SINTEF IN THE CIRCULAR ECONOMY

Alexandra Bech Gjørv

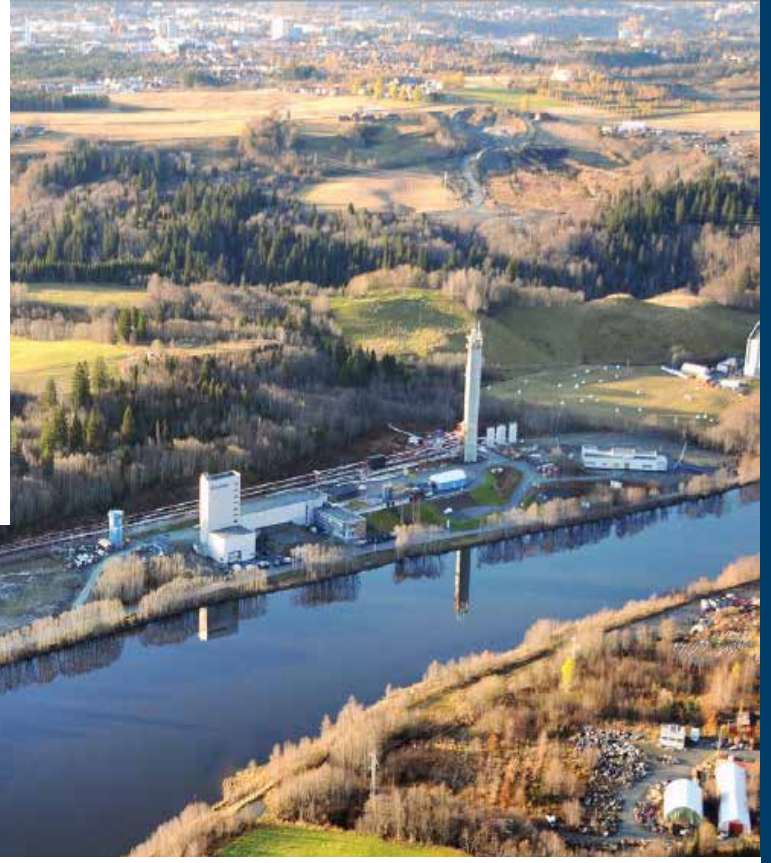
CEO SINTEF

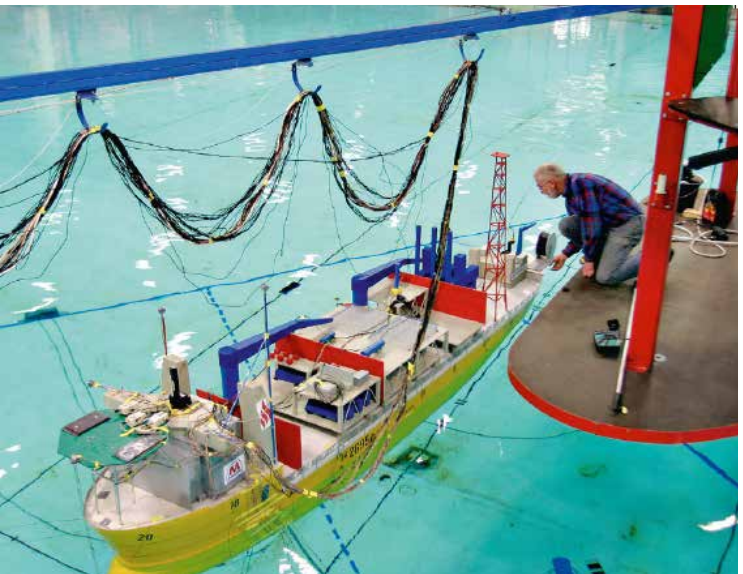
One of Europe's largest independent research organization

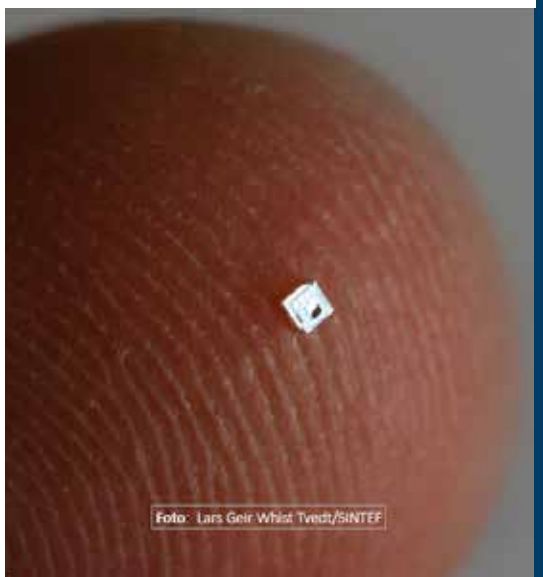
NOK 3.1 billion
Revenues

NOK 450 MILL
International sales

SINTEF







A unique offering

- More than 55 percent PhDs
- World class labs; from nano electronics and TEM microscopes, to huge multiphase flow, high voltage and ocean labs
- Modelling, experimental results, big data and algorithms - digitalization of society from nano to macro scale

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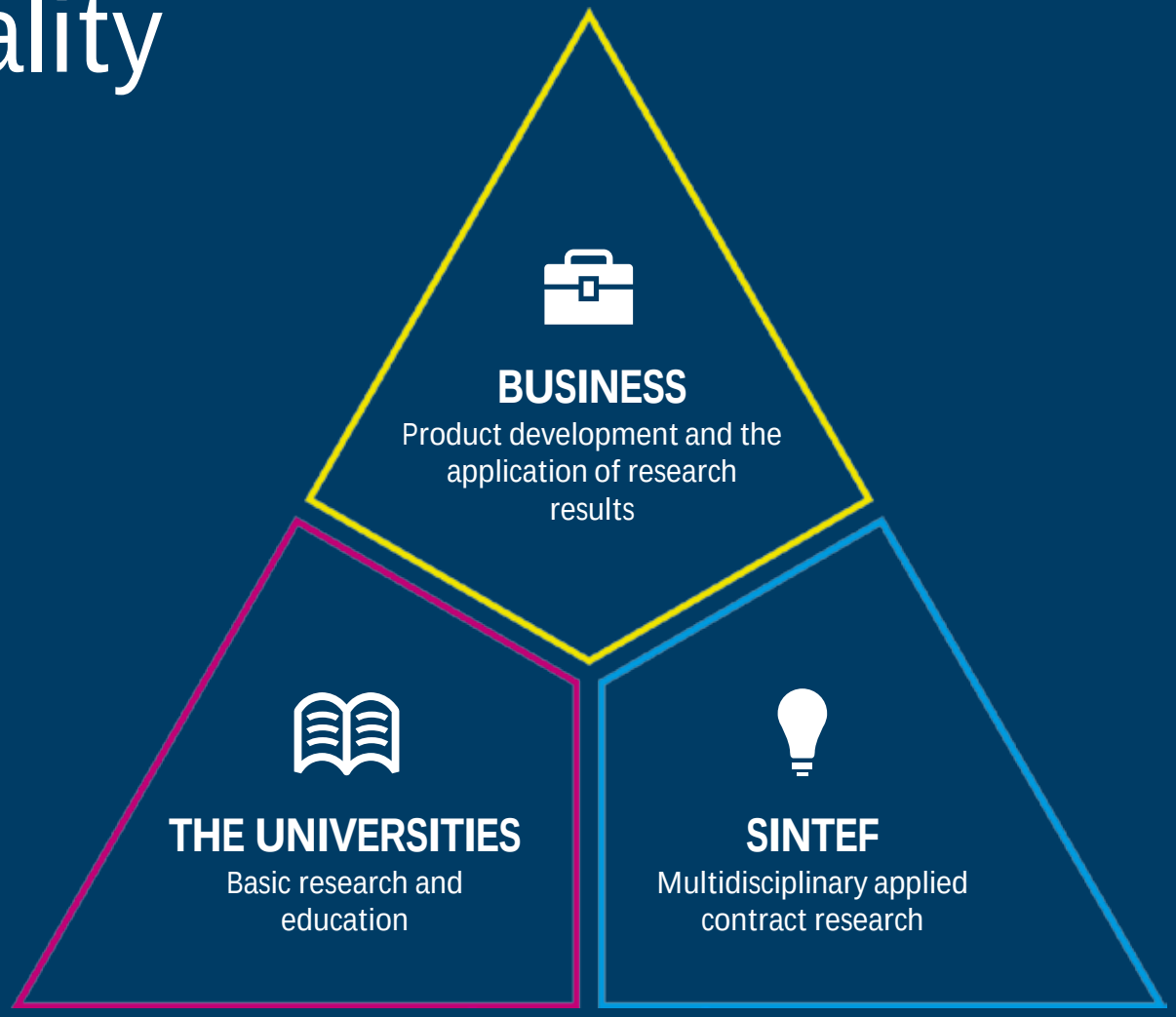
Close working relationships generate innovation and high quality



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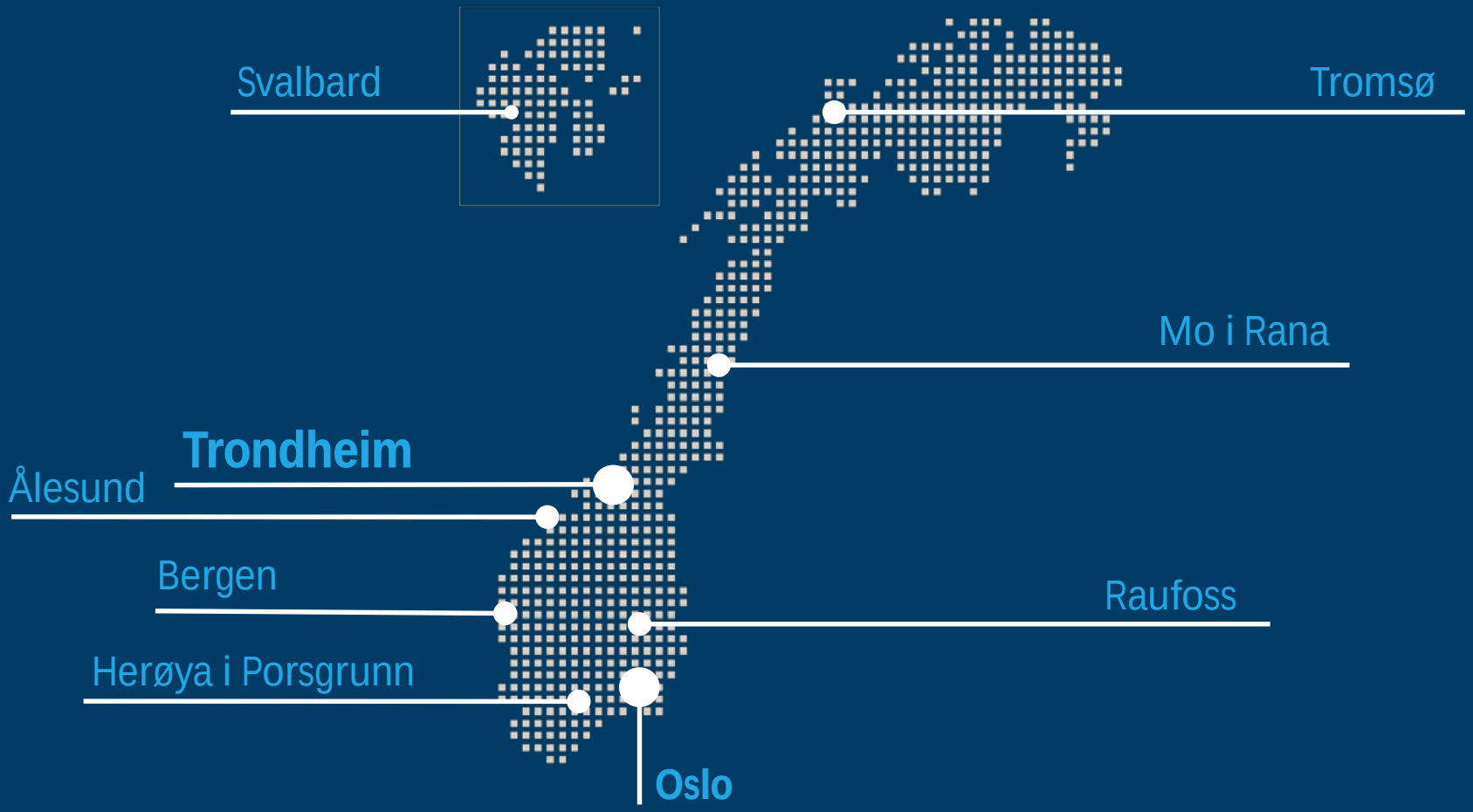
Close to customers



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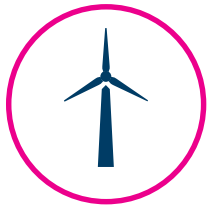
Applied research, technology and innovation

Expertise from ocean space to outer space:


Renewable energy


Ocean space


Industry


Buildings and infrastructure


Materials


Micro-, nano- and biotechnology


Climate and environment


Oil and gas


Health and welfare


Society


ICT


Transport

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COP21 · CMP11
PARIS 2015
UN CLIMATE CHANGE CONFERENCE

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Technology for a better society

Solutions to the grand challenges

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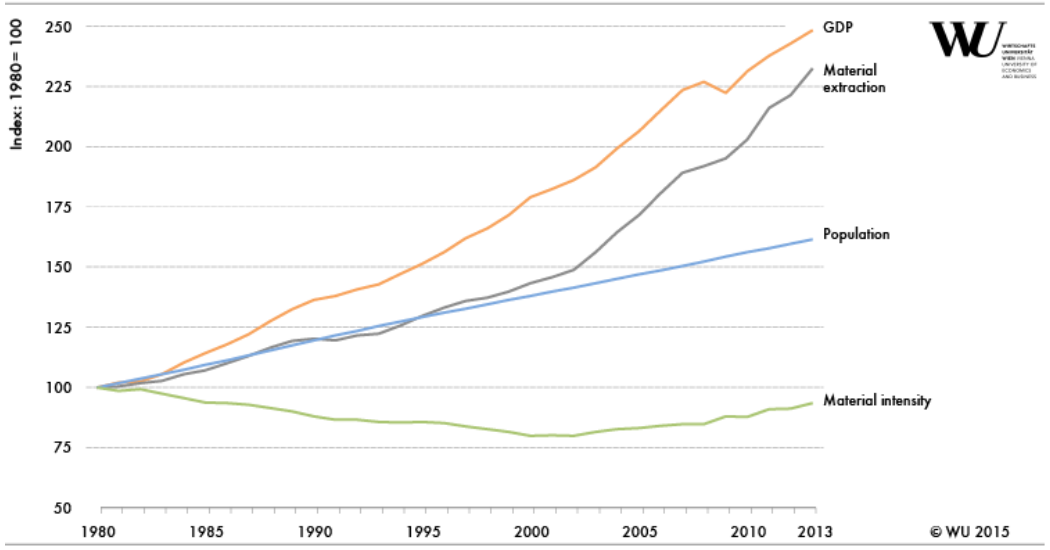
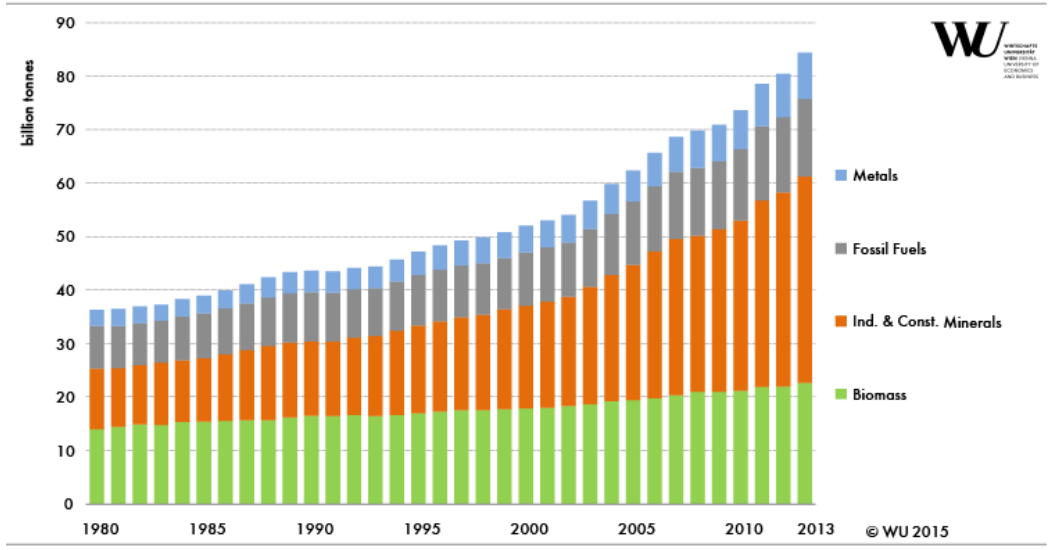
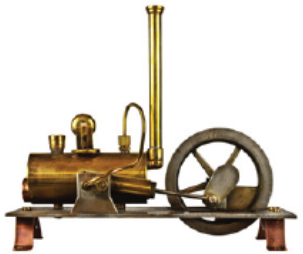
Circular economy - Why?





Kilde: Vienna University of Economics and Business (WU)

Increased demand of Materials and Metals



C Ca Fe

Sn W Cu Mn Pb C Ca Fe

Sn W Mg Mo Ni Sn W Mg Mo Ni Cu Mn Pb Co Cr C Ca Fe Al REE

Pd Rh Ta Te U Ru In K Li Nb P Re Sn W Mg Mo Ni Ge Sn W Mg Mo Ni Ga Cu Mn Pb Co Cr Cd C Ca Fe Al REE Ag

1700 1800 1900 2000

Source: "Mineraler for det Grønne Skiftet"-NGU Report Nov 2016

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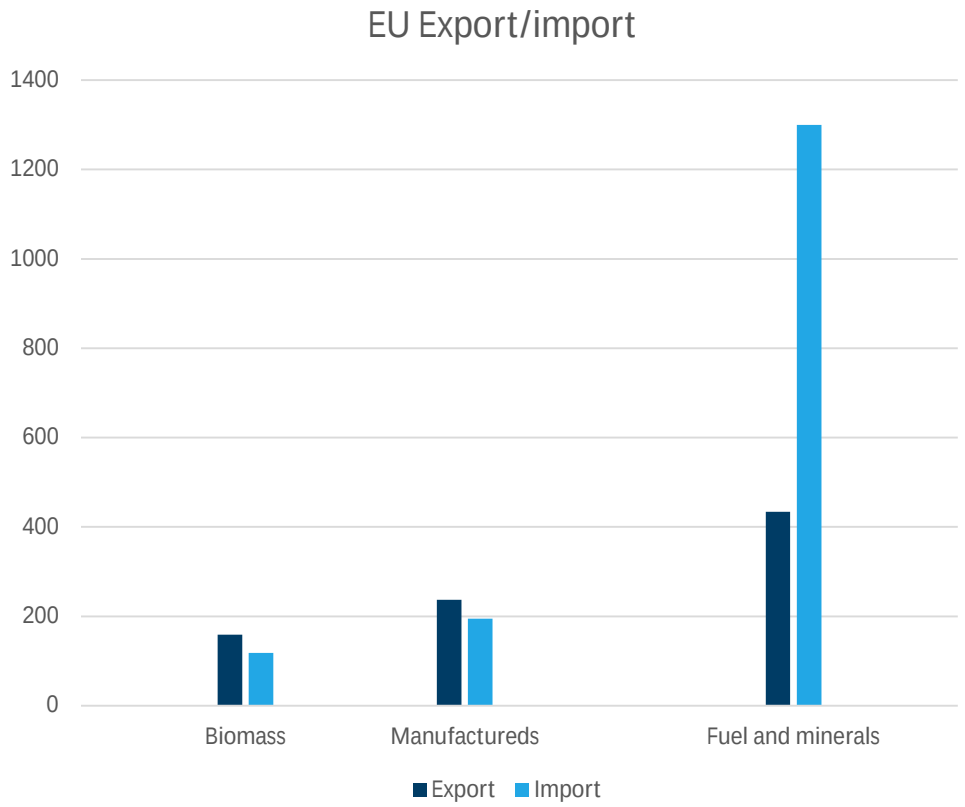
EU heavily depends on imported raw materials

EU Priority sectors:

- Plastics
- Food waste
- Critical raw materials
- Construction and demolition
- Biomass and Bio-based products



http://ec.europa.eu/environment/circular-economy/pdf/seminar/1%20DG%20ENV_Circular%20Economy%20package.pdf

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EU action plan for the Circular Economy

From waste to resources:

- Boosting the market for secondary raw materials and water reuse
- Recycled materials injected back to the economy as new raw materials

Waste Management:

- Reduce landfills, increase recycling
- Improvements in waste collection and sorting

Production:

- Products designed for durability, reparability and disassembly.
- Sustainable sourcing of raw materials and use of by-products in industrial symbioses

Consumption:

- Changed consumer behavior
- Economic instruments (Governmental incentives)
- New forms for consumption (sharing economy, new business and consumption models)

Source: European Committee

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EU – Expected benefits

Economic growth
+7% GDP
€ 600 billions in savings (8% of annual turnover for business in the EU)

Job creation
170 000 direct jobs in waste management sectors created by 2035

Encouraging innovation

Reducing emissions
reducing total annual GHG emissions by 2-4%

Boosting competitiveness and ensuring security of supply

Building economic and environmental resilience

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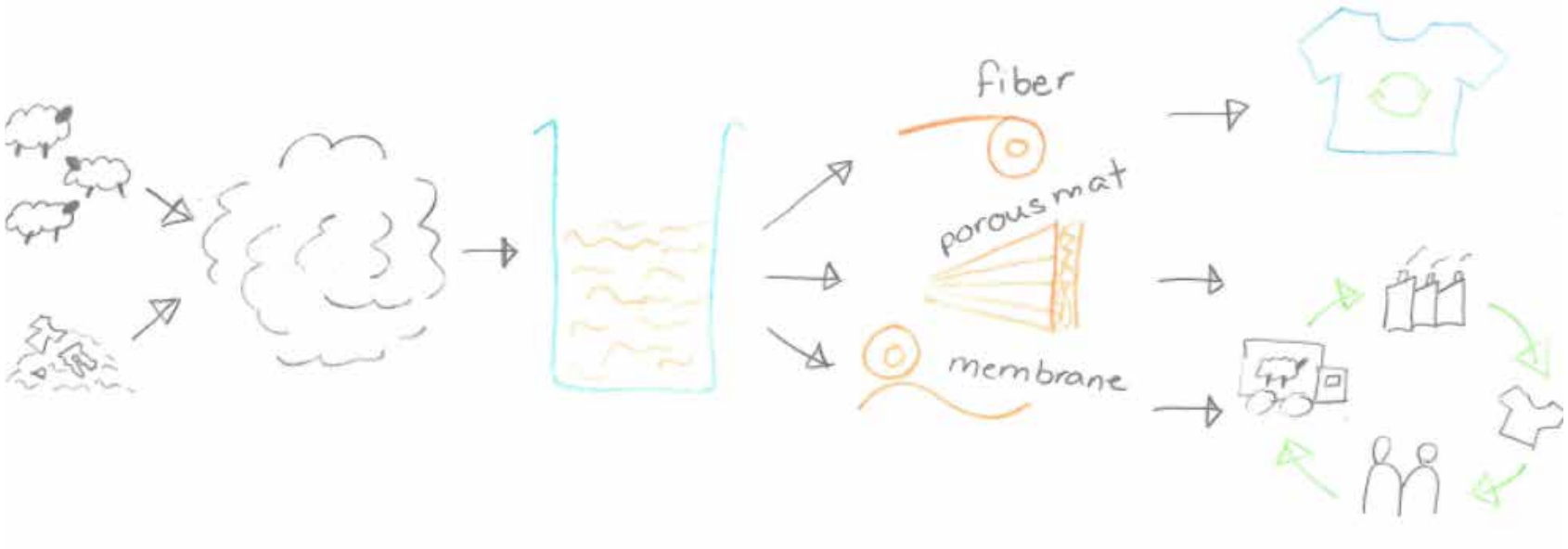
http://ec.europa.eu/environment/circular-economy/pdf/seminar/1%20DG%20ENV_Circular%20Economy%20package.pdf

SINTEF'S CURRENT WORK RELATED TO CIRCULAR ECONOMY – SOME EXAMPLES

Regeneration of wool

RegenWool: Investigating Wool Keratin Chemical Recycling as a Part of Applying a Circular Business Approach



The Research Council of Norway

HELLY HANSEN

norilia

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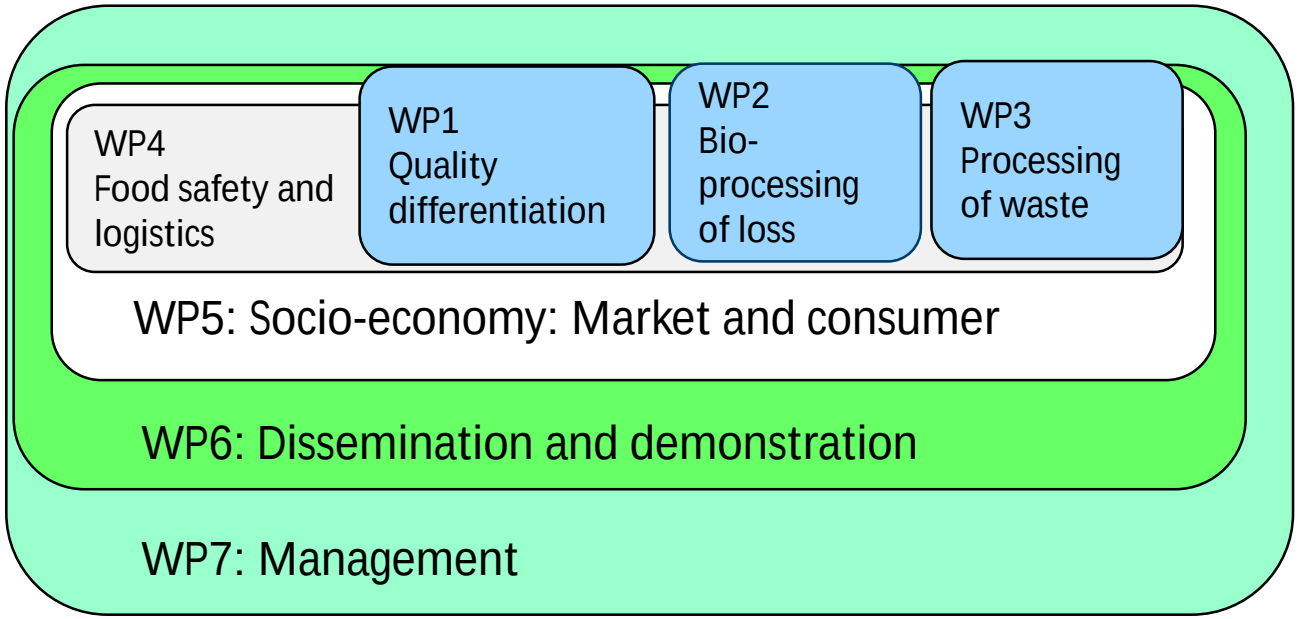
CYCLE: Total utilization of raw materials in the supply chain for food with a bio-economical perspective

Main goal:

Introduce a holistic approach to improve resource utilization in the Norwegian food chain by developing knowledge and sustainable solutions for eco-friendly bio-processes and technology within a bio-economical perspective

Key results

- Robotic automated releasing of chicken fillets from carcass
- UpCycling Rest Raw Materials in the Meat Industry
- New technological solutions for upcycling rest raw materials in the fisheries sector.



Use of plastic waste from the ocean as input to production

Main goal:

Increased competitiveness for Norwegian industry based on shared value creation and sustainability where strategic, economic and societal needs meet.

Main result:

New circular business models by implementing new technology and competence on circular material streams.

Website:

www.sisvi.no

World class sorting solutions

"SINTEF is a key research partner for us in developing world-class, sensor-based sorting solutions. We have been working with them for more than 20 years in an extremely successful way." – **Volker Rehrmann**, Executive Vice President and CTO, Head of TOMRA Sorting Solutions

Waste Sorting

SINTEF contribution:

High speed dedicated spectrometer design and data analysis for large volume belt sorting

Food Sorting

SINTEF contribution:

Dedicated high-accuracy spectrometer design and geometry. Quantitative data analysis in collaboration with Nofima

Mining Sorting

SINTEF contribution:

Design of high-speed electromagnetic detection

Reverse Vending Sorting

SINTEF contribution:

Dedicated spectroscopy, camera system design and data analysis for plastic bottles

A long-standing partnership with TOMRA

1972 **Tomra founded by Petter & Tore Plancke**

1992 SINTEF begins developing optics and camera system for sorting of plastic bottles with Tomra

1994 SINTEF develops Elopak Drinks Carton Sorter and from this develops world's first online sorter of selected plastics

1995 **TiTech AutoSort founded by Tiedemanns (now Ferd)**

2000 SINTEF develops several high-speed spectrometers, enabling more flexible sorting of paper, plastic and other materials

2002 **TiTech acquires Real Vision System Gmbh**

2004 SINTEF develops miniature, low-cost dedicated spectrometer

2004 **Tomra acquires TiTech**

2005 Nofima & SINTEF adapt spectrometer design for food quality

2007 **Qvision AS founded by Tomra for the food industry**

2008 SINTEF develops more robust algorithms & hardware for bottle recognition & fraud avoidance

2009 Nofima & SINTEF optimise QVision500 for the meat industry

2013 **Tomra expands food sorting by acquiring Odenberg & BEST and merge with Qvision activities**

2016 Nofima & SINTEF adapt Qvision500 to new food sorting applications

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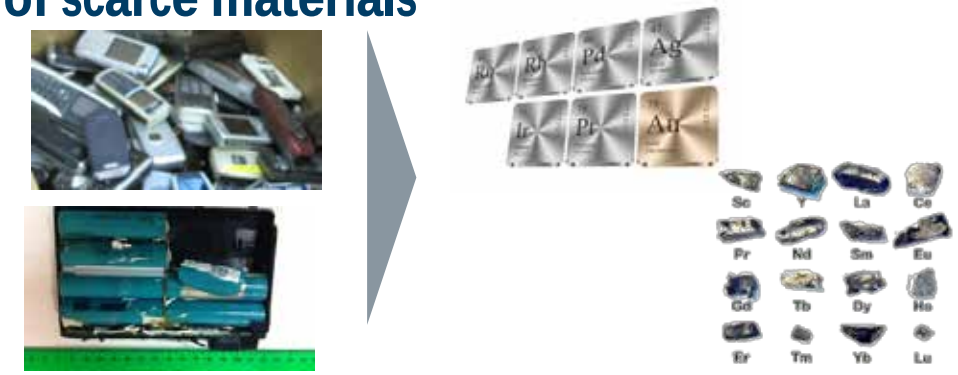
Aerto – Value from Waste

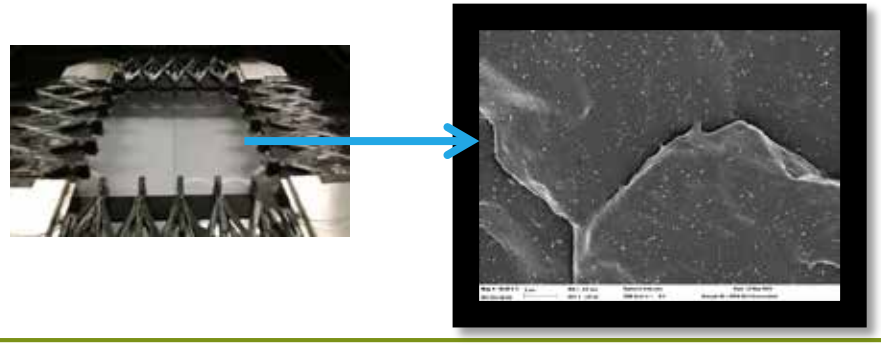
1

Sustainable recovery, separation and reuse of scarce materials



2

Safe management of nanowaste



Goals:

1. Sustainable recovery, separation and reuse of scarce metals
   - Gold and copper from mobile phones and cobalt, nickel and rare elements from used batteries
2. Safe management of nanowaste
   - Release of TiO_2 nanoparticles during incineration
   - Environmental assessment of CeO_2 nanoparticles

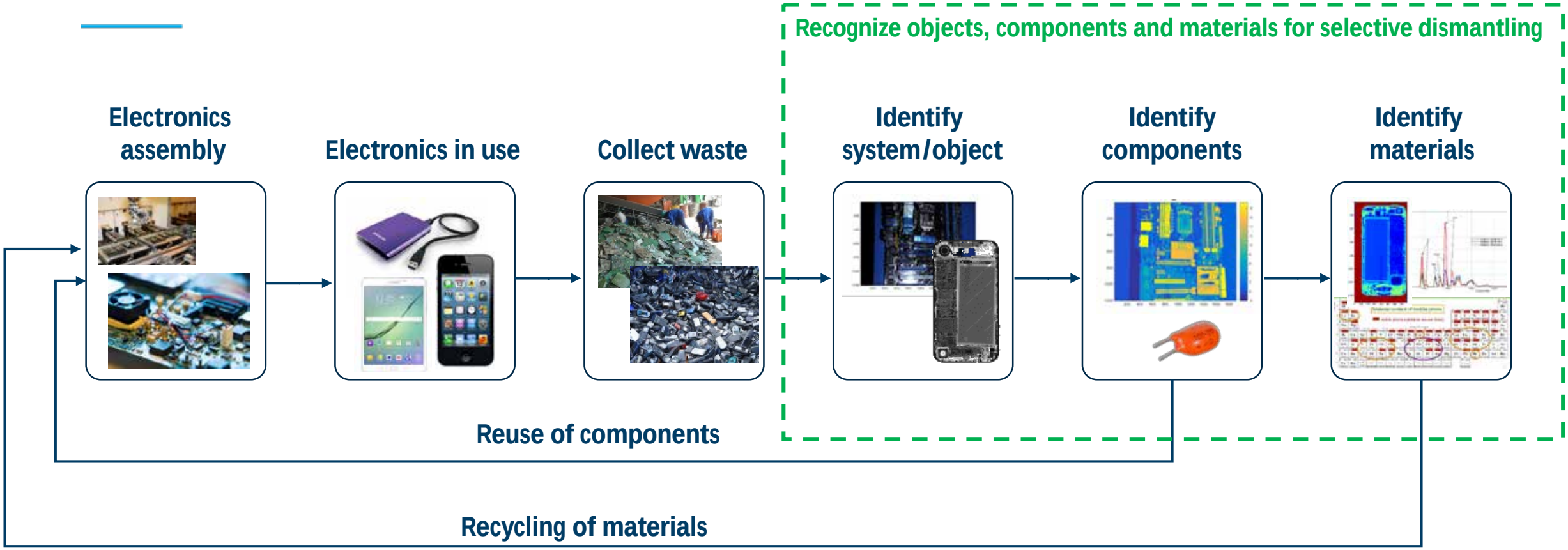
Main deliverables:

- Models for LCA for selected materials
- Inventories of waste streams containing critical materials
- Methods for analysis and sensing of critical elements
- Methods for extraction of selected critical materials
- Techniques for recycling of polymer containing nanometals

SINTEF tecnalia SP VTT

cea Fraunhofer TNO SINTEF

Industrialized methods to reuse and recycle electronic waste



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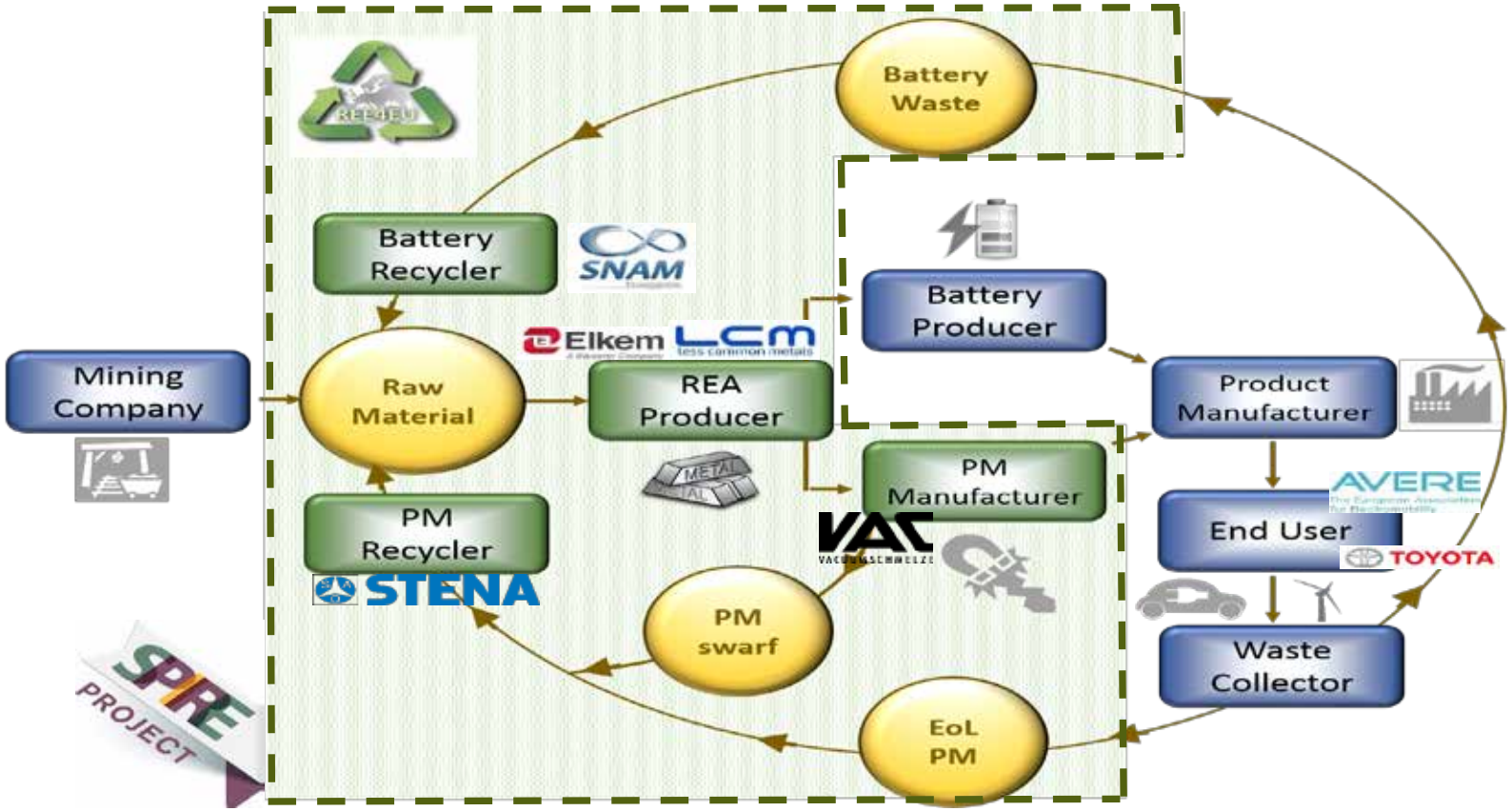
Recovery of Rare Earth metals from permanent magnet and battery waste streams

H2020 REE4EU - Integrated High Temperature Electrolysis And Ion Liquid Extraction for a Strong and Independent European Rare Earth Elements Supply Chain



Website:
www.ree4eu.eu

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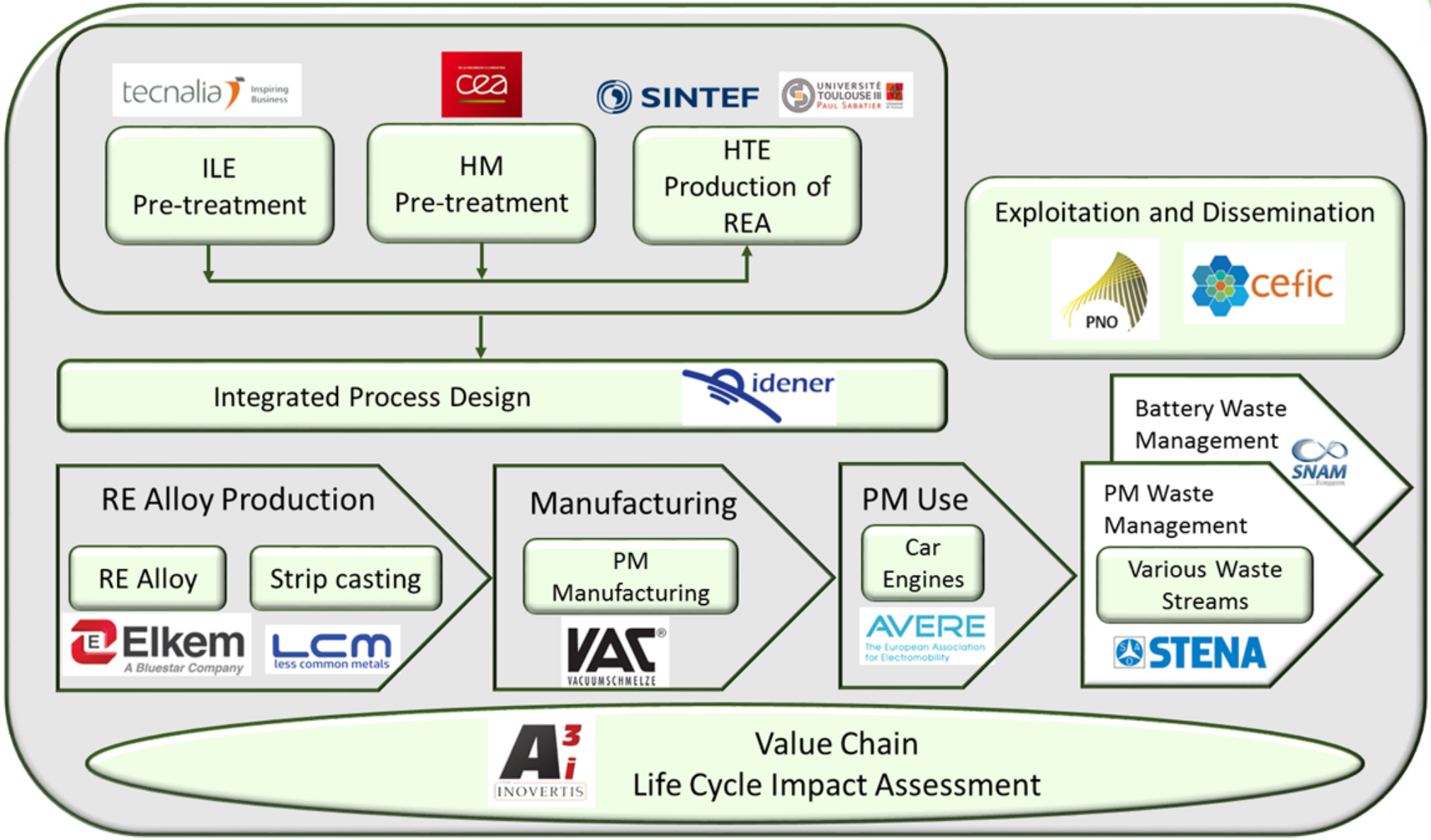
REE4EU Consortium and Value Chain



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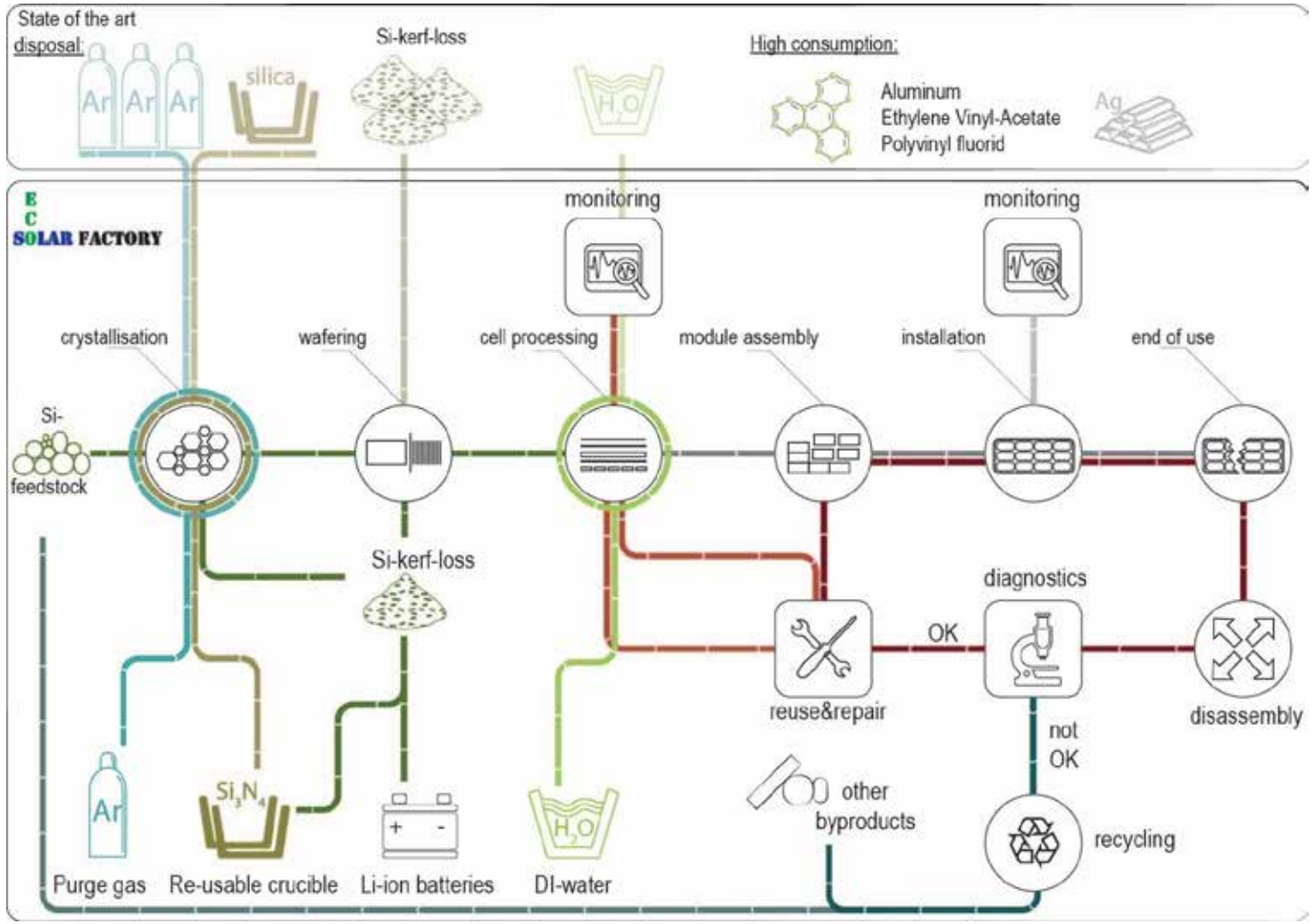
H2020 Eco-efficiency gains in the photovoltaic value chain



EC SOLAR FACTORY

SINTEF

APOLLON SOLAR

NorSun

ISC International Solar Energy Research Center Konstanz

STEULER SOLAR

aimen

GARBO your innovative partner

ingesea

SOLITEK

bifa Umweltinstitut

Boukje.com

EFFRA a MANUFUTURE initiative

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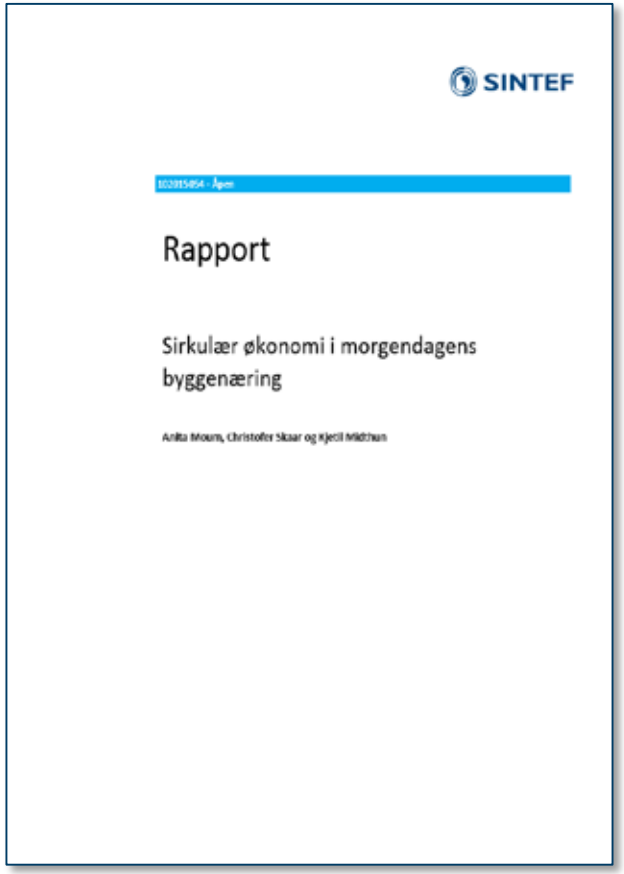
Buildings and construction



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RESGRAM – Recycling of waste banks

VELDE

AS Kristiansands CEMENTSTØBERI

Statens vegvesen

Forskningsrådet

SINTEF

UNIVERSITETET I AGDER

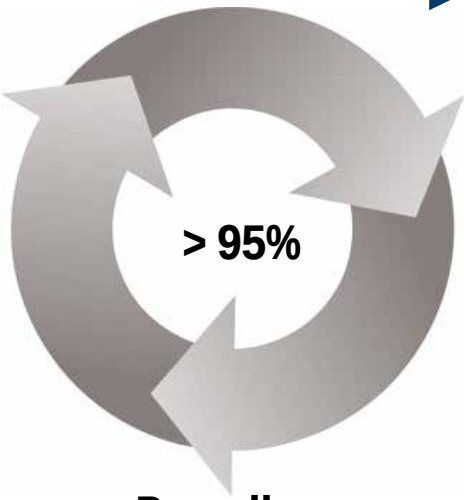
Waste banks

Waste transport

Advanced, high-capacity, cost-efficient plants

Optimal high quality treatment processes

Large capacity to meet market demand



Recycling

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THE ECONOMIC TIMES

Pollution

Norway to help India manage construction waste

By IANS | 30 Dec, 2015, 07.35PM IST

READ MORE ON » Recycling of Construction and Demolition Waste | memorandum of understanding | human resource | Construction waste | Clean India Campaign

NEW DELHI: India will sign an MoU with Norway for training of human resource to handle construction and demolition waste, in tune with the Clean India Campaign launched by Prime Minister Narendra Modi.

A Memorandum of Understanding (MoU) will be signed between SINTEF, Norway and Central Public Works Department (CPWD) for cooperation in the development of human resource capacity-building and scientific research in the field of Recycling of Construction and Demolition (C&D) Waste in India.

India's construction industry generates about 10-12 m tonnes of waste annually.

The proposal in this regard was cleared by the union cabinet on Wednesday.

India's construction industry generates about 10-12 million tonnes of waste annuall

There is a huge demand of aggregates in the housing and road sectors but there is significant gap in demand and supply, which can be reduced to a certain extent by recycling construction and demolition waste.

News Updates

MoU between SINTEF, Norway and CPWD in the field of Recycling of Construction and Demolition Waste

30 Dec, 2015

The Union Cabinet, chaired by the Prime Minister Shri Narendra Modi has approved the signing of a Memorandum of Understanding (MoU) between SINTEF, Norway and Central Public Works Department (CPWD) for cooperation in the development of human resource capacity building and scientific research in the field of Recycling of Construction and Demolition (C&D) Waste in India.

Background:-

On 2nd October, 2014 Hon'ble Prime Minister launched "Swachch Bharat Mission", a massive mass movement that seeks to create a clean India.

Construction industry in India generates about 10-12 million tons of waste annually. There is a huge demand of aggregates in the housing and road sectors but there is significant gap in demand and supply, which can be reduced to a certain extent by recycling C&D waste. While some of the items like bricks, tiles wood, metal, etc. are re-used and recycled, concrete and masonry, constituting about 50% of the C&D waste is not currently recycled in India.

One thought on "MoU between SINTEF, Norway and CPWD in the field of Recycling of Construction and Demolition Waste"

VARUN KUMAR says:
December 31, 2015 at 4:02 pm

Popular News

"मेरा देश बदल रहा है...आगे बढ़ रहा है" #TransformingIndia
26 May, 2016

PM's address at "Ek Nayi Subah" Event on the completion of 2 Years of the Government
28 May, 2016

PM's address at the public meeting in Shillong
27 May, 2016

PM's remarks at Chabahar Connectivity event
23 May, 2016

PM's statement to the media during his visit to Iran
23 May, 2016

Latest News

Prime Minister's Keynote Speech at AGM of US India Business Council (USIBC)
07 Jun, 2016

Documents signed/finalized in the run up to the visit of Prime Minister of India to the US
07 Jun, 2016

Fact Sheet on the framework for the US-India Cyber Relationship
07 Jun, 2016

India-US Joint Statement during PM's visit to USA
07 Jun, 2016

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GOING FORWARD WITH CIRCULAR ECONOMY

SINTEF

Strategic focus areas

- Transform key industries in Norway throgh use of enabling technologies
- Establish new growth industries
- Participate in strategic sharing around disruption and new value chains

SINTEF

SINTEFs corporate strategic programme

Competence building + business development (2016-2018)

Corporate strategic programme

Competence development

- Enhanced cooperation between expert teams (economy, social sciences, technology and environment)
- New cross-disciplinary competence and skills

Business development

- Close cooperation and proximity to industry clusters
  - SINTEF Helgeland (Mo i Rana) – mining and process industry
  - SINTEF Tel-Tek (Herøya in Porsgrunn) – chemical industry
  - SINTEF Raufoss Manufacturing (Raufoss) – manuf. Industry
  - SINTEF Ålesund (Ålesund) – maritime sector
  - + others (blue and green sector)

Value proposition to the market

Framework for holistic analysis of new business models

- Material flow analysis
- Techno-economic evaluation
- Life-cycle analysis

Quantification of the potential contribution of new technology and new business models

- Profitability
- Environmental parameters
- Sustainability indicators

SINTEF has taken the initiative to establish a Center for Research Based Innovation (SFI) within Circular Economy

SINTEF

Centre for Research-based Innovation/ Senter for Forskningsdrevet Innovasjon - SFI

- A SFI is a long-term research effort where companies, research institutes and universities cooperate within a thematic area of high importance for our society
- Typical numbers for a SFI:
  - 8 years duration
  - 250-300 mill NOK in turnover (contribution from the research council of Norway typ. 50%)
  - 10 PhD's educated
  - 500 mill NOK in affiliated projects
- Requires international excellence
- International scientific cooperation
- Strong commitment from industry partners

"SFI Circular Economy – *Industrial value creation in a Green Economy"*

Initial/core partners:

SINTEF

NORD universitet

NTNU
Norwegian University of Science and Technology

We're aiming for success, which means going for quality and commitment from day one
-> Consortium partners are welcomed!

Contact person: Kjetil.Midthun@sintef.no

Technology for a better society

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