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# Making value from aquaculture plastic

A Norwegian example of drivers and barriers for circular economy

'Circular Economy Express', Estonia,  
16th of November  
Presentation by SINTEF



Teknologi for et bedre samfunn



INDUSTRI

## Lenge var det umulig å resirkulere havbruksplast

It has become possible to recycle plastic from aquaculture

The key for success is close collaboration

Large investment in recycling facilities are made, resulting in large quality improvements of recycled plastic



Rokterne i lakseindustrien går på gangbaner som til nå har vært lagd av ny plast. Norske fagfolk har nylig bevist at resirkulert plast gir like gode og sterke gangbaner som det jomfruelig plast gjør. Det åpner for bruk av resirkulert hardplast også i mange andre produkter. Foto: Akva Group

Henrik Brynthe Lund (forsker på Sintef), Eli Fyhn Ullern (forsker og doktorgradsstipendiat ved Sintef og NTNU), Runar Stenerud (markeds- og utviklingsjef i Plasto) og Tormod Steen (prosjektleder i Noprec)

12. juni 2022 - 16:00

## Ruster næringa for å kunne behandle eget plastavfall fra havbruket

Nyheter av redaksjonen 17. februar 2022

med aktører i hele verdikjeden, fra opprettere til produsenter. Utviklingen hadde ikke vært mulig uten dette samarbeidet, skriver selskapet i en pressemelding.

I tråd med Norges plaststrategi ruster Oceanize Norge for å kunne behandle eget plastavfall fra havbruket.

– Ved å eksportere plastressursene sendes all utvikling med på lasset, samtidig fjernes grunnlag for verdiskaping og sysselsetting i Norge, det ønsker vi ikke sier Tormod Steen i Oceanize.



Kommunikasjonsleder i Oceanize Tormod Steen foran resirkulerte oppdrettsmerder klare for nytt liv som gangbaner.



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# A world-leading research institute

-independent and non-profit

Technology for a better society



# One of Europe's largest independent research organisations



INTERNATIONAL

**540 mill NOK**

PUBLICATIONS (incl. disseminations)

**6100**

NATIONALITIES

**80**

CLIENT SATISFACTION

**4,5 of 5**



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# Technology for a better society

## Our goal gives us important social roles



### Research and innovation

Develops new technological solutions and knowledge with our clients



### Laboratories and software

Develops and runs important research infrastructure



### Commercialisation

Creates new products and firms



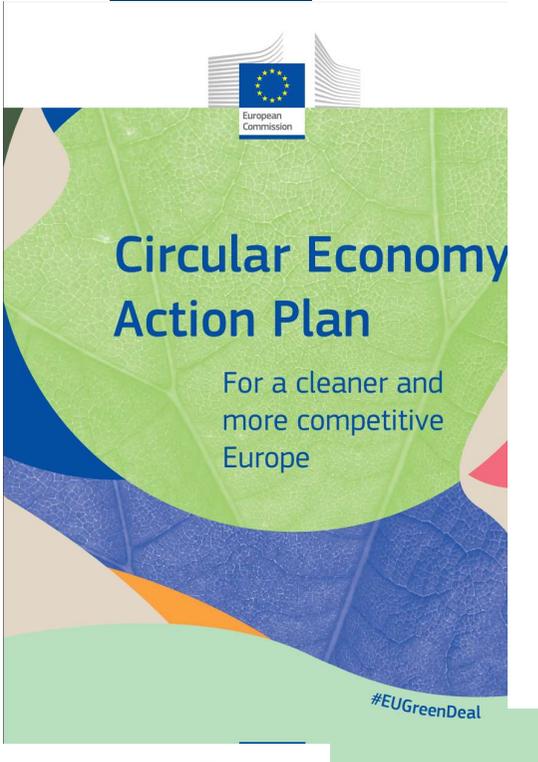
### Thought leadership

Contributes to debate and politics with advice and knowledge



# Strategic initiatives provide multidisciplinary collaboration for complex challenges





Plastic



# Meld. St. 45

(2016-2017)

Meldi

Avfall  
– avfallspolitikk



Departementene



Departementene

Noregs plast:

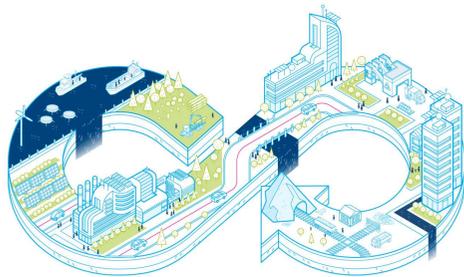
Strategi

## Nasjonal strategi for ein grøn, sirkulær økonomi

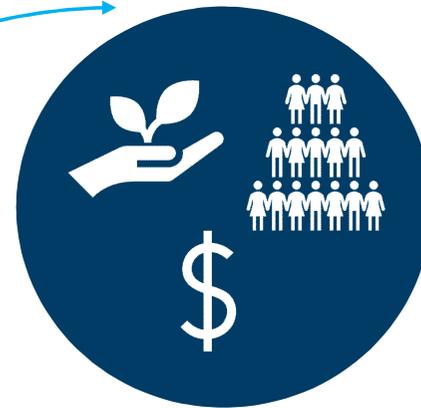




### Circular economy actions in Norway



### Impacts on economy – society - environment



electronics



construction and building



textiles



packaging and plastics



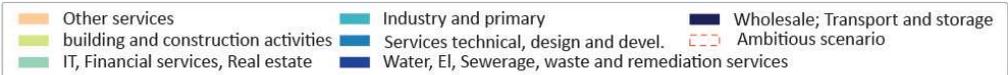
metal efficiency

- Value added
- Jobs
- GHG emissions

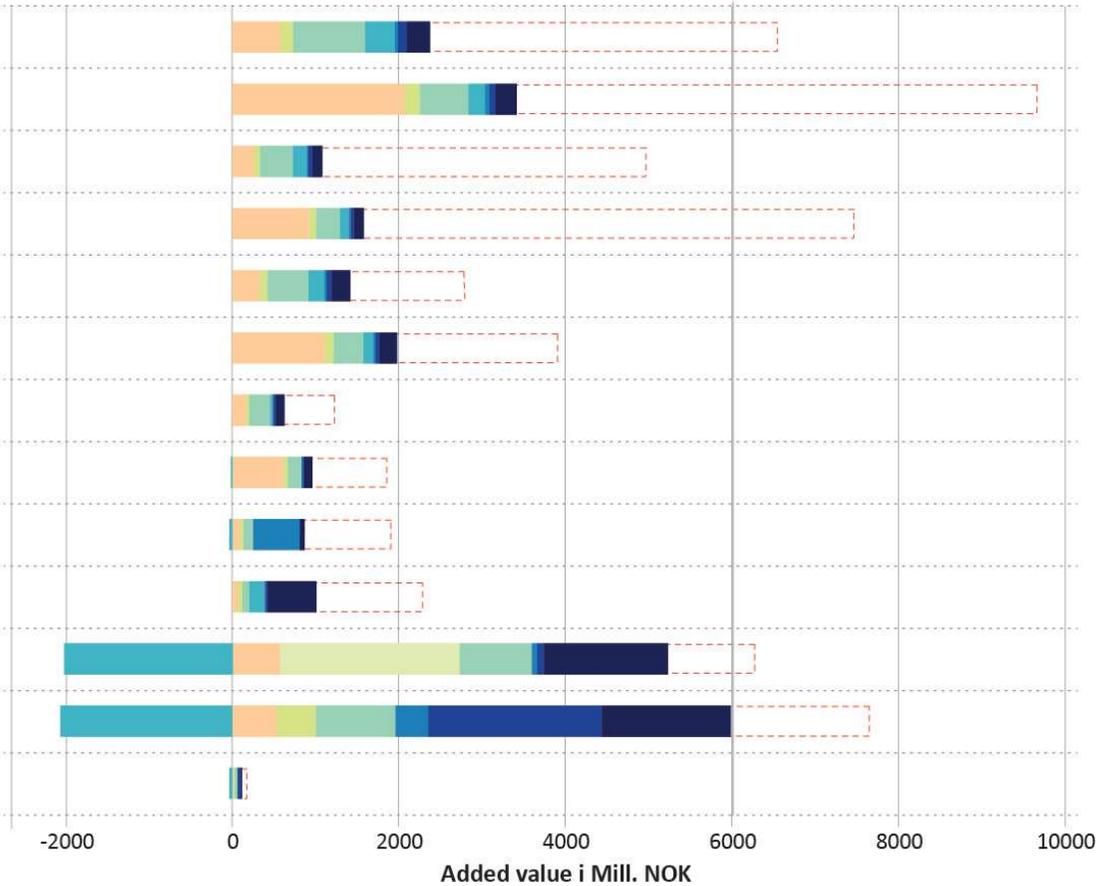
- > Year 2030



# Impacts on value creation in different industries

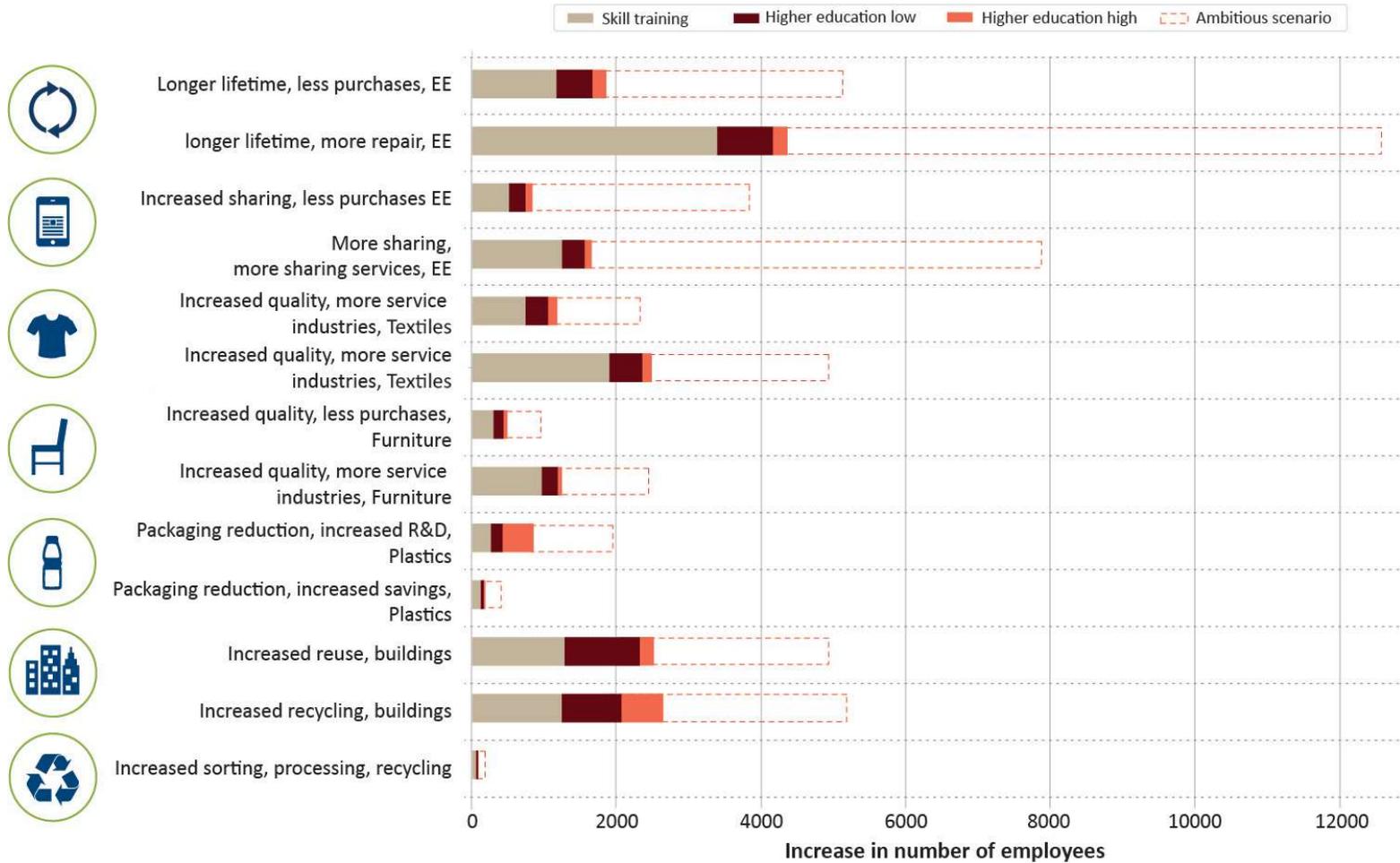


- Longer lifetime, less purchases, EE
- longer lifetime, more repair, EE
- Increased sharing, less purchases EE
- More sharing, more sharing services, EE
- Increased quality, more service industries, Textiles
- Increased quality, more service industries, Textiles
- Increased quality, less purchases, Furniture
- Increased quality, more service industries, Furniture
- Packaging reduction, increased R&D, Plastics
- Packaging reduction, increased savings, Plastics
- Increased reuse, buildings
- Increased recycling, buildings
- Increased sorting, processing, recycling





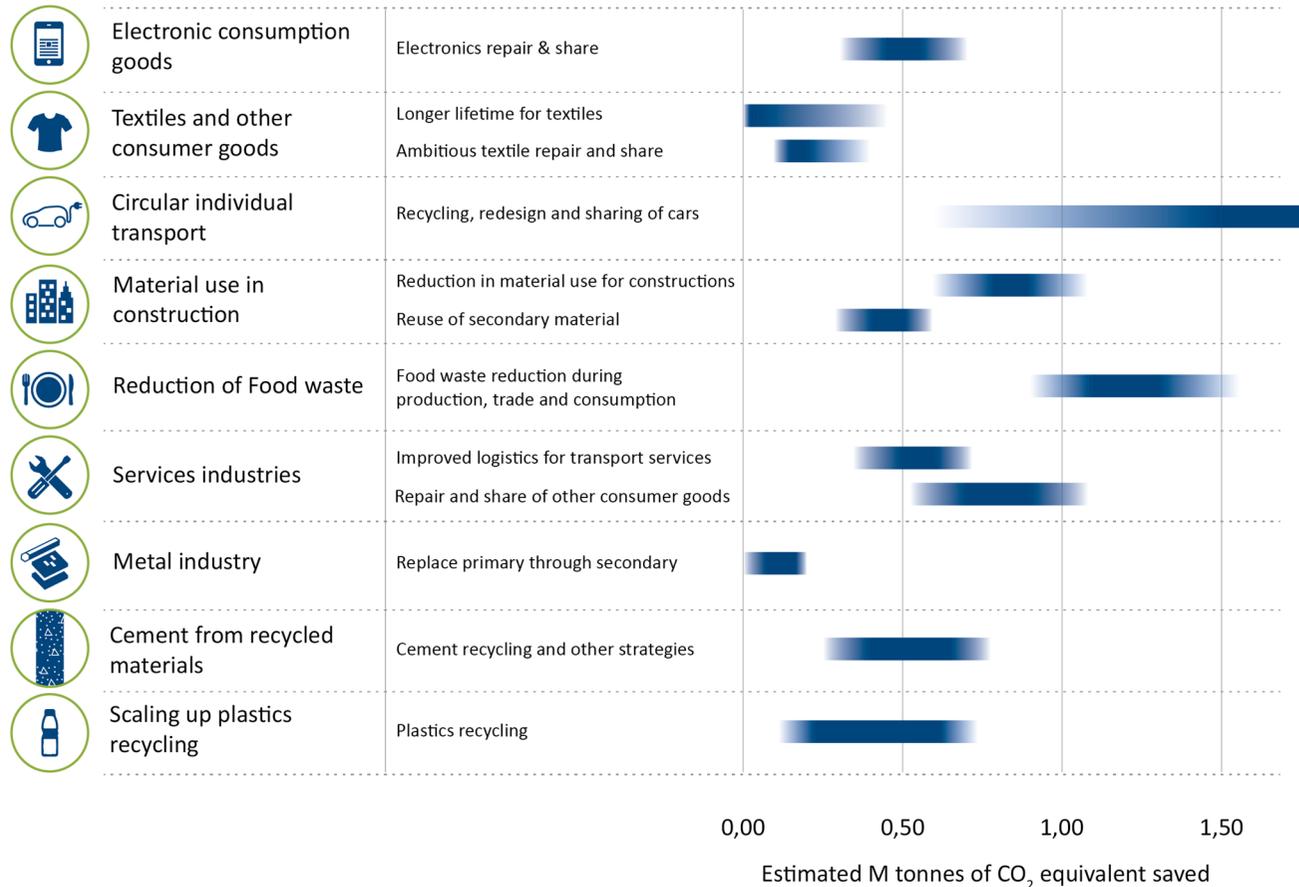
# Impacts on jobs and skill requirements





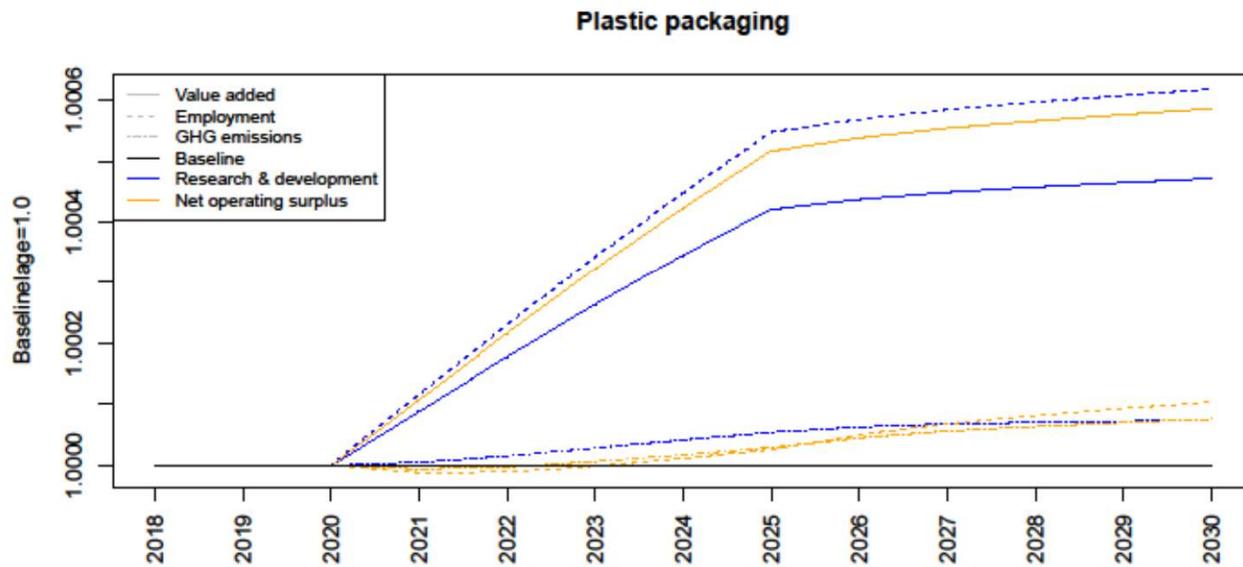
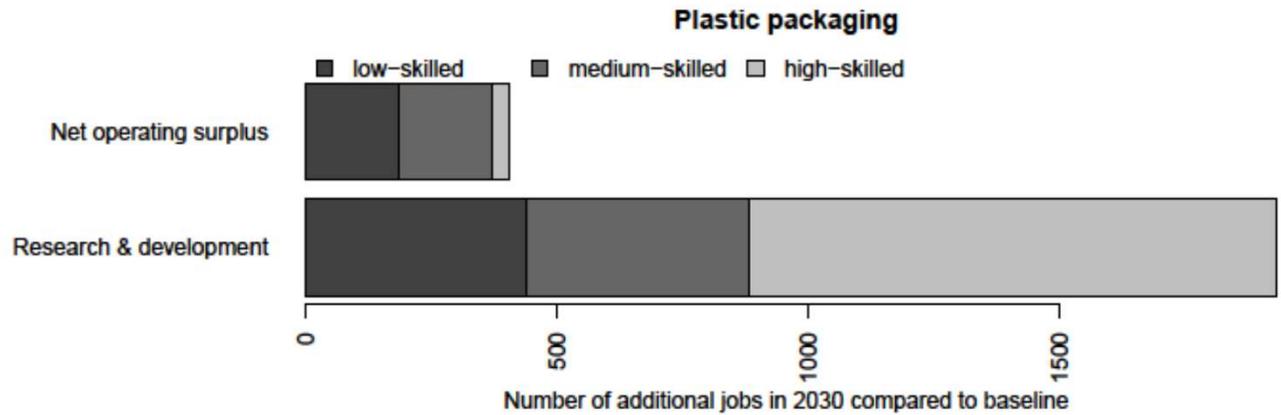
# Impacts on green house gas reduction potentials

## Circular economy opportunities





# Impacts from plastic packaging actions



The logo for POCO plast, featuring a stylized blue infinity symbol with a white wave-like shape inside, and a blue arrow pointing clockwise.

**POCO**  
plast

Henrik Brynthe Lund, SINTEF



# POCOplast (Pathways to sustainable post-consumer plastics in aquaculture)

Overarching Stakeholders



NCE AQUATECH CLUSTER  
Norwegian Aquaculture Technology

**BELLONA**



**NTNU**  
Norwegian University of  
Science and Technology

**SINTEF**



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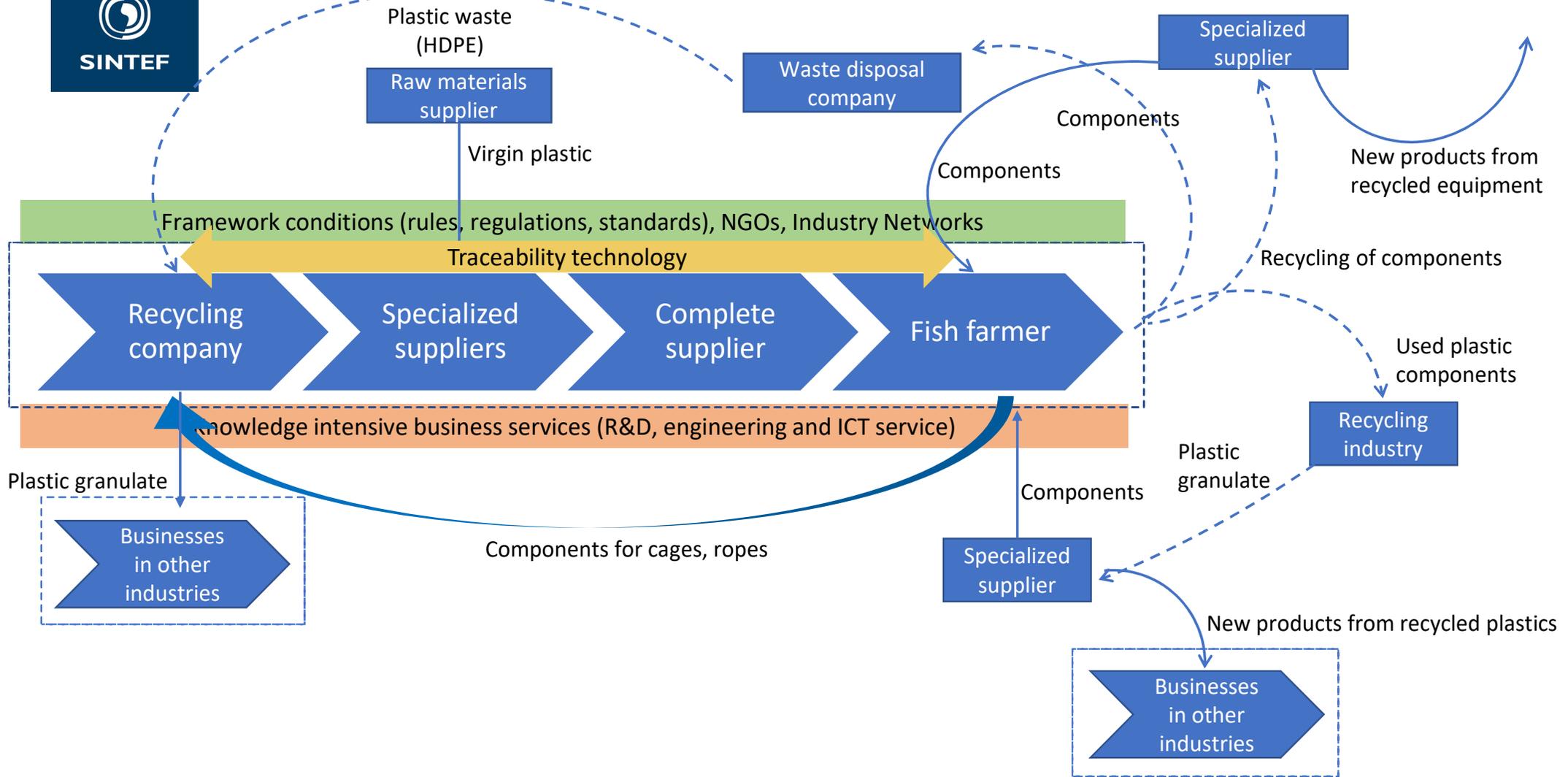
How can plastic waste from Norwegian aquaculture be used more sustainably through circular economy strategies and collaboration?

- What are drivers and barriers?



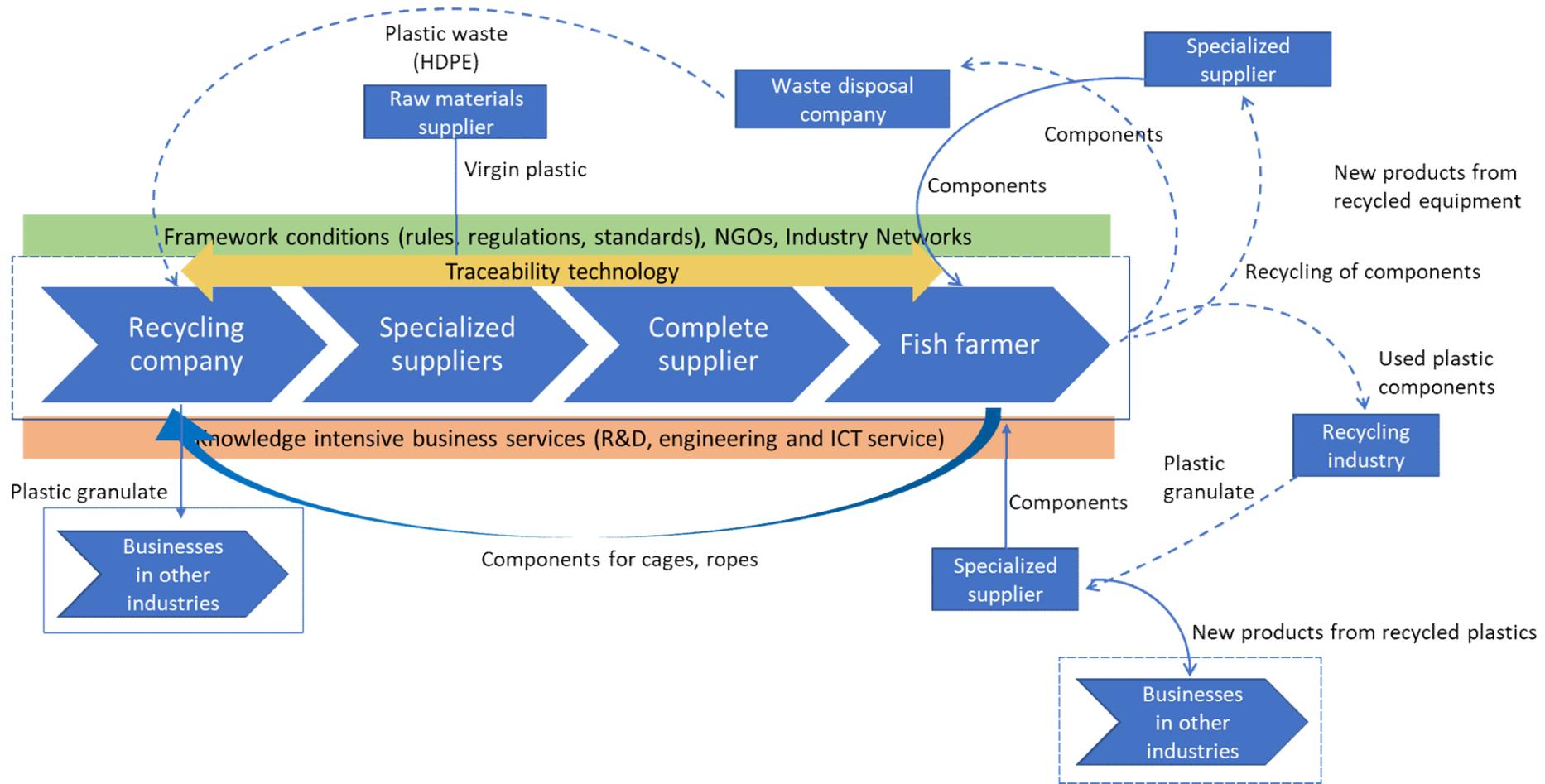
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Several concurrent developments and actions must be activated to get a well-function circular system





# A complex system with all involved actors





# The actors in the value chain

Functions	Raw material producers	Sub-suppliers	Full-range suppliers	Fish farmers (aquaculture)	Waste management	Recycling	Users (outside aquaculture)
Entrepreneurial activity							
Knowledge development							
Direction formation							
Market formation							
Resource mobilisation							
Building legitimacy							



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# The actors in the value chain

Functions	Raw material producers	Sub-suppliers	Full-range suppliers	Fish farmers (aquaculture)	Waste management	Recycling	Users (outside aquaculture)
Entrepreneurial activity	Low development	Rapidly developing	Low development	Developing	Developing	Rapidly developing	Fastly developing
Knowledge development	Developing	Rapidly developing	Developing	Developing	Low development	Low development	Rapidly developing
Direction formation	Low development	Developing	Low development	Low development	Rapidly developing	Rapidly developing	Rapidly developing
Market formation	Low development	Developing	Low development	Low development	Developing	Developing	Developing
Resource mobilisation	Developing	Developing	Developing	Low development	Developing	Rapidly developing	Developing
Building legitimacy	Low development	Rapidly developing	Developing	Developing	Developing	Developing	Developing



# Example – Raw material producers

Functions	Raw material producers	Sub-suppliers	Full-range suppliers	Fish farmers (aquaculture)	Waste management	Recycling	Users (outside aquaculture)
Entrepreneurial activity	Low development						
Knowledge development	Developing						
Direction formation	Low development						
<b>Market formation</b>	Low development						
<b>Resource mobilisation</b>	Developing						
Building legitimacy	Low development						

- Market formation:
  - Low prices on virgin plastic
  - Compete with recycled plastic is challenging
- Resource mobilisation
  - Most of the supply is still virgin, fossil-based plastic



# Example – Sub suppliers

Functions	Raw material producers	Sub-suppliers	Full-range suppliers	Fish farmers (aquaculture)	Waste management	Recycling	Users (outside aquaculture)
<b>Entrepreneurial activity</b>		Rapidly developing	<ul style="list-style-type: none"> <li>• Entrepreneurial activity both to products and business models are on-going               <ul style="list-style-type: none"> <li>– Pavements from 100% recycled plastic</li> <li>– Norwegian produced circular ropes</li> <li>– Plastic granulates to new products</li> <li>– New collaboration models between industrial actors</li> </ul> </li> </ul>				
Knowledge development		Rapidly developing					
Direction formation		Developing					
Market formation		Developing					
Resource mobilisation		Developing					
Building legitimacy		Rapidly developing					



# Example – Full-range suppliers

Functions	Raw material producers	Sub-suppliers	Full-range suppliers	Fish farmers (aquaculture)	Waste management	Recycling	Users (outside aquaculture)
Entrepreneurial activity			Low development	<ul style="list-style-type: none"> <li>The knowledge need for more sustainable use of plastic is fragmented and not systematised</li> </ul>			
<b>Knowledge development</b>			Developing				
Direction formation			Low development				
Market formation			Low development				
Resource mobilisation			Developing				
Building legitimacy			Developing				



# Example – Fish farmers

Functions	Raw material producers	Sub-suppliers	Full-range suppliers	Fish farmers (aquaculture)	Waste management	Recycling	Users (outside aquaculture)
Entrepreneurial activity				Developing	<ul style="list-style-type: none"> <li>Market for components made of recycled plastic is under-developed</li> <li>Related to sub-suppliers activity -&gt; developing, testing, commercialising products take time</li> </ul>		
Knowledge development				Developing			
Direction formation				Low development			
<b>Market formation</b>				Low development			
Resource mobilisation				Low development			
Building legitimacy				Developing			



# Example – Waste management and recycling

Functions	Raw material producers	Sub-suppliers	Full-range suppliers	Fish farmers (aquaculture)	Waste management	Recycling	Users (outside aquaculture)
Entrepreneurial activity	<ul style="list-style-type: none"> <li>Expectations of coming regulations for plastic leads to strong formation of direction</li> </ul>				Developing	Rapidly developing	
Knowledge development					Low development	Low development	
<b>Direction formation</b>					<b>Rapidly developing</b>	<b>Rapidly developing</b>	
Market formation					Developing	Developing	
Resource mobilisation					Developing	Rapidly developing	
Building legitimacy					Developing	Developing	

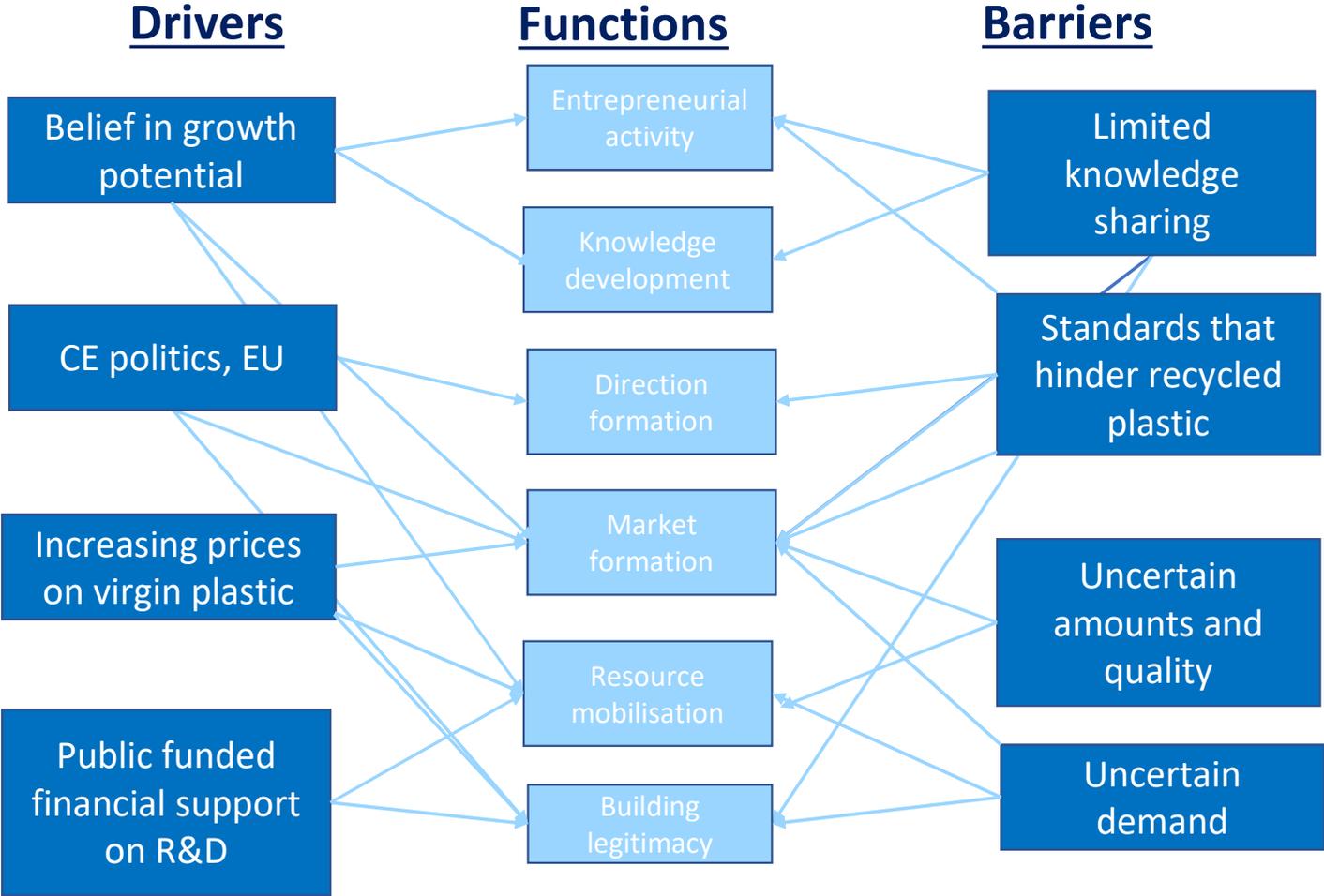


# Example – Other users

Functions	Raw material producers	Sub-suppliers	Full-range suppliers	Fish farmers (aquaculture)	Waste management	Recycling	Users (outside aquaculture)
Entrepreneurial activity	<ul style="list-style-type: none"> <li>• Experience an increasing interest for green products.</li> <li>• Working with UN SDGs and circular design gives legitimacy</li> </ul>						Fastly developing
Knowledge development							Rapidly developing
Direction formation							Rapidly developing
Market formation							Developing
Resource mobilisation							Developing
Building legitimacy							Developing

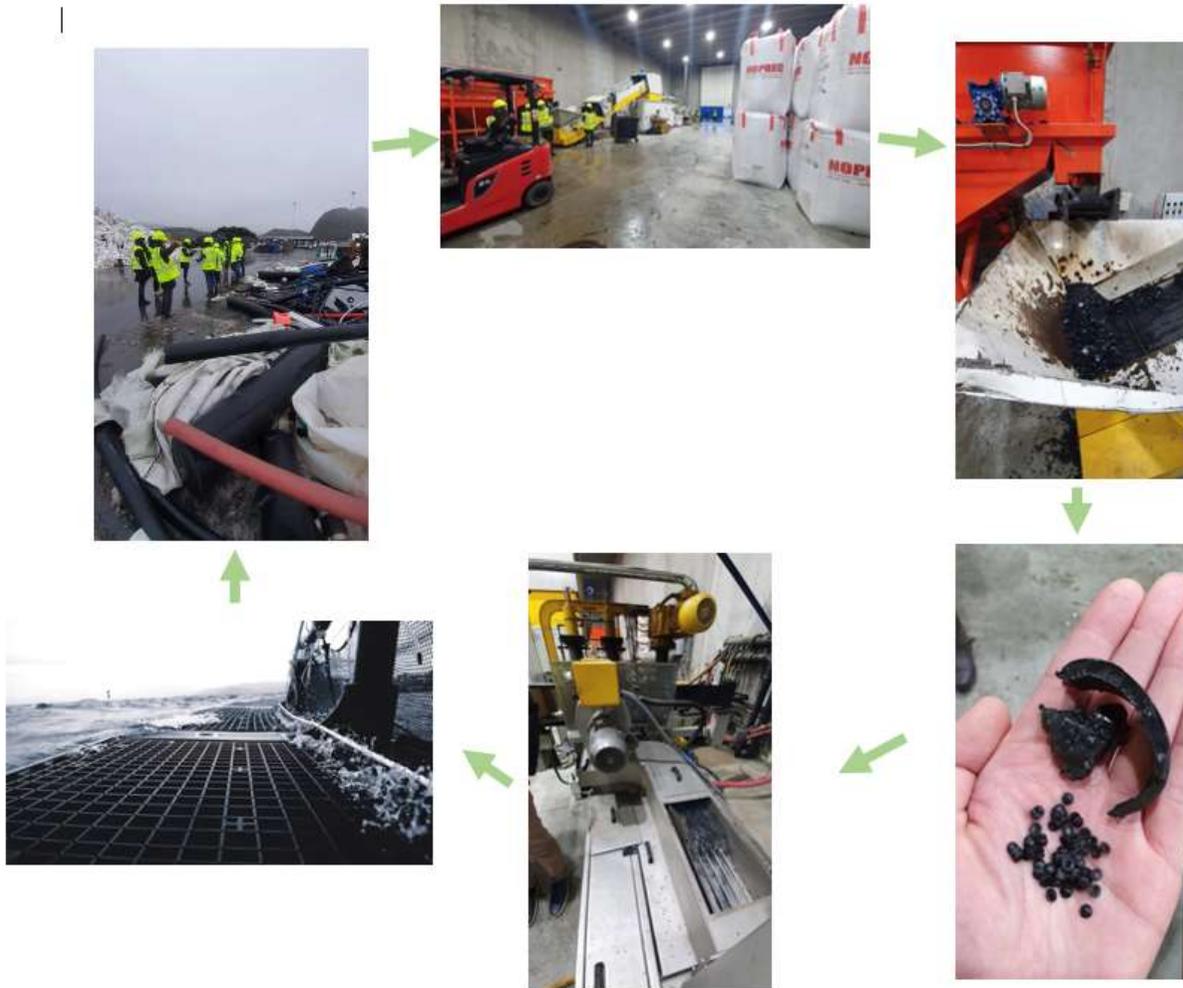


# Main drivers and barriers





# Potential for realization for new green value creation



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# Recommendations for industry actors

- Competence building (material, design, business models)
- New collaboration models (between industries, with NGOs and public authorities)
- Prioritise green procurement and set requirements
- Certifications / EDPs for legitimacy
- Improve documentation and digitalise product information
  - Reduces uncertainty
  - Balances supply and demand



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# Recommendations for myndigheter

- Private-public collaboration
- Financial support to stimulate sustainable use and more recycled material
- Extended Producer Responsibility
- Requirements for waste and plastic sorting
- Setting goals and requirements for amount of secondary raw material -> predictability
- Circular public procurement



## Meld. St. 45

(2016–2017)

Melding til Stortinget

Avfall som ressurs  
– avfallspolitikk og sirkulær økonomi





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# Technology for a better society

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