Circular Economy and the Triple Bottom Line: A case of plastic waste management in Norway

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Content

- Background: Sustainability
- Circular Economy and pathways
- Sustainable and Circular business models
- Case: Plastic waste management in Norway
- Summary

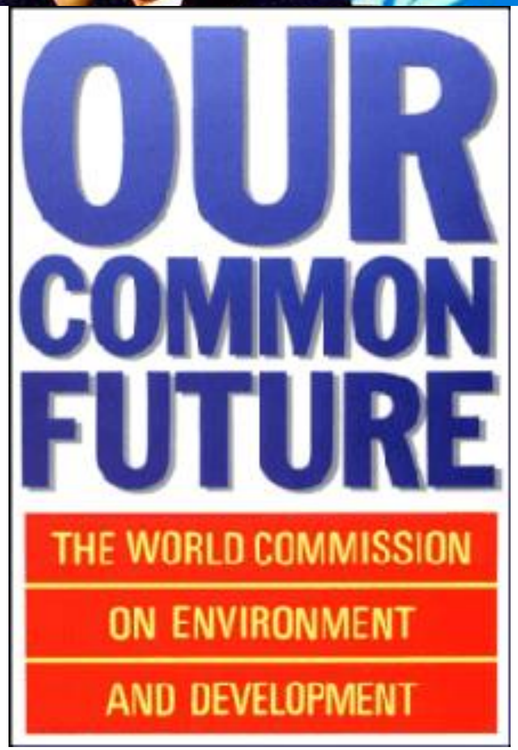
Uncovering: Sustainable Development

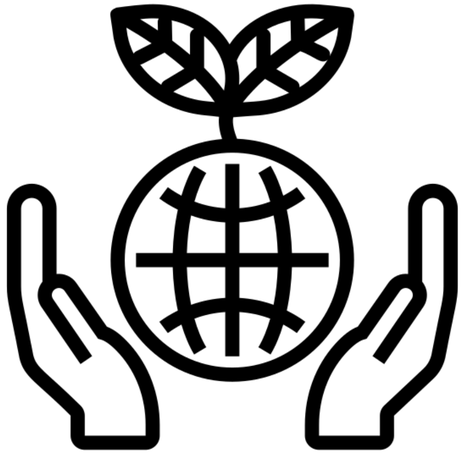
Sustainable development was defined in the World Commission on Environment and Development's 1987 Brundtland report ´*Our Common Future*` as:

'**development that meets the needs of the present without compromising the ability of future generations to meet their own needs**'

It contains within it two key concepts:

1. The concept of '**needs**,' in particular the essential needs of the word's poor, to which overriding priority should be given; and
2. The idea of **limitations** imposed by the state of technology and social organization on the environment's ability to meet present and future needs."





Increased consumption = Increased Development? = Sustainable Development?

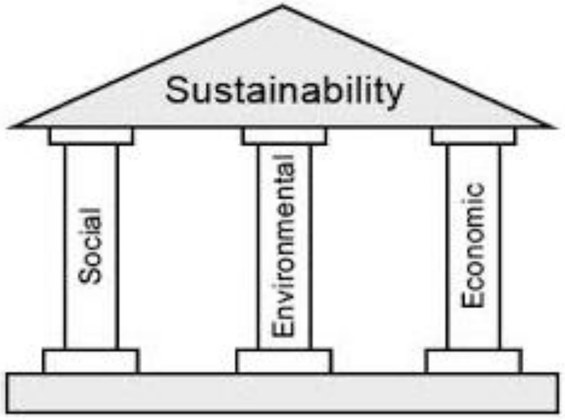
NO!!

Sustainable development is a holistic development within the environmental, economic and social dimensions, also called as **Triple Bottom Line**. SD is aimed for well-being of *People, Planet and Profit..*

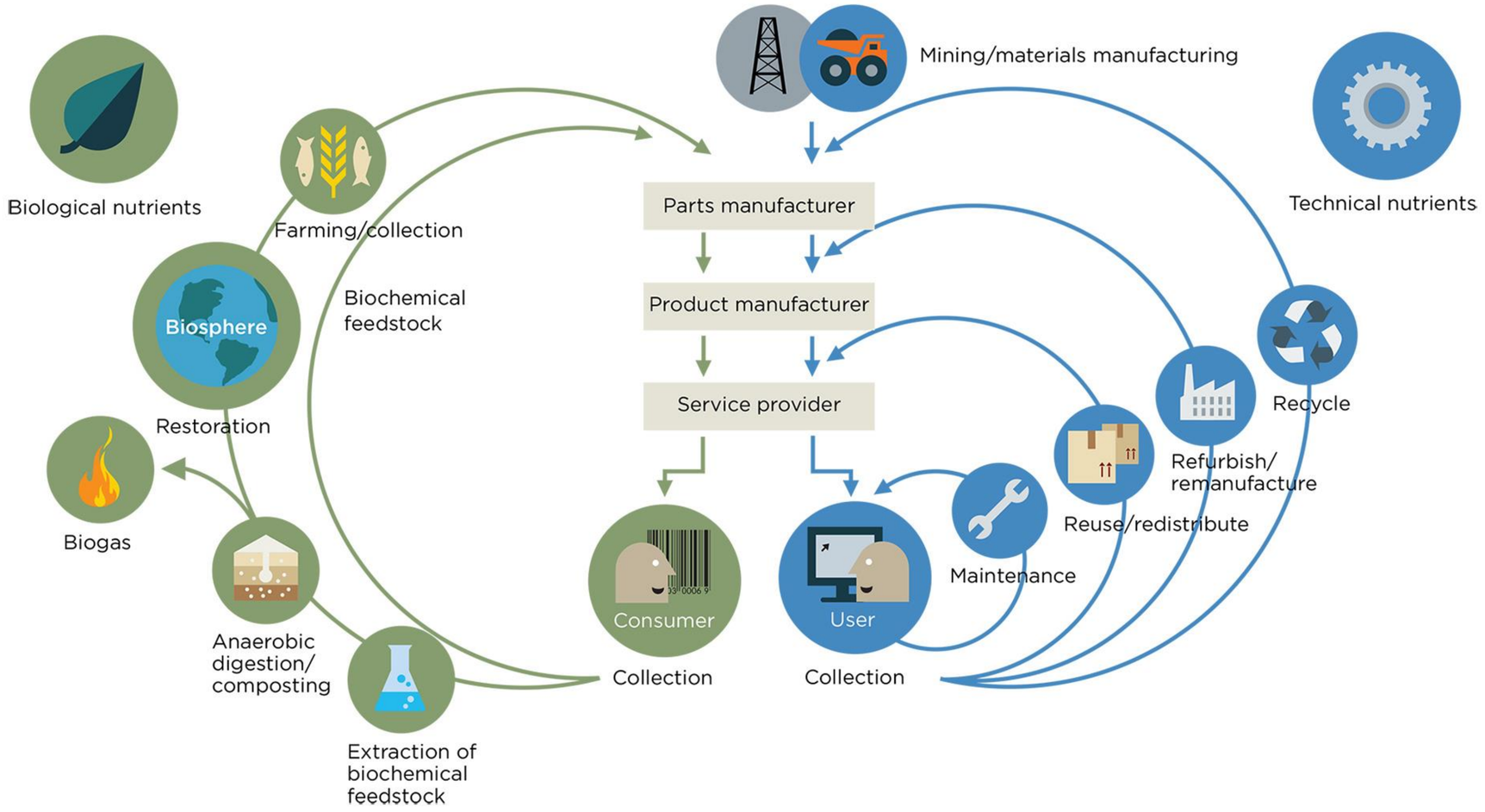
Dimensions of Sustainability: Triple Bottom Line

Social dimension – Environmental dimension – Economic dimension

People – Planet – Profit



Circular Economy: Concept



Source: MacArthur, Ellen. "Towards the circular economy." J. Ind. Ecol (2013).

Pathways to Circular Economy

Slowing

- Maintain
- Repair
- Reuse
- Refurbish
- Remanufacture

Closing

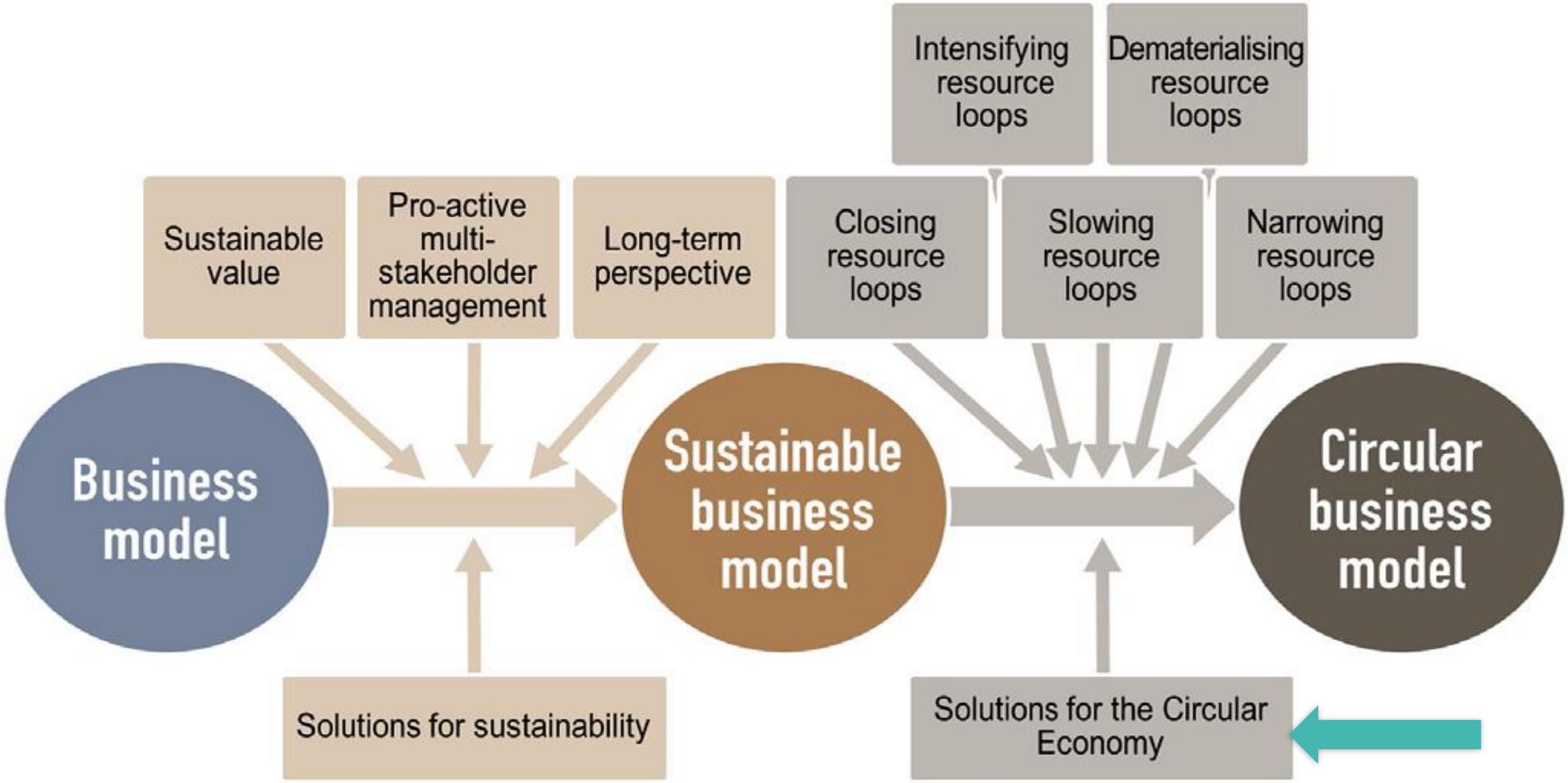
Recycle

- Reduce waste
- Compost
- Cascade

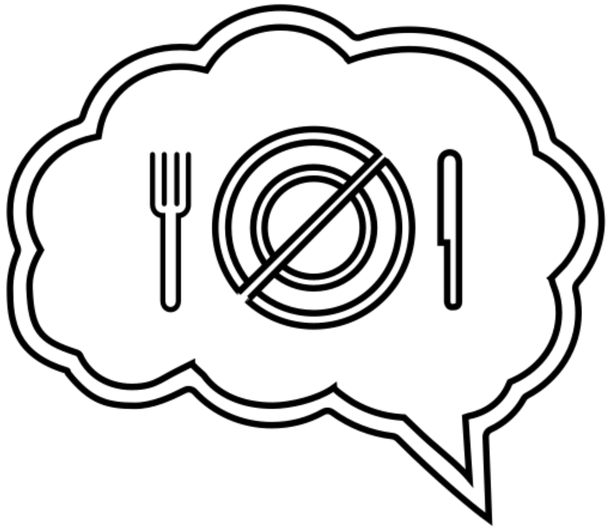
Narrowing

Eco-designing

- Reduce resources used per product
- Reduce resource used in production processes



Source: M. Geissdoerfer et al (2018)



Is Sustainability = Circularity?

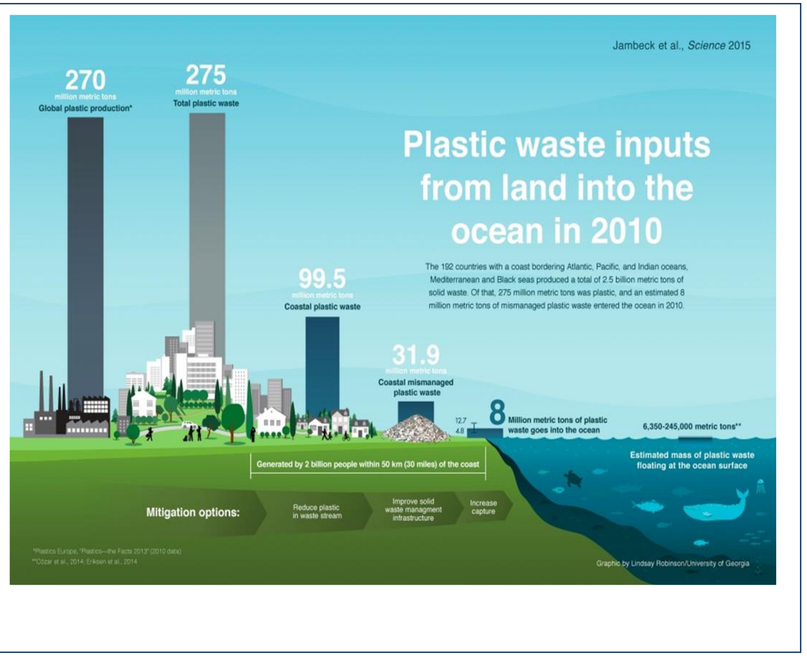
Sustainable and Circular Value Creation from Waste:

CASE OF PLASTIC WASTE FROM FISHING SECTOR

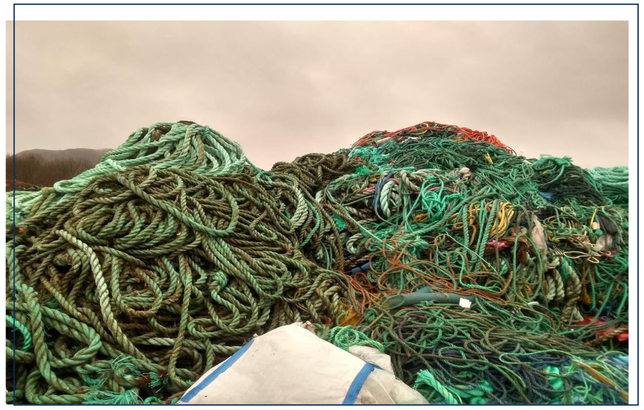
Plastic Waste Management

Important Research on Plastic pollution concluded:
Around **8 to 12 MMT** waste plastic enters in Ocean from land every year due to mismanagement!!

Knowledge Gap



Plastics from fishing in the ocean



Plastics from fishing on land

Jamback et al (2015)
Total plastic waste from land to ocean

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Impacts of Abandoned and Lost Fishing Gears

Material Flow Analysis on FGs

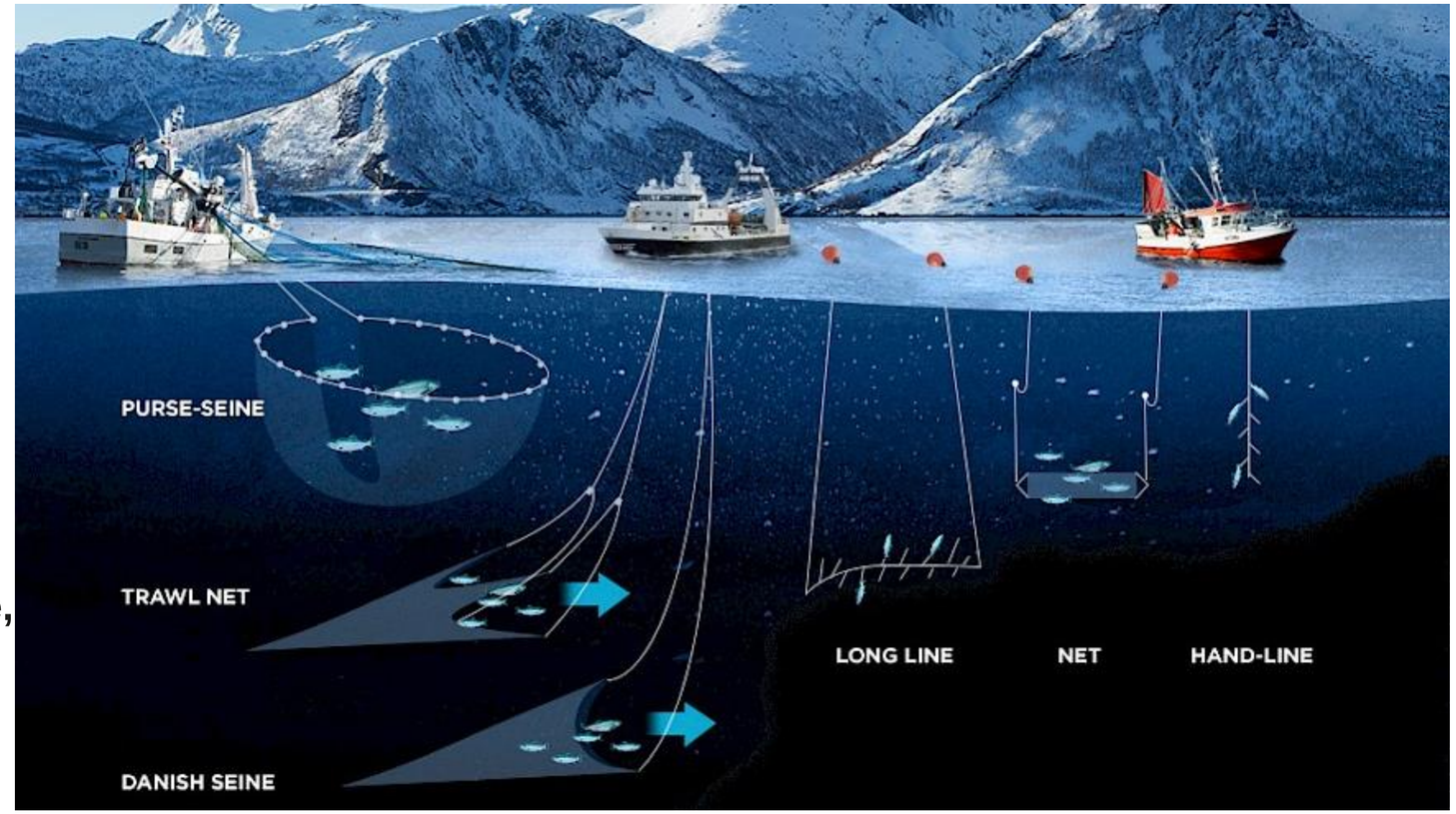
Objective: To map the typical life-cycle system of six FGs used in the commercial fishing fleet in Norway and scientifically estimate

- **average annual purchase, repair and disposal patterns**
- **quantities of plastic entering in the ocean as ALDFG**
- **annual quantities of plastic polymers (PP, PE and Nylon) collected after end-of-life**

Commercial Fishing in Norway

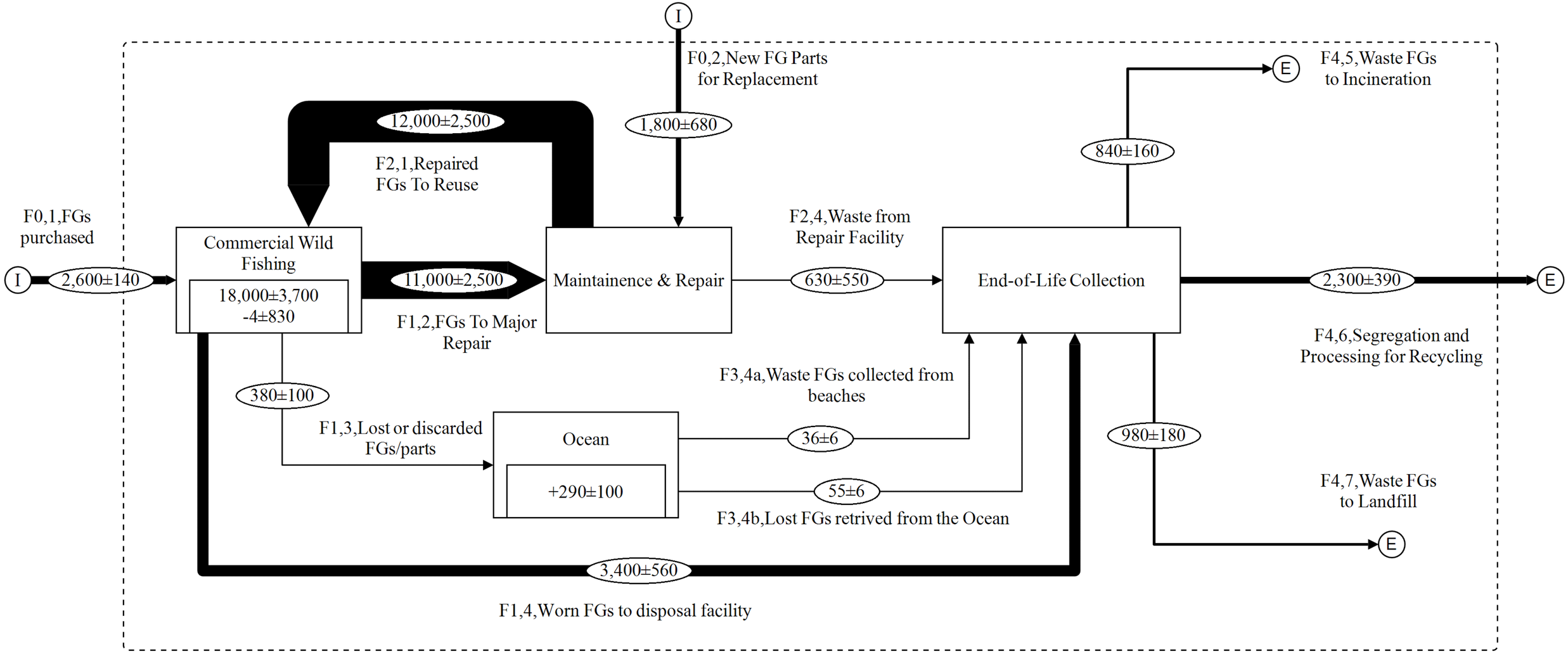
- Structure of commercial fishing fleet ≈ **5500** fishing vessels, both deep-water and coastal vessels.
- Typical FGs used:
  Trawls, Purse Seines, Danish Seine, Longline, Gillnets, Traps/pots
- The term “plastics” includes polyethylene (PE), polypropylene (PP) and Nylon (PA).

(Baeta et al., 2009, Brown and Macfadyen, 2007, Deshpande et al., 2019).



Commercial Fishing Gears in Norway

Source: Vista Analyse AS (2018)



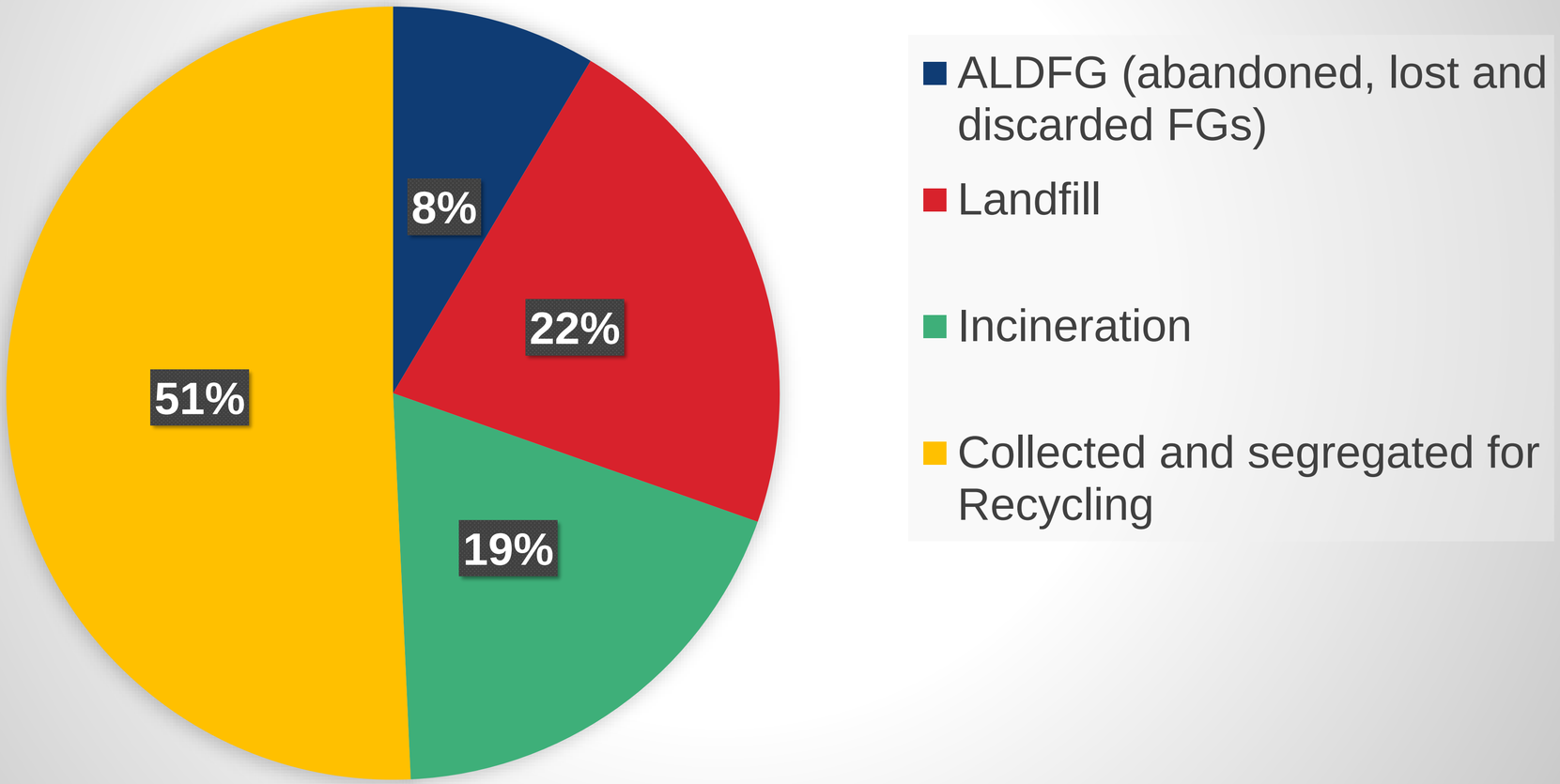
Annual MFA of Plastics (PP, PE & Nylon) from Commercial Fishing Gears Deployed in Norway 2016-2017 (t/yr)

Source: Deshpande et al (2019)

Norway status of marine plastic waste 2016-2020

Key Facts	Fishing (tons/yr)	Aquaculture Ropes (tons/yr)
Amount of plastic entering the oceans through lost or discarded parts	452±100	NA
Waste removed from Oceans	55±6	NA
Waste collected from beaches	36±6	NA
Waste Collected at Waste Management Companies	**4200±550**	**7505±970**

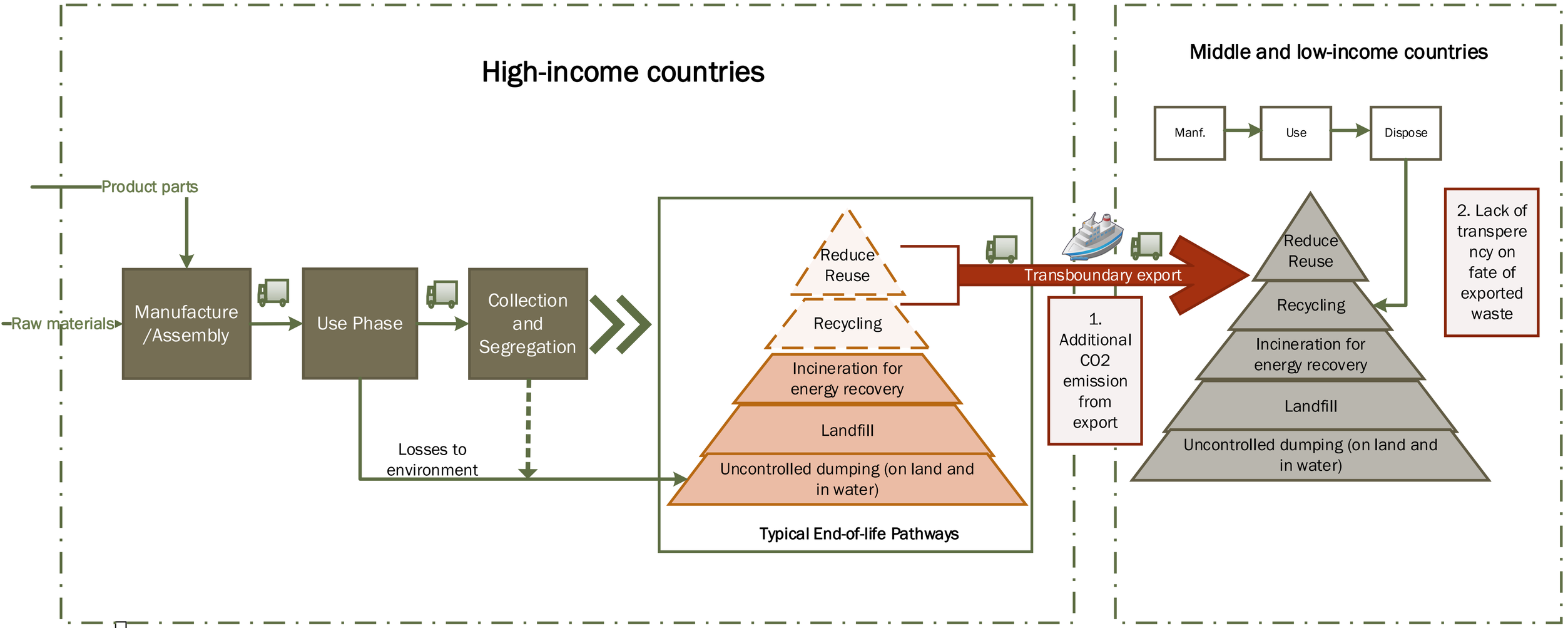
Fate of plastic waste from Norwegian fishing fleet 2018



Myth1. Exporting Waste is NOT Recycling!!!

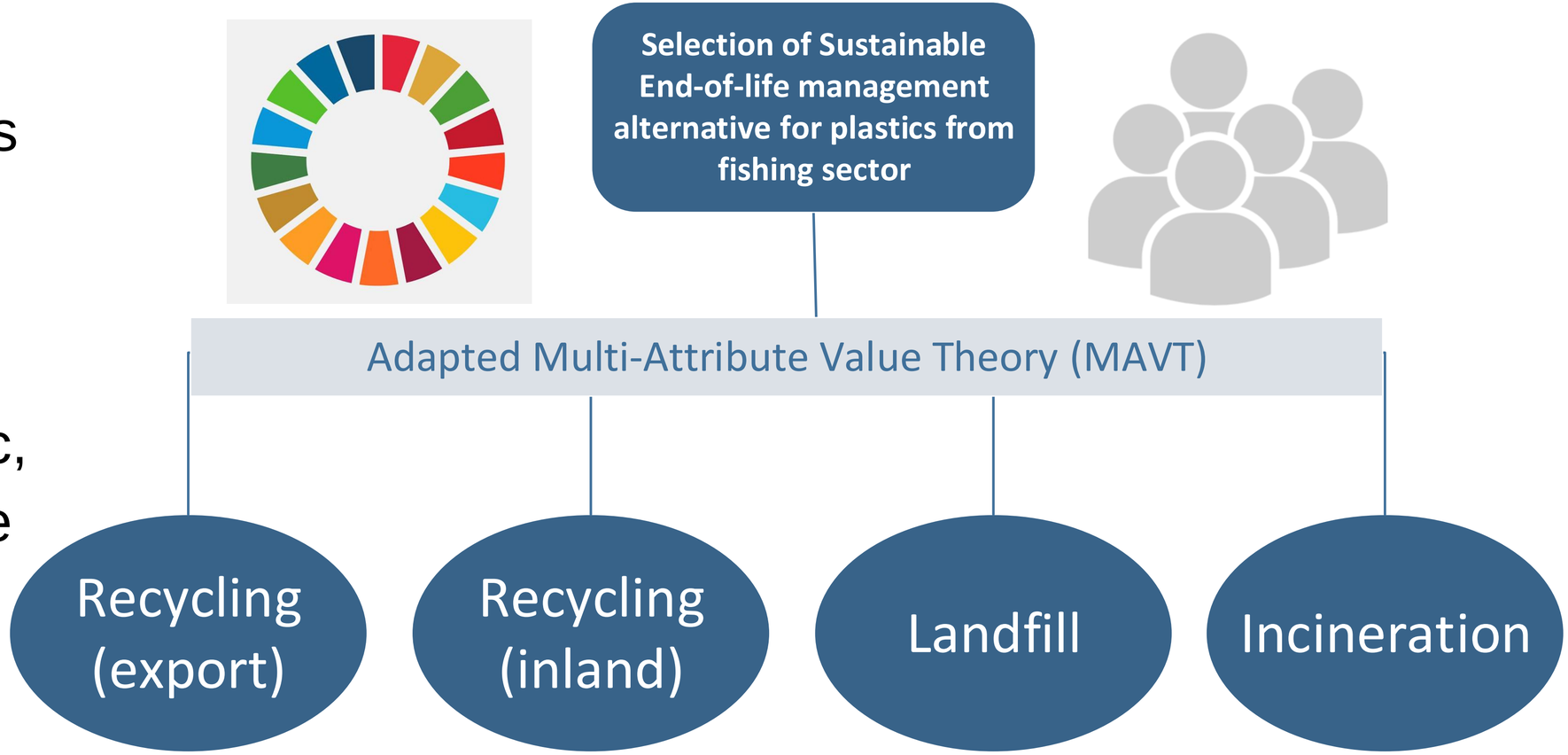
Illustration by Alexandre Magnin - Sustainabilityillustrated.com

Myth 2. Circular = Sustainable?

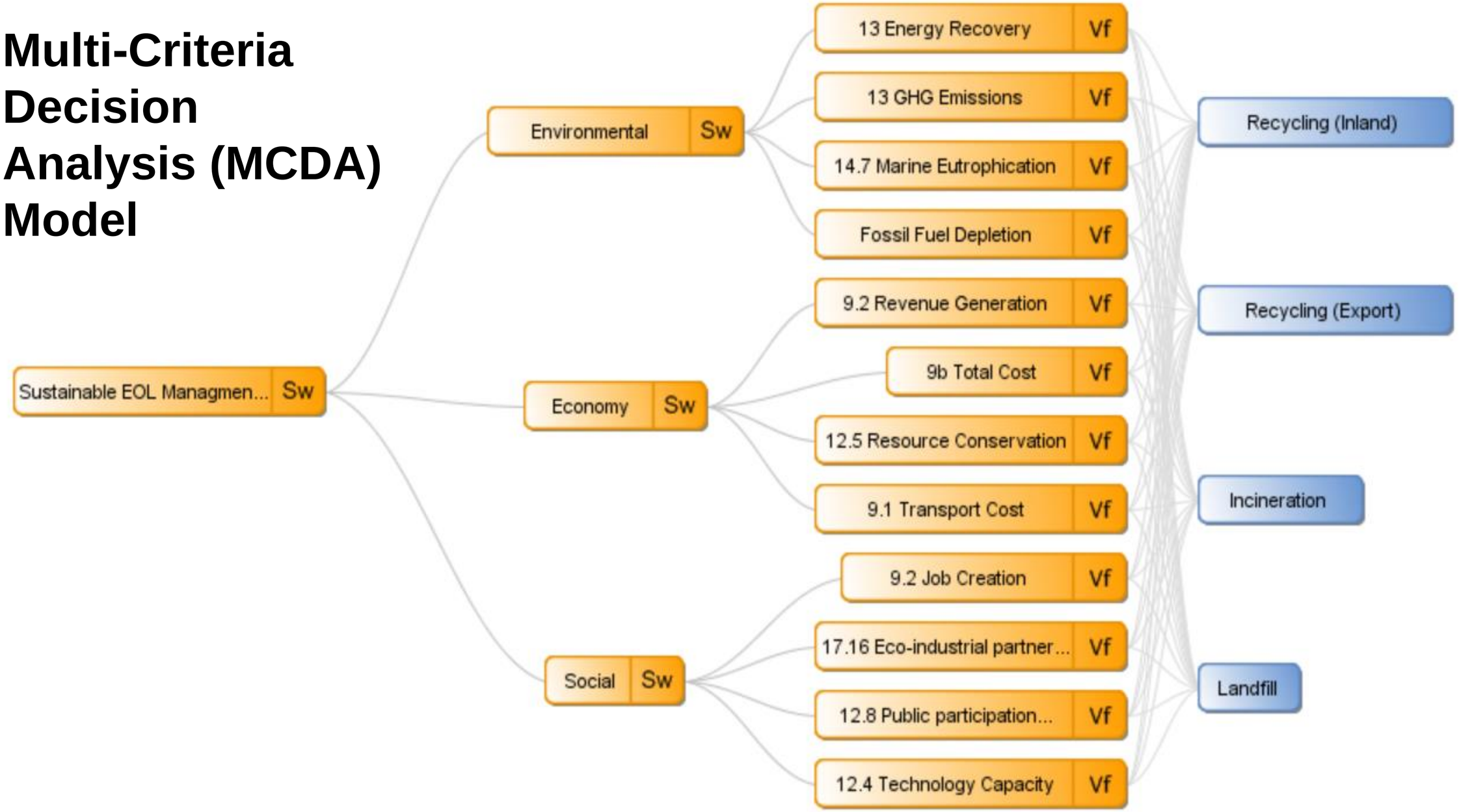


MCDA: Sustainability Assessment

Function:
the ability of EOL management alternatives to manage 4,200 tons of waste FGs annually through maximizing environmental, economic, and social benefits, while minimizing the negative effects.



Multi-Criteria Decision Analysis (MCDA) Model

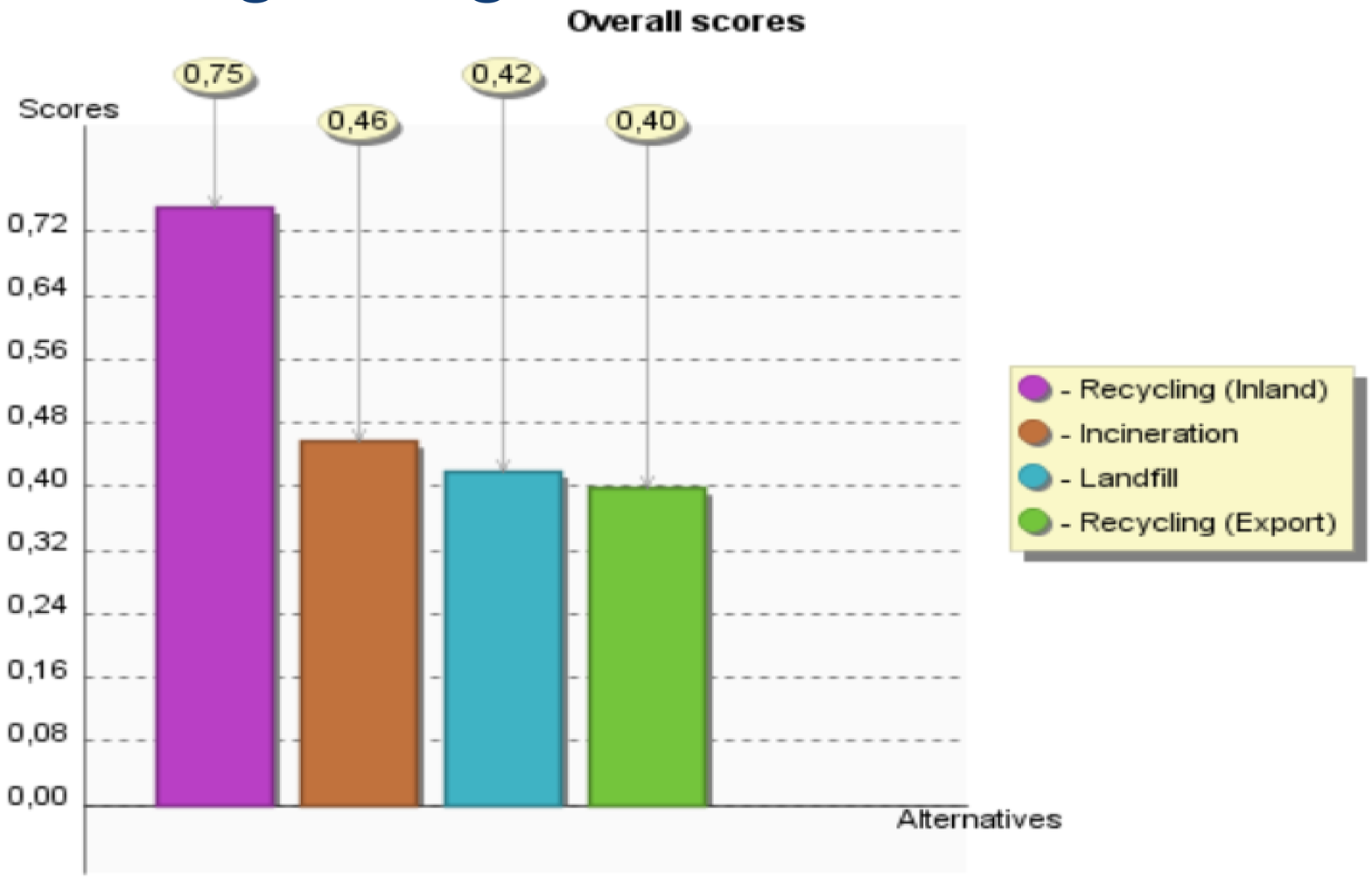


Case Study

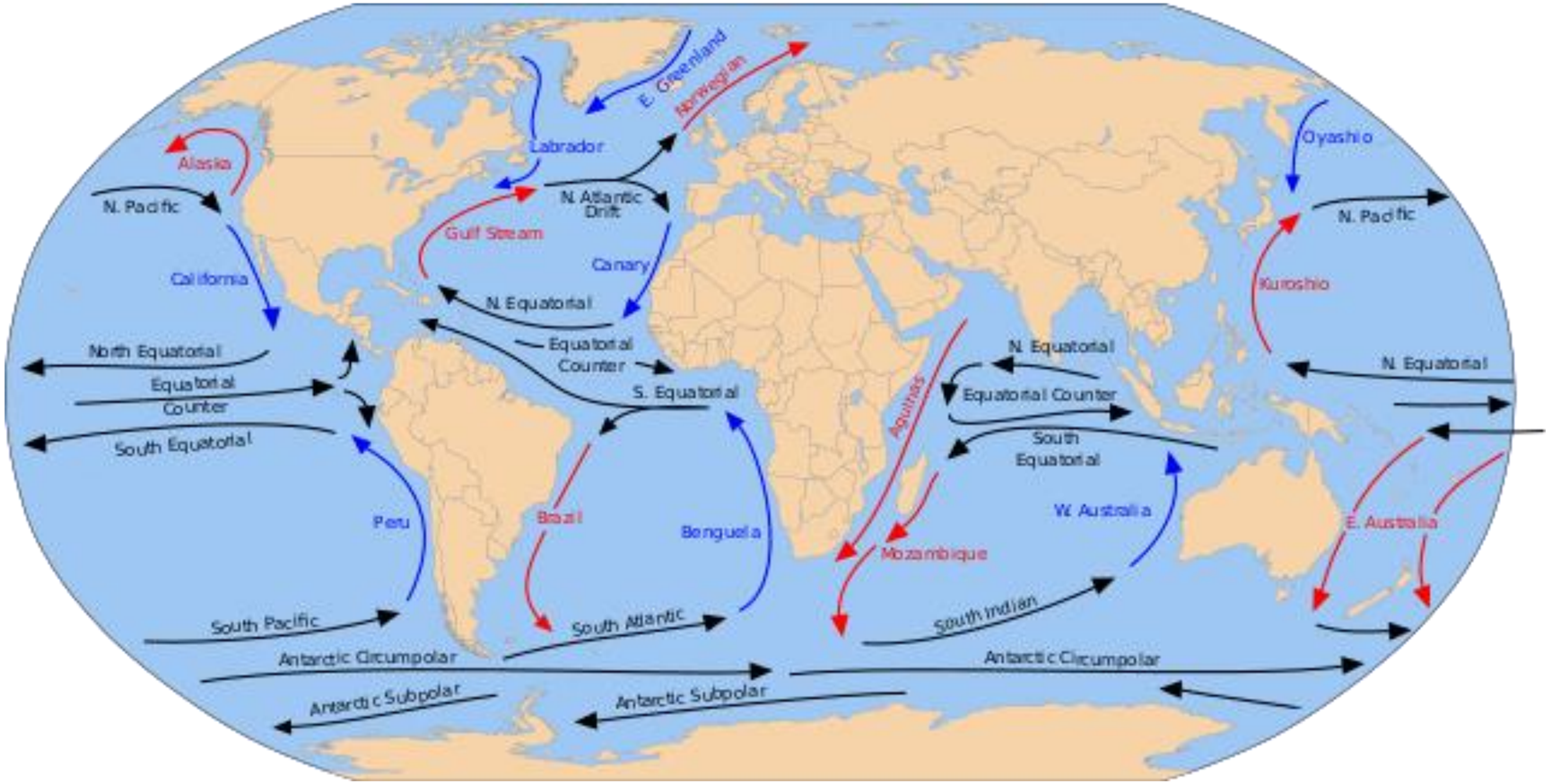
Final Ranking using MAVT

«Location is important in ensuring sustainability of CE stratgey for waste plastics from fishing sector of Norway»
-- Small Circles!

Deshpande et al. (2020)

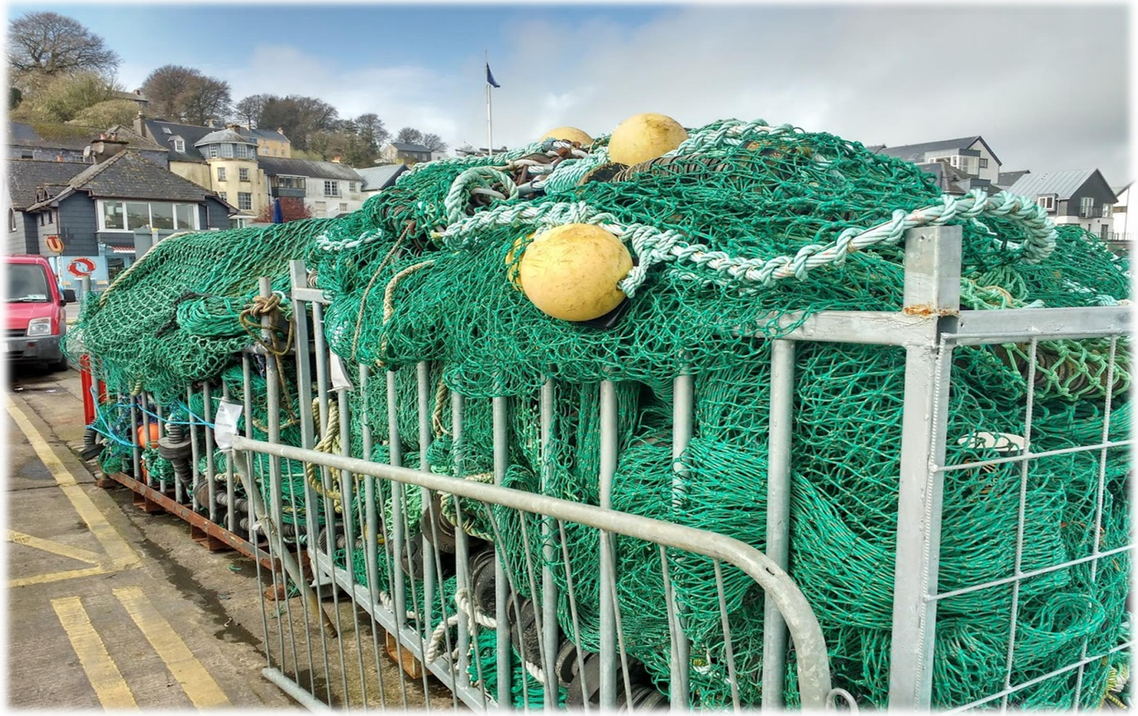


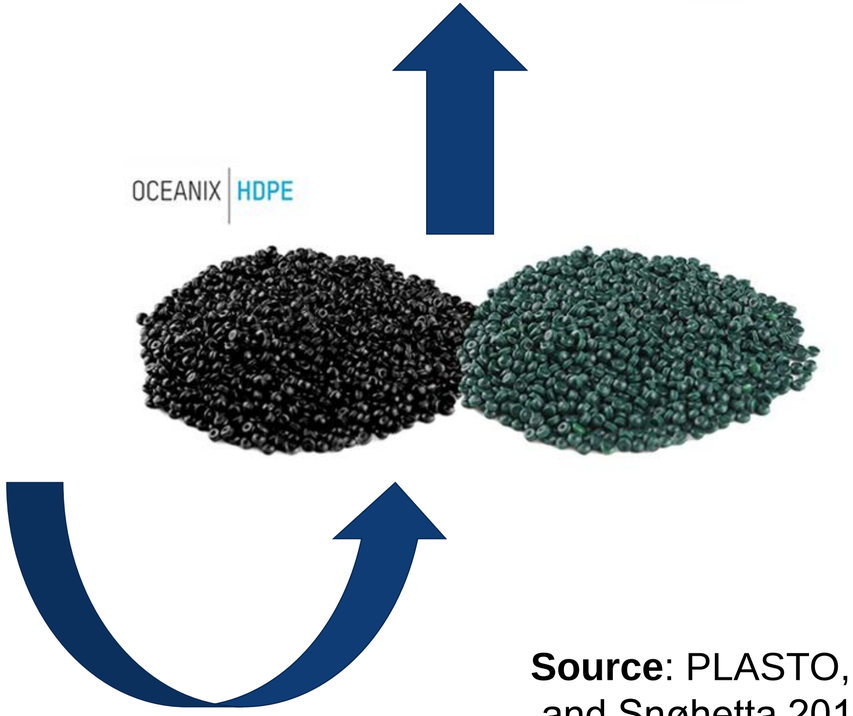
Everything is Interconnected!!!



Norway: Dependency on Ocean Ecosystem

- 25,148 km (approx. 15500 miles) long coastline
- EU-EEA leader in capture fisheries **(40%)** and Aquaculture **(Globally, 2nd Major exporter)**
- Maritime transport, oil & gas..
- Climate regulation
- Tourism and recreation





Source: PLASTO, 2017; Plastix, 2017 and Snøhetta 2019

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Environmental ++

Social +

Economic -- --

Recycling vs. Triple Bottom Line

THE CHALLENGE OF RECYCLING

Globally, 18 percent of plastic is recycled, up from nearly zero in 1980. Plastic bottles are one of the most widely recycled products. But other items, such as drinking straws, are harder to recycle and often discarded.

Ease of recycling by type*

- Easy
- Manageable
- Difficult
- Very difficult

1 PET *Polyethylene terephthalate*

Beverage bottles, food jars, clothing and carpet fiber, some shampoo and mouthwash bottles

11%

2 HDPE *High-density polyethylene*

Detergent and bleach bottles, snack boxes, milk jugs, toys, buckets, crates, plant pots, garden furniture, trash bins

14%

3 PVC *Polyvinyl chloride*

Credit cards, window and doorframes, gutters, pipes and fittings, wire and cable sheathing, synthetic leather

5%

4 LDPE *Low-density polyethylene*

Packaging film, shopping bags, bubble wrap, flexible bottles, wire and cable insulation

20%

5 PP *Polypropylene*

Bottle tops, drinking straws, lunch boxes, insulated coolers, fabric and carpet fiber, tarps, diapers

19%

6 PS *Polystyrene*

Plastic-foam cups, egg boxes, meat trays, packing peanuts, coat hangers, yogurt containers, insulation, toys

6%

7 OTHER

Nylon fabrics, baby bottles, compact disks, medical storage containers, car parts, watercooler bottles

24%

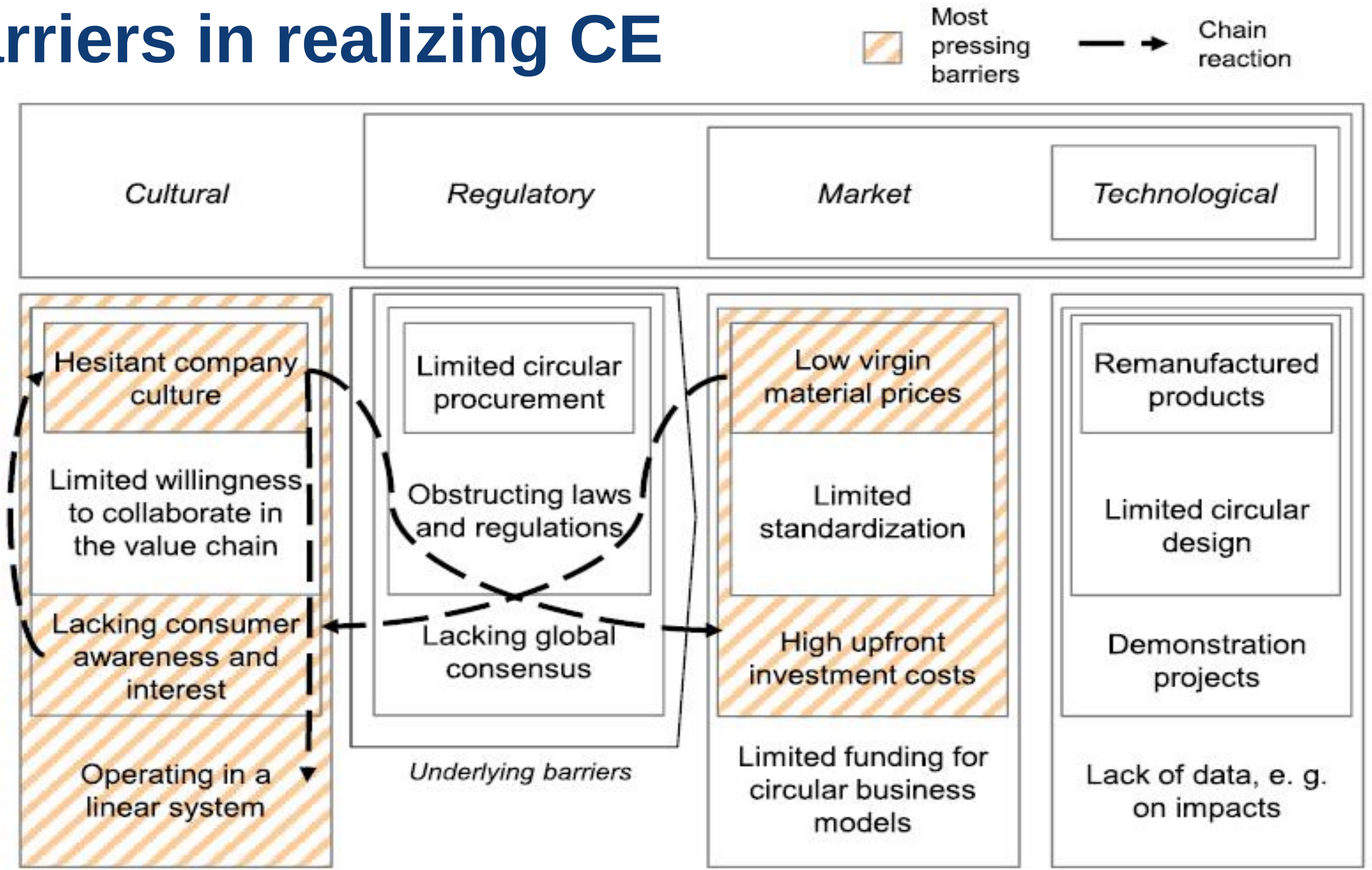
Percentage of global plastic waste, 2015

Barriers and opportunities for Circular Business Models

Critical Factors for Circular Business Models	Current Status
Raw material availability (EOL plastics from FG)	Available
Supply chain	Minimal
Recycling technology	Available
Ease of recycling	Low
Policy drivers	Minimal
Awareness	Low
Market Economy (Value creation, proposition)	N/A

Deshpande et al (2021)

Barriers in realizing CE



J. Kirchherr et al. (2018)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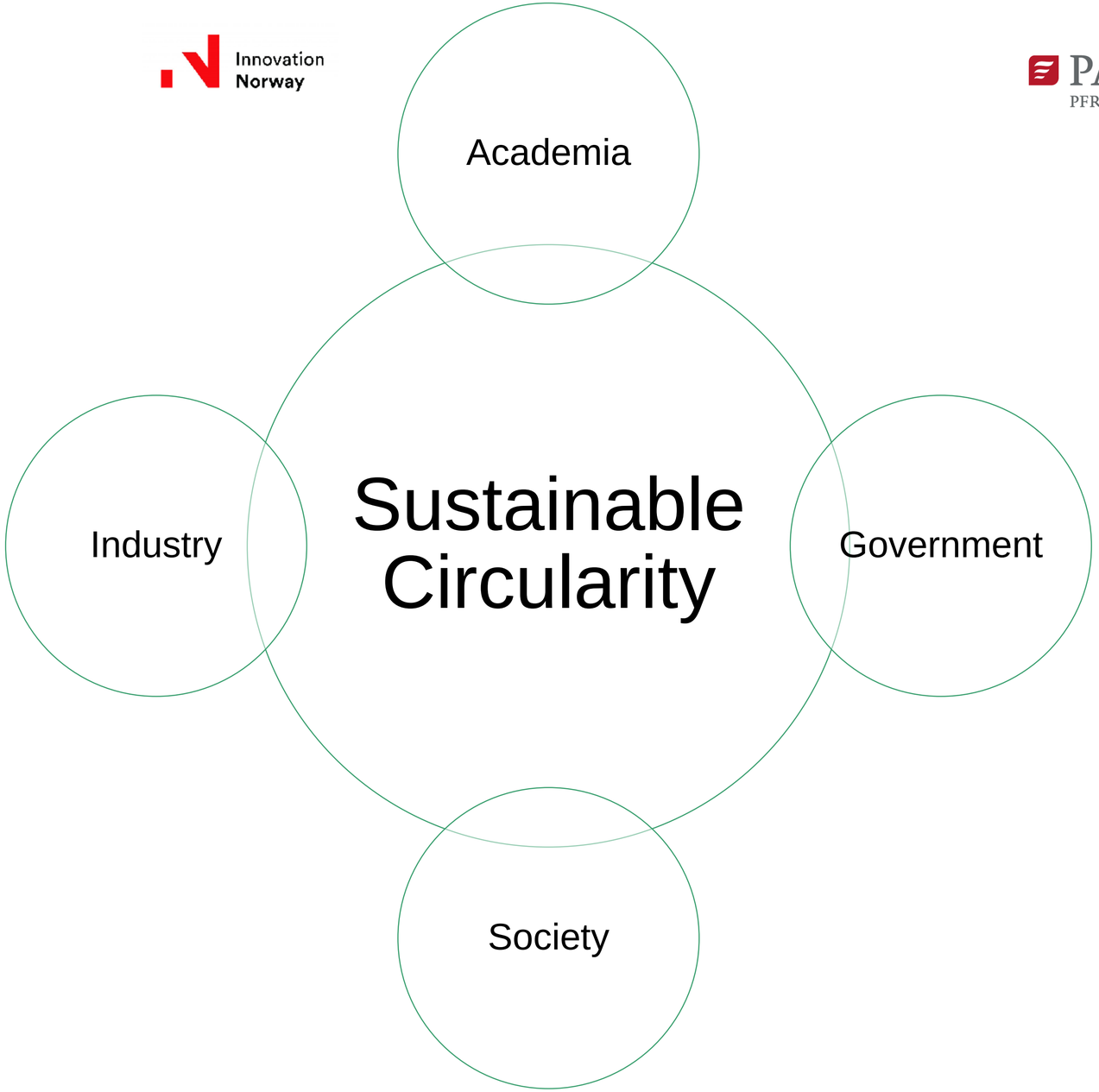
PARTNERSHIPS
FOR THE GOALS


Academia
Industry
Sustainable
Circularity
Government
Society

Potential Benefits to Business from Circular thinking

- Cost savings
- Resource conservation, driver for sustainable development
- Raw material security
- Hedging against future price shocks
- New forms of revenues, diversification
- Source of innovation and collaboration
- Driver of change and transition
- Long term competitiveness
- Customer interest and new customer attraction
- Compliance & being ahead of legislation
- Business resilience
- Meaningful jobs & being an attractive employer

(**Source**: Bocken et al. 2016)

Summary

- The circularity is not always SUSTAINABLE!!
- Stakeholder collaborations and Partnerships (SDG17) is the key!
- Systemic life cycle thinking and interdisciplinary research is required to facilitate options such as ***industrial symbiosis*** or ***waste to value***
- Waste reduction is effective than clean-ups!
- Localized solutions are MUST for sustainable waste management
- Plastic pollution is **Extended Stakeholder Responsibility**
- Enabling technologies, supply chain management, infrastructural changes and corporate mindset are required to overcome barriers towards Circular Business Models

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Thank you!!

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