Industrial minerals sector at the core of circular economy

Industrial Minerals

Together for Sustainable Future

IMA Europe

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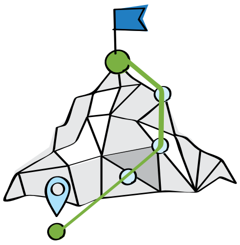
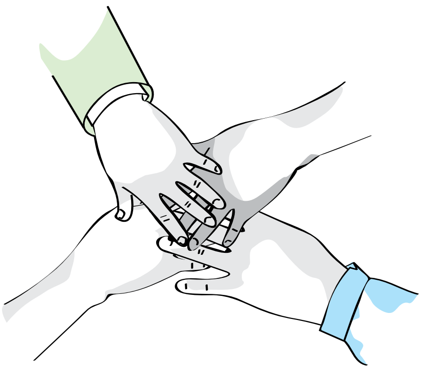
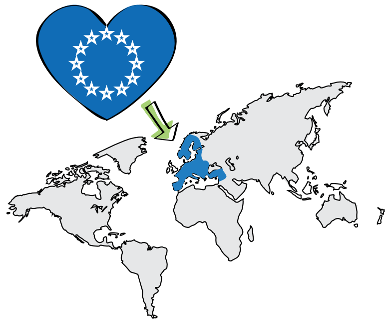
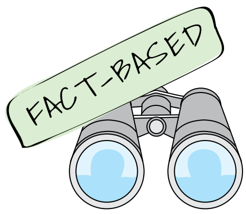


Mission

To provide a forum for members to discuss and tackle non-competitive issues of common concern and support the development and reputation of the sector at the heart of a sustainable Europe.

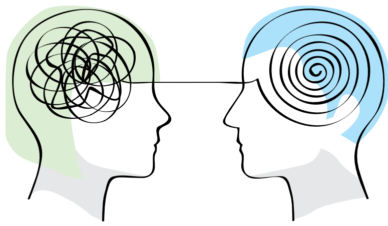






Vision

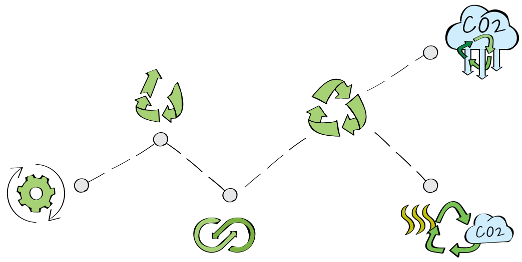
A reference organisation based on science and fact-based communication.



Executive summary

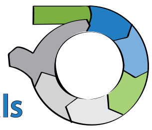
Over the years, the circularity has gained momentum from a policy viewpoint and has driven more business operators and sectors towards rethinking existing practices into more innovative transition pathways. The transition has created a momentum to, 1. assess internal/external resource flows by connecting with value chain stakeholders to map production and consumption existing practices and rethink, co-create and test new collaborative trends and innovative solutions.

As the minerals sector is enabling so many value chains, and upon some internal reflection, we have put together this brochure, that aims to be a first building block of our commitment to embrace and enable more circular practices based on the three building blocks below:



1

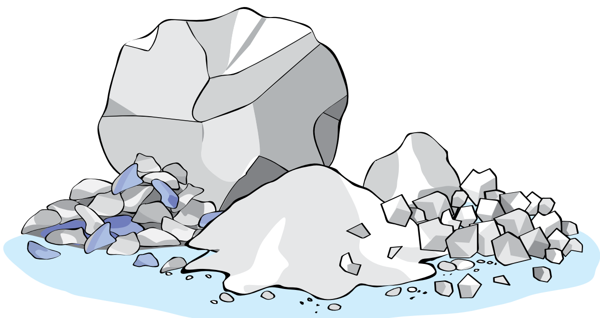
Define Circularity conditions for minerals



2

Agree on five Mineral Business models contributing to circularity:

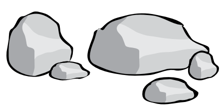
- **Optimized and symbiotic RM supply**
- **Resource recovery**
- **Product / Material Life extension**
- **Material as a service**
- **Industrial Symbiosis**



3

Map 23 practices and projects thanks to minerals are contribution to circularity at various resource stages

By Inspiring IMA members and our value chain stakeholders, we commit to follow up closely the EU policy developments and enable more practices and projects that contribute to the principles of circularity internally or along the value chains we operate.

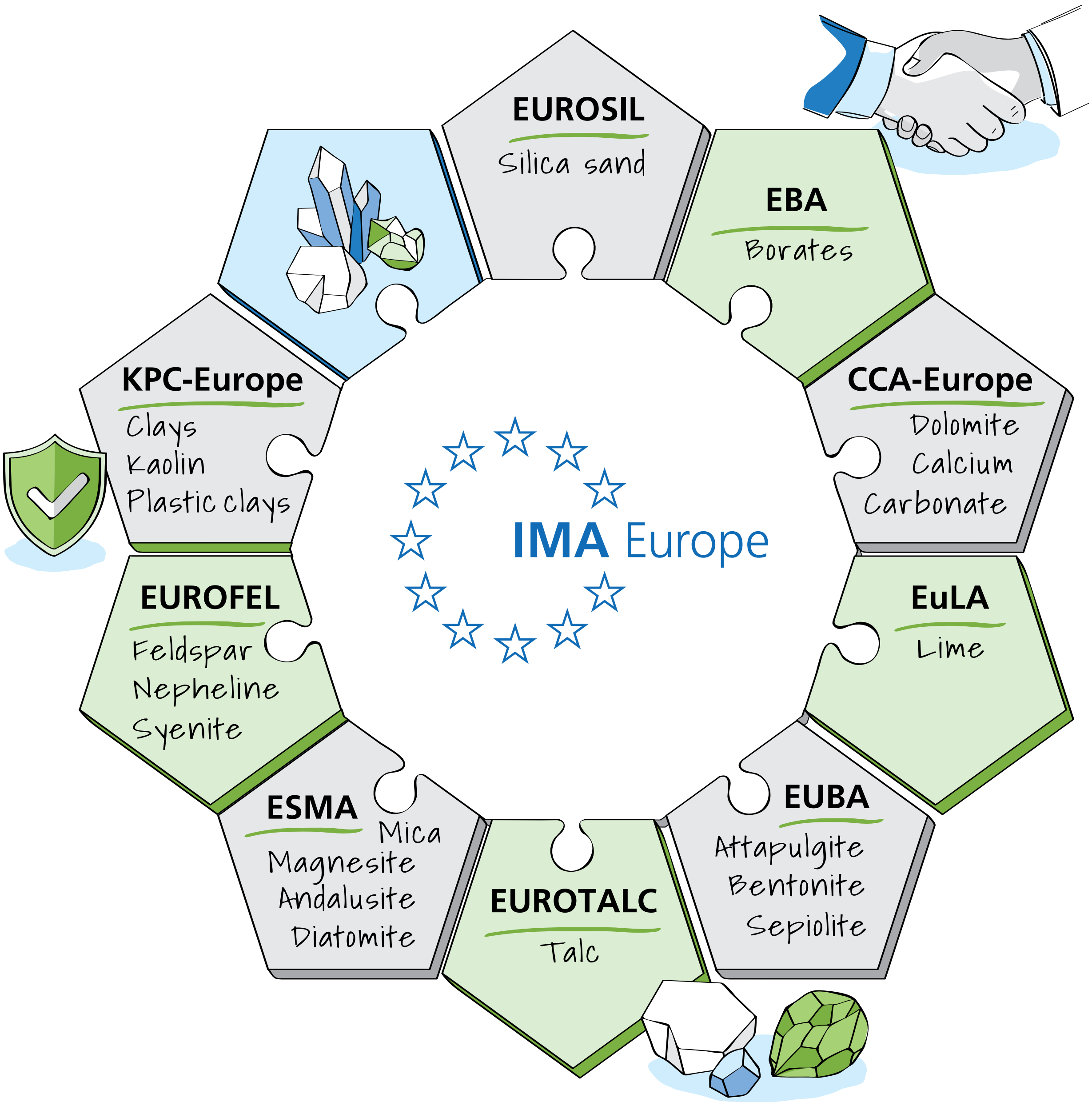


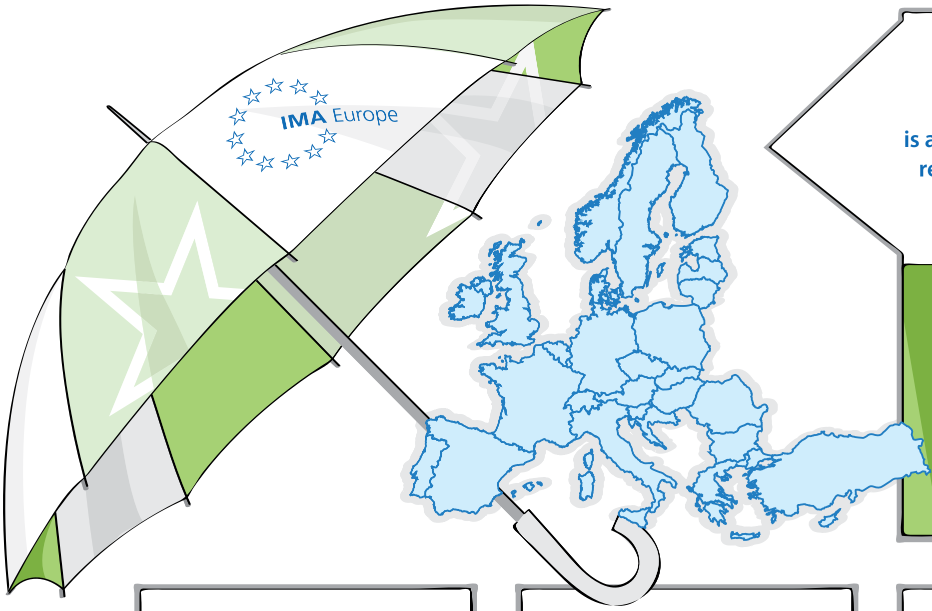
1. Introduction of mineral sector

Industrial minerals are geological materials which are mined for their commercial value. They are not fuel (fuel minerals or mineral fuels) and are not sources of metals (metallic minerals). They are used in their natural state or after beneficiation either as raw materials or as additives in a wide range of applications.

The most known industrial minerals are: Andalusite, Attapulgite, Bentonite, Borate, Calcium Carbonate, Clays, Limestone, Kaolin, Plastic Clays, Silica sand, Diatomite, Dolomite, Feldspar, Magnesite, Mica, Sepiolite, Talc.

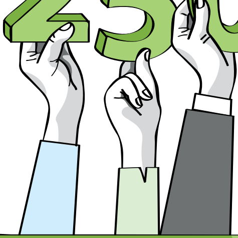
Industrial Minerals Association Europe (IMA-Europe) is an umbrella association representing the interests of various minerals represented within dedicated mineral.



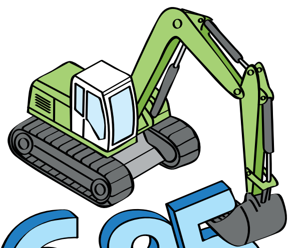


The Industrial Minerals Association in Europe (IMA-Europe) is an umbrella organization representing the interests of the minerals industry in various countries.

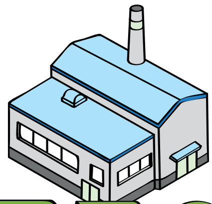
IMA-Europe members operate in:
EU27 + UK
+ Norway
+ Turkey
+ Switzerland



250 member companies



685 mines and quarries



750 processing plants

180 million tonnes of minerals produced per year

42,500 people employed in 28 European countries (30 million jobs in downstream industries)

€14 billion contribution to the European economy

2. Mineral uses

The most known industrial minerals are: Andalusite, Attapulgite, Bentonite, Borate, Calcium Carbonate, Clays, Limestone, Kaolin, Plastic Clays, Silica sand, Diatomite, Dolomite, Feldspar, Magnesite, Mica, Sepiolite, Talc.

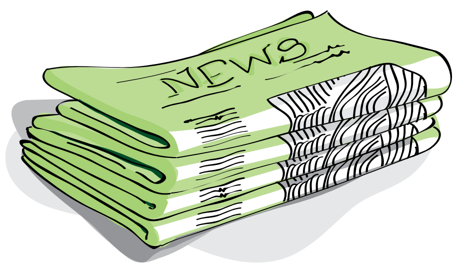
Thanks to the multifaceted nature of minerals, they are part of every-day applications. Multiple minerals are necessary in the same application to ensure adequate functionality.

Did you know that?

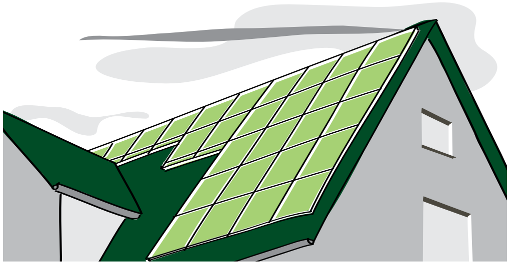
GLASS: 100% minerals
Silica sand, Dolomite, Calcium carbonate, Lime, Feldspar, Borate.

PAINT: 50% of minerals
Calcium carbonates, Quartz, Cristobalite, Plastic clay, Talc, Bentonite, Diatomite, Mica, Perlite.

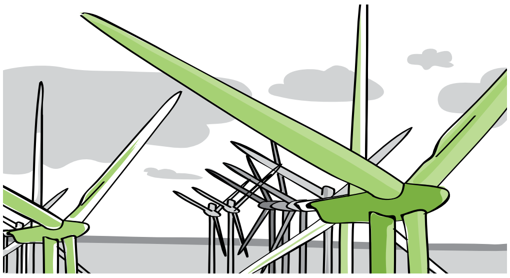
CERAMICS: 100% minerals
Feldspar, Clay & Kaolin, Lime, Talc, Silica.



PAPER: up to 50% minerals
Calcium Carbonate, Talc, Kaolin, Bentonite.

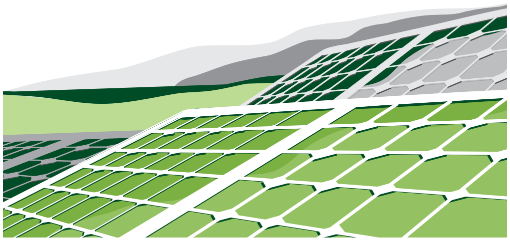


HOUSE: up to 150 tonnes of minerals
Cement (Clay, Lime, Silica sand), Plaster & Plasterboard (Gypsum, Hydrated lime, Calcium carbonate), Insulation (Perlite), Ceramics, Bricks & Tiles, Glass, Paint, etc.

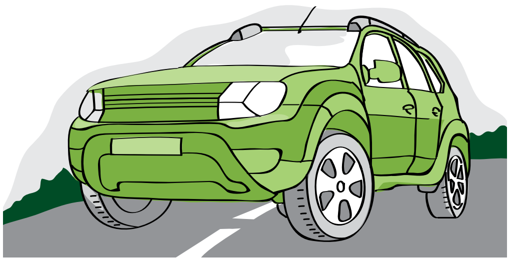


WIND MILL BLADES: up to 95% of minerals
Advanced plastic & Fiberglass (Silica sand, Limestone, Soda ash, Borax, Feldspar, Nepheline Syenite, Magnesite, Kaolin, Clay),

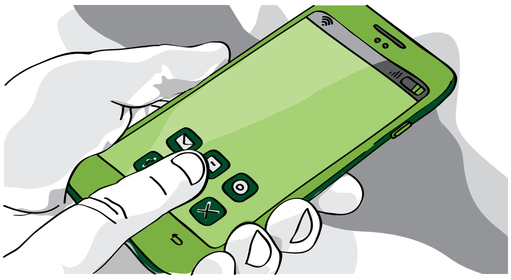
WIND MILL STRUCTURE:
Steel (Limestone, Bentonite, Silica sand), Concrete (up to 85% of minerals, Lime(stone)).



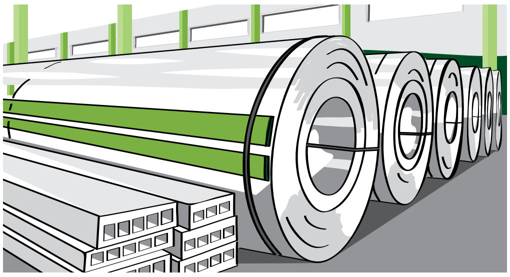
SOLAR CELLS: up to 95% of minerals
Quartzite, Boron.



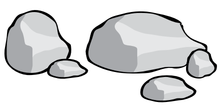
CAR: up to 100-150 kg of minerals
Rubber (Talc, Calcium carbonate, Baryte), Plastics (Talc, Calcium carbonate, Kaolin, Silica sand, Wollastonite), Glass (Silica sand, Dolomite, Calcium carbonate, Lime, Feldspar, Borate), Casting (Bentonite, Silica sand, Wollastonite).



SMARTPHONE: up to 60% of minerals
Cover (resistant, lightweight, fi re-proofed and recyclable Carbonates, Mica, Talc), Battery (Calcium carbonate, Silica sand, Clays), Reinforced Steel (Silica sand, Andalusite, Lime), Glass (47 g Silica sand).



STEEL
The amount of lime required for steelmaking varies, but a typical range is 23–50 kg of lime is needed per ton of steel. This lime (a fluxing agent) is crucial for removing impurities like sulfur from molten steel. The exact quantity depends on the specific steelmaking process, the quality of the inputs, and the desired final steel product.



3. Circular Economy challenge: the policy

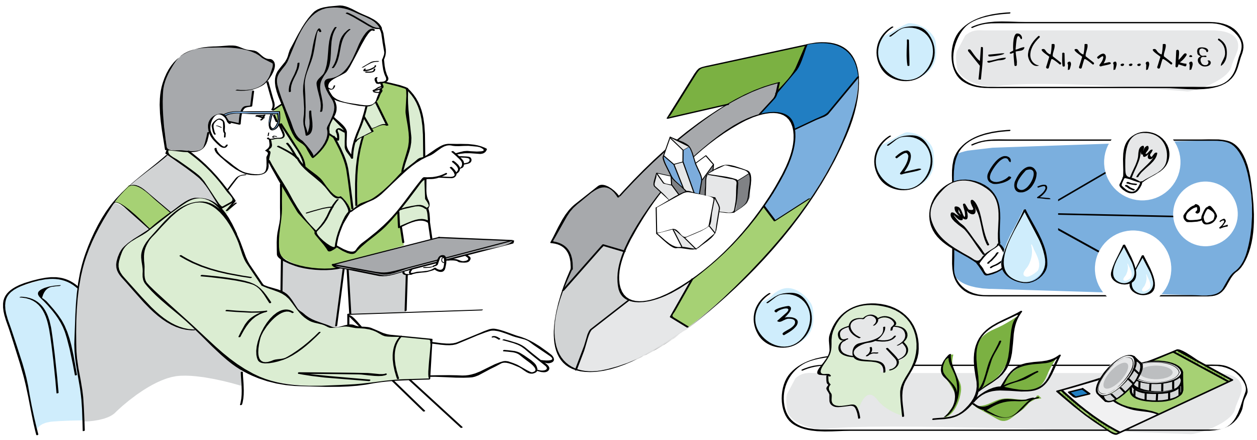
The circular economy concept is not new, but the 2015 EU policy initiatives have put it back in the focus of directly and indirectly concerned value chain stakeholders. A group of researchers have conducted two extensive literature reviews (Kirchherr et al 2017; 2023) and have identified that in the past decade, use of the circular economy (CE) concept by scholars and practitioners has grown steadily.

Kirchherr et al. (2017) found that the CE concept is interpreted and implemented in a variety of ways. While multiple interpretations of CE can enrich scholarly perspectives, differentiation and fragmentation can also impede consolidation of the concept for real implementation purposes. Some scholars have discussed these trends in context-specific cases, but no large-scale, systematic study has analysed whether such consolidation has taken place across the multiple investigated fields or value chains. 221 recent CE definitions analyzed by Kirchher et al (2023), summarize some of their findings intro multiple clusters:

1. The concept has seen both consolidation and differentiation in the past five years;
2. Definitional trends are emerging that potentially have more meaning for scholarship than for practitioners in the field;
3. The scholars increasingly recommend a fundamental systemic shift to enable CE, particularly within supply chains;
4. Sustainable development is frequently considered the principal aim of CE, but questions linger about whether CE can mutually support environmental sustainability and economic development.

Last finding, recent studies argue that CE transition relies on a broad alliance of stakeholders, including producers, consumers, policymakers, and scholars as enablers. This study contributes an updated systematic analysis of CE definitions and conceptualizations that serves as an empirical snapshot of current scholarly thinking.

This literature review explores the developments and concept evolution but at the same time most concepts refer to the finished products and their circularity. As none of the definitions was applicable to the minerals sector, the Industrial Minerals sector experts set a working group to respond to these policy challenges and develop a sector definition.



Circular economy pillars

Raw material valorisation

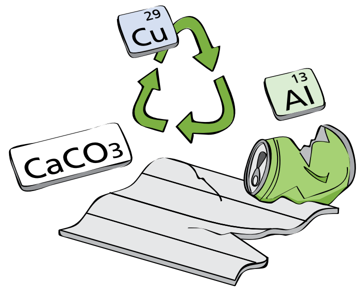
Value creation

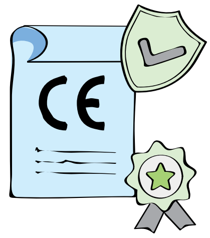
Waste avoidance

Waste reduction

Cost of transport

Viability of circular solutions





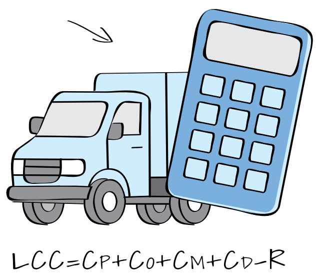
Policy drivers

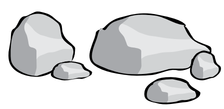
Costly landfilling

Forbid incineration

Zero waste

Waste hierarchy





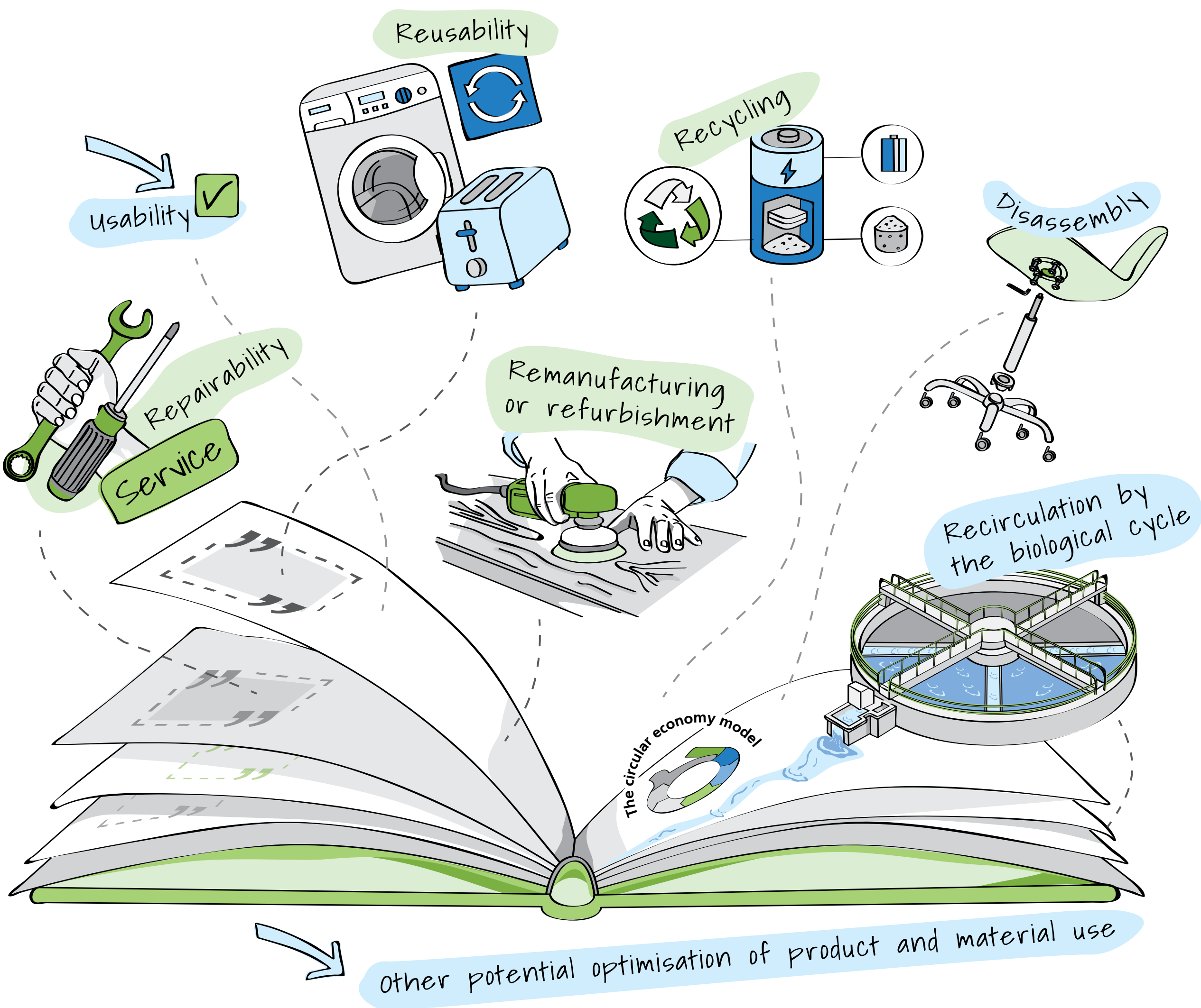
4. Circular economy definitions

Circular economy

Is a system in which the value of products, materials and other resources in the economy is maintained for as long as possible, enhancing their efficient use in production and consumption, thereby reducing the environmental impact of their use, minimising waste and the release of hazardous substances at all stages of their life cycle, including through the application of the waste hierarchy.

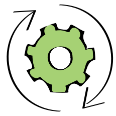
The European circular economy principles are:

i. usability;
ii. reusability;
iii. repairability;
iv. disassembly;
v. remanufacturing or refurbishment;
vi. recycling;
vii. recirculation by the biological cycle;
viii. other potential optimisation of product and material use.

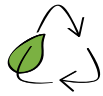


Recovery

The technically feasible and economically viable recovery of nutrients, compounds, materials, parts, components or even products (depending on the organization) at the same level of functional equivalence through reuse, repair, refurbishment, repurposing, remanufacturing, recycling or biodegrading. Excludes energy recovery from waste and any biological cycle waste that is not sustainably grown and replenished or regrown through natural cycles after extraction.



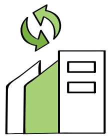
Recycling



Any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations.

Remanufacturing

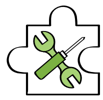
Industrial process by which an item is returned to a like-new condition from both quality and performance perspectives. This process can apply to items that have been previously sold, leased, used, worn, or even non-functional products or parts. A like-new condition can also be described as "same-as-when-new" or "better-than-when-new".



Repair

Restore a product to a condition needed for the product to function according to its intended purpose.

Reparability



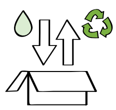
The ease with which a product can be repaired and restored to a functional state. This includes the availability of spare parts, the simplicity of disassembly, and the accessibility of repair information.

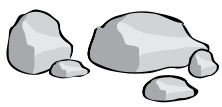
Resource efficiency

Ratio of economic output to material consumption, emphasizing the importance of reducing material use while maintaining economic growth.

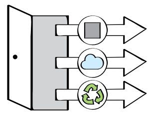
Resource inflows

All materials, substances, and products entering an organisation's operations or value chain for the purpose of production, consumption, maintenance, or service delivery. This includes virgin and secondary raw materials (including, energy carriers used for material purposes), semifinished goods, and components, regardless of whether they are purchased, reused, or internally recovered. The scope of resource inflows reflects the organisation's dependency on natural resources and its potential impact on resource efficiency and circularity. Resource that leaves the undertaking's facilities.



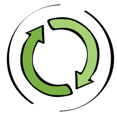


Resource outflows



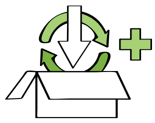
All materials, substances, and products that leave an organisation’s operations or value chain as a result of its activities, including outputs such as products sold, by-products, waste, emissions, and materials intended for reuse, recycling, or disposal.
This encompasses both intended outputs (e.g. finished goods) and unintended outputs (e.g. waste), and reflects the organisation’s efficiency in resource use, waste prevention, and circularity performance. Resource that leaves the undertaking’s facilities.

Reuse



Any operation by which products or components that are not waste are used again for the same purpose for which they were conceived. This may involve cleaning or small adjustments, so it is ready for the next use without significant definition.

Secondary resources



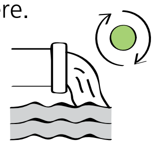
Materials previously used (secondary) and that are recovered from waste streams and reintroduced into production cycles, reducing reliance on primary resources and minimizing environmental impact.

Waste stream

A particular mass flow of waste from a process, activity, facility or industry often grouped by material (e.g., plastic, metal, organic), origin (e.g., household, industrial), or hazard (e.g., hazardous vs. non-hazardous).

Wastewater

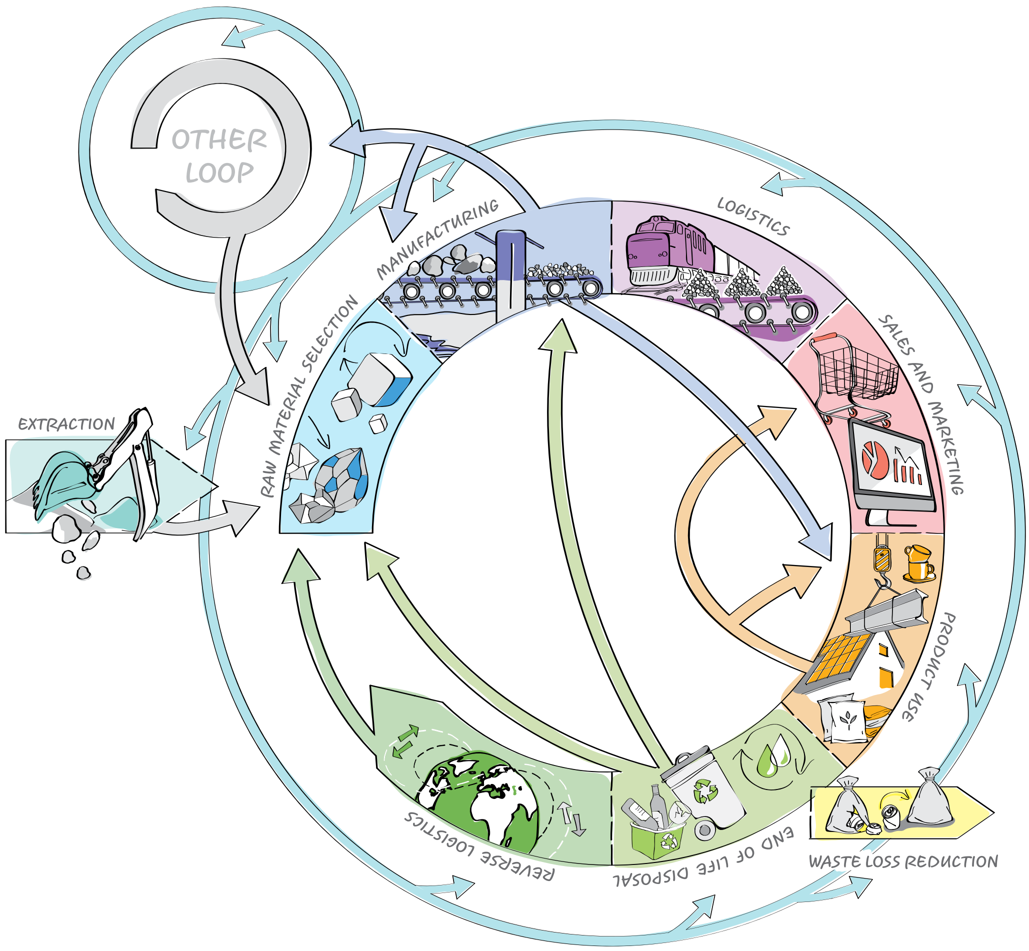
Water which is of no further immediate value to the purpose for which it was used or in the pursuit of which it was produced because of its quality, quantity, or time of occurrence. Wastewater from one user can be a potential supply to a user elsewhere. Cooling water is not considered to be wastewater.



Water (recycled and reused)

Water and wastewater (treated or untreated) that has been used more than once before being discharged from the undertaking’s or shared facilities’ boundary, so that water demand is reduced. This may be in the same process (recycled) or in a different process within the same facility (own or shared with other undertakings) or in another of the undertaking’s facilities (reused).

5. Circular economy definition for minerals sector



Circular economy is an economical model focusing to optimize the use of extracted materials from the earth, preserving the value of materials / products at a high level and minimizing waste in the value chain. This model requires an integrated management of resources[1] (primary and/or secondary raw material, energy, heat, water, CO_2[2],…) along all the life cycle stages by all the value chain stakeholders when technically, environmentally and economically practicable'.

Circularity for minerals

= an economically viable model[3];

= requiring an integrated management of resources[1] along all life cycle stages;

= carried out when technically, environmentally and economically practicable.

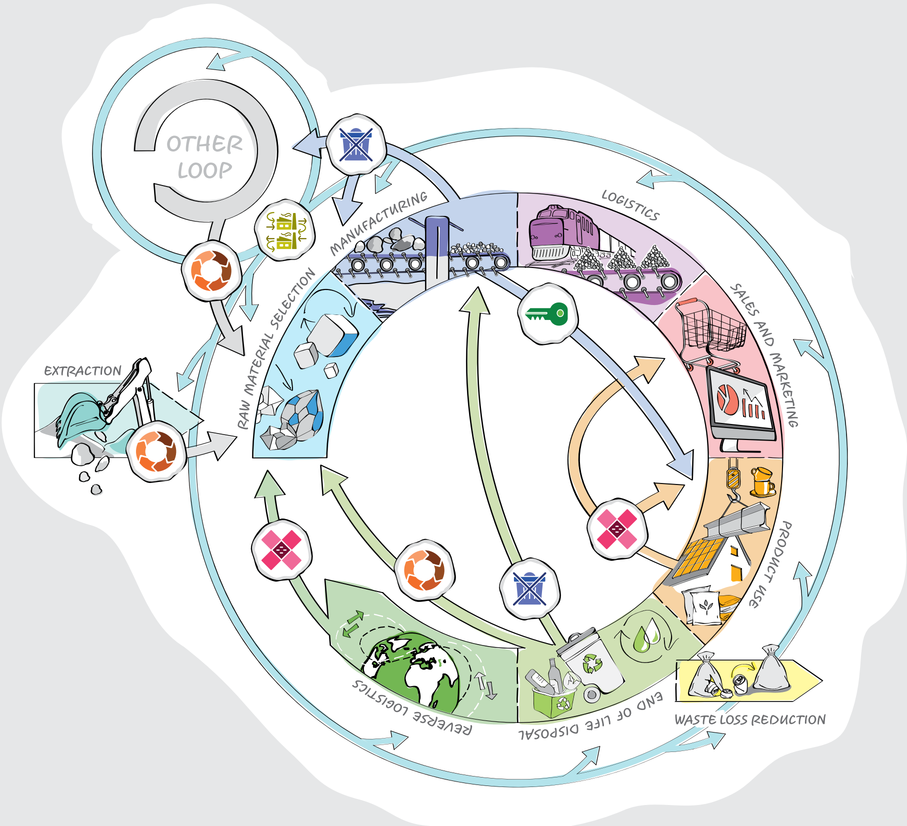
[1] 'Resources' covers: materials (primary/secondary), energy, heat, water and CO_2,

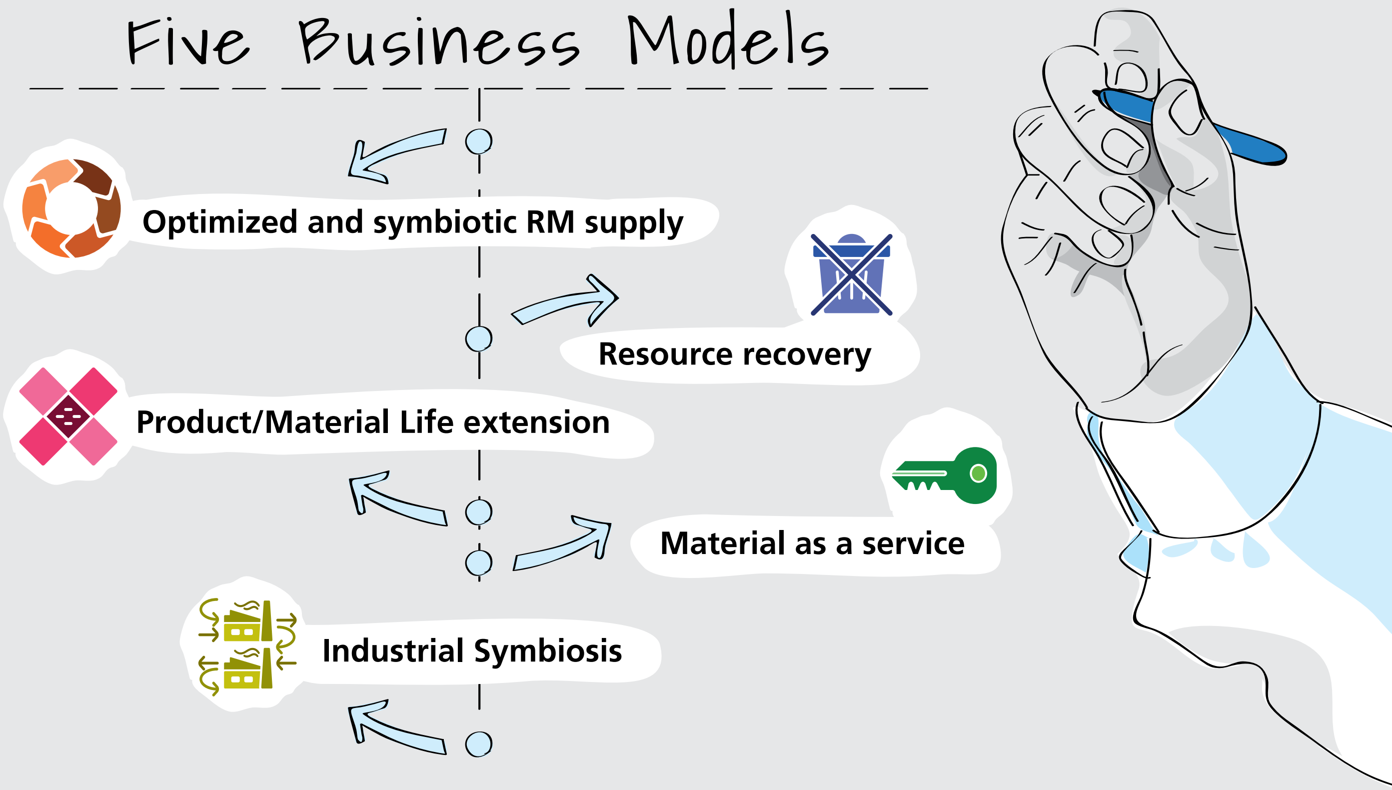
[2] CO_2 is referring to CCU.

[3] Transportation distance can be a circular economy bottleneck for minerals (aggregates 50 km, minerals 200 km by truck).

6. Business Models for CE solutions for minerals and applications

Five business models have been identified as applicable and directly contributing to circular economy practices and objectives in different life stages of mineral raw materials or products containing minerals.

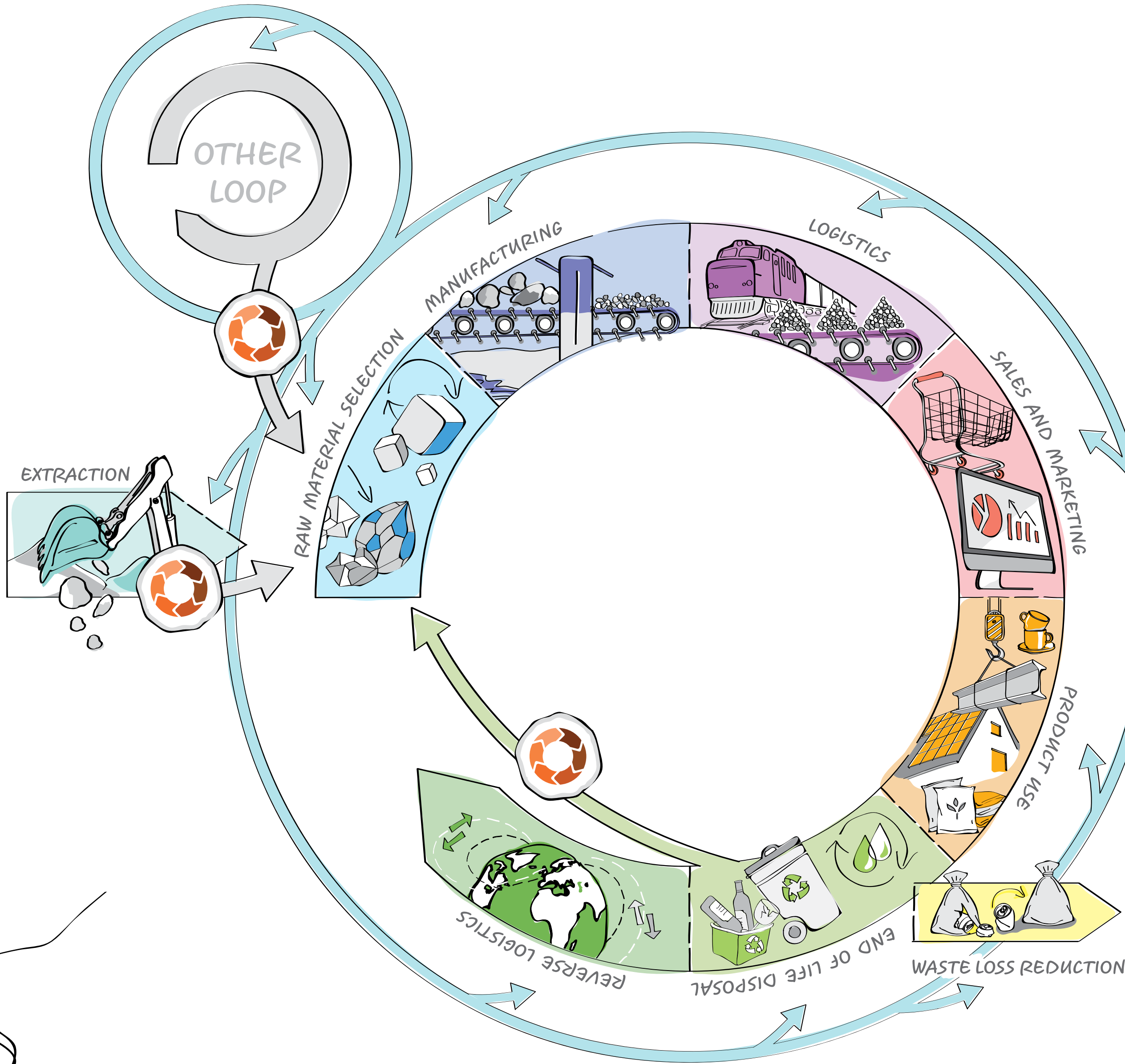




7. Case studies contributing to circular economy practices

BM 1: Optimized and symbiotic RM supply

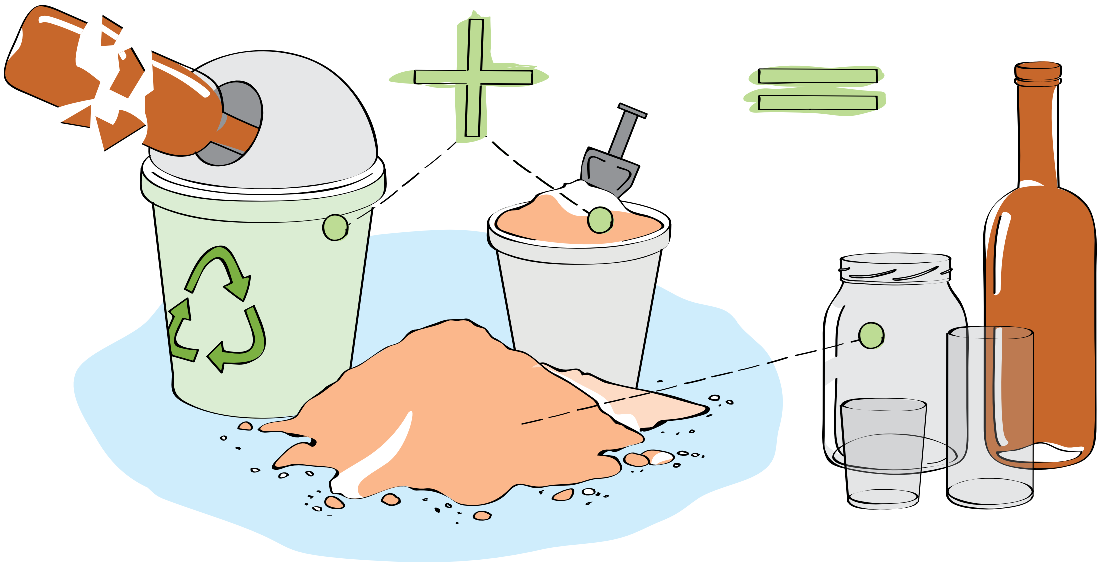
Provide durable and functional materials by optimizing the use of primary raw materials or combining primary and secondary raw materials.



1. Silica Sand and Cullet symbiosis (BE)

Company project

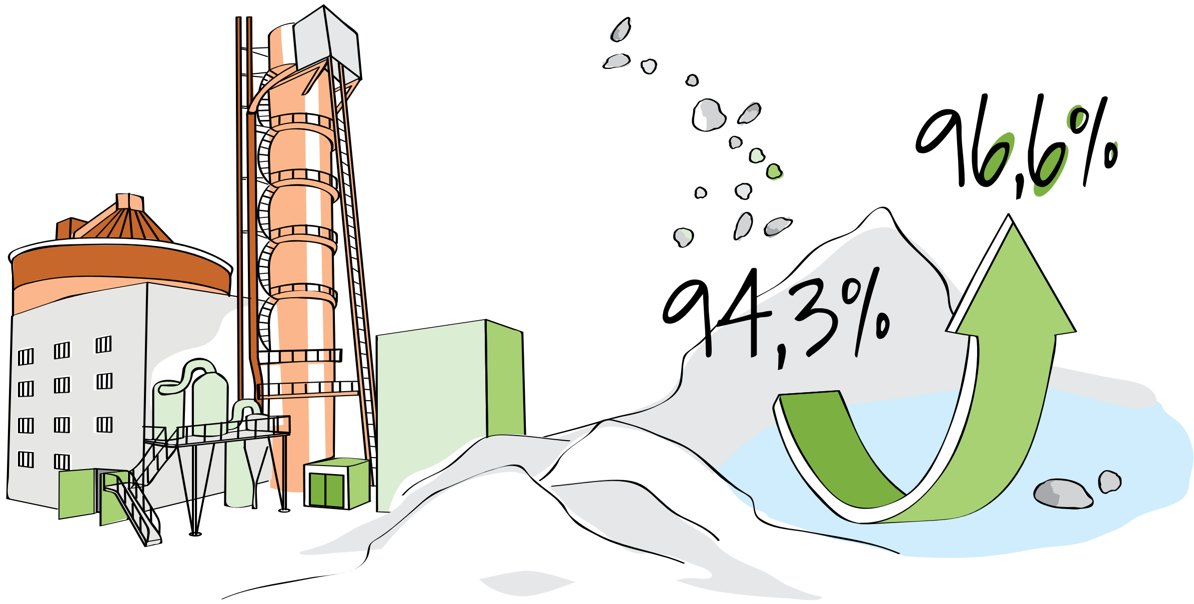
Glass is a fully recyclable material (cullet) and has endless lives without loosing its quality. Glass recycling is a perfect example of primary and secondary raw material symbiosis (Silica sand & Cullet). The high recycling rates are strongly conditioned by: 1. Glass collection; 2. Quality of the glass; 3. Separation techniques (color separation) to meet end-user criteria.



2. Resource Optimization from the extraction and processing stages (FI)

Company project

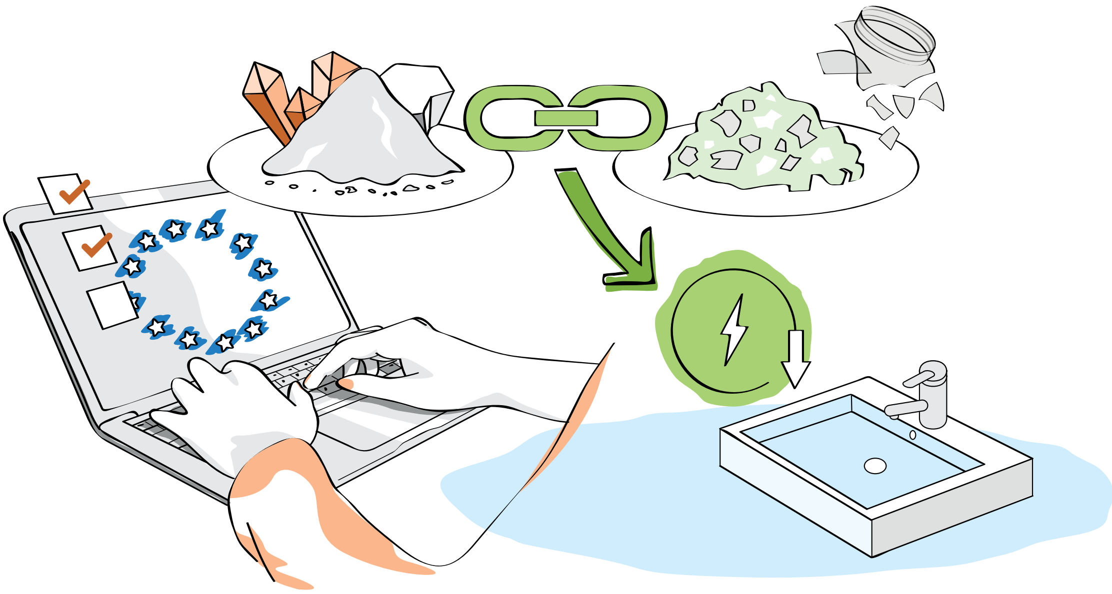
Raise the material efficiency rate from 94.3% to 96.6%, valorizing lime kiln dust (LKD) and wall rock by-products to ensure the same functionality during the use phase.



3. Sanitser (IT)

EU project

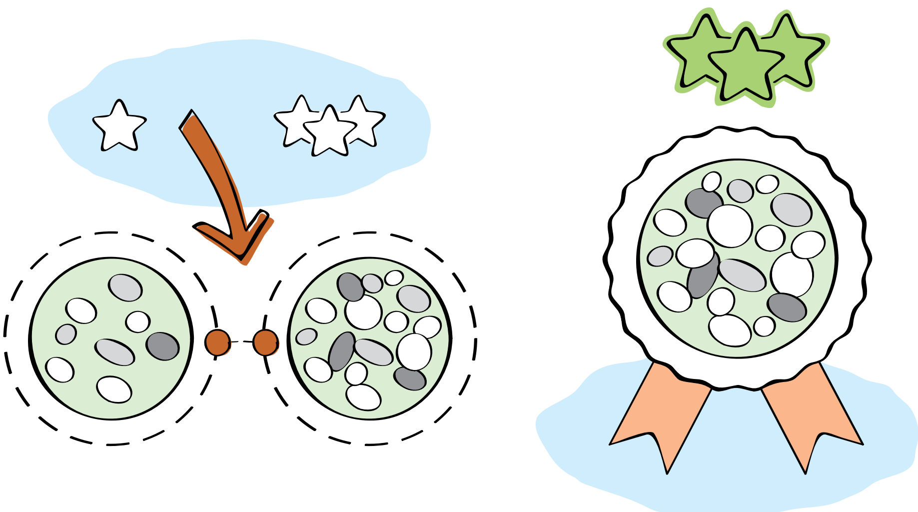
The **LIFE SANITSER** project revise the vitreous sanitary ware (VSW) formulation and production process by introducing relevant amounts of glass cullet from urban waste disposal into the ceramic blend formulations. The project's process innovations are designed to: i) contribute to sustainable waste management, in terms of the recovery of large amounts of glass cullet waste (soda lime glass SLG); ii) improve the environmental performances of the ceramic sanitary ware sector by reducing CO_2 emissions (-16-18%); and iii) reduce the consumption of energy (-80-110 °) and natural resources such as feldspar and silica sand.

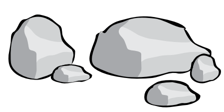


4. Resource efficiency (DE; ES; HE; IT)

Company project

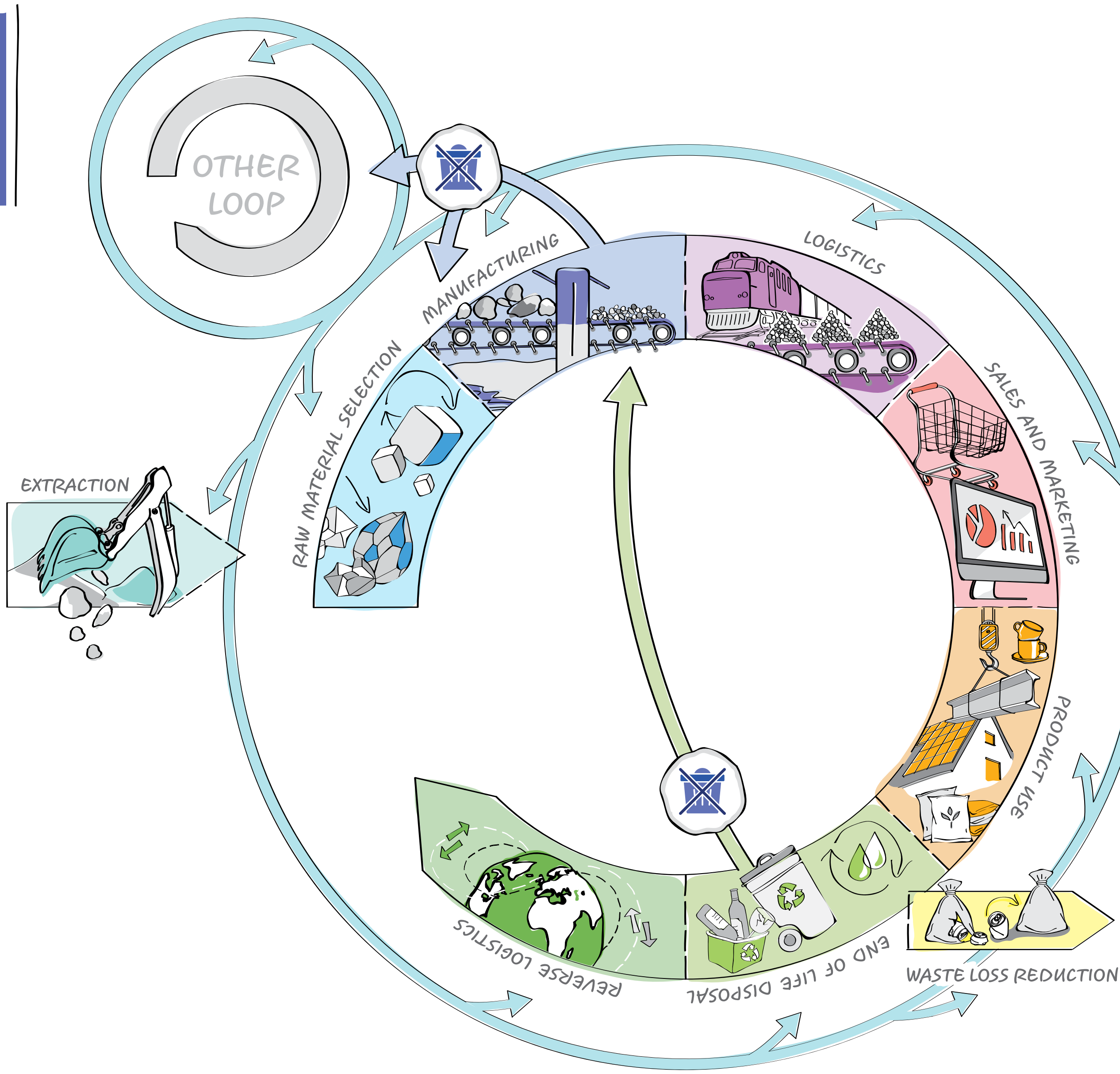
Use low purity bentonite raw material to mix with high purity one to avoid sacrificing high purity when not required in the end application.





BM 2: Resource recovery

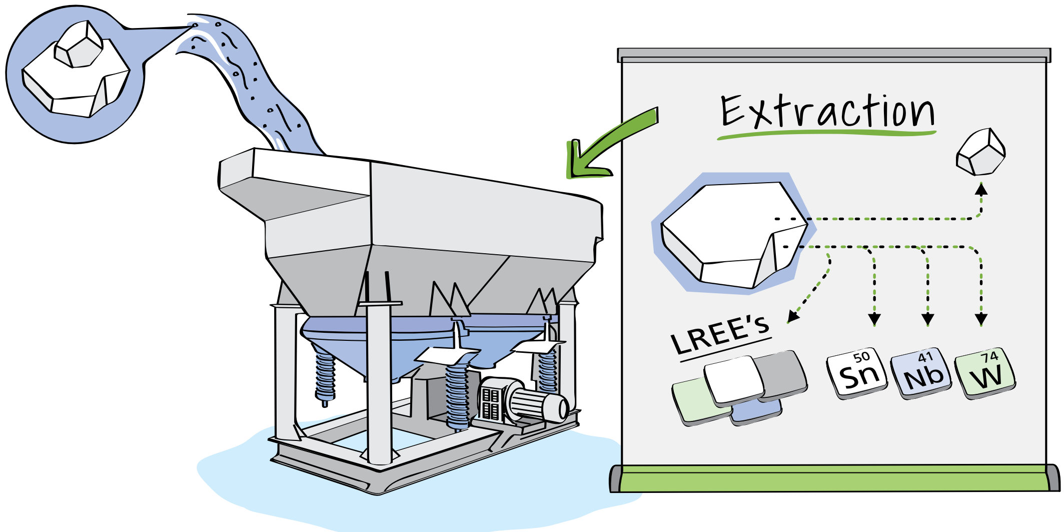
Prevent & Minimize resources loss / waste and valorise useful resources (materials/energy) out of by-products or disposed products.



1. Kaolin waste as source of Light Rare Earth Elements (UK)

EU project

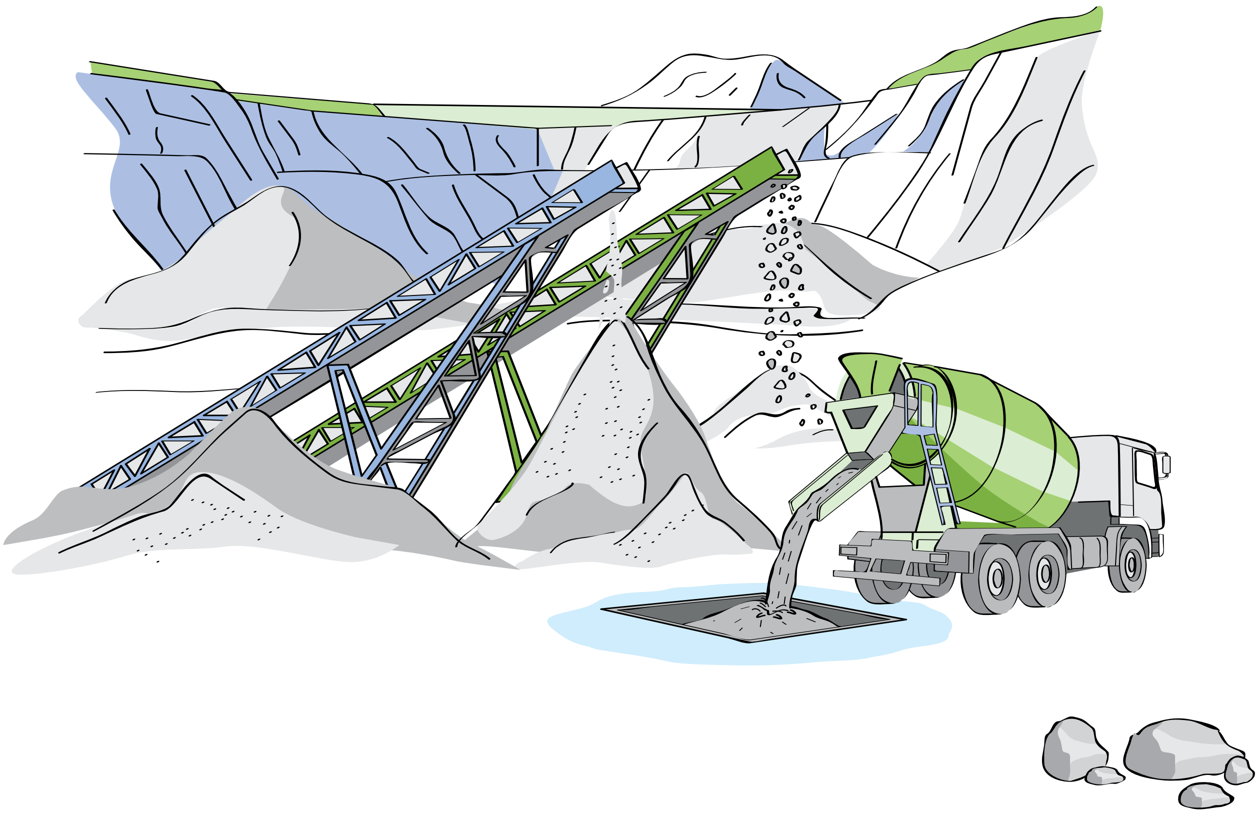
Kaolin processing waste were assessed for their viability to process and to supply critical raw materials. Light Rare Earth Elements (LREE), hosted in monazite and rare-metals (Sn, Nb, W), hosted in cassiterite, rutile and wolframite, respectively, are pre-concentrated in the micaceous residue of a kaolin plant. An enhanced gravity concentration flowsheet was developed and tested, to assess feasibility of extracting the LREE's and metals.



2. Gravel Mining in Bentonite Quarries (HE)

Company project

Bentonite overburden is processed, separated and classified to get sand and especially gravel for the concrete industry.

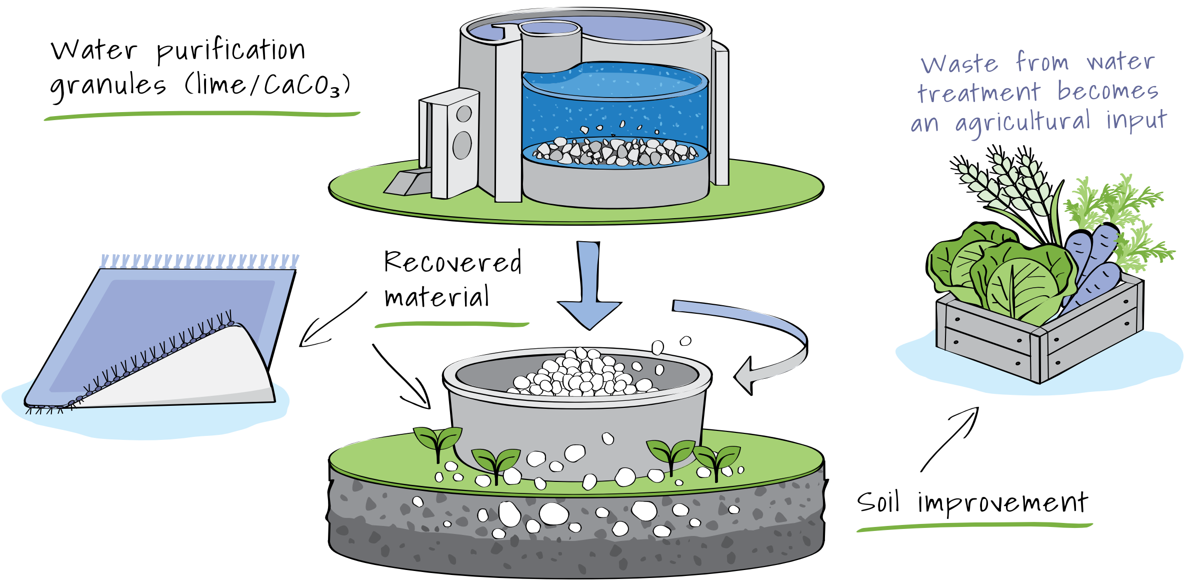


BM 2

3. New life from water purification granules (EU/Global)

Company project

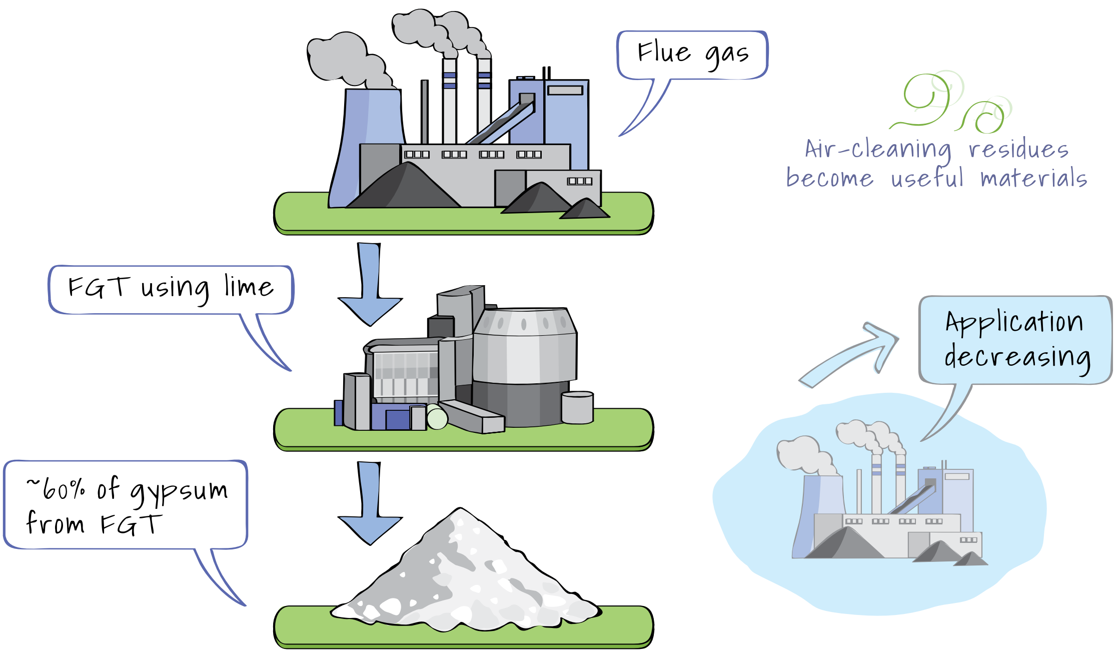
Granules from water purification (with Lime/calcium carbonate) find a market: within the agriculture sector or at the back of carpets delivering the same functionality as primary ground calcium carbonate (GCC).



4. Flue Gas Treatment/Desulphurisation/Cleaning (FGT/FGD/FGC) (EU/Global)

Company project

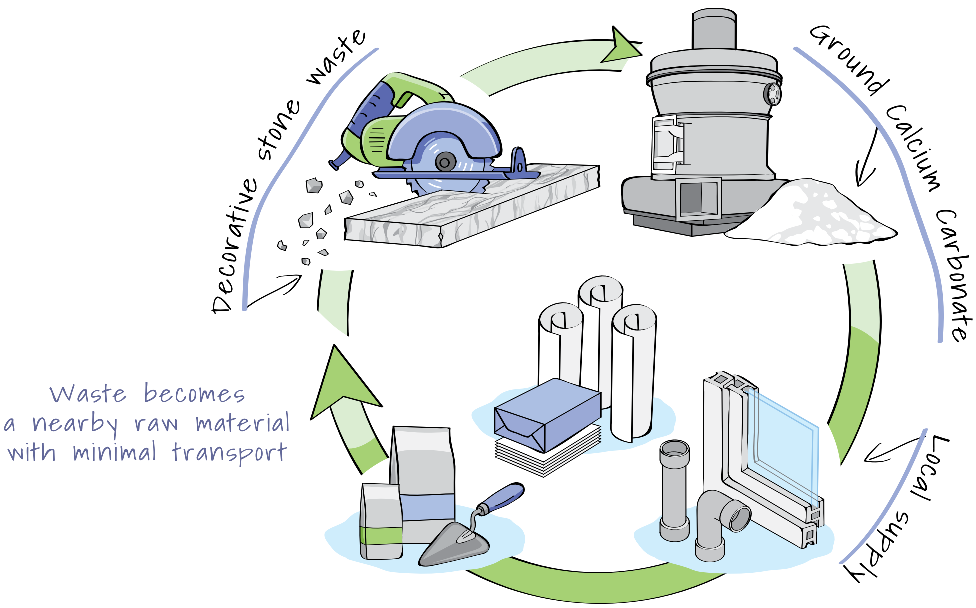
60% of Gypsum is produced from the Flue Gas Treatment (FGT) precipitation from coal plants thanks to the use of lime and calcium carbonate. Due to the closure of the coal fired plants, in the future this application will be reduced.



5. Decorative stone waste used as resource inflow for Ground Calcium Carbonate (GCC) making (IT)

Company project

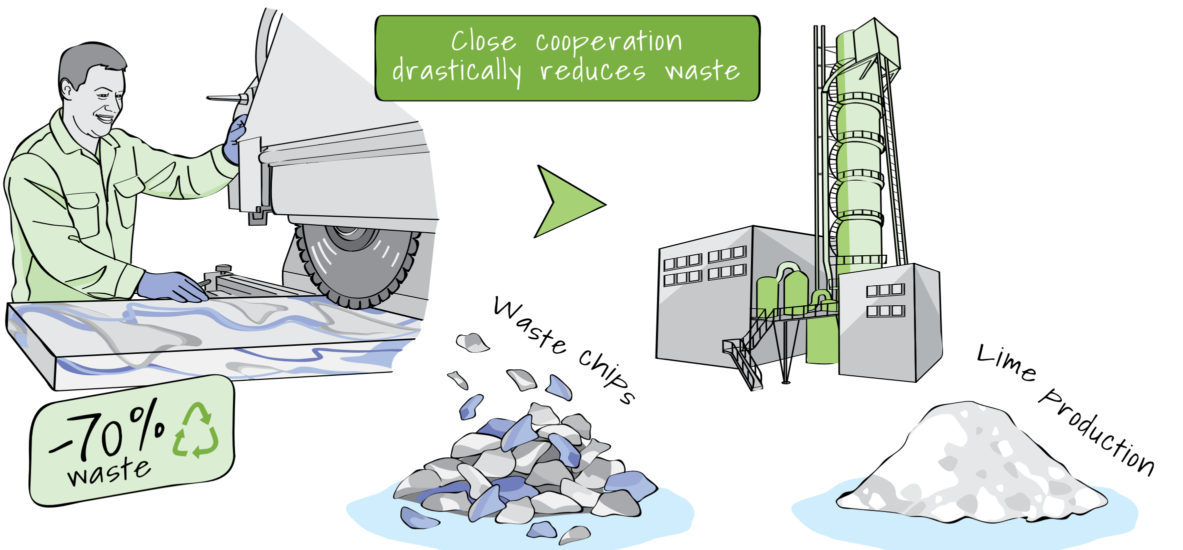
The Carrara, the waste generated from the marble decorative stone cutting, is used as input and resource inflow by the GCC producers nearby. This cooperation is successful due to the short transportation distances and the supply of the GCC goods in the vicinity of the industries needing them.



6. Decorative stone waste chips are used in lime production (PT)

Company project

The close cooperation has reduced by 70% the waste generation by the decorative stone operator and this waste from one site serves as input for the lime making operated by IMA member in the vicinity.

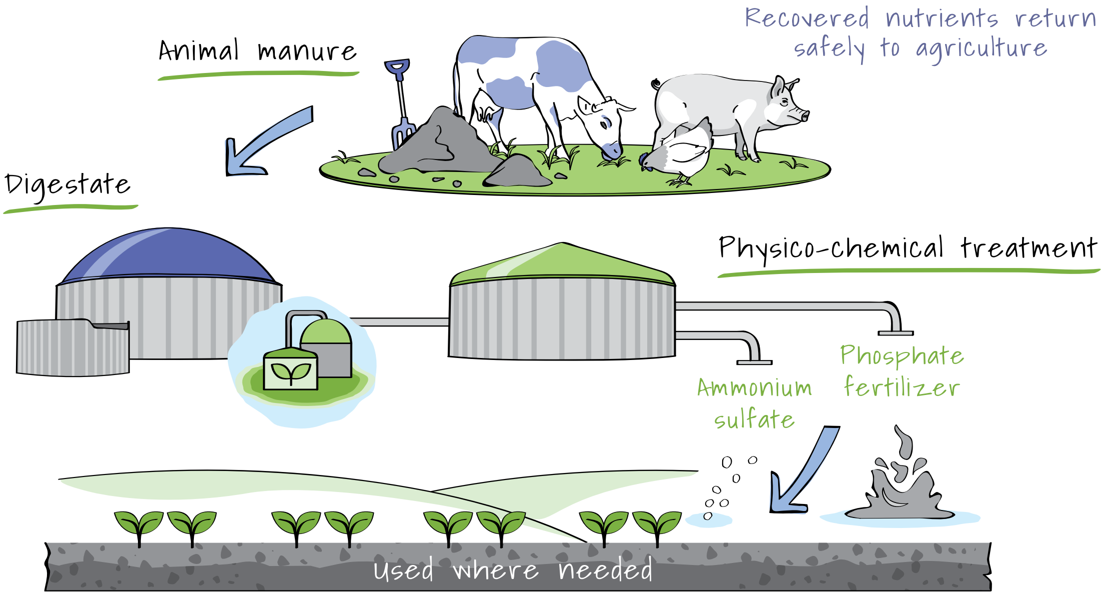


BM 2

7. Phosphate Recovery from cattle manure (NL)

Company project

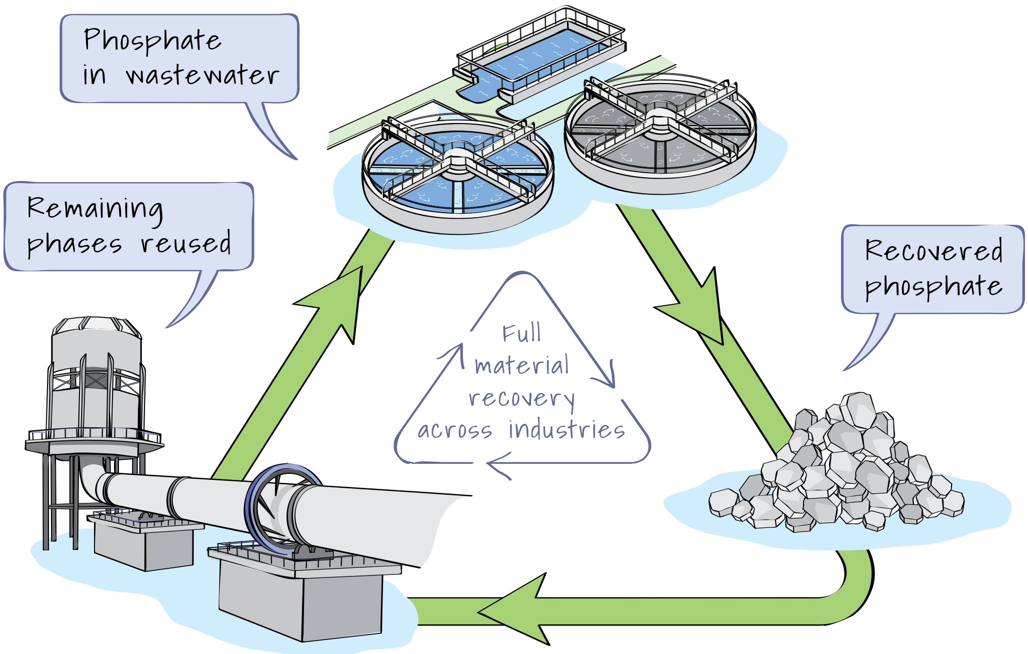
The animal manure is digested together with co-products in an anaerobic digestion plant. Nitrogen and phosphate are recovered and concentrated from digestate in separate fractions by a physicochemical treatment with a specially developed lime-based product. The nutrients are concentrated in a stream of ammonium sulfate and a phosphate fertilizer and can be valorized where needed and used in agriculture.



8. Phosphate Recovery at the end of life (DE)

Company project

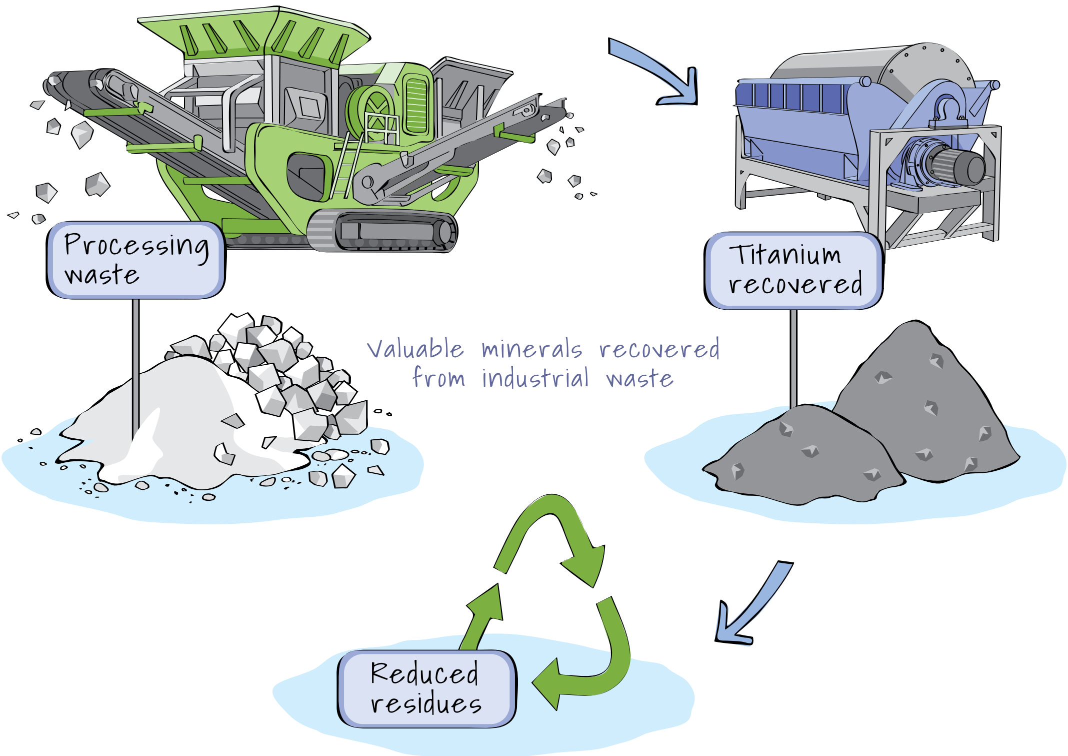
The project developed a lime crystallization process for recovering phosphate fertilizers from the wastewater purification process with complete recovery of the remaining phases for use in the cement industry.



9. Titanium mineral enrichment from feldspar production waste (TR)

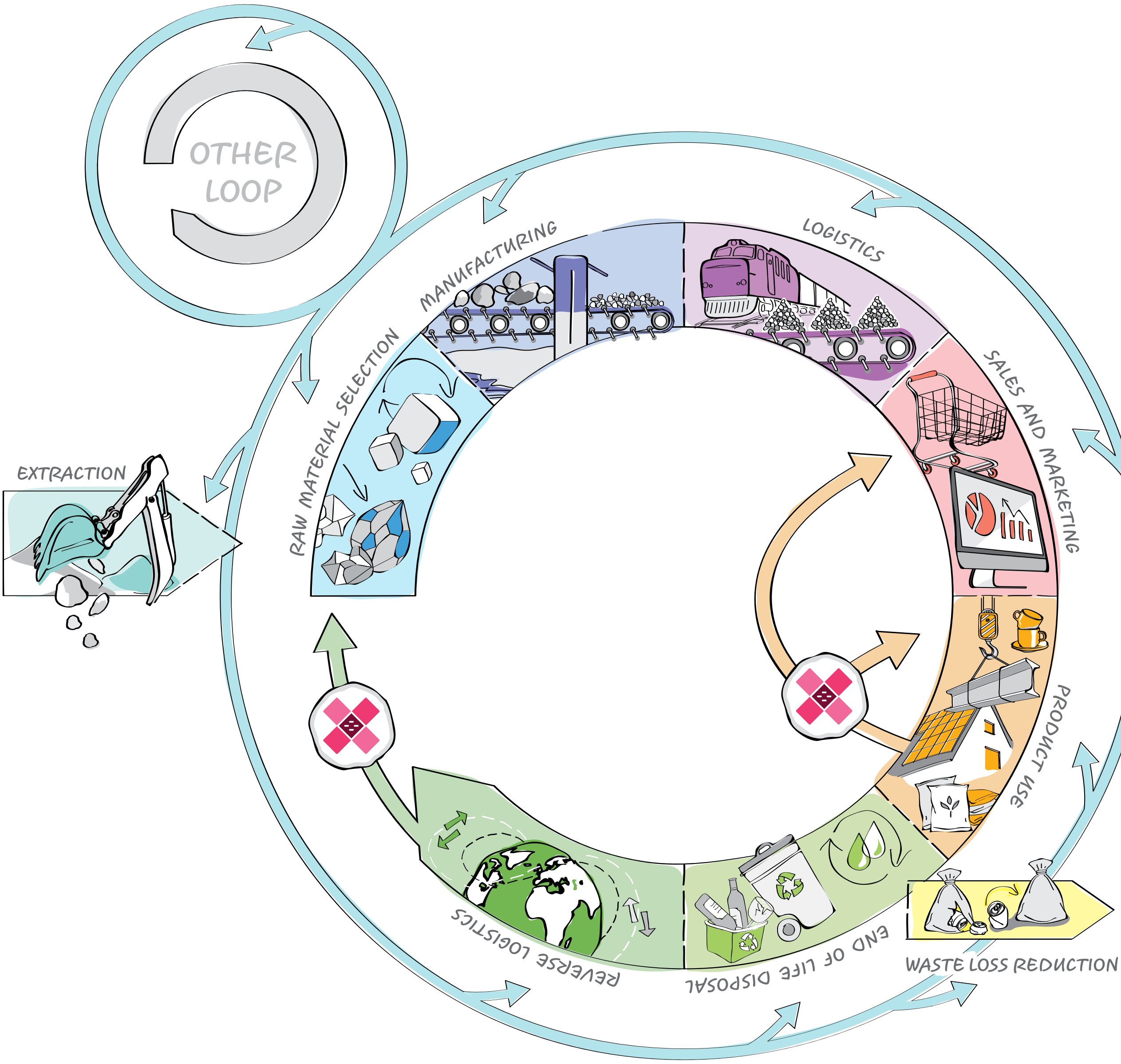
Company project

Enrichment of the titanium minerals contained in feldspar processing waste has achieved significant progress. This is an important project from a circular economy perspective, as we are aim to valorise valuable minerals (such as Ti) from Feldspar mining waste in the near future.



BM 3: Product/Material Life extension

Provide material solutions that extend the working lifecycle of a product or enable and facilitate the product/material recycling (remanufacturing, up-cycling, eco-design).

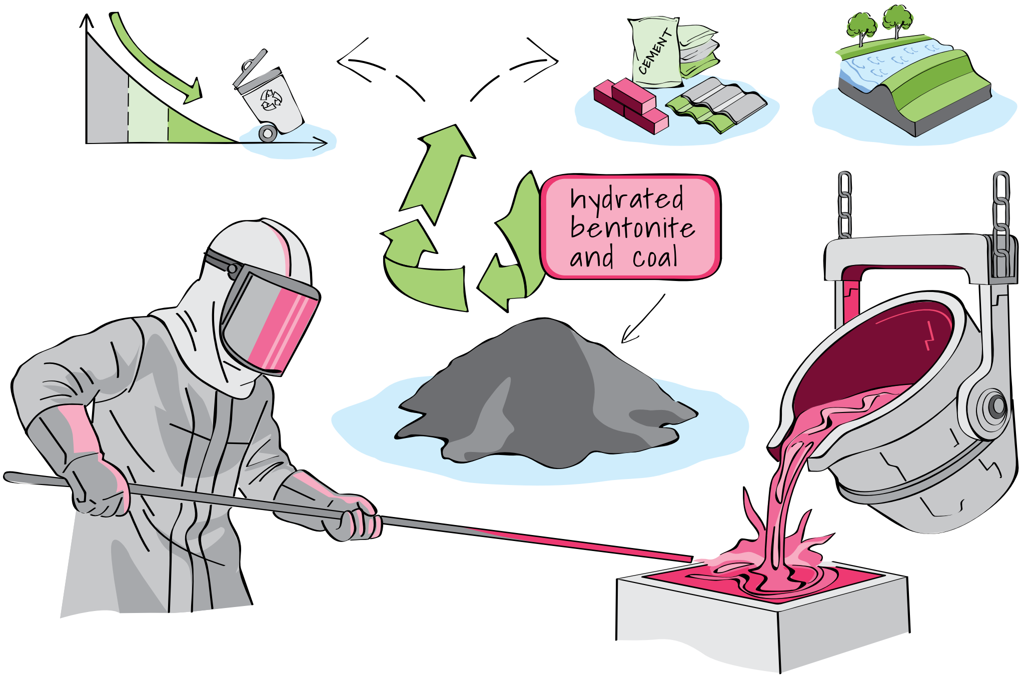


BM 3

1. Bentonite improved performance and up cycling (DE)

Company project

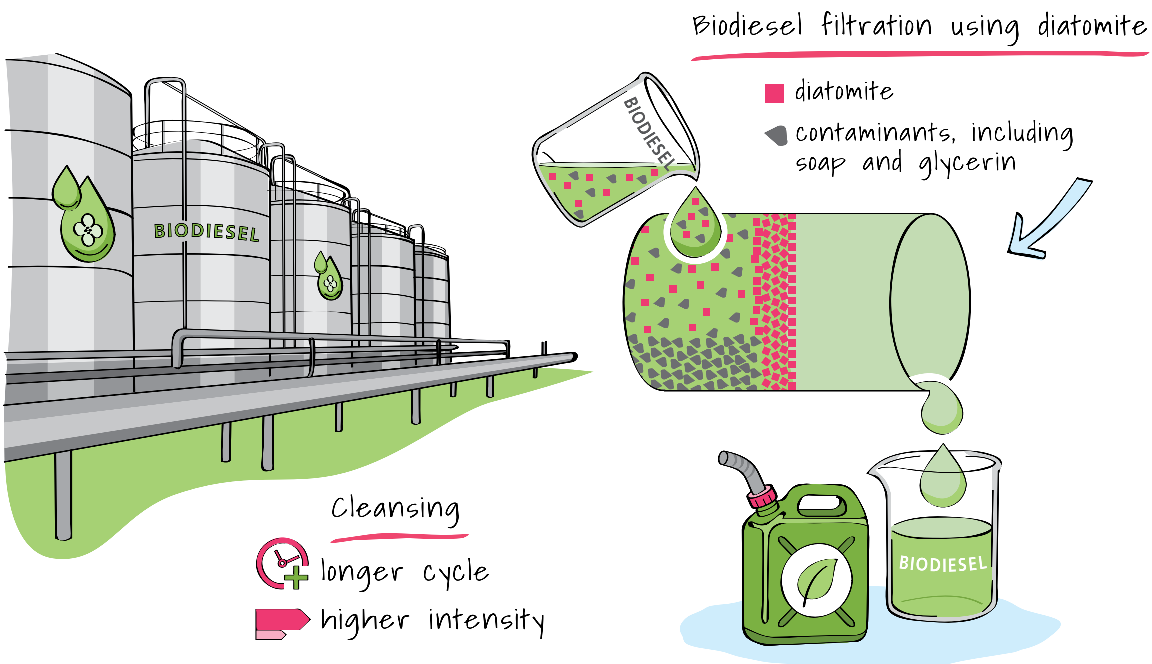
Totally hydrated bentonite and coal are generated from foundry waste streams resulting in better performing bentonite and reduction of waste disposal.



2. Longer filtration cycle due to Diatomite (ES; FR)

Company project

Biodiesel purification with longer cycle times and higher flow rates using a diatomite based Adsorbent Filter Aids.

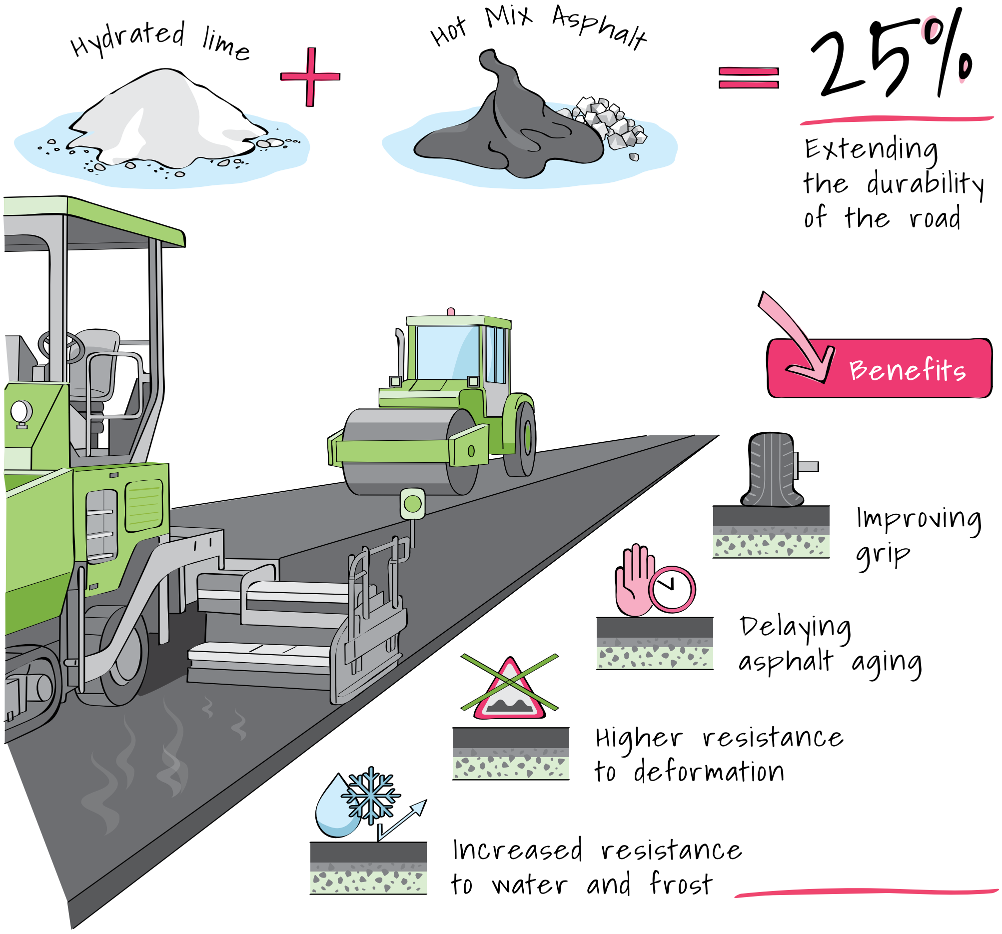


BM 3

3. Longer Asphalt durability due to Lime (EU/US)

Company project

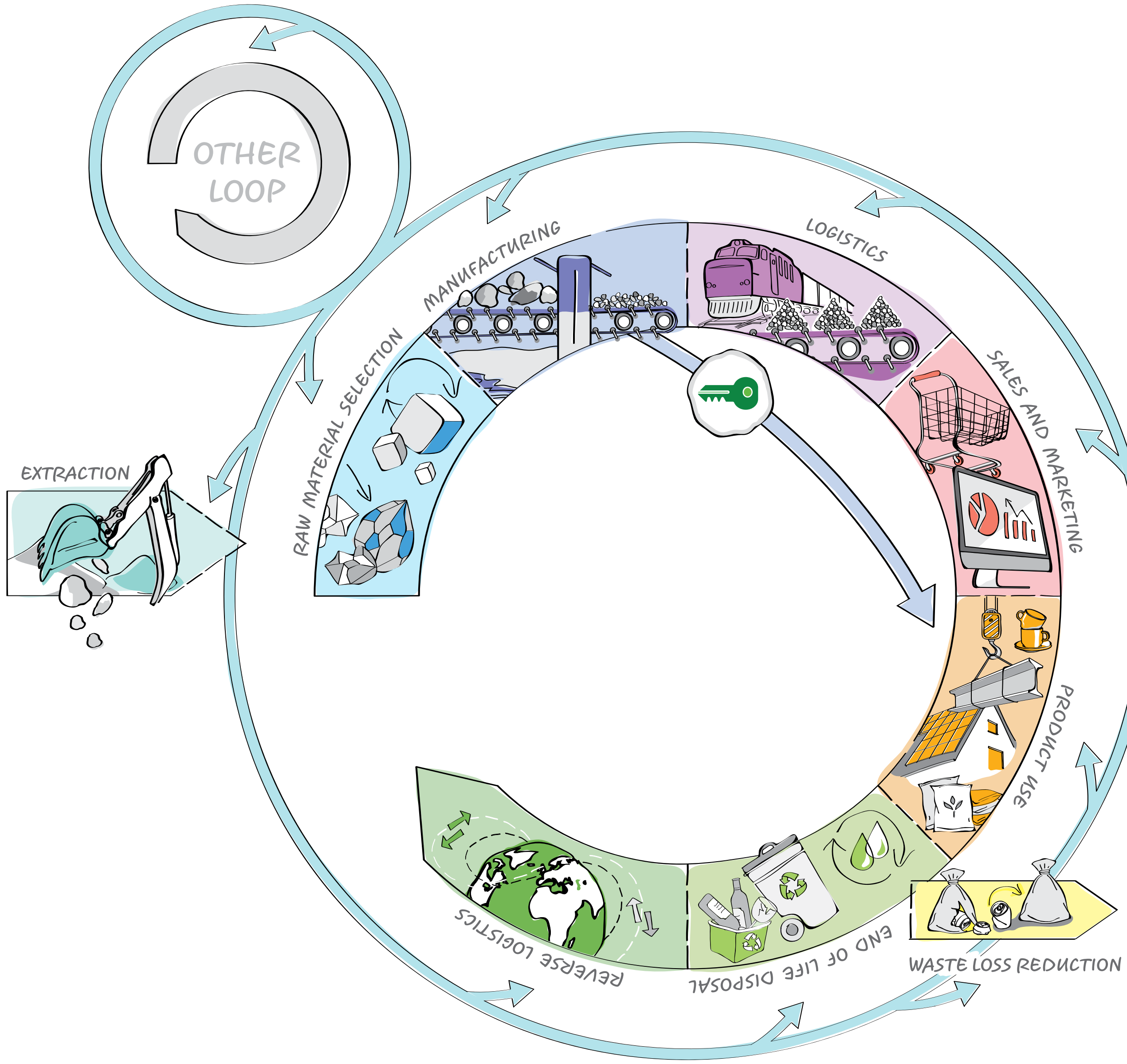
Use of lime in Hot Mix Asphalt contributes to extension of 25% of the road durability.



BM 3

BM 4: Material as a service

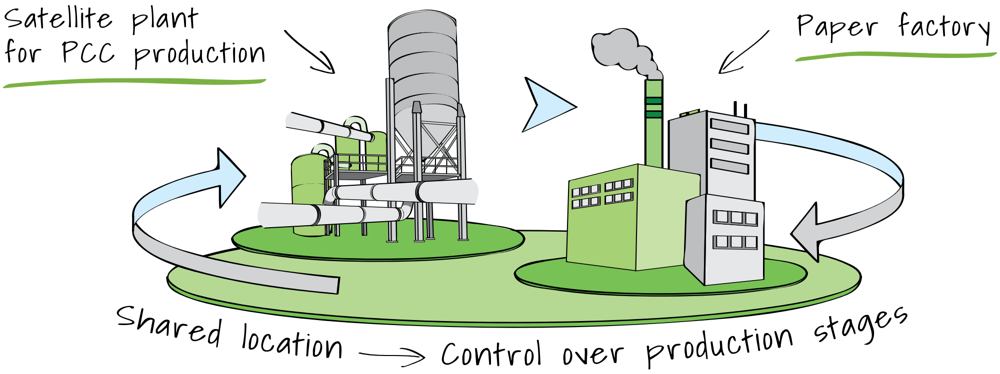
Offer material access and retain ownership to internalize the management and optimization of the circular resource.

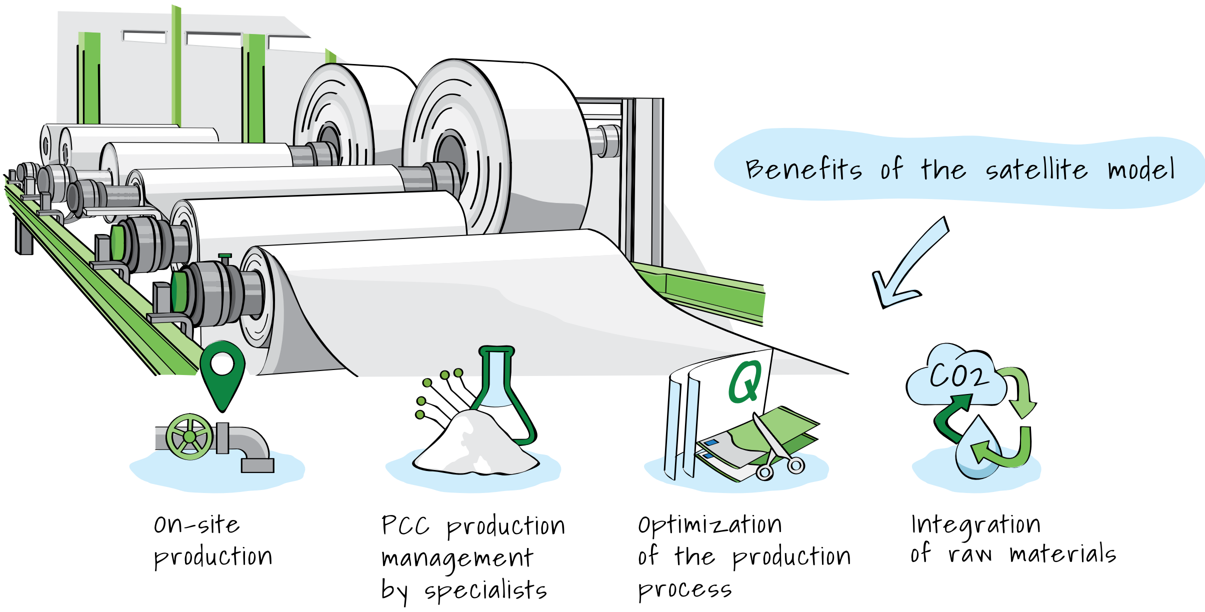


1. Paper making in satellite plants (EU/Global)

Company project

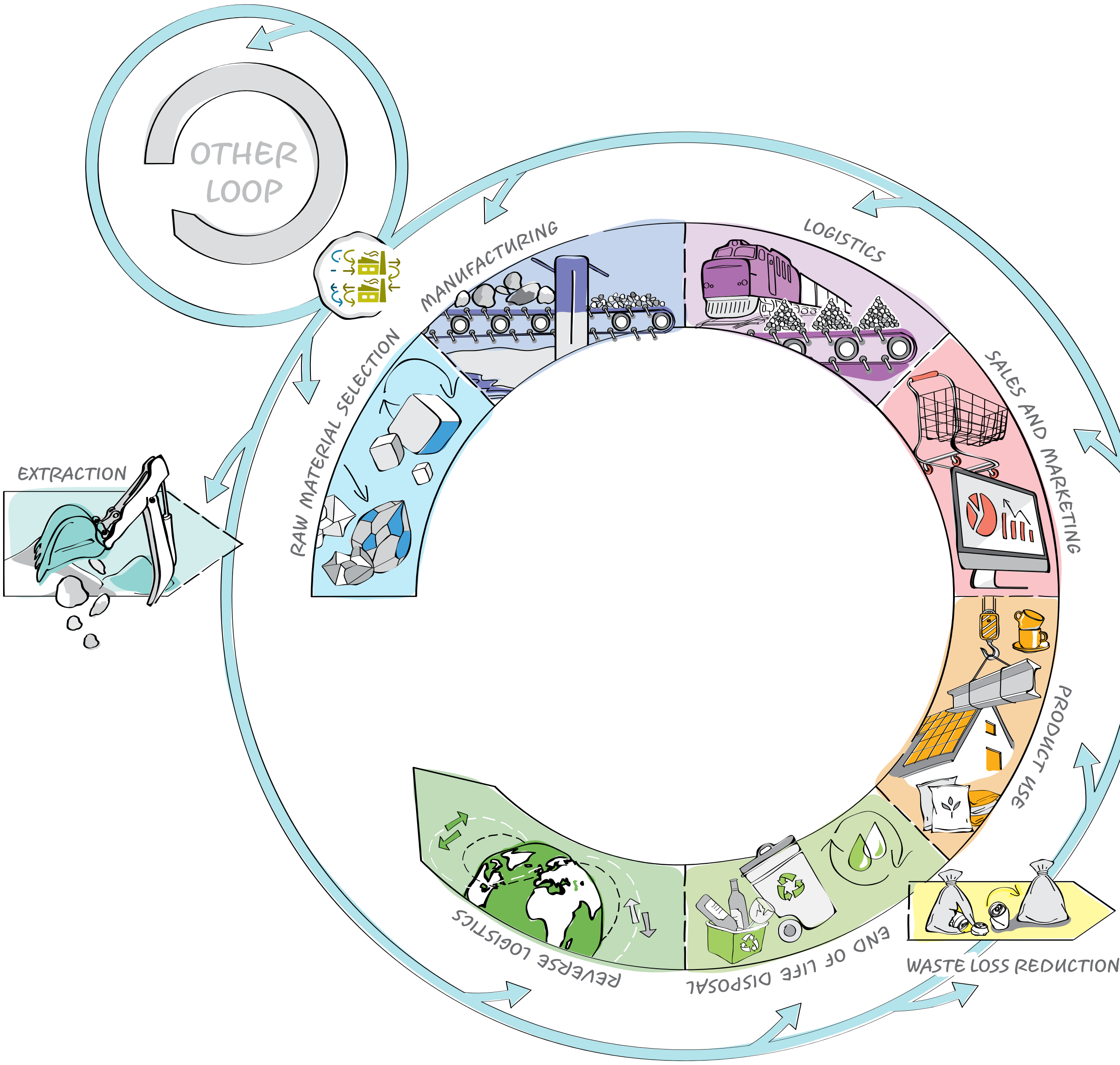
The paper making process in the satellite plants, the Precipitated Calcium Carbonate (PCC) is managed by PCC producers as an on-site service.





BM 5: Industrial Symbiosis

Close the loop by sharing flows (materials, energy, heat, water, CO_2) and create additional value and minimize waste.

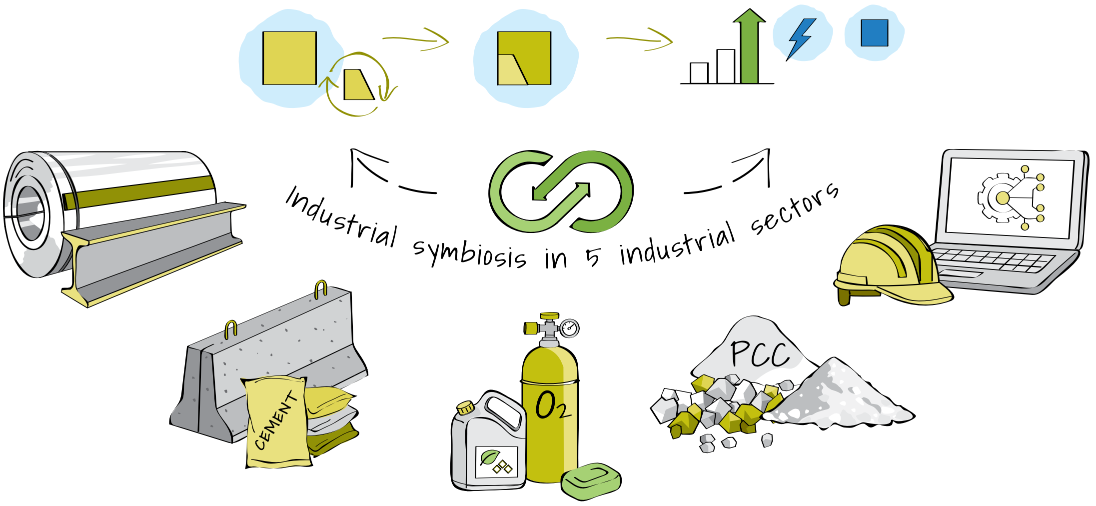


BM 5

1. EPOS (UK)

EU project

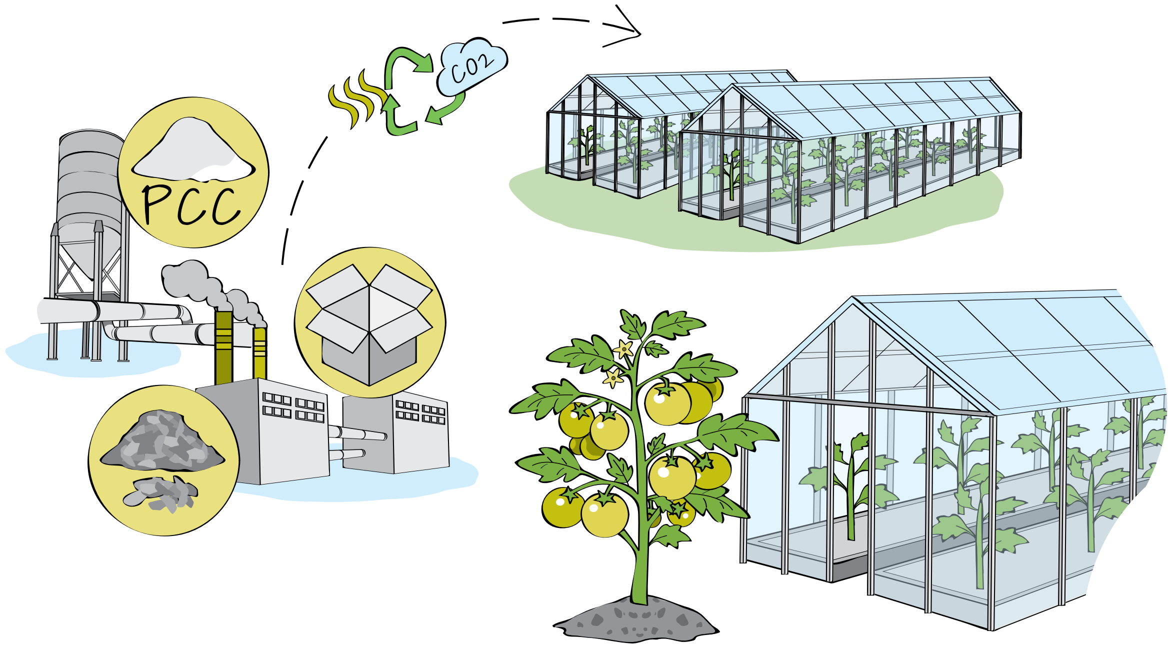
Project EPOS (Enhanced energy and resource efficiency and Performance in process industry Operations via onsite and cross-sectorial Symbiosis) brings together 5 global process industries from 5 key relevant sectors: steel, cement, chemicals, minerals (calcium carbonate) and engineering. The use of by-products for one sector as an input to another sector improve energy & resource efficiency. For example, the EPOS toolbox led to the identification of a high calorific by product stream from a chemical process that could be used in the kiln of a nearby cement plant, hence reduce primary fuel consumption by 20%.



2. CORALIS (ES; SE)

EU project

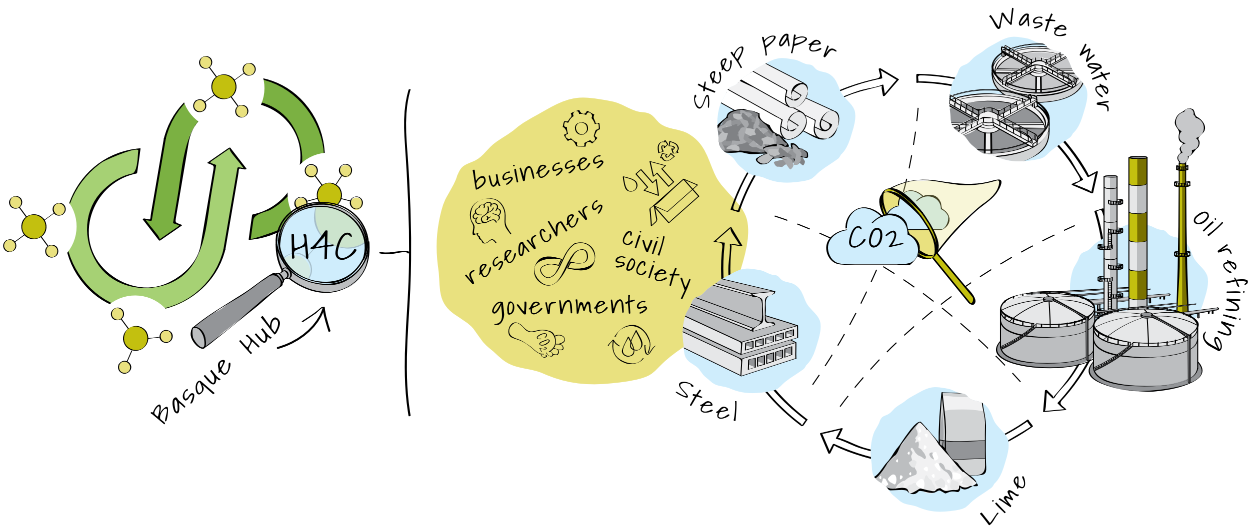
CORALIS (Industrial Symbiosis in Intensive Energy Industries minerals (Lime & PCC). Heat recovery from Precipitated Calcium Carbonate (PCC) in Pulp and Paper making is used for green house vegetable growth in Frovi (Sweden).



3. IS2H4C (ES)

EU project

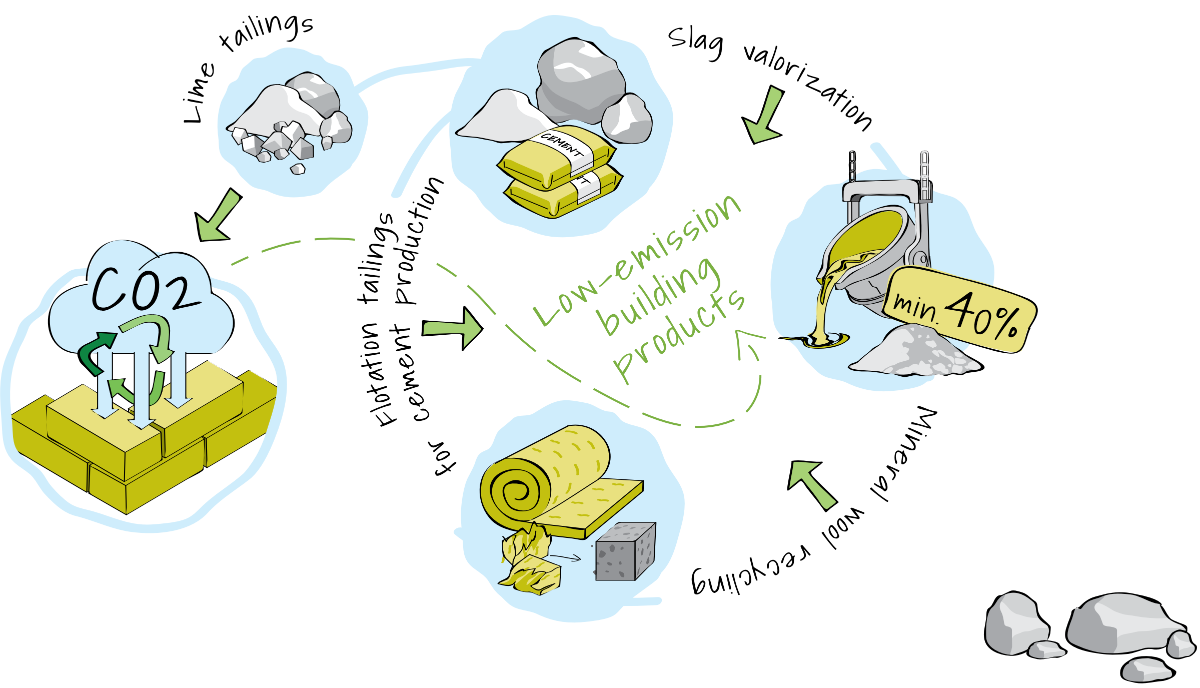
IS2H4C (Sustainable Circular Economy Transition: From Industrial Symbiosis to Hubs for Circularity) is the Spanish Hub (ES). Hubs4Circularity (H4C) provide spaces where diverse actors, such as businesses, governments, researchers, and civil society, collaborate to accelerate the Circular Economy (CE) transition. They are nexuses for knowledge and resource sharing, cross-industrial collaboration, and sustainable technology innovation. The EU project has 31 partners. Lime industry participates in the Basque Hub that also contains oil refining, steel, pulp and paper industries and the public wastewater treatment plant located in the highly industrialized area of the Basque Country connected in the Basque hydrogen corridor.



4. Circularity: Low carbon construction products (FI)

Company initiative

Four operators close to each other, are assessing possible cooperation opportunities in the frame of industrial symbiosis and the increased significance of circular economy processes. The cement making process is integrating limestone waste tailings, as a side stream of the flotation process, in their cement making process. Other sectors involved: Steel (valorise a minimum 40% of blast furnace slag); Saint-Gobain Insulation development work continues to use mineral wool waste as part of their valorisation efforts.

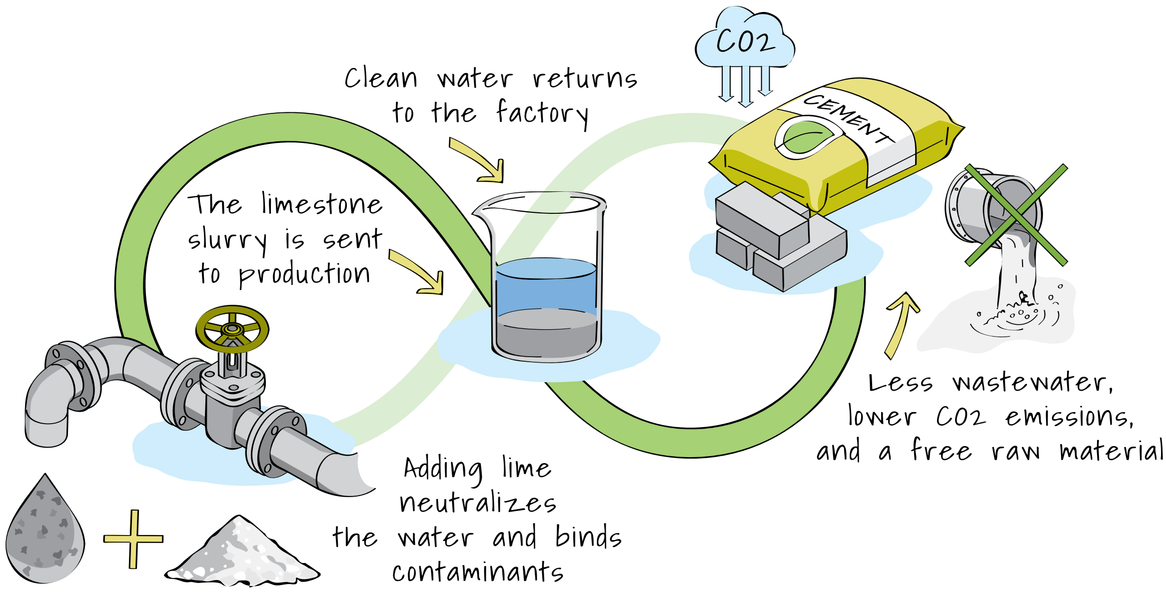


BM 5

5. Reduce wastewater volume (FI)

Company project

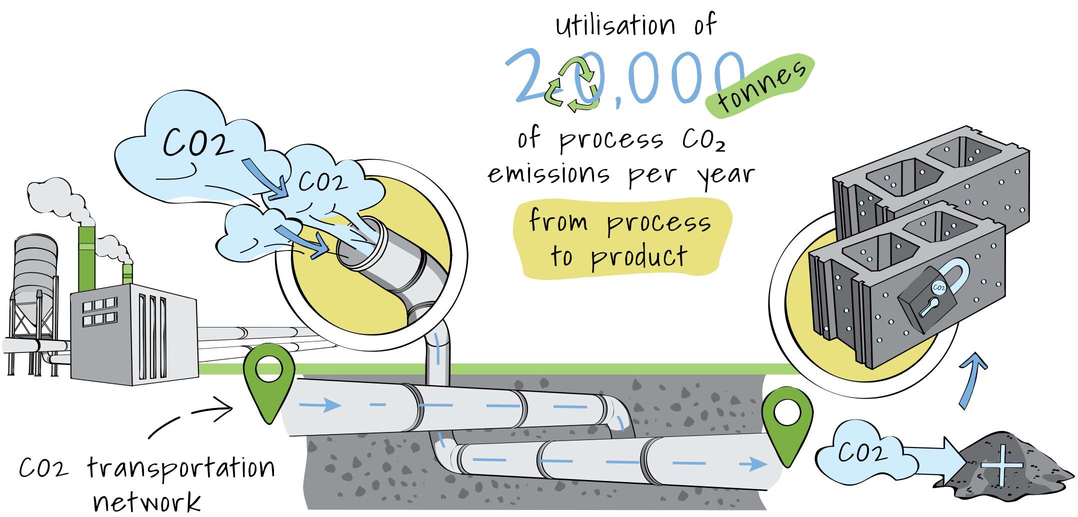
Cement process water stream to be valorised using the properties of lime products to purify and and reduce wastewater volumes to be managed by the operator.



6. CO2ncrEAT for low carbon building blocks (BE)

National project

Valorise 20000 t CO_2 process emissions annually between three sectors: Lime; CO_2 transport infrastructure; Construction. Valorization of waste & CO_2 process emissions – mixing CO_2 process emissions to make Building blocks with lower CO_2 footprint. This project is viable only if there are sufficient incentives to make it economically viable (such as access to infrastructure and CO2; transportation distances, right parters close to project, etc).



8. Bottlenecks of circularity

Take aways: Areas for further action from a minerals sector perspective

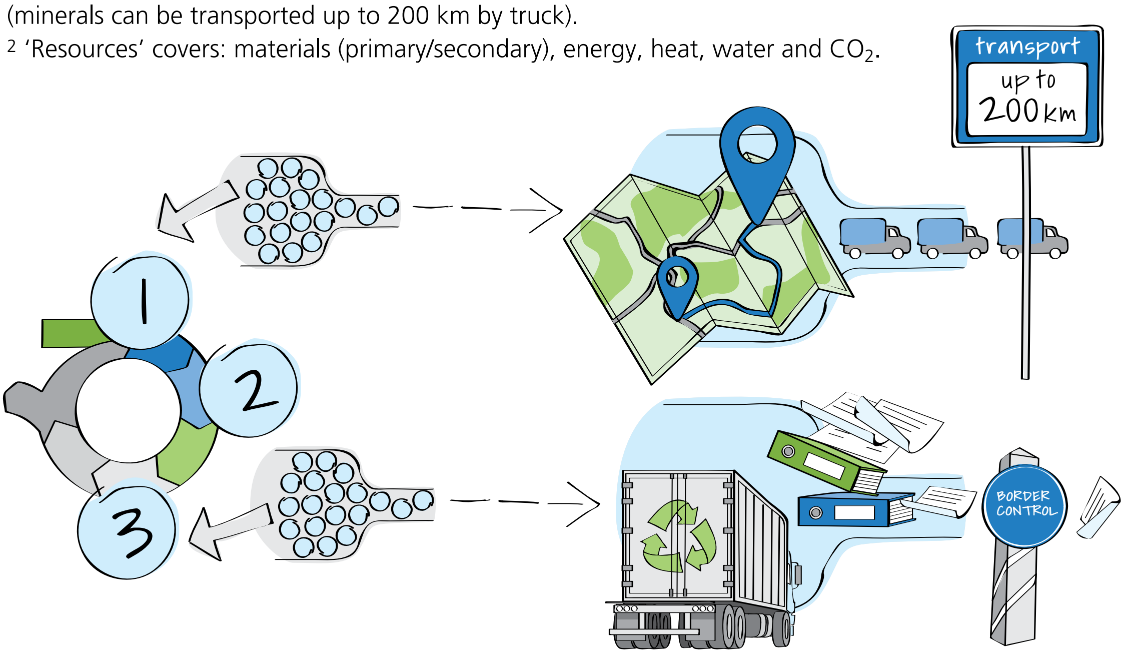
Circularity must reflect Sector Realities

The definitions on circularity were not addressing the specificity of our extraction and processing sector. Circular economy model for minerals must fulfil these three conditions:

1. They are economically viable models[1];
2. Require & contribute to an integrated management of resources[2] along all life cycle stages;
3. Circularity is carried out when technically, environmentally and economically practicable.

The transportation of waste outside of national borders, requires a lot of paperwork.

1 Transportation distance can be a circular economy bottleneck for minerals (minerals can be transported up to 200 km by truck).
2 'Resources' covers: materials (primary/secondary), energy, heat, water and CO_2.



Circular Economy needs Partnerships, towards better Industrial Symbiosis Practices

Circularity should not put primary and secondary raw materials in competition, but industrial and/or technological symbiosis of these material flow sources should be able to work on symbiotic manner to tackle the issue of the lower quality of some secondary raw material flows.

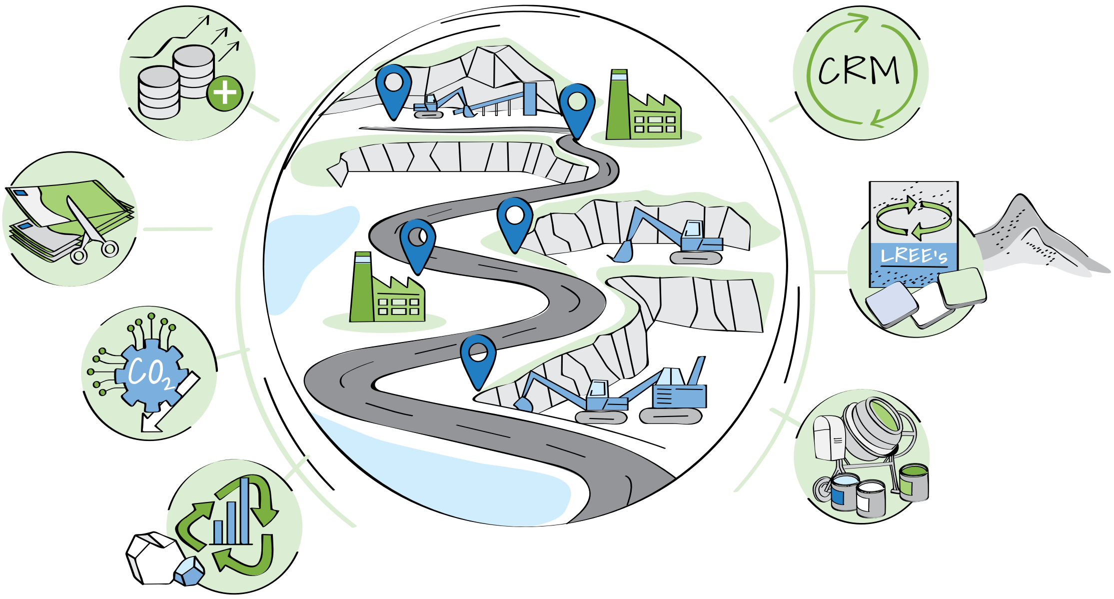
Combining primary and secondary raw materials within the same product/sector or between different industry value chain stakeholders should be considered a circular economy solution.

Circularity should not be either or at any cost, but should be above all a cooperative business model and identification of the best possible economically viable solutions towards the circular economy goals. These solutions should be affordable to meet demand and end consumers' requirements.

Every circular model is specific to local specifications and can be conditioned by various factors (e.g. weather in Finland vs the CO_2 footprint balance).

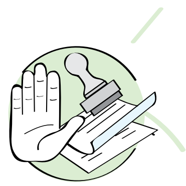
Empower Expertise, Accelerate Permitting

Mineral companies operate locally, and mineral solutions deliver in the processing and valorisation of critical raw materials from primary extraction, as well as from the valorisation of tailings from former mining operations. Upgrading the role of essential raw materials as essential and valuable to the circular economy, will provide the right incentives to boost the recovery of critical raw materials (CRM) from domestic locations and reduce dependency from non-EU suppliers.



Enable Cross-Border Recycling without Bureaucracy

As already explained above, the minerals sector operates near most of its downstream customers. Thus, most of our products are not shipped far away, however when shipping is requested there are some red tape practices to be reported.



Don't reinvent the Wheel: Clarify; Simplify; avoid Duplication

As it is common knowledge, the Directive provided flexibility, and a regulation (CEA) will apply as such. How will these two very different legal instruments work coherently?

We fear that with the extensive & complex legislative framework in place; there is no need to add another layer of legislation. Boost & support cooperation; Exchange best practices and 3. Harmonize the interpretation of the existing legal terms/definitions and their interpretation derived from EU legislation and transposed nationally will be more beneficial than another layer of legal burden.

9. List of references

IMA 2025. IMA-Europe response to the open public consultation on Circular economy. https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/14812-Circular-Economy-Act/F33114113_en

Kirchherr J., Reike D., Hekkert M. 2017. Conceptualizing the circular economy: An analysis of 114 definitions. Resources, Conservation & Recycling 127: Pp. 221–232 (pages 12). http://doi.org/10.1016/j.resconrec.2017.09.005

Kirchherr J., Yang N-H N., Schulze-Spüntrup F., Heerink M.J., Hartley K., 2023. Conceptualizing the Circular Economy (Revisited): An Analysis of 221 Definitions. Resources, Conservation & Recycling 194: Pp. 23. https://doi.org/10.1016/j.resconrec.2023.107001

Notes

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