SecREEts Policy Council

SecREEts

Secure European Critical Rare Earth Elements

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Abbreviations

A: Answer
CEO: Chief Executive Officer
CO2: Carbon Dioxide
CRM: Critical Raw Material
DG GROW: The Commission's Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs
EASME: Executive Agency for SMEs
EIT: European Institute of Innovation and technology
ERMA: European Raw Material Alliance
EU: European Union
ISO: international Organisation for Standardisation
JRC: Joint Research Centre
OECD: The Organisation for Economic Co-operation and Development
NGO: Non-Governmental Organisation
PM: Permanent Magnet
Q: Question
R&I: Research and innovation
REE: Rare Earth Element
SINTEF: research and Innovation organisation
SME: Small and Medium-sized Enterprises

Executive Summary

The second Policy Council of the SecREEts project took place online on 30 September 2020, broadcasted live as part of the EIT Raw Materials Summit. The Summit was organised in conjunction to the launch of the European Raw Materials Alliance (ERMA), which took place the day before, This new Alliance has been founded to ensure the cooperation of all important actors in establishing a sustainable and stable supply of Critical Raw Materials in Europe, essential to the Green Deal's achievement.

The Policy Council is a high-level meeting engaging experts across the European critical raw materials sector, including academia, industry, policy-makers, other EU-funded projects, and REE end-user sectors. In line with the European Green Deal agenda for sustainability, the theme for this edition was "Rare Earths and the EU Green Deal: What policies for what purposes?"

In this second edition of the Policy Council, participants discussed the burning questions regarding the current and future state of the REE market in Europe. The event hosted high-level speakers from the most relevant sectors related to the SecREEts project, such as mining, renewable energy, transport and environment, as well as representatives from policy and other Horizon2020 funded project. Moreover, the discussions engaged the participants in all the debates, thus gaining an important feedback regarding stakeholders' concerns on the current state and future needs of REE, both at European and global level.

There was a consensus among the speakers regarding the future increased need of REE in a variety of industries, including automotive and renewables, and the consequent need for a stable and sustainable supply chain in Europe. The main challenges mentioned were that currently there are no operating mines, neither an established recycling practice for REE in Europe. However, the initial steps are taken now at different stages in the value chain to deal with this gap.

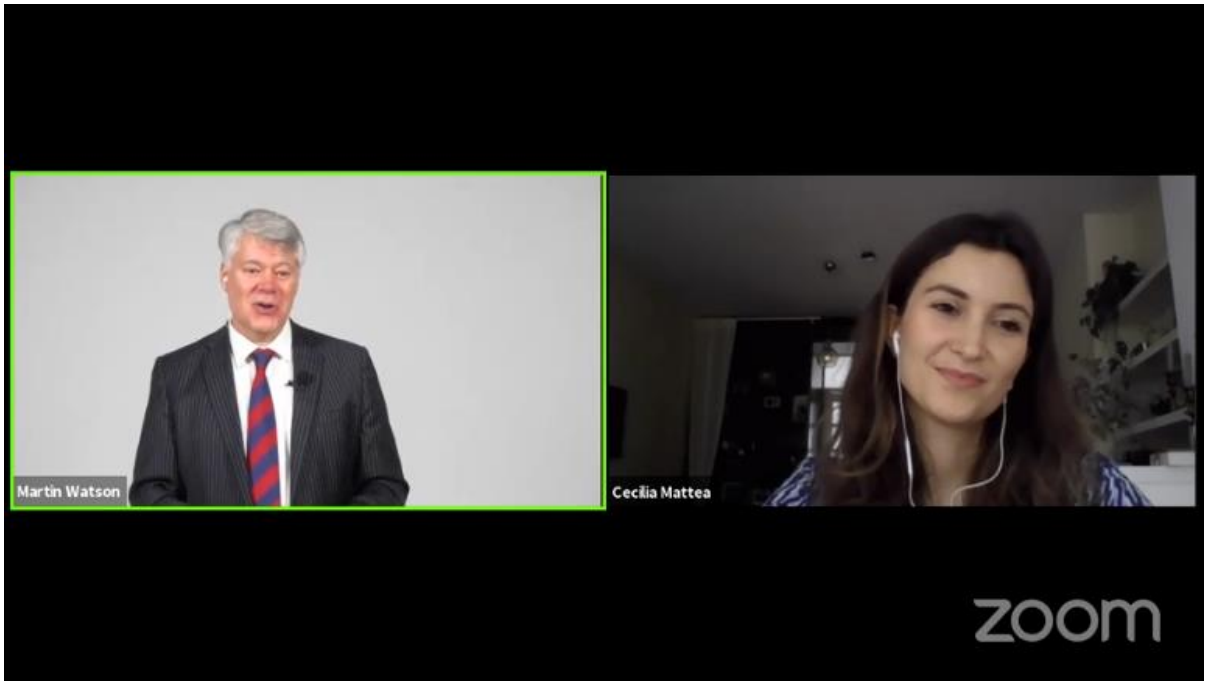
The Policy Council ended on a positive note, acknowledging all the existing challenges and most importantly the new opportunities and solutions available, as well as policies needed, to build a European sustainable source of REE.

Session I – Impact of EU Green Deal's on the European industries and their raw materials needs

The first session of this second SecREEts Policy Council explored the challenges faced by the European industries with regards to the EU Green Deal implementation and the subsequent needs for raw materials. This session hosted three high-level key speakers, experts in the sectors most affected by this transition (mining, transport, and energy) and engaged the audience in a lively debate, via the chat.

1.1 Cecilia Mattea – Clean Vehicles Expert, Transport & Environment

Q: Replacing fossil fuel powered vehicles with electrical ones will require large amounts of raw materials. What are the best ways of approaching this? How can we achieve this transition without damaging the environment or depleting our raw materials?



A: The vision of Europe's leading clean transport campaign group is a mobility system with zero emission, affordable and having minimum impact on people's health, climate and environment. Transport, including aviation, cars, shipping, and freight, is a growing sector and it is the source of largest CO_2 emissions, responsible for the 20 % of all emissions in EU. In the area of transport, cars are accounting for 40 % of emissions, therefore this is an area where producers and consumers need to shift from the fossil fuelled powered engines to zero emission mobility system. It is important to keep in mind that direct electrification of vehicles is by far the most efficient and convenient solution**.**

In order to meet the EU cars' CO_2 emission standards for climate neutrality goals, the target is to sell one million electric vehicles this year. However, this has to be achieved in sustainable ways. The above-mentioned target will require an increase in batteries production. In order to comply with the Green Deal's standards, we need to ensure that the raw materials used in the batteries are sustainably sourced and manufactured. The three main requirements are:

- Sustainable and ethical sourcing of raw materials
- Accurate and up to date specific carbon footprint of manufacturing
- Appropriate repair, reuse and recycling system

At the moment, the EU lacks a professional certification scheme and enforcement which encompasses all these dimensions. There are today track-and-trace systems in place which are used to identify the supply chain risks by companies. Hence, European policy-makers could also use these tools in order to ensure that the European battery supply chain complies with the sustainable criteria. By mandating the OECD guidelines for sustainable sourcing for companies that use globally extracted materials in Europe, this would ensure responsible business conduct across the supply chain. OECD guidelines are a five-step framework:

1. Establishing a strong company management system
2. Identifying and assessing the risk from the supply chain
3. Designing and implementing strategies to respond to those risks
4. Carrying out independent audit of the supply chain where the risks have been identified
5. Reporting on supply chain due diligence

Moreover, mining companies and traders should comply with the ISO international standards for environmental impact and occupational health, if their materials are used in batteries present on the European market. The industry sector should cooperate with the policy makers in order to achieve this and to be the leading example for international practice.

Q: One of the consequences of following the above-mentioned standards is that the products manufactured in Europe have a premium price. Are the European companies and consumers prepared and willing to pay this premium price?

The fact that green doesn't have to come at a premium price was demonstrated by Northvolt, one of the European battery producers, who established a green sustainable production across the value chain. Green is no longer a luxury, it's a precondition to be part of the future technology.

Interaction with audience:

Q: What would be a good approach to replace fossil fuelled vehicles with electrical ones?

Comments: There is a call for better design in the circular economy to reuse materials parts and components and the idea that the waste needs to be collected properly, thus enabling recycling. Moreover, there are leverage factors. For instance, each tone of material in e-mobility displaces more than 10 tonnes of fossil fuel, hence this could be a good starting point to leverage the people that take decisions.

Q: What is your view regarding the above-mentioned matter and how to bring this forward?

A: Recycling and circularities are recommended prior to opening new mines in Europe. Materials used for the electric vehicles, such as lithium and cobalt, are present in our mobile phones and laptops, hence we can start to recycle immediately. However, Europe does not have yet the capacity to recycle some of the raw materials locally. Therefore, most of the lithium is sent to China for

recycling. Thus, we need to ensure that Europe can collect and recycle in-house, planning for better circular design and waste collection.

Q: Would you like to tell us something regarding the importance of education and awareness raising from children to politicians?

A: We are not suggesting that everyone needs to replace their vehicle. Before purchasing a new car, consumers should think about the long-term impact the car will have on the environment. Moreover, people living in cities should assess if they really need to own a car while having access to public transport and intermodular vehicle system.

1.2 Evangelos Tzimas – Directorate Energy, Transport and Climate, Unit – Knowledge for the Energy Union, Joint Research Centre (JRC), European Commission

Q to the audience: Europe plans to make a massive shift to renewable energy, but how will this impact our imports of raw materials and dependence on foreign suppliers?

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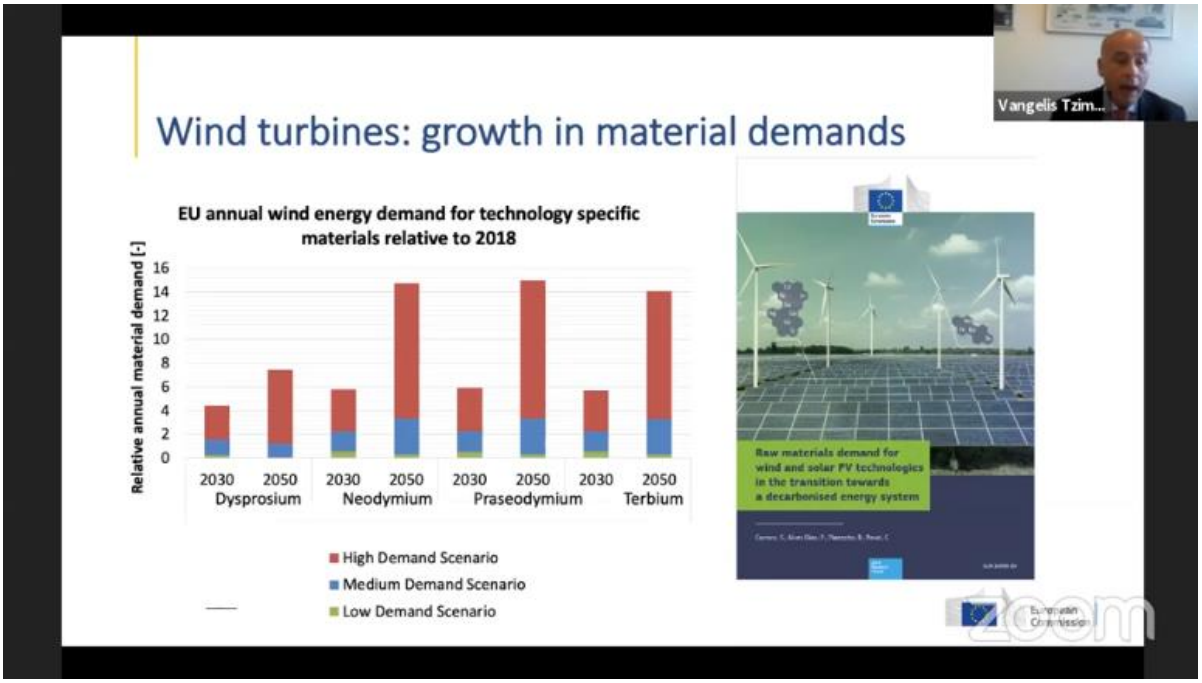


A: For the past decade the Joint Research Centre (JRC) has been doing research to provide evidence that is important for the delivery of the European Green Deal. Last year the European Commission proposed the European Climate Law and two weeks ago the ambition was raised to reduce greenhouse gas emissions by at least 55% below the 1990 levels by 2030. The transition of the energy sector envisioned by the European Green Deal is dependent on the large-scale deployment of the clean energy solutions. For example, it is expected that by 2050, the EU will have three times the renewable technology installed today. Among the renewable technology, wind and solar are the sectors with the fastest growing markets and one of the solutions available for the supply of electricity needed to fuel the electric vehicles, discussed in the previous presentation.

Importantly, the supply of green energy comes at the cost of increasing need for raw materials, which are not always available in Europe and have to be imported. This poses a great risk in meeting the supply of certain raw materials, particularly when these are highly concentrated in few countries. This is actually the case with the supply of raw materials for the wind energy sector.

Within the supply for wind turbines, the highest risk exists at the level of raw materials. Europe has less than 1% of the raw materials for wind turbines but plays a major role at the assembling stage where the European share is above

50%, which makes Europe a global leader in the wind energy markets. Among the raw materials used in wind energy technology, the highest concern is for the family of REE, particularly for neodymium, praseodymium, terbium and dysprosium, that are used for the production of Permanent Magnets (PM). PMs are key components of most wind turbine generators and they are highly favoured due to their reduced size and high-power output. In onshore wind turbines they can be substituted by other technologies, however this is currently not possible in offshore turbines, which is currently a fast growing and important sector worldwide.

Today, China has a quasi-monopolistic role in the supply of REEs, as over 60% of their production and 90% of their refining is concentrated in China. In 2018, the EU deployed wind turbines that contained about 860 tons of neodymium, 150 tons of praseodymium, 95 tons of dysprosium and 30 tons of terbium, in total over 1000 tons of REE. Future trends depend on the energy needs and the progress in wind energy technology development, as well as materials optimisation and substitution. It is predicted that the annual demand for wind energy technology will increase considerably both at European and global level. Recycling, the use of alternative materials and successful R&I projects in this area could lead to the decrease in demand of REE. Moreover, there are several mining projects in Australia, Canada, Greenland, and Sweden which may come online in the next decade.

The problem is not just with the raw materials but also with the other components used in clean energy solutions, hence we need a good mapping of the value chain. As customers are more aware of the impact their choices have on the environment and social aspects, it is important to have the mapping in order to be informed about the source and the way products were made.

In conclusion, in the near future we do not expect to have shortages of REE in Europe, at least in the energy sector, but we need to remain vigilant, monitor the risks and ensure the efficient operation in the value chain. Moreover, we need to develop a European value chain for the components used in green technologies, such as wind turbines, so that we can become an example for the rest of the world and the global leader in their development and deployment.

Audience input: The flow of raw materials across the world is a complex problem including parts and components, products and end of life waste. Do you agree that we need a mapping of the value chain?

A: absolutely! We are living in a globalised economy and indeed, materials extracted in country X is transported to country Y, refined and then assembled in components in another place that may be used in a totally different place in the world. Hence, it is very important to have this mapping and understanding of the flow of various materials. We have seen that dependency on a single supplier creates a risk and now the various industries are working to map their supply chains.

Q: Is the manufacture of the wind turbine done also in the EU?

A: Today European companies are responsible for more than 50% wind turbine manufacture around the world. Europe is a global leader, although we are importing components and materials from everywhere around the world and we also export around the world. In the top 10 companies in the world, European are at least 6 or 7.. However, if we want Europe to flourish, we have to look into the global market, not only in the domestic one. The whole world will decarbonise and would like to use wind turbines and solar panels as well as other

technologies. Being now a global leader, it is a very good opportunity for Europe to export green technology to the rest of the world. Hence, we need to continue building wind turbines, with a European know-howcreating European jobs.

Q: If we manufacture this technology in Europe, there will be a premium price. Are the consumers and the market willing to pay for this premium?

If the consumers have to pay a premium, they need to have the assurance that they get the products they are paying for. Hence, it would be a good idea to have a transparent mechanism that will offer a guarantee of origin, to prove where the components' raw materials are coming from.

1.3 Maria Sunér Fleming – CEO of the Swedish Mining Association

Q: A green transition will require substantial raw materials, can Europe's mines supply these and will the public accept new mines?

Today, Sweden is one of the important mining countries in Europe, producing several of the base metals needed for the society, such as iron, lead and copper. Moreover, there is potential in Sweden and in other Northern European countries to produce more materials. Furthermore, Swedish mining sector has high standards and aims to supply Europe with sustainable materials for the green transition, by operating fossil free by 2030.

The launch of the European Raw Materials Alliance and the new edition of the Critical Raw Materials (CRM) List has triggered an increased focus on the raw materials supply. Only recently these materials and their availability has become known to the public opinion and to companies and we should now be concerned with securing the European supply.

Traceability is extremely important. Swedish mining association is running a product called Tracemet – tracing carbon footprint and the amount of recycled materials within different metal products. It is desirable that the producers of electric vehicles and windmills start to put demands on how materials are produced, and this might enable them to have an increase premium.

Europe needs to find ways to create a secure supply and to make it more sustainable. Presently there are also obstacles, for instance in the mining sector there is a long process for the permits related to the social acceptance and the environment. Hence, we need to find ways to speed up these processes while at the same time retaining a high standard for environmental performance. Moreover, we need to have coherent legislations both at national and European levels.

One of the challenges is that mines have to be located in the place where mineral deposits are found, they cannot be moved. Sustainable finance framework is also important for the investment in mining. In order to become fossil free and to have zero emission in mining production, we need reasonably priced electricity.

It is possible to have a source of REE in Europe: as mentioned previously Sweden and Greenland have the capacity to supply a substantial amount. Sweden has now several projects with promising possibilities to start supplying REE, especially dysprosium, if the required permits and the necessary legislation come in place. Finally, recycling is an important aspect, but the knowledge and the processes often go hand in hand with the primary production. Thus, the start the primary production could also facilitate the recycling process.

The policy framework we are operating (i.e. regulations, EU base laws) could either enable or obstruct the way we move towards the green economy.

The audience comments confirmed the need for the policy framework to create the standards for the raw materials production and the fact that using tailing in mines could be a very good approach to extract more materials out of the existing mines

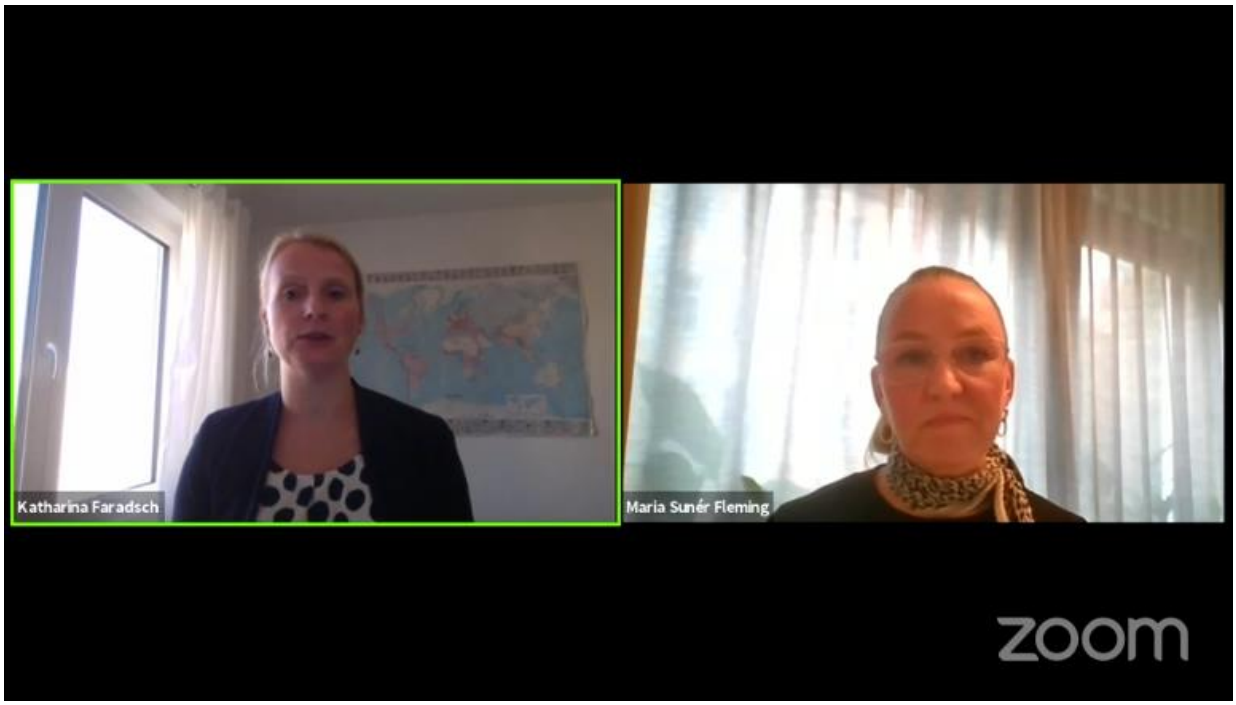
Q. From the audience: Could you give an idea of a possible location of new mines and how close they are to cities and villages?

A: A mineral deposit in the ground is located where it is, no matter if it is far away or close to the city. When they are close to the city things get complicated and it

might not be possible to develop. There are a lot of discussions around this issue, both in Sweden and in Europe, from indigenous groups, the agricultural sector, and other bodies, hence it is really complicated when it comes to new mines. However, the mining sector should also show what is a modern mine as it might be different from the public perception of what a mine is and to show how the ground will be restored after the mining period. We need to show how can we work with the nature and with the people living in this area.

Q: Shouldn't the priority be to extract critical raw materials from the secondary raw materials rather than from virgin materials?

A: We need both. Today the REE are recycled less than 1 % globally and then if we proceed to a big increase as shown earlier by Vangelis, we will need more primary raw materials coming into the system, for quite a long time.



Session II – The implications of an increasing demand for rare earths for EU policies and regulations

The second session of the Policy Council focused on the consequences of the increased demand for REE, from the perspectives of EU policies and regulations. How the EU policy framework and laws facilitate or hinders the efforts to create a European sustainable value chain of REE.

2.1 Milan Grohol – Policy Officer, Resource Efficiency and Raw Materials, Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs DG GROW, European Commission

Q: "We've heard about the needs and challenges of different European industries. From a policy perspective, what are the main policy instruments available to support these needs? How are they contributing to the EU Green Deal and its targets?"

A: In addition to what has been discussed today with regards to the Green Deal, we need to incorporate an important aspect, namely resilience. This is important

in order to face future crisis, such as the current pandemic situation. With regards to CRM policy background, we have just launched a new program, including the list of CRM 2020, and right now we are inaugurating the European Raw Materials Alliance (ERMA).

It is expected a tough competition between different materials used in different technologies, as it is obvious now that major sectors such as transport, renewables, defence, space, and others will all need CRM and they will be directly affected in the future by their availability.

A short action plan for CRM is being implemented, starting with the launch of ERMA which is a very important step in the capacity building of a carbon-neutral economy in Europe by 2050. Secondly, there are efforts in creating better financing conditions for projects in the EU, which need the support of industries, NGOs, and from the entire society in the Member States. Thirdly, there is a focus on improving circularity by encouraging the repair, reuse and support innovation in the area of recycling REE which presently is almost non-existent in Europe. Fourthly, there is a need to start building domestic sourcing by address the lack of mining sites in the EU, having in mind the possible available sources in Sweden, Finland and other Member States, as well as conducting research about mining and processing of CRM. Importantly, we need to take advantage of the existence of platforms such as Copernicus and use them to monitor mining operations. Additionally, there is the need to diversify from third countries and work on the ethical delivery of CRM for the products that enter the EU market. Finally, EU is looking forward to new partnerships with Canada, Africa and neighbouring countries rich in CRM.

The ten actions to ensure Europe’s access to raw materials are available in the attached Annex.

2.2 Roland Gauss, Senior Advisor – Substitution and Recycling, Sustainable Materials for Future Mobility, EIT Raw Materials

Q: "What is the European Raw Materials Alliance expectation regarding the CRM? Are the ten points actions mentioned by Milan sufficient? What do businesses need to make this transition?"

The Alliance is actually part of the ten actions plan. Industry stakeholders from across the value chain (mining, design, recycling) need to come together to tackle one of the biggest challenges that we as a society face today, the extraction, use, and recycling of raw materials. We need to identify the regulatory and financial obstacles to the growth of this industry in Europe. We need to understand why mining process in Europe is declining. Bringing all the actors together could help us identify these challenges.

The second key aspect we need to identify, particularly with the industry and the private sector, is the good investment case that will make a difference in securing access to raw materials and advanced materials as well as in the field of product design and recycling. EU industrial players in automotive, energy, health, electronics, constructions and other sectors should grasp these opportunities and strategically invest. We are also expecting that the upstream players are coming along with the most sustainable and technologically advanced solutions at cost competitive levels and that they can demonstrate the superiority of these solutions. Hence, this is the time that investors can sign up and propose investment cases. We will start now with a cluster on rare earth magnets and motors and a second one on energy materials, storage and conversion. There will be more clusters and we aim to identify them in collaboration with the stakeholders.

Q: "How can we create an environment where the magnet users are willing to accept the premiums that they need to pay for European raw materials?"

A: Roland Gauss: First, we need to talk about these issues and make people aware, it is all about informing people and developing a business case around

this. Sustainability does not come for free, we need to strategically invest, to raise awareness and to create a business case.

Q: "What are your views on European standardisation and verification of sustainable energy equipment?"

A: Milan Grohol: Standardisation proved to be quite an effective tool which has been used by certain players during the past few years and we found out that it is worth pursuing the standardisation of the products containing CRM as this creates a competitive advantage for the products. The Member States were recently advised to look into standardisation of the raw materials for energy transition. However, we can only set standards if we participate in this industry

Session III – Conclusions & examples of European R&I projects

In the final session of the Policy Council the coordinators of the Horizon2020 projects SecREEts and SUSMAGPRO addressed their closing remarks linking the challenges faced in these projects with the previous discussions.

3.1 Arne Petter Ratvik – SINTEF - Coordinator of H2020 SecREEts project

Q: The SecREEts project aims to create a stable supply of REE. How we are doing that?

A: SecREEts is working to start the first production of REE in Europe, an integrated value chain from raw materials to finished magnet products. The

consortium is very glad to have the support from the EC and, for those interested in the project, there will be a further session at EASME this afternoon. One observation is that it will be difficult to have a recycling of REE without a primary production in this industry, hence, the start would be to create the production in the EU. The SecREEts project is confident that it will achieve its goal.

Q: It is correct that in SecREEts we are not mining the REE directly, but it is a secondary process?

A: Yes, it is correct. We are actually taking the REE out from the fertiliser production. REE are today going directly to the fertiliser and we can extract it from the fertiliser process.

Q: Are you confident that in the next two years, before the end of the project, we will be ready for the market in this value chain?

A: Yes, we are doing a very good work and I think we will be ready.

3.2 Carlo Burkhardt – Hoschule Pforzheim – Coordinator of H2020 SUSMAGPRO project

Q: There has been a lot of work about recycling. This is the field of SUSMAGPRO!

SUSMAGPRO is a follow-up of other European funded projects in this area. The process does not go back to the REE but keeps the neodymium, iron and boron as an alloy by hydrating it, a very clean process, 90 % less energy consumption and 98 % less toxic process. On the lab scale we proved that this is working very nicely and SUSMAGPRO is really now a scale up project. The project consortium has nineteen partners and is trying to create an entire recycle value chain from the recycling to the magnets producers and to the end users. The recycling of the magnets when we have it on the table is very simple, however we see there are many issues when it comes to access the magnets, some of them are not designed for recycling and over the project we learn these things, which coatings,

and corrosion protection are good for recycling, we are collating all these data which is a good based for what has been previously discussed today like standardisation. We set up four pilot plants with a capacity of 110 tonnes per year and it is envisioned that by the end of the project SUSMAGPRO will provide a recycling process for the PM which the EU can use.

Q: The project is just starting. By the end of the project are we going to have a process here that the European industries can use? Can they rely on you to recycle their magnets and to produce new goods and services?

A: The short answer is ‘Absolutely’, the long answer is a bit longer. We set up these pilot plants and we are focusing on the available large quantities like wind turbines, traction, and here we have a defined material loop and these quantities will increase in the future

Conclusions

The second SecREEts Policy Council has brought together a broad range of stakeholders and high-level key speakers, enabling an important dialogue on the future of the REE market in Europe.

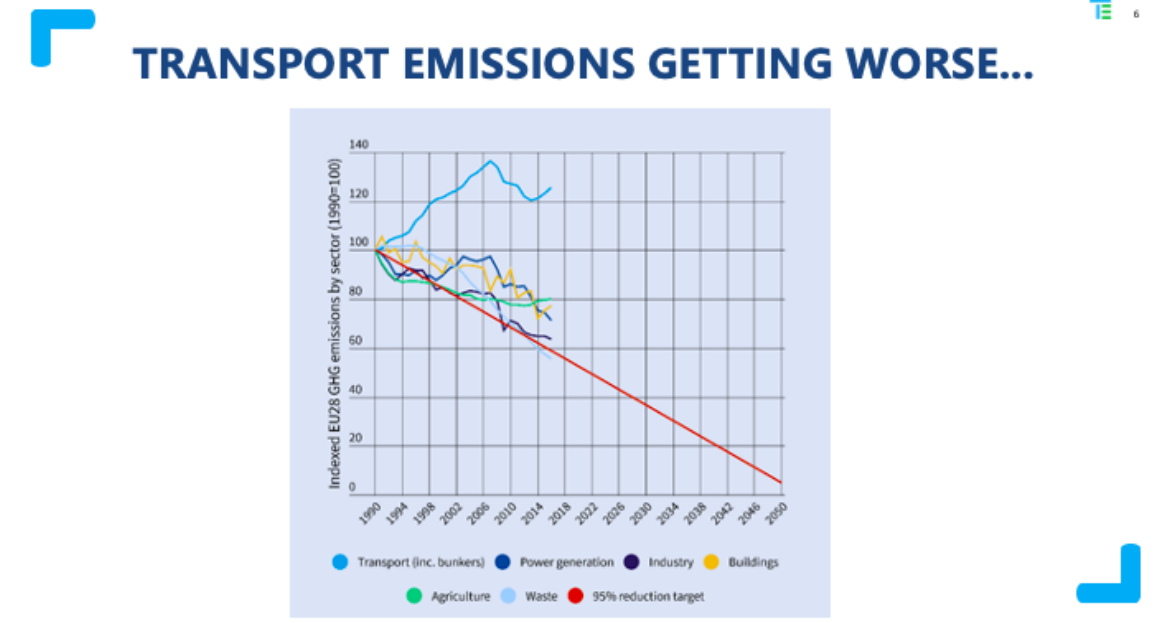
The main message of this edition is the immediate need to create a European stable and sustainable value chain of REE, to supply the future needs of important industry sectors (i.e. transport, renewables). The discussions focused on the challenges and opportunities to achieve this goal, both from industrial side and European policy. While currently there are no operating mines to extract REE in Europe, neither knowledge and technology to recycle them, there is potential and first action taken to address these.

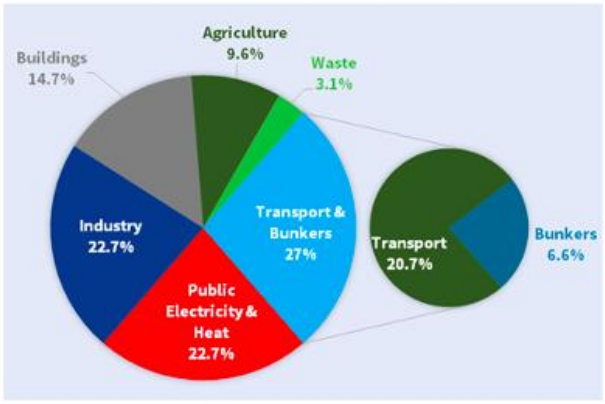
On the European policy side, the highlight is the launching of the European Raw Materials Alliance, which is dedicated to address all the steps needed to ensure a sustainable and ethical source of REE for all the products entering the European market. This will be accomplished by developing rigorous certification programs.

Finally, there is a cooperation between the European R&I Horizon 2020 funded projects, SecREEts working closely with SUSMAGPRO, aiming to be an important part of the European value chain for REE in the near future.

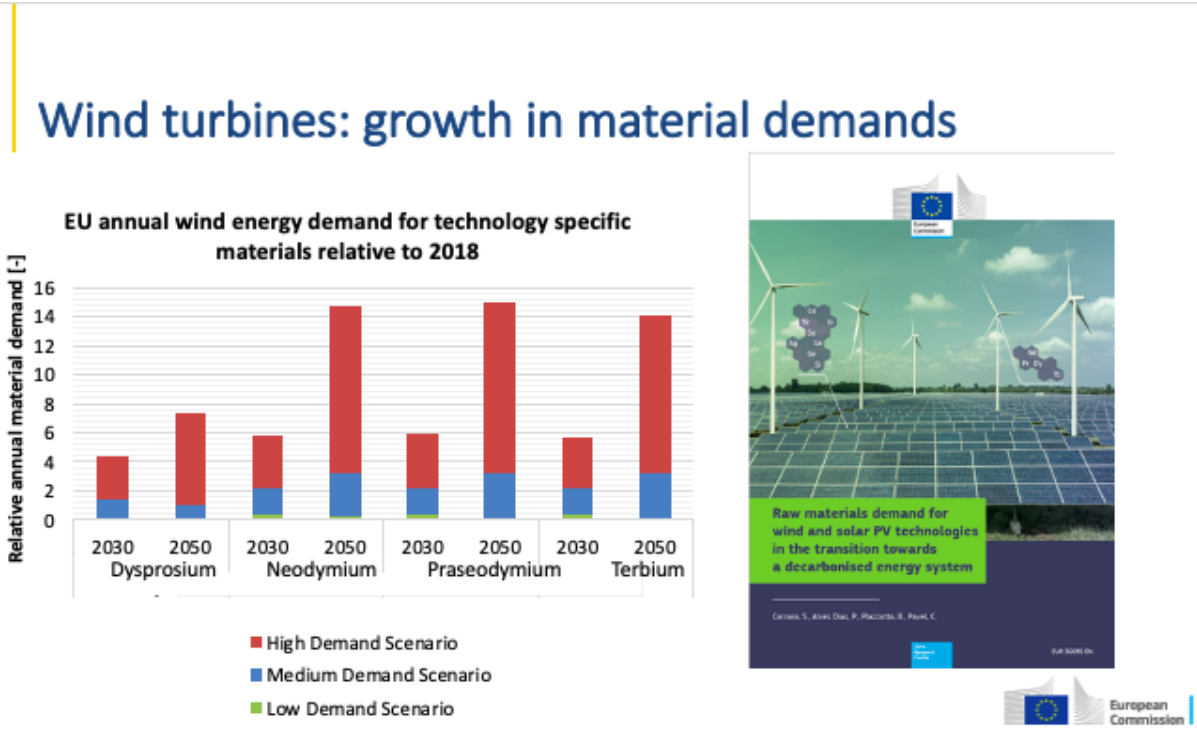
Annex 1. Presentations

Cecilia Mattea - Clean Vehicles Expert, Transport & Environment

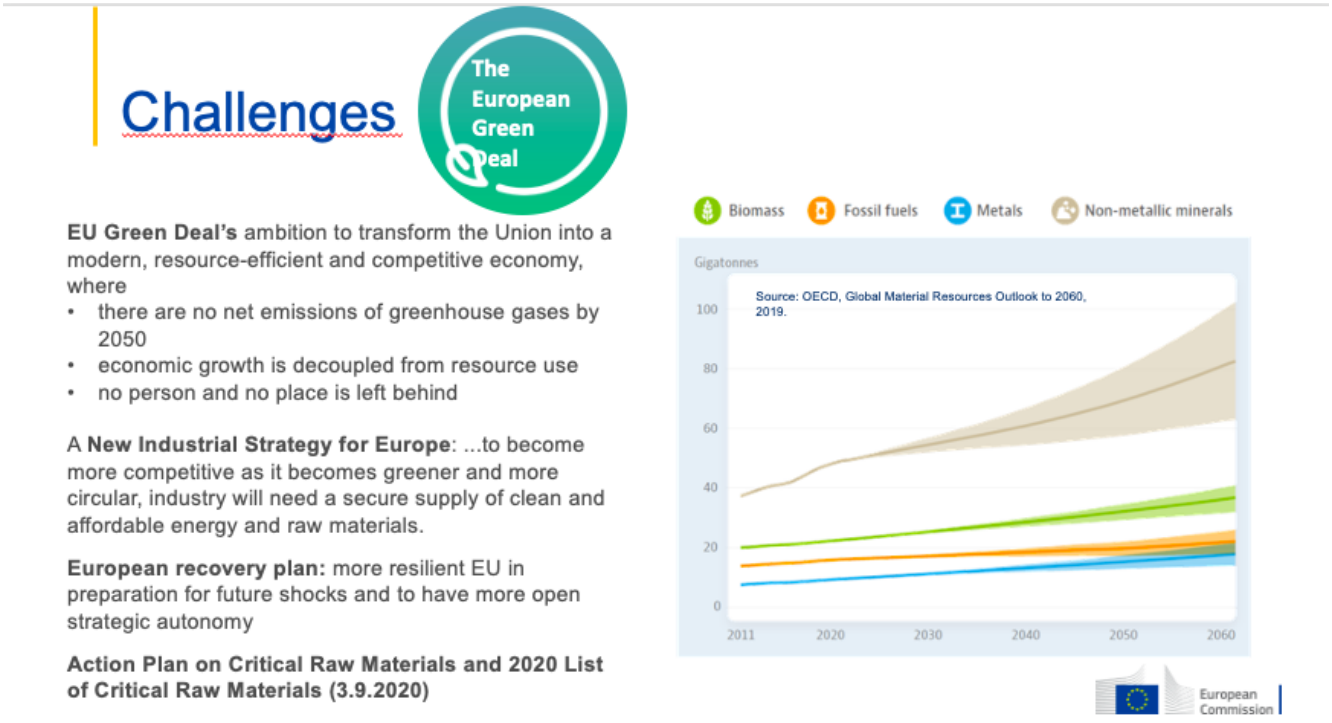




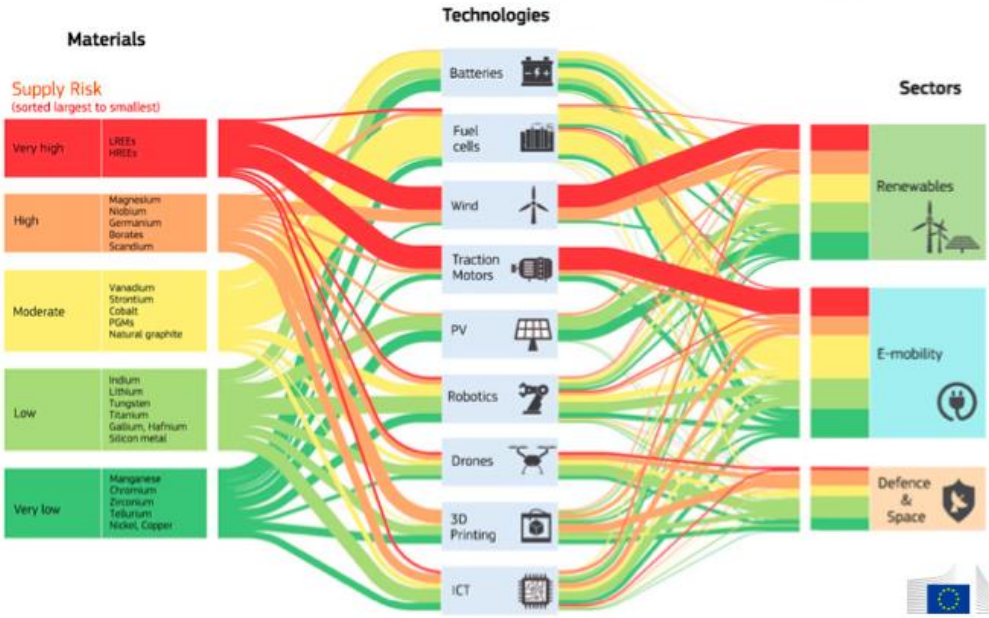
Evangelos Tzimas – Directorate Energy, Transport and Climate, Unit – Knowledge for the Energy Union, Joint Research Centre, European Commission



Milan Grohol - Policy Officer, Resource Efficiency and Raw Materials, Directorate-General for Internal market, industry, Entrepreneurship and SMEs DG GROW, European Commission

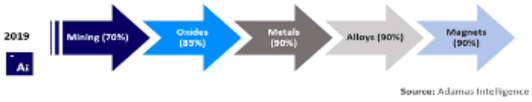


Which materials do we use for green technologies?



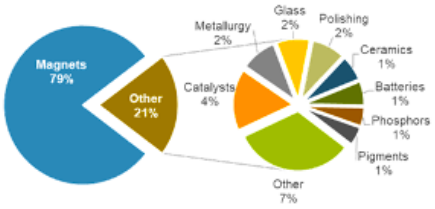
European Commission

10 actions to ensure Europe's access to raw materials (1/4)



Resilient value chains for EU industrial ecosystems

1. Launch an industry-driven **European Raw Materials Alliance** on 29 September 2020
   - Initially to build resilience and open strategic autonomy for the rare earths and magnets value chain, before extending to other raw material areas
   - Bring together industrial actors along the value chain, Member States, regions and civil society
2. Develop **sustainable financing criteria** for the mining extractive and processing sectors in Delegated Acts



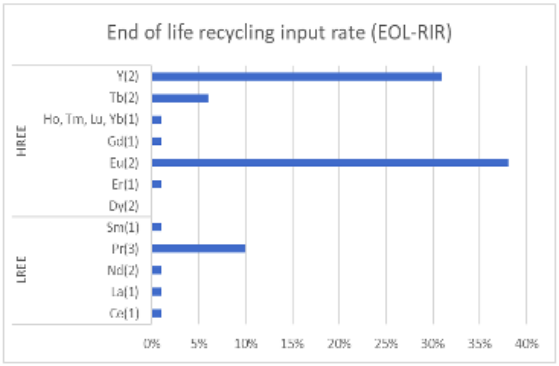
EUROPEAN RAW MATERIALS ALLIANCE | ERMA

European Commission

10 actions to ensure Europe's access to raw materials (2/4)

Circular use of resources, sustainable products and innovation

3. Launch critical raw materials **research and innovation** on waste processing, advanced materials and substitution
4. Map the potential supply of **secondary critical raw materials** from EU stocks and waste and identify viable recovery projects

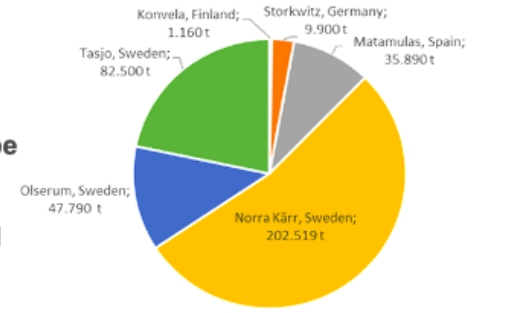


European Commission

10 actions to ensure Europe's access to raw materials (3/4)

Sourcing from the European Union

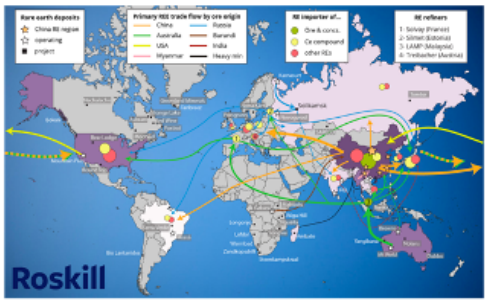
5. Identify **mining and processing projects that can be operational by 2025**
6. Develop expertise and skills in mining, extraction and processing technologies - **regions in transition**
7. Deploy **Earth-observation** programmes and remote sensing for resource exploration and production monitoring
8. Develop **Horizon Europe** R&I projects on exploitation and processing of CRMs to reduce environmental impacts

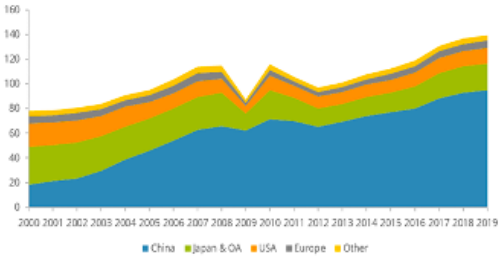


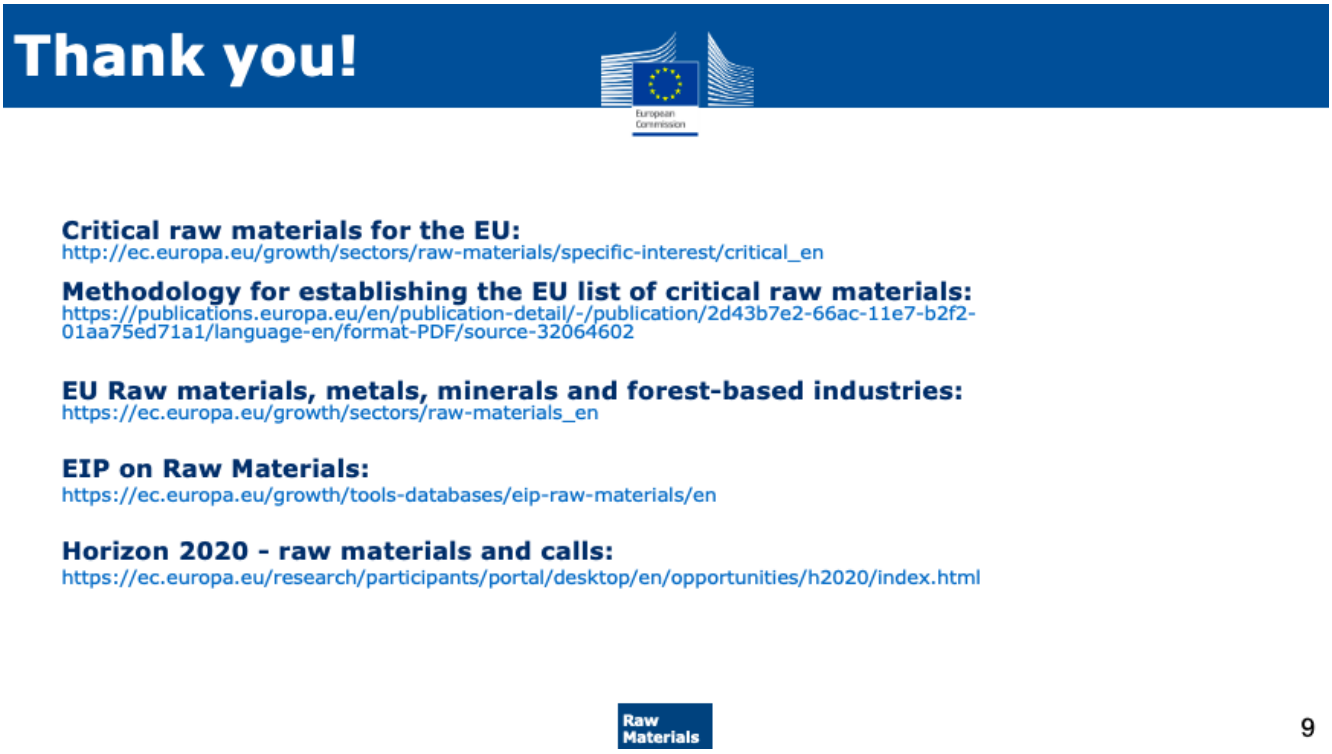
10 actions to ensure Europe's access to raw materials (4/4)

Diversified sourcing from third countries

9. Develop strategic **international partnerships** and associated funding to secure a diversified supply of sustainable critical raw materials, including through undistorted trade and investment conditions
10. Promote **responsible mining practices** for critical raw materials through the EU regulatory framework and relevant international cooperation







Critical raw materials for the EU:
http://ec.europa.eu/growth/sectors/raw-materials/specific-interest/critical_en

Methodology for establishing the EU list of critical raw materials:
https://publications.europa.eu/en/publication-detail/-/publication/2d43b7e2-66ac-11e7-b2f2-01aa75ed71a1/language-en/format-PDF/source-32064602

EU Raw materials, metals, minerals and forest-based industries:
https://ec.europa.eu/growth/sectors/raw-materials_en

EIP on Raw Materials:
https://ec.europa.eu/growth/tools-databases/eip-raw-materials/en

Horizon 2020 - raw materials and calls:
https://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/index.html