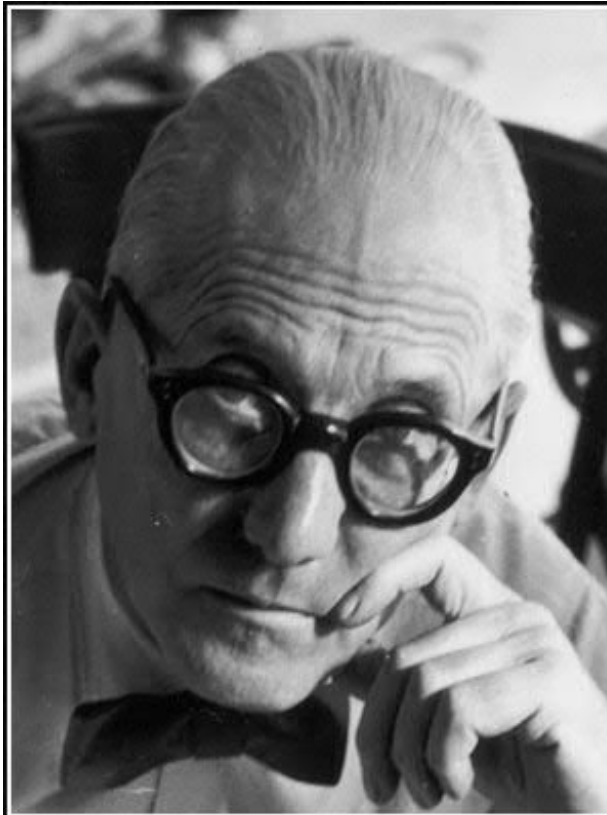
Aalto Magazine
4/2020



Umpinaista kasvihuonetta kutsutaan Plant Factoryksi tai vertikaalifarmiksi. Ala on niin uusi, että terminologia ei ole vielä vakiintunutta.

Tulevaisuudessa Vacuum Insulation System (VIS) -elementeistä rakennetut kasvihuoneet ovat sekä ruoan-, energian- että lämmöntuottajia.

1. Kasvit kasvavat useissa kerroksissa päällekkäin: maankäyttö on jopa sata kertaa tehokkaampaa verrattuna ulkoviljelyyn. Vertikaaliviljely säästää viljelymaata eikä metsiä tarvitse kaataa ruoantuotantoa varten.
2. Led-valot tuottavat ihanteellisen valokirjon yhteyttämiseksi. Sen ansiosta kasveihin voidaan saada enemmän ravinteita, ja ne maistuvat paremmilta.
3. Ilmatiivis kuori estää kosteuden haihtumisen. Tämä vähentää vedenkulutusta 99 prosenttia perinteiseen maatalouteen verrattuna.
4. Kasvihuone toimii itsessään pitkäaikaisena hiilidioksidin varastona.
5. Kasveista haihtunut vesi varastoidaan ja käytetään uudelleen.
6. Tyhjiöpumppu voidaan kiinnittää VIS-elementteihin milloin tahansa.
7. Tyhjiökuivaamisella VIS-elementit saadaan kuiviksi ja terveiksi. Sen avulla seinien elinkaari on erittäin pitkä. Kosteutta pitää poistaa valmiista elementeistä tyhjiökuivamalla arviolta kerran vuodessa.
8. Kasvihuoneen katolla on aurinkopaneelit.
9. Led-valot voidaan sammuttaa sähkön hintapiikin ajaksi. Tällöin sähkön keskimääräinen hinta viljelyalaa kohden jää alhaisemmaksi.
10. Laaja valikoima antureita, jotka lähettävät reaaliaikaista tietoa pilvipalveluun: lämpötila, kosteus, hiilidioksidipitoisuus, tuulen nopeus.
11. Tehokkuutta optimoidaan tekoälyn avulla.
12. Ylimääräistä lämpöä voidaan siirtää kaukolämpöverkkoon.
13. Tuotanto noin 2 megawattia 1 000 neliometriä kohden.



A house is a machine for living in.

— *Le Corbusier* —

AZ QUOTES

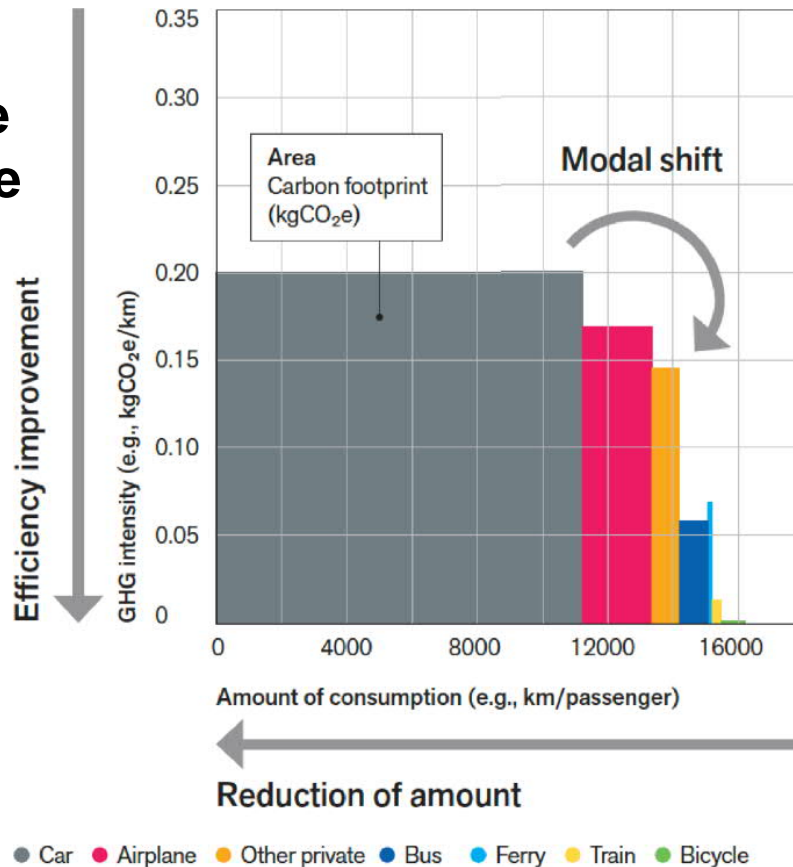
Business concepts for product-service-systems

- Extended warranties
- Leasing (service & capital)
- Availability/capacity (pay per time)
- Service (pay per unit)
- (Energy) Performance contracting
- Mobility as Service (flexible set of means to produce contracted outcomes)

A&C (p .333): Manufacturing vs maintenance costs



How we produce



What we produce

How much we produce



<https://www.aalto.fi/en/departement-of-design/15-degree-lifestyles>



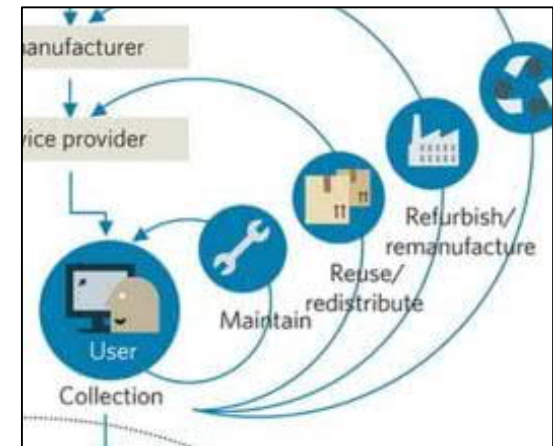
27.4.2021
12

R-strategies for Circular economy (A&C Ch23)

- Does durability pay off?
- Optimised components may be both more expensive and prevent reuse ... but does standardization lead to increased materials demand?



Väinö Paasonen / Karhulan Iasi 1953



https://www.ellenmacarthurfoundation.org/assets/downloads/news/EMF_Engineering-the-Circular-Economy_300913.pdf

Allwood et al ch 23

Barriers to materials efficiency

- Cheap materials, costly human labour
- Easy of standardization vs customized design
- Path dependency and previous investments
- Risk aversion and over-specification... but traceability is increasing
- Focus remains in product sales and not service

Regulation
Examples & Demos
New standards
Public, audited data

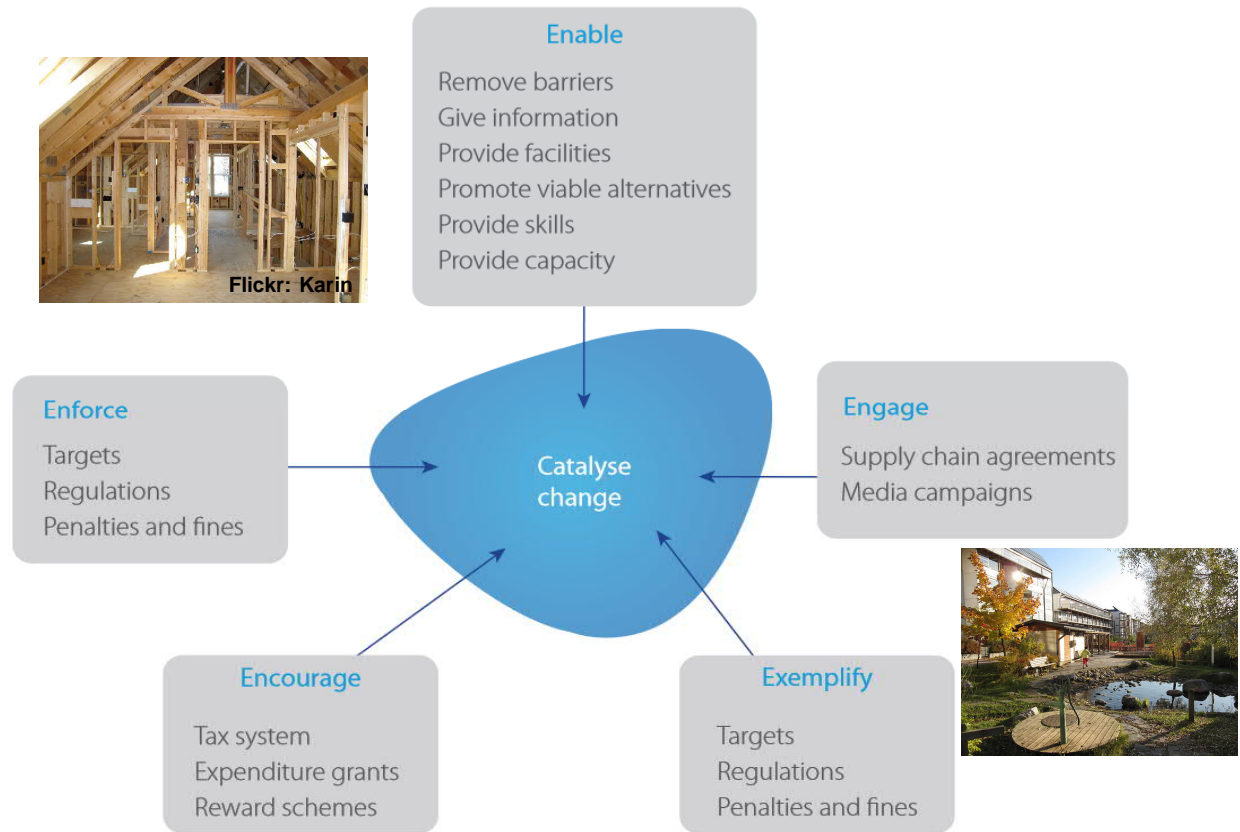


Figure 24.2—Options for change

For the next time

Find three product/service labels or certificates preferably from different areas

- Document the main criteria or data
- Find out who has created the label or grants it



CHILD LABOR IS WORK THAT HARMS CHILDREN OR STOPS THEM GOING TO SCHOOL
 In the worst cases there's trafficking or modern slavery.
 Children can help out in their own home or do light, supervised, age-appropriate work outside school hours.

IT IS A HUGE PROBLEM IN THE COCOA INDUSTRY
 An estimated 2 million children work on cocoa farms in Côte D'Ivoire and Ghana alone.

CHILD LABOR IS FORBIDDEN ON UTZ CERTIFIED FARMS
 However, it's impossible to guarantee a complete stop to child labor. No system can monitor 24 hours a day, 365 days a year.
 And banning child labor is not enough. Stop a child working on one farm and they'll work somewhere else.

THAT'S WHY UTZ...

...EMPOWERS COMMUNITIES TO PROTECT CHILDREN'S RIGHTS

- PREVENTION:** Training & awareness raising.
- IDENTIFICATION / MONITORING:** Know if, where and when child labor occurs.
- REMEDIATION:** Find solutions to get children into school.

...WORKS WITH THE SECTOR TO TACKLE CAUSES OF CHILD LABOR

- COMPANIES:** Sustainable supply chains
- GOVERNMENTS:** Infrastructure & legal framework
- NGOs:** Lobbying & awareness
- FARMERS:** Prevent, monitor & remediate

UTZ
 Better farming
 Better future

Type 1 labels

WHAT IS A TYPE I ENVIRONMENTAL LABELLING PROGRAMME?

A Type I label is a third-party assessment of a product based on a number of criteria involved in the environmental impact of a product or material throughout its life cycle. The objective of this type of environmental labelling programme is to contribute to a reduction in the environmental impacts associated with products, through the identification of products that meet the specific criteria of a Type I programme for overall environmental preferability.

<https://www.iso.org/news/ref2273.html>

EU Ecodesign directive



- Refrigerators
- Washing machines
- Dishwashers
- Electronic displays (including televisions)
- Light sources and separate control gears
- External power suppliers
- Electric motors
- Refrigerators with a direct sales function
- Power transformers
- Welding equipment

https://ec.europa.eu/growth/industry/sustainability/ecodesign_en

Different scopes for impact assessment



Scope 1	Scope 2	Scope 3
<p>Fuel combustion Company vehicles Fugitive emissions</p>	<p>Purchased electricity, heat and steam</p>	<p>Purchased goods and services Business travel Employee commuting Waste disposal Use of sold products Transportation and distribution (up- and downstream) Investments Leased assets and franchises</p>

<https://www.carbontrust.com/resources/briefing-what-are-scope-3-emissions>

Labelling

- Enter the break-put room
- Insert one of your labels on the Flinga board. (Save the image and use the camera-icon)



Flinga - BA Design S3 _ labels and product standards/

Labelling - Flinga results



For next time

No compulsory readings

Search for an example of how products/services communicate sustainability beyond metrics/numbers/certification schemes.

- E.g. Volvo Polestar <https://www.polestar.com/us/precept/>
- <https://www.aalto.fi/en/creative-sustainability/the-test-site>

How do ‘we’ explore and think about sustainability through design?