

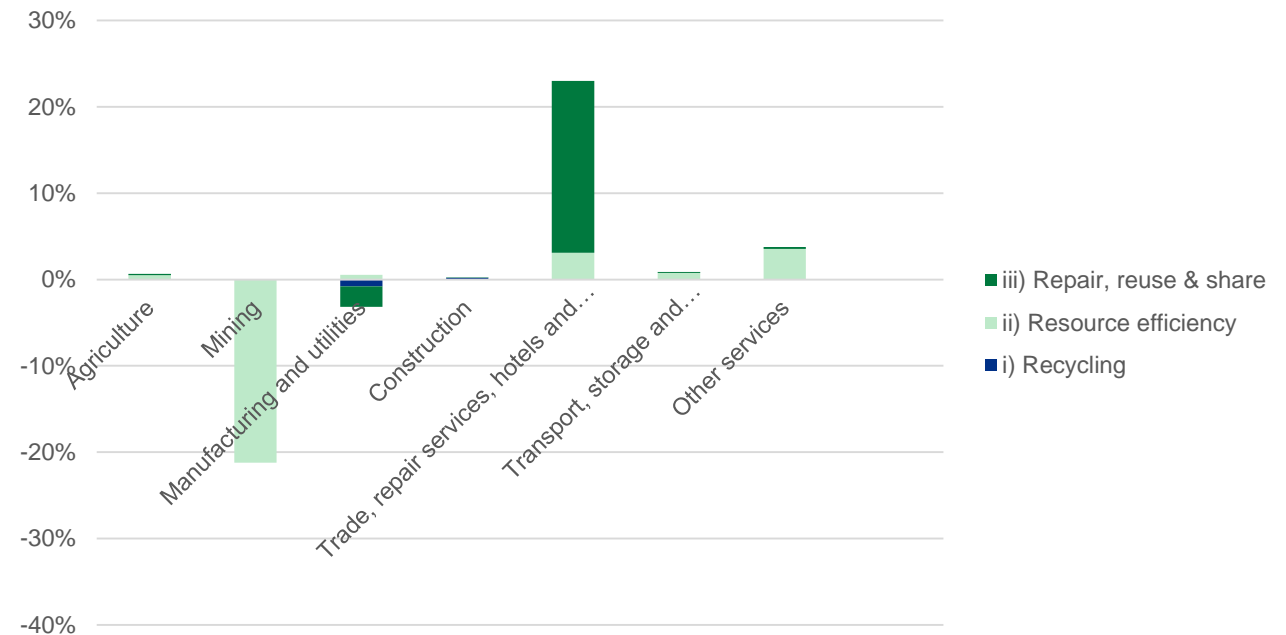
Relevante kunnskapsunderlag fra Sintef

Global sirkulærøkonomiverdiskaping og sysselsettingsanalyse

Et studie utført av SINTEF og NTNU, sammen med Den internasjonale arbeidsorganisasjonen (International Labour Organization – ILO), viser at den sirkulære økonomien ikke fører til arbeidsledighet, men faktisk kan et scenario med høyere sirkulær-økonomiske tiltak føre til 2,5% økning i arbeidsplasser innen 2030 sammenlignet med et "business-as-usual" scenario.

Gjennom disse sirkulær-økonomiske tiltak reduseres etterspørselen fra primærnæringer og etterspørsel fra tjenester økes. Nedgangen i arbeidsplasser i bergverksdrift og industri blir kompensert av veksten i arbeidsplasser i gjenvinningsindustrien og spesielt innen reparasjons- og andre tjenester, som er mer arbeidsintensive næringer

Endring i global sysselsetting ved implementering av et sirkulærøkonomisk modell



[Global Circular Economy Scenario in a Multiregional Input-Output Framework](#), Kirsten S. Wiebe* Marek Harsdorff Guillermo Montt Moana S. Simas Richard Wood, Environ. Sci. Technol. 2019, 53, 11, 6362

Studiet av potensiale for utslipps reduksjon ved sirkulærøkonomi

Report no. 2020:00416 - Open

Study of the potential for reduced greenhouse gas emissions and the transition to a low-emission society through circular economy strategies

Authors

Susie Jahren , Vibeke S. Nørstebø,
Moana S. Simas and Kirsten S. Wiebe

Client

ENOVA

SINTEF Industry
2020-04-30

- Mindre utslipp ved gjenvinning av stål og aluminium
- Fra et globalt perspektiv er det mindre utslipp om primærproduksjon av aluminium opprettholdes i Norge men nedbygges i andre land
- Potensiale for å redusere utslipp ved utnyttelse av biprodukter, men mangler på data på hvor mye
- Teknologiske, økonomisk og regulatorisk barriere identifisert

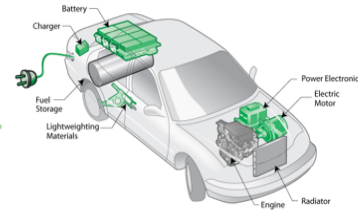
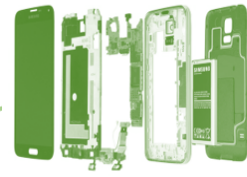
Prosjekteksempler

REE4EU. Recycling Rare Earth Elements for Europe



1. The EU/ SPIRE needs

EU needs: secure the supply of REE (CRM imported 97% from China) through valorization and re-use of waste streams, including recycling of post-consumer waste streams



4. How will this happen?

REE4EU will develop the **know-how** and **demonstrate** the concept on a **pilot level**. **Exploitation** on industrial scale either by the **consortium** or **technology transfer** to other potential **stakeholders** is needed.



2. The Project Solution

REE4EU is now developing, validating and demonstrating in **2 industrially relevant Pilots** an innovative **cost-effective** RE-extraction and a novel direct **RE alloy production route**. It will allow the recovery of **90% RE** from in-process wastes.



In-process waste



3. Value to Customers

Customers currently depends nearly **100%** on the **export** from **China**. When REE4EU solution will be available at industrial scale, customers will be able to **diversify** their **supply sources**, and buy REE from a **stable EU source**, **high environmental standards** and with a **fixed** and **reasonable price**.

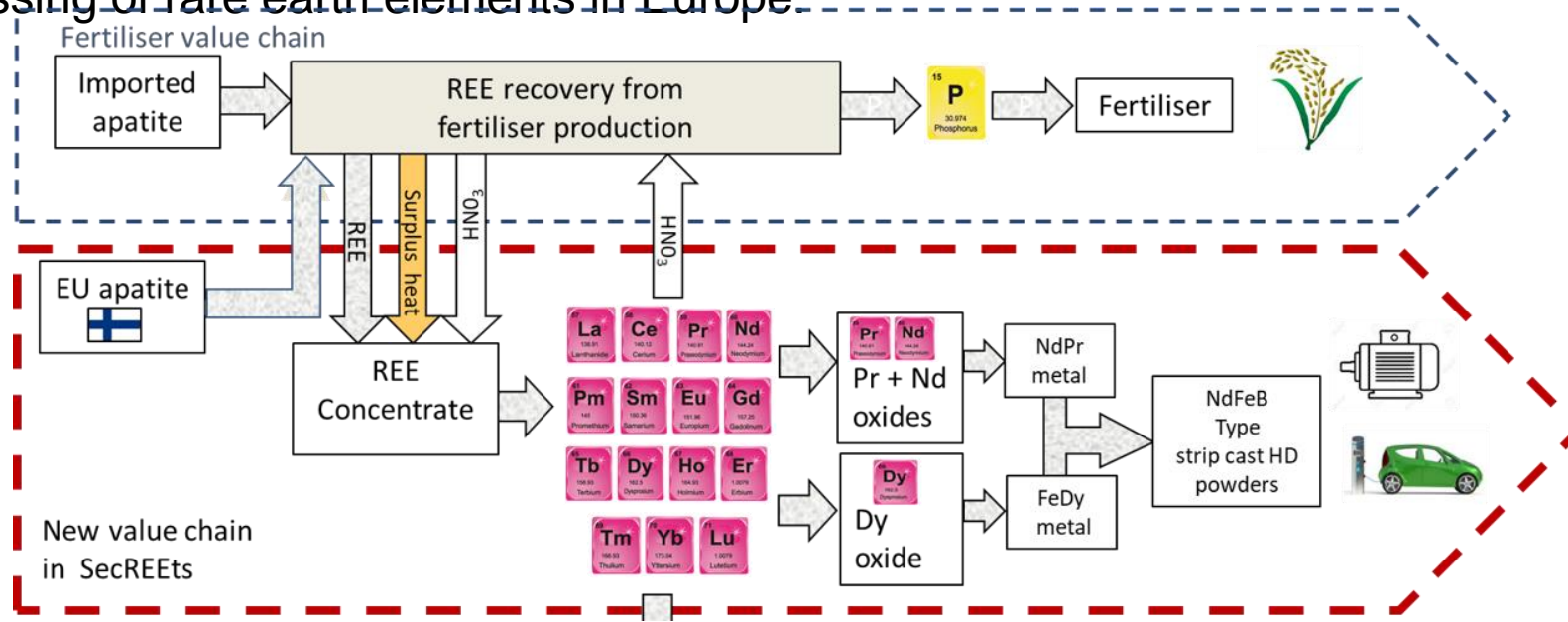
www.ree4eu.eu



SecREEs

SecREEs. Secure European Critical Rare Earth Elements

The research and innovation project SecREEs, is a partnership between REEtec, the Norwegian fertilizer giant Yara, and the research institute SINTEF, who heads and coordinates the project. The project has been granted EUR 12,5 million in support under the EU Horizon 2020 program. SecREEs was one of only four projects that won support in the latest round of grant awards where a total of 49 projects were competing. The goal of SecREEs is to ensure a sustainable, stable and safe extraction and processing of rare earth elements in Europe.

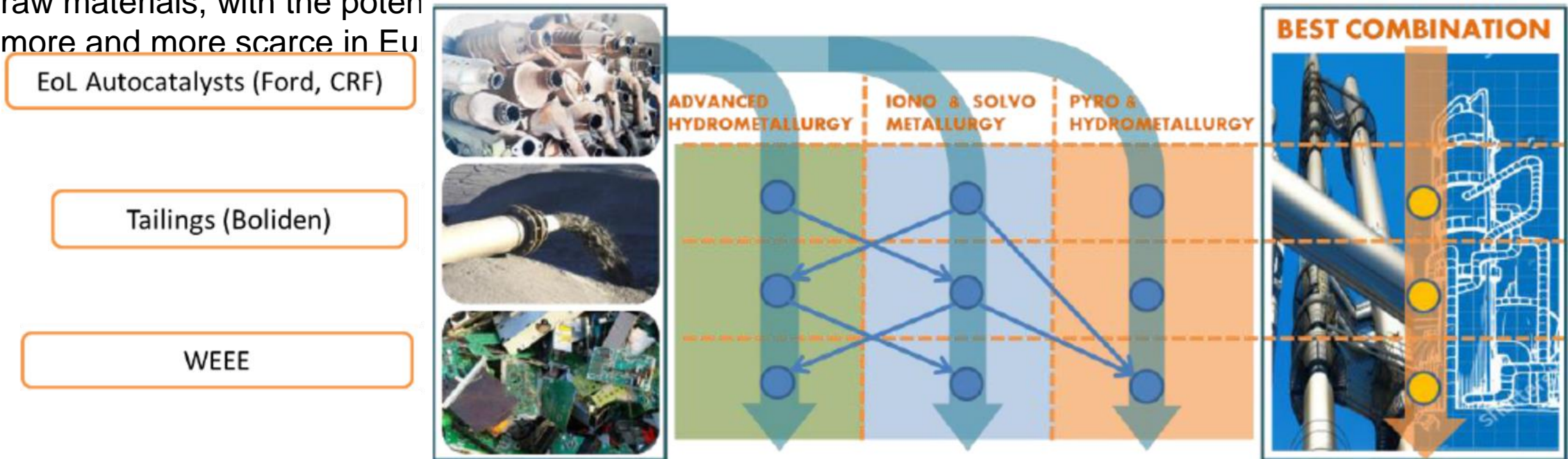


<https://www.sintef.no/siste-nytt/utnyttet-del-av-norsk-gjodsel-kan-bli-kjernen-i-elbilmotorer/>

Platirus. PLATInum group metals Recovery Using Secondary raw materials

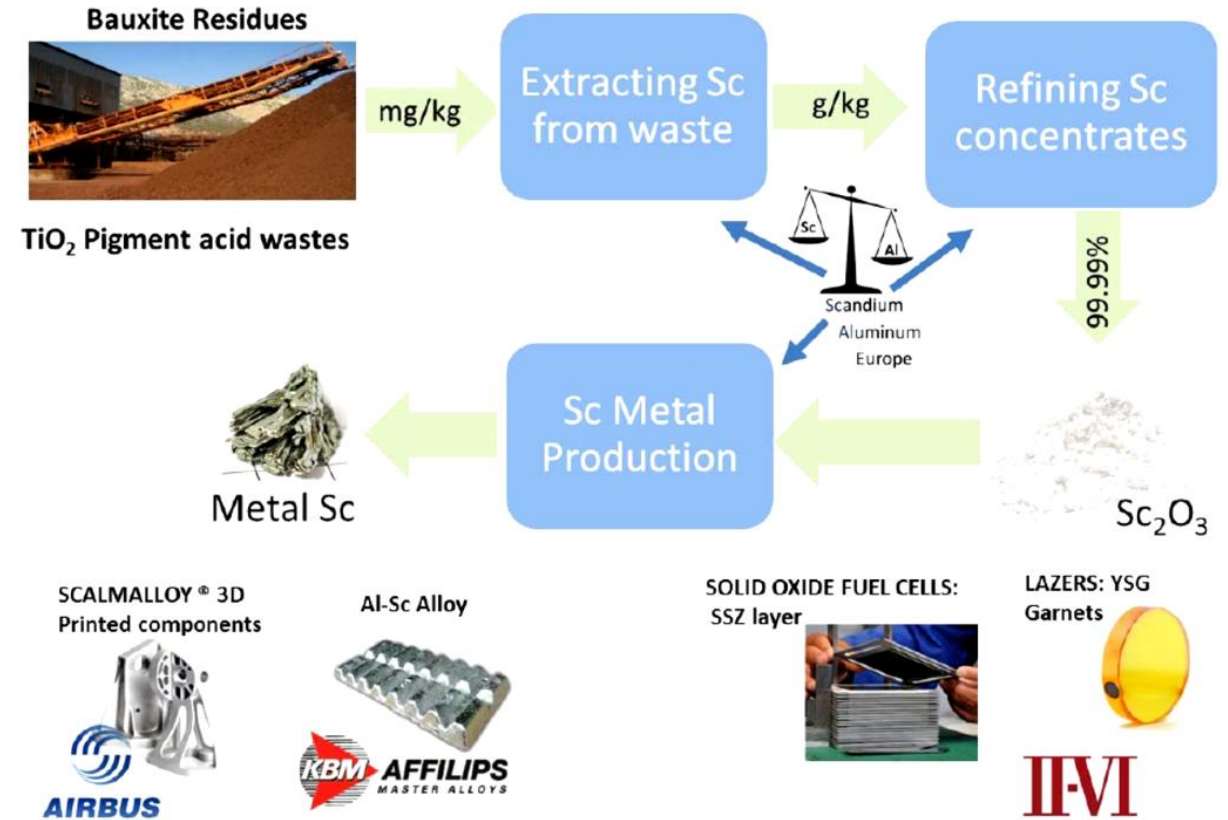
The PLATIRUS project aims at reducing the European deficit of Platinum Group Metals (PGMs), by upscaling to industrial relevant levels a novel cost-efficient and miniaturised PGMs recovery and raw material production process.

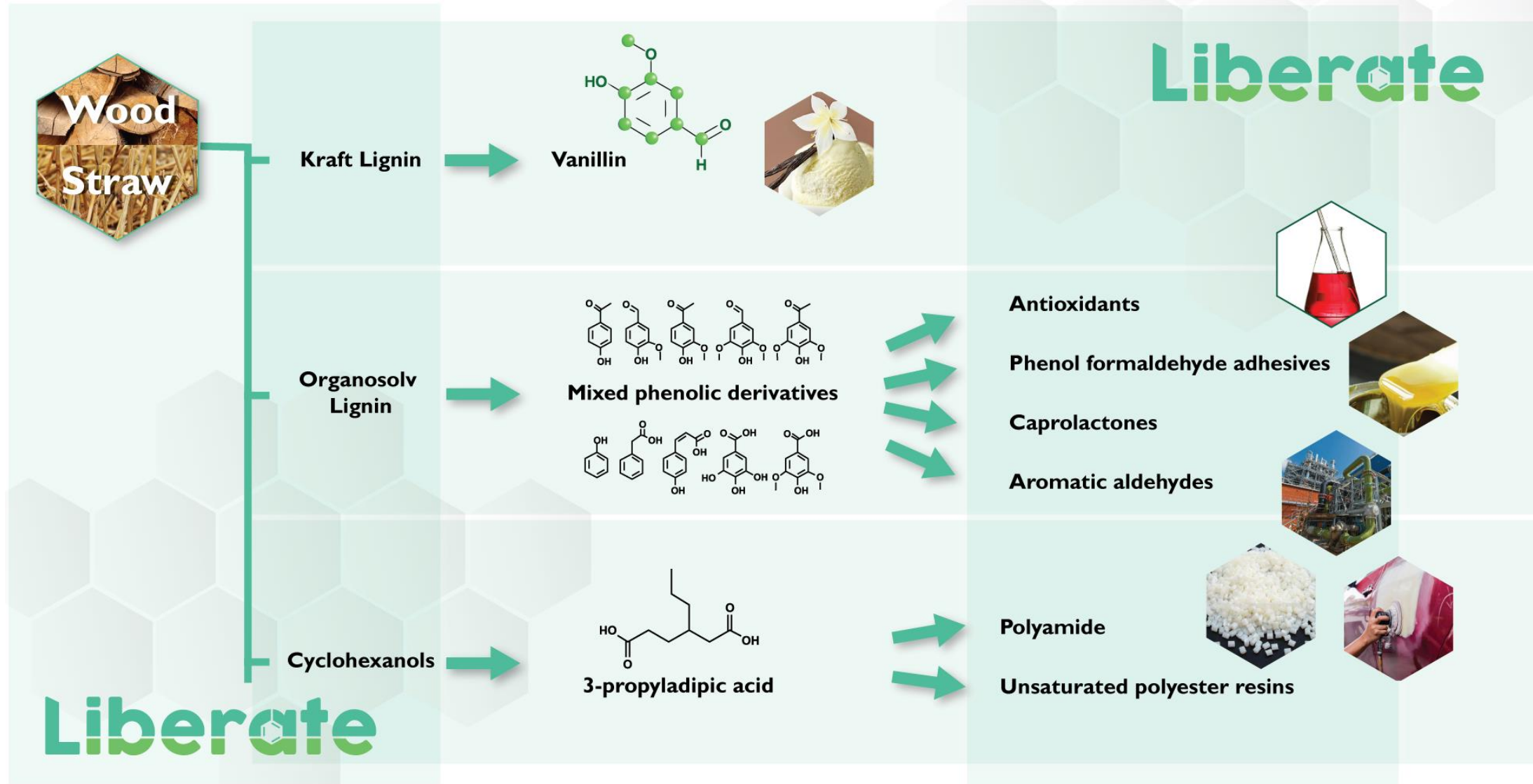
The targeted secondary raw materials will be autocatalyst waste, electronic waste (WEEE) and tailings and slags from nickel and copper smelters, opening-up an important range of alternative sources of these critical raw materials, with the potential to become more and more scarce in Europe.



ScAIE. Production of Scandium compounds and scandium-aluminium alloys from European metallurgical by-products

The main aim of ScAIE is the efficient exploitation of EU high concentration scandium containing resources including bauxite residues resulting from alumina production and acid wastes from TiO₂ pigment production to develop a stable and secure EU scandium supply chain to serve the needs of EU aerospace and high-tech industry. This will be achieved through the development of several innovative extraction, separation, refining and alloying technologies that will be validated in an appropriate laboratory and bench-scale environment to prove their technical and economic feasibility.





LIBERATE will deliver a pilot scale electrochemical plant to demonstrate the commercial opportunities of converting low cost lignin, extracted from biomass such as wood, in high value bio-sustainable chemicals. Currently, lignin is being burnt for energy purposes, but LIBERATE aims to change that. The project will extract basic chemicals for the European industry to produce valuable products such as polymers or antioxidants, currently coming from petrochemical industry.

Alpakka Circular Aluminium Packaging in Norway



In the project, we aim at increasing the recycling rate of aluminium packaging

waste, transforming the material into value-added products by combining innovations in return/collection systems, packaging design, and furnace operations for packaging melting/recycling operations, thereby preventing 40.000 tonnes of metal from going to waste incineration each year in Norway, which could be re-melted with 5% of the energy used for primary aluminium production (with associated reduction in CO2 emission). Instead,

the industrial partners aim at producing 30.000 tonnes of wrought aluminium

alloy and 10.000 tonnes of cast aluminium in the most environmental friendly

way. Alpakka will contribute to increased consumer awareness, as well as new jobs in both collection, design and recycling plants in Norway.



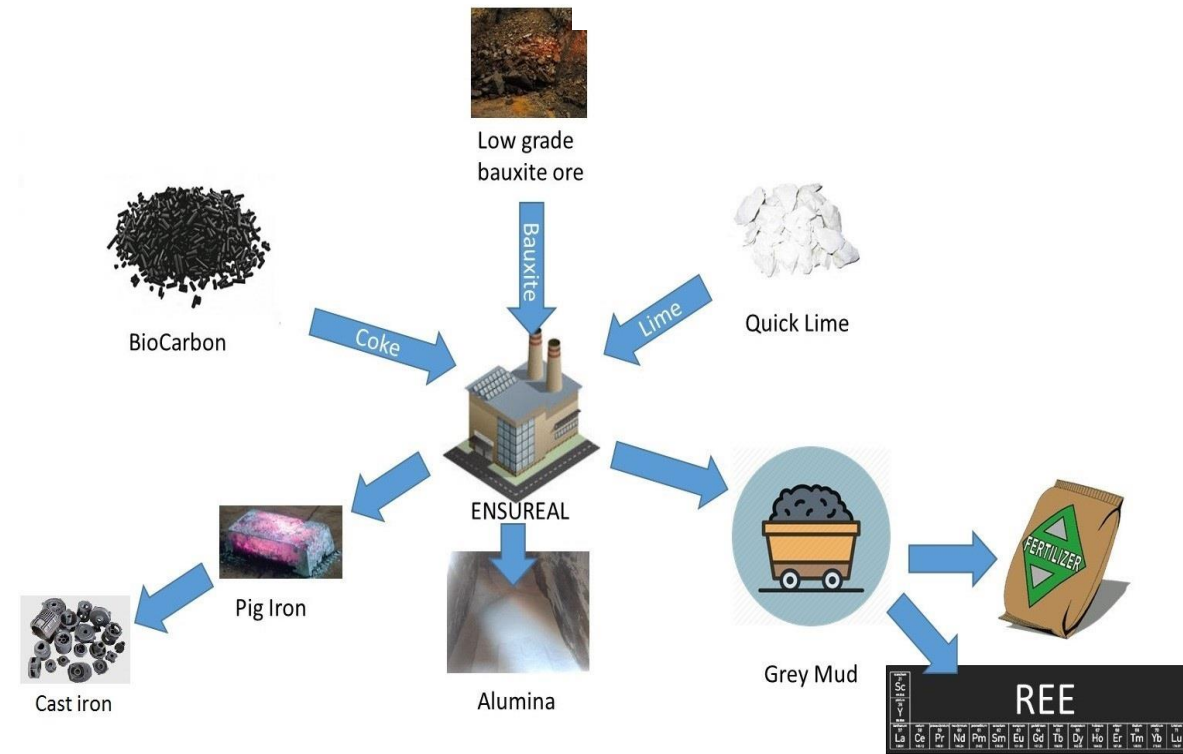


The ENSUREAL process is an investment in innovative processes that make the sector more sustainable, from the environmental and economic point of view:

- **Less dependent on raw materials** i.e. bauxite, as it can recirculate low quality bauxites from the process' tailings;
- **More flexible**, as it can use other sources of alumina;
- **Environmentally sustainable**, as it swaps “red mud” waste for “grey mud”, which is highly valorisable;
- **More energy efficient**, as it eliminates the need of treating “red mud” (3,5 million € savings in AoG’s case);

The process also is an investment in circular economy, as it integrates the iron and agriculture sectors, as well as taking into account other valorisation routes like the construction sectors and high added value applications of alumina.

Besides, other applications related to the construction and fire protection applications will be assessed.



Dare2c

Durable Aluminum Reinforced Environmentally-friendly Concrete Construction

The DARE2C project's main goal is to develop a new type of reinforced concrete that is more durable and more environmentally friendly than existing qualities. The aim is to replace about 50% of the clinker with less CO₂-intensive cement constituents. The new constituents shall be produced from waste materials. It is expected that the new concrete may be considerably lighter than today's concretes. Several tests using Bauxite Residue, BR, (also called red mud) as a replacement for regular clinker have been made. The first results are encouraging. The cement hardens well and the BR acts as a pozzolan.

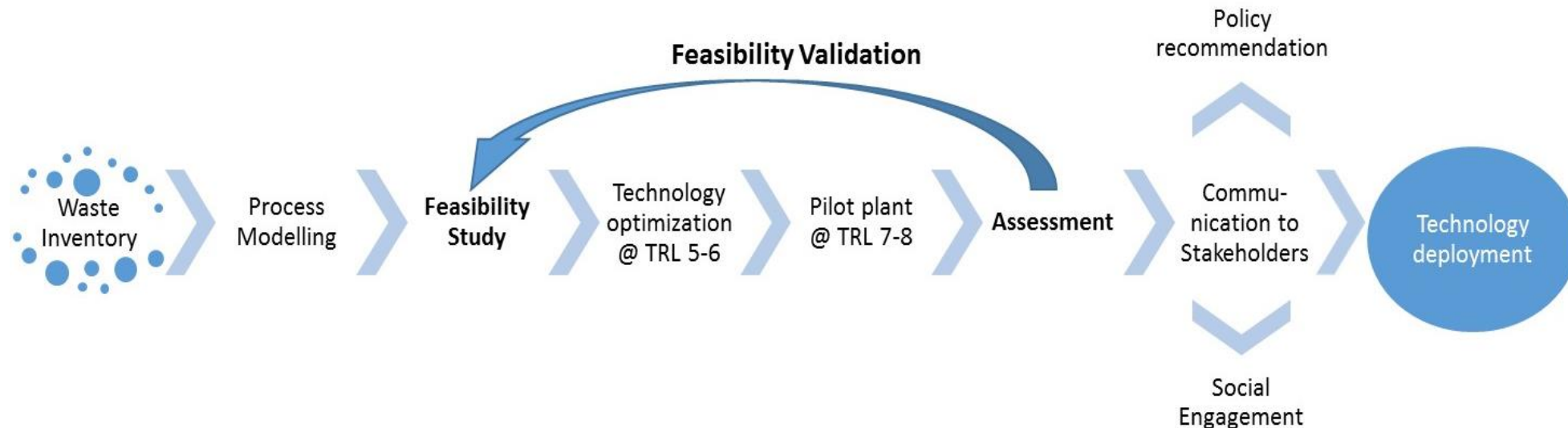
Another project objective is to use lightweight aluminium as concrete reinforcement. The high pH in regular concrete leads to strong aluminium corrosion. Tests have shown that BR together with other additives make a concrete with a sufficiently low pH and low aluminium corrosion.

<https://www.sintef.no/prosjekter/dare2c/>



RemovAL – Main Objective

Deliver and validate a **complete feasibility study** for each of the **4 alumina producers** and **the 1 legacy site owner** in the consortium detailing the optimum processing flow sheet for valorising the produced Bauxite Residue (BR) along with other industrial by-products, taking into consideration waste characteristics, logistics and potential for symbiosis with other plants in the geographical vicinity.



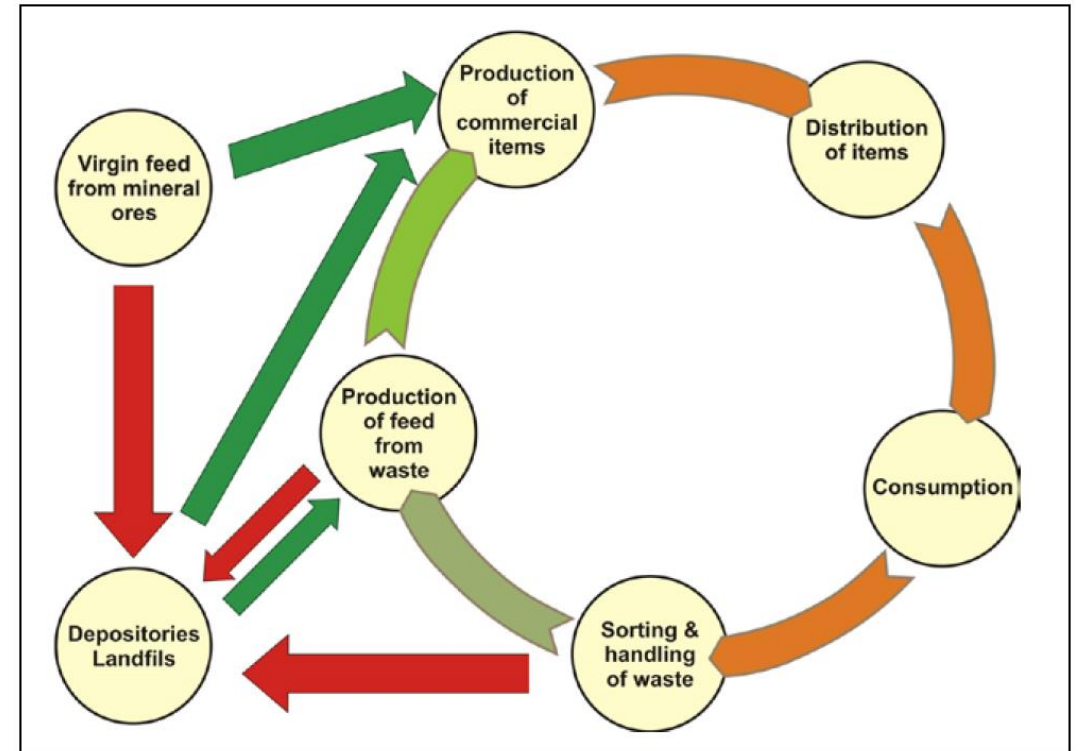
Example: Life cycle assessment & Value chain optimisation

PRICE

PRocess Industries in the Circular Economy - development of improved environmentally friendly processes and recoveries of strategic elements

To prepare the industrial partners to the circular economy:

- Increased recirculation and recovery of metals and minerals
- Recovery or removal of (low concentration) valuable elements and toxic components in process solutions
- Electrochemically enhance separation of elements present in trace concentrations
- Value chain assessment to evaluate the impact of circular economy



Sirkulær økonomi Orkanger - forprosjekt

- Næringshagen i Orkdalsregionen: mål på å etablere sirkulær økonomi og bio-sirkulært industrisenter på Orkanger Industriområde (Grønnøra) -> Thamsklyngen





VALORISING METHANE RESOURCES

C123 Methane oxidative conversion and hydroformylation to propylene

Propylene production is classified as the 4th largest emitter of greenhouse gases among the major chemical compounds. As the polypropylene market is huge and still growing, it is essential to find alternatives to current, energy-intensive production processes to meet the European environmental challenges.

C123 will validate currently largely available and unexploited methane resources by an efficient and selective transformation into C3 hydrocarbons, particularly aiming at propylene. The breakthrough innovation is that propylene will not be produced via the very energy intensive steam cracking process, but rather by the less energy demanding and more selective buildup from smaller molecules.



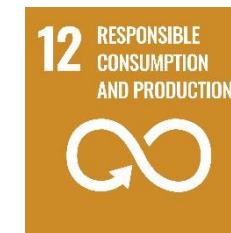
Ambitions

Bringing a new perspective to waste handling and urban mining, through the adoption of institutional lenses

Advancing innovations in the ways mineral needs are sourced and supplied

Promoting better practices for managing waste resources, so that fewer resources end up either in landfills or incinerated

Theorizing institutionalisation of practices in the paradigm of green shifts



Project owner: Nord Univeristy
Project period: 2020-2023
Budget: 15 MNOK

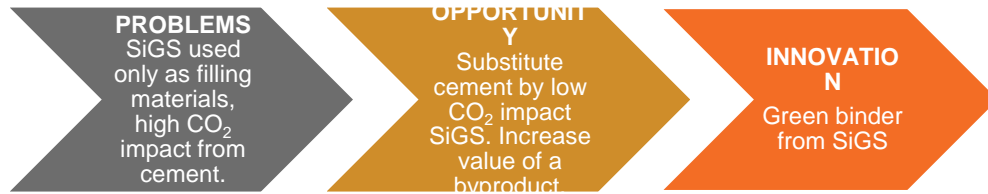
Project with financial support the Norwegian research council, MILJØFORSK



ValSiGS Improved Sustainability for Concrete through SiGS Valorization

Main goal

Valorization of silicomanganese green stone through development of an alternative binder that can offer partial replacement of cement



Project owner: ERAMET Norway
Project leader: SINTEF Helgeland
Project period: 2020-2022

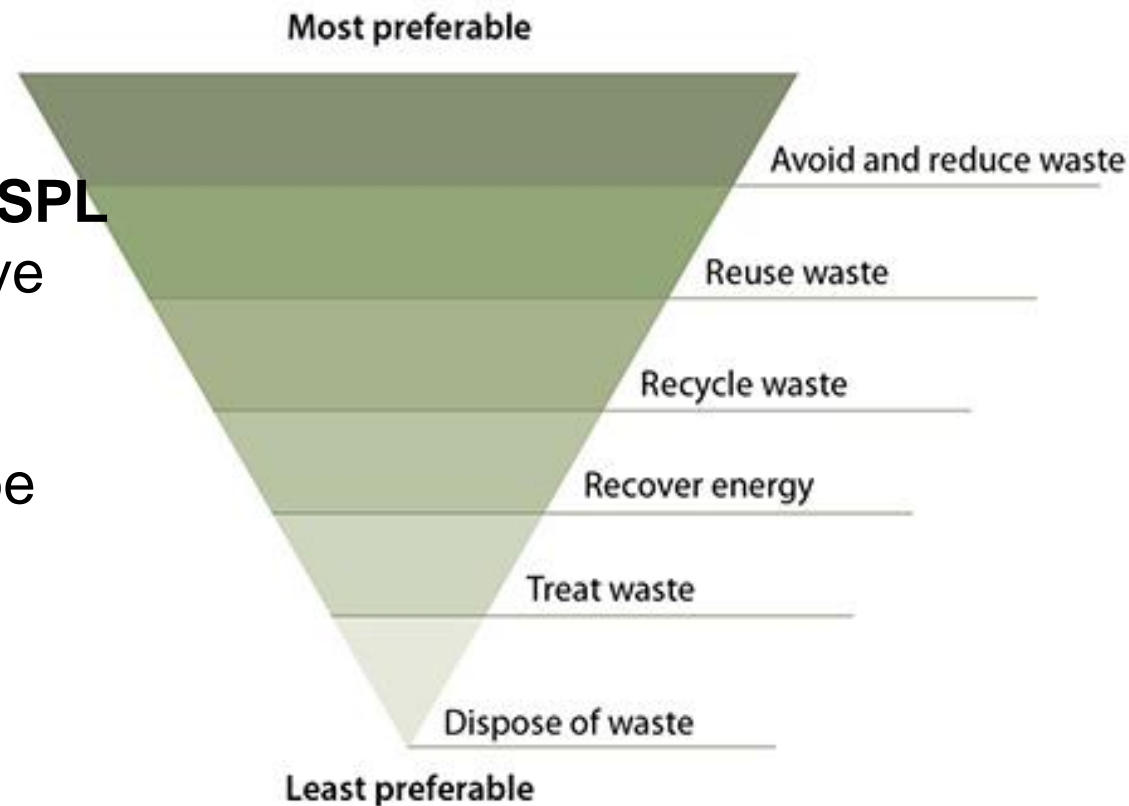
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No Deposition of Spent Potlining (NoDeSPoL)

Creating valuable products from hazardous SPL and avoid deposition. The project aims to move SPL up the pyramid to recycle or reuse waste. Thermal vacuum treatment will be used to treat first-cut spent pot lining. The main product will be graphite material.



Project owner: Alcoa Norway ANS
Project manager: SINTEF Helgeland
Project period: 2020-2022
Contact: Per Anders Eidem,
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Foto: Ada Jervelf, SINTEF Helgeland

Reducing the price of biocarbon with a circular economy approach

- Full utilization of main and biproduct flows
- Energy integration
- Local and efficient logistics

Project owner: Elkem Rana
Project leader: SINTEF Helgeland
Project period: 2019-2021

Project with financial support from regional research funds in Northern Norway

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Mo Industripark as





COLLECTION

Development of an innovative collection system able to identify the quantity and quality of packaging deposited in the containers and to automatically inform waste transport companies.



TRANSPORT

Optimization of the transport process of packaging waste from the urban containers to the sorting plants, decreasing the final price of recovered plastic by saving fuel and transport costs.



SORTING

Improvement of sorting technologies to achieve a better separation of different types of plastic in treatment plants, including multilayer and multi-material packaging.



REPROCESSING

Development and validation of added-value applications and products from the plastic packaging waste previously sorted leading to a better valorization of these materials.