ClubEMAS
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Networking
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Economia Circular: indicadors i metodologies

8 Nov 2022

El concepte

The circular economy is a model of production and consumption, that implies reducing waste, resource efficiency and where the life cycle of products is extended.

*Products, components and materials are kept within the economy and can be productively used again and again, **creating further value**.*

Mesura de la circularitat

Circular economy monitoring framework

1 EU self-sufficiency for raw materials
The share of a selection of key materials (including critical raw materials) used in the EU that are produced within the EU

2 Green public procurement
The share of major public procurements in the EU that include environmental requirements

3a-c Waste generation
Generation of municipal waste per capita; total waste generation (excluding major mineral waste) per GDP unit and in relation to domestic material consumption

4 Food waste
Amount of food waste generated

5a-b Overall recycling rates
Recycling rate of municipal waste and of all waste except major mineral waste

6a-f Recycling rates for specific waste streams
Recycling rate of overall packaging waste, plastic packaging, wood packaging, waste electrical and electronic equipment, recycled biowaste per capita and recovery rate of construction and demolition waste

7a-b Contribution of recycled materials to raw materials demand
Secondary raw materials' share of overall materials demand – for specific materials and for the whole economy

8 Trade in recyclable raw materials
Imports and exports of selected recyclable raw materials

9a-c Private investments, jobs and gross value added
Private investments, number of persons employed and gross value added in the circular economy sectors

10 Patents
Number of patents related to waste management and recycling

Production and consumption
Waste management
Competitiveness and innovation
Secondary raw materials

Circularitat mesurada en 4 pilars:

- Producció i consum
- Gestió de residus
- Matèries primeres secundaries
- Competitivitat i innovació

https://ec.europa.eu/eurostat

Metodologies i indicadors de circularitat

Metodologia de circularitat

- ✓ Disseny, Fabricació i distribució
- ✓ Ús
- ✓ Reparació/Manteniment
- ✓ Reutilització
- ✓ Remanufactura
- ✓ Reciclatge

Indicadors de circularitat: CMU

Circular material use rate
CALCULATION METHOD | 2018 edition
MANUALS AND GUIDELINES | eurostat

The CMU rate is defined as the ratio of the *circular use of materials (U)* to an indicator of the *overall material use (M)*:

$$CMU = \frac{U}{M}$$ (Equation 1)

A higher CMU rate value means that more secondary materials substitute for primary raw materials thus reducing the environmental impacts of extracting primary material.

Indicadors de circularitat: MCI

Indicadors de circularitat: CFF

La circularitat també té un impacte:

Single Market for Green Products Initiative ⟶ **CFF: circular footprint formula**

Material

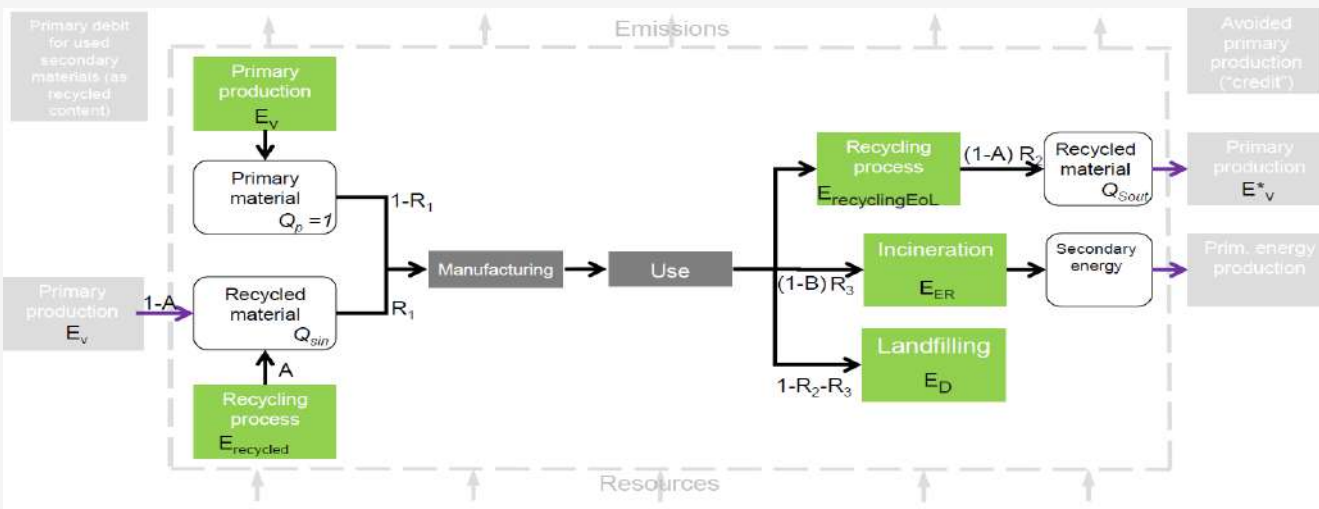$$(1 - R_1)E_V + R_1 \times \left(AE_{recycled} + (1 - A)E_V \times \frac{Q_{Sin}}{Q_p} \right) + (1 - A)R_2 \times \left(E_{recyclingEoL} - E_V^* \times \frac{Q_{Sout}}{Q_P} \right)$$

Energy

$$(1 - B)R_3 \times (E_{ER} - LHV \times X_{ER,heat} \times E_{SE,heat} - LHV \times X_{ER,elec} \times E_{SE,elec})$$

Disposal

$$(1 - R_2 - R_3) \times E_D$$

Metodologies i indicadors de circularitat

La realitat és que:

- **No** hi ha una **manera comú i consensuada** de mesurar indicadors de circularitat a escala micro (indústria)

- **Falten indicadors** específics- sectorials

S'han d'adaptar les metodologies i indicadors existents a cada producte o organització concreta

De què mesurem la circularitat?
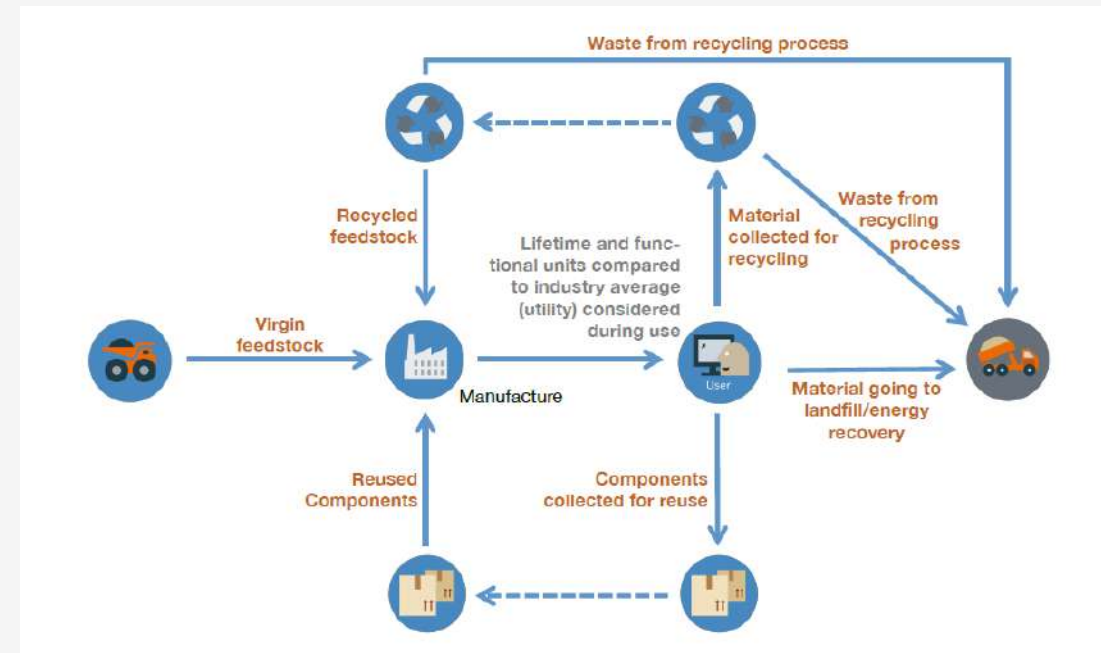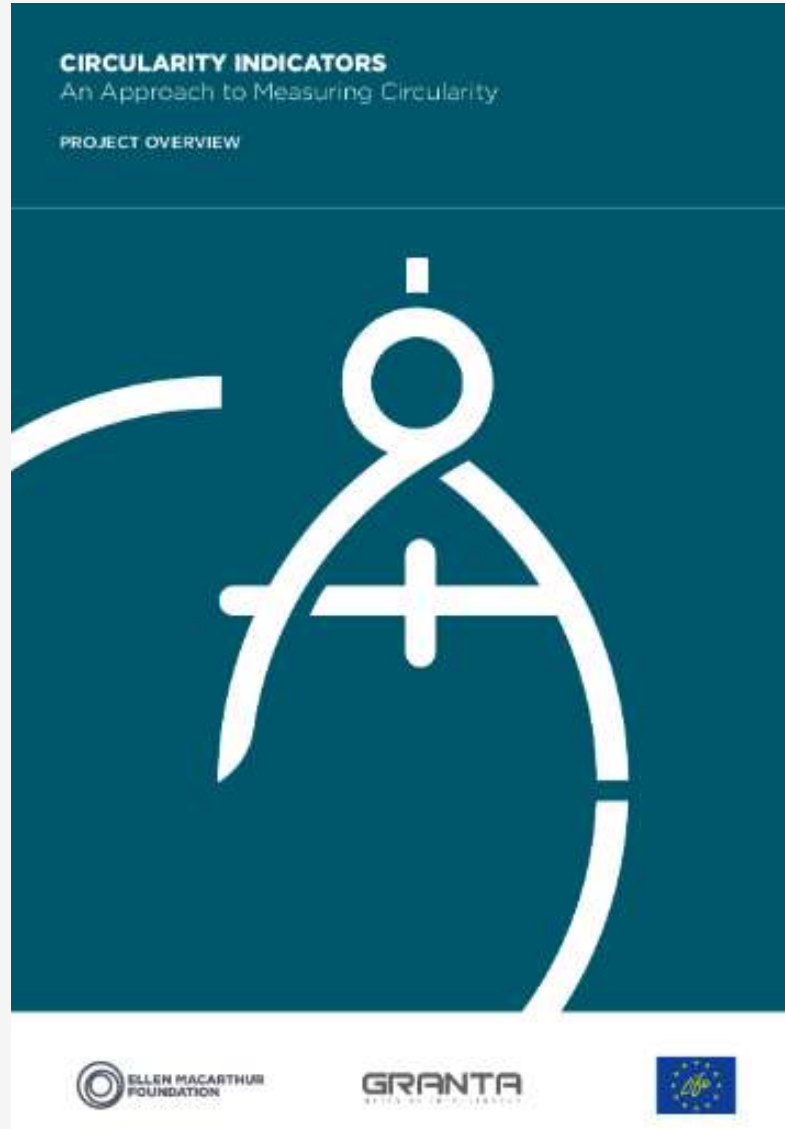
Procés?

Producte?

Organització?

Disassembly

Waste management

R-Framework

End-of-life management

0   5   10   15

Own elaboration based on Kristensen, H.S. & Mosgaard M.A. (2020)

La tendència es mesurar circularitat associada a processos de reutilització, reciclat...
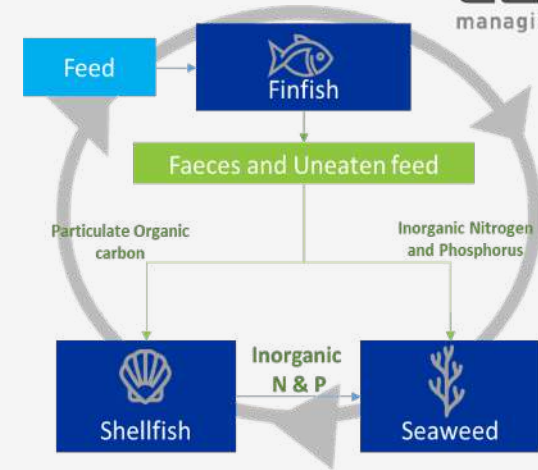
Seguint un enfoc de producte

✓ Life Cycle Thinking
✓ Focus on product, material, component
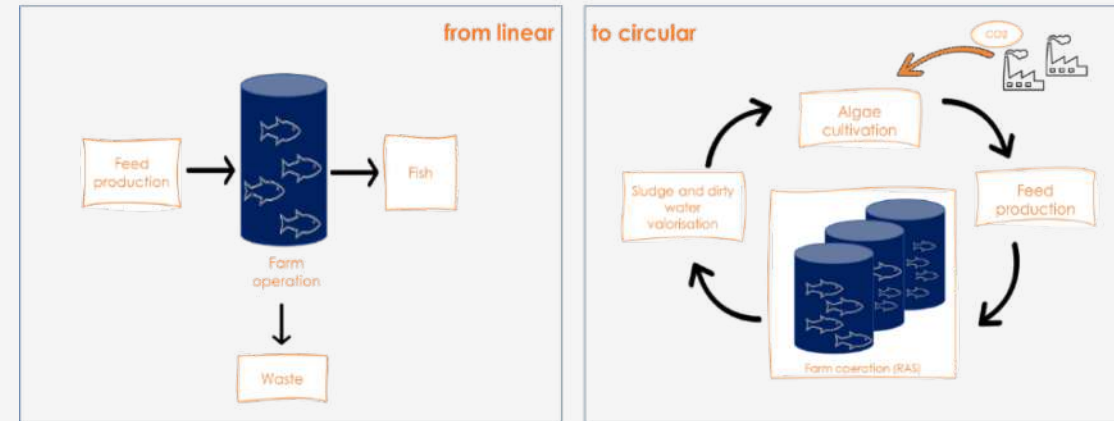X Only for technological cycles
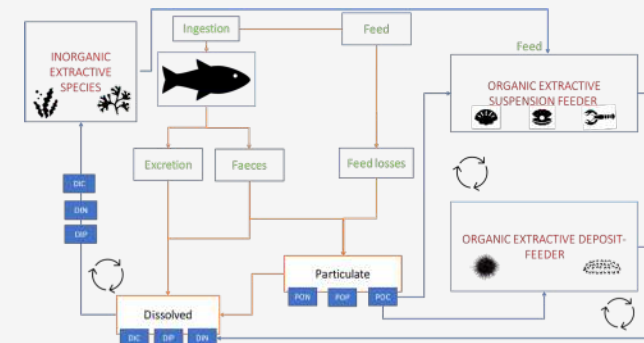
Exemple: Circularitat a l'aqüicultura

Circular business framework for IMTA Systems

Development of a circularity methodology to assess new innovative feeds and aquaculture production systems
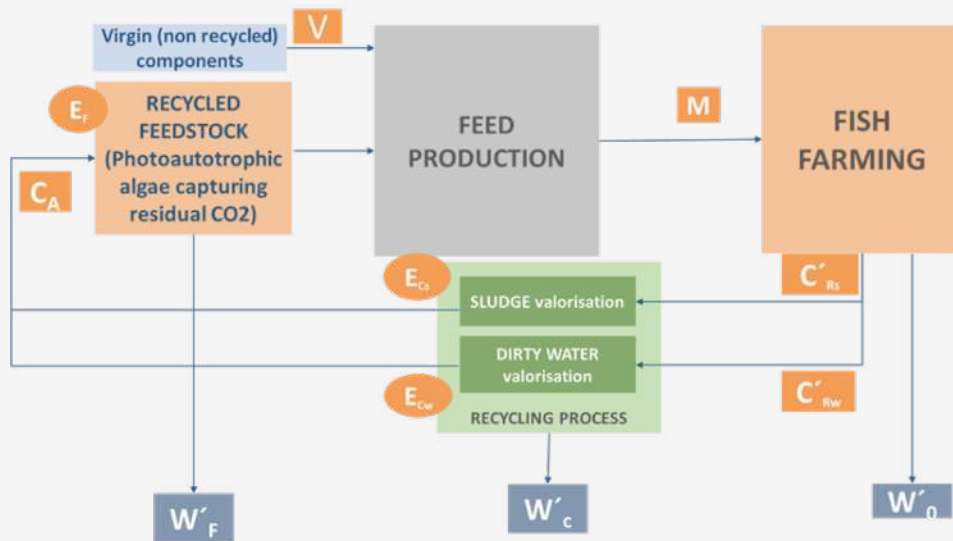
Assessment of circularity of IMTA at different levels (infrastructure, bioremediation, feeding systems)

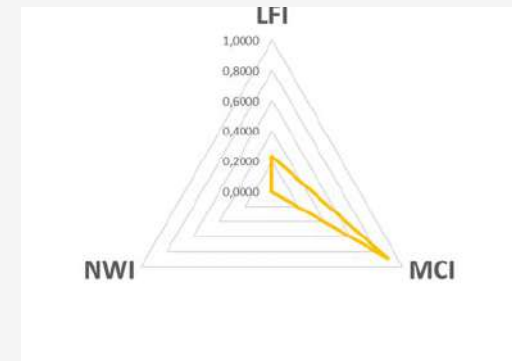Definició d'una metodologia per avaluar la circularitat

Anàlisi de la circularitat dels processos d'aqüicultura amb sistemes de *feeding* innovadors que incorporen ingredients procedents de la valorització de subproductes

Portion of raw materials input flow

Portion of restorative material flows (that comes from reused or recycled sources)

Utility of the product (assessed based on use intensity when compared new circular feeds against an industry average product)

Key parameters:
V_ Virgin components
E_ Efficiency of the recycling process
W_ Generation of waste not recovered
C_ Fraction collected for valorisation

Key Indicators:
✓ Linear flow (LFI)
✓ **Material circularity (assimilation efficiency) (MCI)**
✓ Nutrient waste (NWI)

Moltes gracies

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