



Eramet Norway

# Sustainability report 2020

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## Key figures Eramet Norway

# 2020

Operating revenues  
(billion NOK)

## 5,55

Current Operating Income  
(mill. NOK)

## 670

Employees

## 532



Capital Expenditures  
(mill. NOK)

## 198



Sales volume



## 1 909

Electrical energy  
consumption  
(GWh)



## 741 000

CO<sub>2</sub>-emissions  
(tonnes)



Capex since 2000

## PART 1

In this part of the report, we present our company and what is important to us:

Our employees, our products and our social responsibility.

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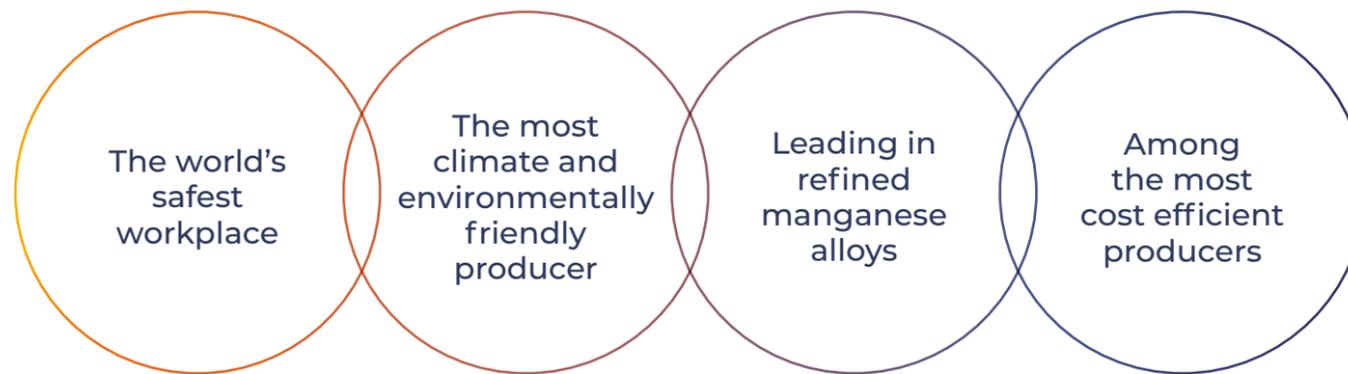
## OUR VISION

**World-leading manufacturer of manganese alloys through involvement, innovation and job satisfaction**

# About Eramet Norway

## OUR STRATEGIC GOALS

In our industry, we aim to be:



## – We work in a learning environment –

**With its three smelters in Porsgrunn, Sauda and Kvinesdal, as well as an R&D-department in Trondheim, Eramet Norway is a world-leading producer of refined manganese alloys for the global steel market.**

Eramet Norway is proud to be a part of the Norwegian industrial history with more than a hundred years of operation at the plants in Porsgrunn and Sauda, as well as production in Kvinesdal since 1974. The company has more than 530 employees. In addition, Eramet Norway welcomes each year a large number of apprentices to do their training at our plants.

Eramet Norway is part of the French mining and metallurgy group ERAMET, which has operations in 20 countries and around 13,000 employees worldwide. The Group is a major international producer of special alloys, manganese, nickel and mineral sands with a turnover of EURO 3.5 billion in 2020, where of Eramet Norway's turnover was NOK 5.6 billion. Eramet Norway is part of the manganese business, which also consists of the Group's smelters in Marietta (US), Dunkerque (France), and CMM (Gabon), as well as the mine in Gabon.

Operating smelters in Norway, located a considerable distance from our main markets in Europe and North America, is solved through extensive networks, solid agreements and

efficient logistics. Eramet Norway produces metals that the world requires for the future zero emission society, and we do so in a resource-efficient way. The company is today one of the world's cleanest producers of manganese alloys as a result of several years of systematic knowledge building, targeted investments and continuous development of the organisation. The work continues, and the company's roadmap for climate and environment includes ambitious goals and development projects related to biocarbon, CCS and circular economy, which is described in Part 2 of this report.

# A steady course thanks to solid experience and a pro-active strategy



**Bjørn Kolbjørnsen**  
CEO Eramet Norway

Eramet Norway was not exempt when the world changed drastically within a few weeks during the first part of 2020. The strict restrictions resulted in a sharp reduction in the demand for a number of products, including steel where our products are an ingredient. Refined ferromanganese alloys, our main product, is an important part of steel grades used in the production of cars, and this market disappeared almost overnight.

The sales team, located at the Group's head office in Paris, moved to exploit the crisis and capture new market shares in a volatile market. We chose a pro-active strategy and produced for as long as we could. This situation lasted until the end of May when we were forced to reduce production due to the decline in order availability.

As a part of our strategy, we made sure we were ready to rapidly increase production again - we kept our organisation in place and had raw materials in stock and equipment available. This proved to be the right approach, and by summer, we could once again increase our production. Several of our competitors had reduced their production or suffered delivery problems which led to market shortages and a subsequent price hike. Thanks to our strategy, solid experience and employees who were flexible,

stood together and took care of each other and the plants, we ended the year with a financial result far better than we had predicted at the start of the pandemic.

**Last year tested our competitiveness. Eramet Norway reduced its production by about 5% at a time when our largest competitors experienced reductions of between 25 and 40%.**

## Safety first, for everyone, always!

2020 also affected how we worked to maintain our highest priority: The health and safety of everyone who works with us. Our goal is that everyone leaves work in as good health as when they arrived, and in a good mood after working in a safe environment with committed colleagues. As a result of Covid-19, we introduced strict infection control rules that our staff have loyally followed to protect themselves, others and our plants.

In 2020, we reduced our injury rate by half, from 8.1 to 4, however, we did experience incidents with high injury potential. This gives us motivation to strengthen our efforts in implementing our 'All for Zero' programme, with extra focus on risk understanding, implementation of 'Essential (safety) requirements' and safety conversations.

## Research and development for a reduced climate footprint

Eramet Norway is proud to be among the producers in our industry that have the smallest climate footprint per tonne of manganese alloys, but the climate crisis put pressure on development capacity and timelines. We have more than 50 projects in our climate, energy, environment and circular economy roadmaps. They form the basis for how we are to realise of our ambitious, but necessary, objectives.

Our climate roadmap contains projects that will make it possible for us to reach the goal of reducing greenhouse gas emissions per tonne by at least 43% by 2030 and 80% by 2050. The progress was admittedly slower in 2020 than we anticipated due Covid-19 restrictions, but we reached our goal in a subproject in the category 'changing raw materials and adapting our production processes to reduce CO<sub>2</sub>emissions'. The project is related to silicomanganese production (SiMn) and is the result of systematic process development work at the plant in Porsgrunn. Greenhouse gas emissions from our SiMn furnace was reduced by about 8%, and we will now apply this knowledge to our other three SiMn furnaces in Kvinesdal.

We are working on several larger projects with longer time horizons:

- We will use biocarbon as a reducing agent in our furnaces to decrease the use of fossil carbon sources.
- Through the NewERA project, we will increase our process efficiency and reduce the consumption of electrical energy and carbon. The first stage is a pilot plant for energy recovery at the plant in Sauda, with a planned start of the test phase in May 2021.
- In addition, we are working on specific projects to manage the furnace gas, which is the main source of our CO<sub>2</sub>emissions.
  - CCU - solutions where the furnace gas is a resource in other product chains
  - CCS - capture and storage of CO<sub>2</sub>. In 2021, we will conduct a pre-feasibility study with a view to install a carbon capture test facility at our plant in Sauda.

## Steady course towards a more sustainable future

We believe the green shift represents a significant growth potential for Norwegian process industry, and this also requires a pro-active strategy and good cooperation. Eramet Norway has been involved in «Prosess21», a strategic co-working project for the Norwegian process industry. The Group has presented recommendations for reducing emissions and facilitating sustainable growth. Norway's world-leading position in climate and environmental solutions gives us a head start, and good collaboration between political authorities, industry and employees will be a prerequisite for further success.

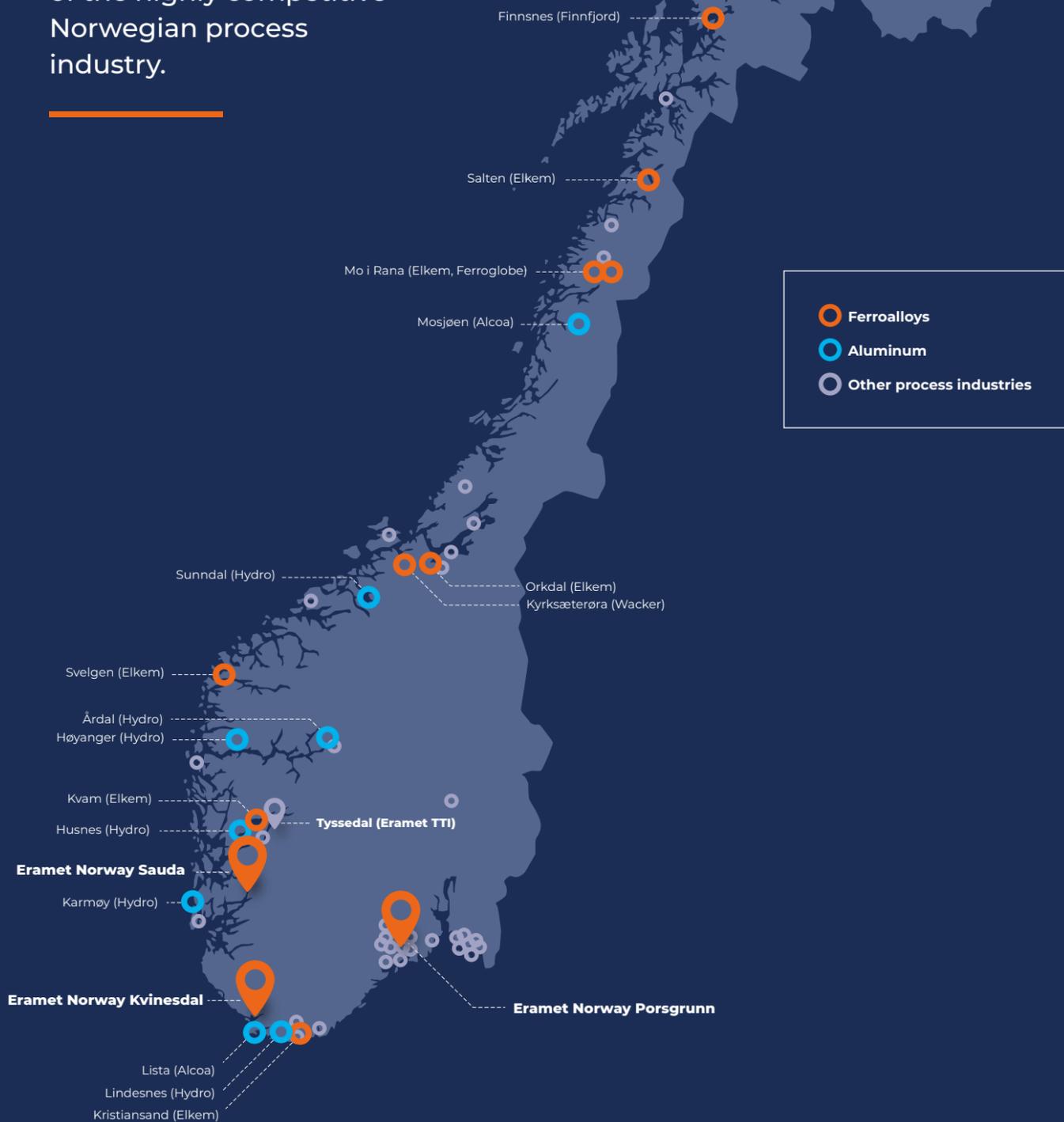
As the pandemic enters its second year, we are more prepared and have more experience, which will serve us well in our efforts to keep a steady course towards a more sustainable future.

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In 2021, Eramet Norway's three manganese smelting plants will become a key part of ERAMET's new manganese alloy business unit. This gives us a good starting point for achieving our goal of being a world leader in our industry and leading the way in sustainability efforts.



Built on renewable energy, Eramet Norway and its skilled workforce, are part of the highly competitive Norwegian process industry.



# Eramet Norway Porsgrunn

The smelter, established in 1913, is part of the leading industrial cluster on Herøya. This location provides great opportunities for cooperation and further development of processes and working methods, including in areas like circular economy.

Eramet Norway Porsgrunn specialises in refined ferromangan alloys, and with its two furnaces and refining facility (Manganese Oxygen Refining - MOR), the smelter is our most flexible processing plant in terms of product qualities.

### Environmental milestones since 2000:

- 2000** Mercury cleaning facility (MRU)
- 2002** Centre chimney filter Furnace 11
- 2007** MOR filter extended
- 2011** New centre chimney filter Furnace 11
- 2015** Optimisation of final cleaning facility (SRA)
- 2018-19** Measures to reduce noise: new doors, gates, isolated walls, sound silencers and fans/equipment
- 2020** Pilot "New process water cleaning concept" (SRA)
- 2020** Project for measurement and analysis of content of dust downfall



Porsgrunn

Population:

**36 400**



**162**

Employees

**16**

Apprentices



# Eramet Norway Sauda

The smelter, locally referred to as 'the factory', is located at the city centre and has been a large part of the local community ever since its establishment. The plant remains an important partner in social and business development in the region.

With its two furnaces and MOR facility, Eramet Norway Sauda is today the largest manganese smelter in Europe. The plant is a world leader in the production of refined ferromanganese, which accounts for about 80% of the plant's turnover. The by-product HC FeMn slag from the production process is an important input factor in the production of silicomanganese in Kvinesdal.

### Environmental milestones since 2000:

- 2000** Upgrade of water treatment plant (VRA)
- 2002** Construction of heavy metals treatment plant (MRU)
- 2004** Construction of centre chimney filter
- 2010** CCT for dust emissions surveillance
- 2012** New treatment plant at MOR
- 2014/17** Watering system over sandbeds MOR and furnace house roof openings
- 2017** Continuous laser measurements of dust in furnace house
- 2020** New slag casting smoke extraction system



Saуда

Population:

**4 600**



**166**

Employees

**29**

Apprentices

# Eramet Norway Kvinesdal

Eramet Norway took over the smelter in Kvinesdal from Tinfos in 2008. The plant started production in 1974 and has an efficient production flow with its three silicomanganese furnaces and compact infrastructure. HCFeMn slag from the Sauda plant is used in the production, contributing to the company's internal slag balance, and is an excellent example of circular economy.

A thermal power plant was built next to the smelter in 1981. The power plant produces about 80 GWh of electrical energy per year, and the surplus heat is used both internally and by external customers, including Stolt Sea Farms fish farm for turbot which is located on the neighbouring plot.

### Environmental milestones since 2000:

- 2000** Cleaning facility for PAH
- 2000** Mercury treatment plant (MRU)
- 2015** New deposit established at Fosslund
- 2016** Extraction system above the casting beds
- 2018** New slag water system
- 2019** New centre chimney filter
- 2020** Improvement of mercury treatment plant (MRU)



Kvinesdal

Population:

**6 000**



**200**

Employees

**22**

Apprentices



# Eramet Norway's R&D department in Trondheim

Eramet Norway's R&D department develops technological solutions and innovations to produce more efficiently and to further reduce our climate and environmental footprint.

The department cooperates with Eramet IDEAS, the Group's technology centre in France, and with leading universities, research institutes, clusters and other companies. The cooperation projects have an annual budget of about NOK 250 million. Many of these projects are supported by the Research Council of Norway, Enova and Innovation Norway.

Priority topics to further develop our leading position in the manganese alloys business are:

- Climate and energy
- Circular economy
- Increased MOR production (refined FeMn)
- Optimisation of silicomanganese production
- Digital Transformation

Trondheim  
Population:  
**207 600**

**4**  
Employees

## Our most important research collaborations and research partners

### NTNU

NTNU, the Norwegian University of Science and Technology, is the country's largest and leading educator of engineers and civil engineers. The disciplines range from nanotechnology and IT to petroleum engineering and ship design. NTNU cooperates with some of the country's most important technology and industrial companies and has its own research environments. Eramet Norway cooperates mainly with the Department of Material Technology

### SINTEF

SINTEF is a broad, multidisciplinary world-leading research institute with international expertise in technology, science, medicine and social sciences. SINTEF conducts commissioned research as an R&D partner for business and local authorities and is among the four largest mission research institutes in Europe. Eramet Norway cooperates mostly with SINTEF Industry, in addition to projects with SINTEF Energy and SINTEF Digital.



### NORCE

NORCE Norwegian Research Centre AS was founded in July 2017 and is one of Norway's largest independent research institutes. NORCE delivers research and innovation in energy, health, climate, environment, society and technology to contribute to required innovation and restructuring together with business and the public sector. Their solutions respond to key social challenges and contribute to value creation locally, nationally and globally.

### Swerim

Swerim is a Swedish leading metal research institute that conducts research and development around metals and processes from raw materials to finished products. The institute's goal is to strengthen the industry's competitiveness through increased product quality, higher resource efficiency and more sustainable production processes. By being a strategic R&D partner, the company wants to strengthen the competitiveness of its customers and contribute to the development of new processes, materials and product solutions.

### RISE PFI

RISE PFI is an internationally recognised research institute in processes and products based on lignocellulose. PFI's priorities are biorefining and bioenergy, fibre technology and applications, nanocellulose and carbohydrate polymers and bio composites. RISE PFI AS is part of the Swedish research institute RISE, Research Institute of Sweden AB.

### FFF

The Norwegian Ferroalloy Producers Research Association (FFF) is the most important arena for the industry's joint research. The organisation was founded by the Norwegian ferroalloy industry to collaborate on research on ferroalloy processes and products. FFF goal is to support the Norwegian ferroalloy industry to maintain its leading position. Eramet Norway and Elkem are the two largest partners in FFF, and together, the companies contribute almost 80% of the funding.



Foto: Erik Børseth

# Safety first, for everyone, always



**Our slogan is «Safety first, for everyone, always». The ambition to improve our safety outcomes was challenged in early 2020 by the pandemic. Although several planned activities and measures were forced to take a different form due to the implications of the pandemic, we can still conclude that 2020 showed a positive trend. However, our work is far from done, and we will strengthen our efforts to achieve zero injuries.**

There are particularly two initiatives which we introduced in 2020, which we believe will greatly contribute to improve our safety results further.

### Creating a climate for speaking up

To achieve good safety performance over time, we are dependent on the interaction between structure and culture. It is not enough to just have and improve routines and systems, we must also take ownership and responsibility through looking out for one another and by complying with the rules which we have established.

If we use the analogy of the house and the home for structure and culture, the structure is the house and consists of all formal structures which are in place to ensure safety. This includes procedures, routines, rules, physical barriers, organisation and hierarchy, methods, analyses, protective equipment etc. Culture is what makes the house a home, what makes it our own, that we take ownership of and care for it. This is created through leadership, dialogue, openness and respect.

We acknowledge that safety culture is strengthened by creating a safe

### Injury rates

TRI: Number of injuries with and without absence per million working hours. The columns show the number of injuries with absence for our own employees and contractors.

- Contractors
- Employees
- TRI rate



environment and building trust, and in order to do this we need to create an environment where everyone is comfortable to speak up: to be able to talk about safety, including helping or correcting each other, in a constructive way. Eramet Norway has, in collaboration with Kulturkompaniet, launched a programme called 'Bry deg' (care), where employees and managers through theory, practical exercises and reflection practice to:

- care about and look out for one another
- intervene in dangerous situations
- have the potentially difficult conversations with colleagues to ensure that this feels OK and becomes a positive experience, and together improve the safety level.

The plant organisation in Porsgrunn, in addition to some staff from our joint functions, participated in the 'Bry deg' sessions, which were held the autumn of 2020. The feedback was that this was perceived as interesting, relevant and partly also challenging. The sessions are part of a long-term development plan, and further events will take place in 2021, both digital and in person (when circumstances allow). The main topics will be how to look out for one another and how to create an environment where everyone feels comfortable to speak up.

In the autumn of 2021, the goal is to implement 'colleague talks' as a tool in the safety and development work.

### Safety coaches: «Boots on the ground»

It is at the plants that the results of our safety work, both the structural and cultural, becomes visible. It is here we see what is actually happening, what challenges we face day-to-day, and what people are really concerned about, and as a result, this is where we can have the most impact. To strengthen our safety culture, we have established a two-year project position as safety coach at each of our three plants. The safety coaches were recruited from own ranks and were selected on the basis of:

- extensive work experience from production or maintenance – it was also favourable to have experience from other companies
- their clear commitment to safety and good understanding of risk
- their ability to communicate
- that they enjoy working with people

The safety coaches help to improve the safety culture through practical

assistance both in production and in maintenance work:

- 90% of the time is spent in different departments at the plants.
- The focus is to increase competence, contribute to desired behaviour and encourage reflection on risk and prevention in work situations.
- Follow up on measures and processes we already have underway or are in the process of establishing: Take5, SJA, 5S, Essential Requirements, Safety Rounds, High Risk Potential incidents, Green Zone etc.

**The safety coach is a successful initiative to improve the safety level at our plants. The key success factor is that we use competent persons with the right attitude and operational experience who spend most of their time out and about. I am very pleased by the work that has been done so far and look forward to see the long-term results in safety attitude and culture."**

Sem Gysland, plant director, Eramet Norway Kvinesdal

# Sickness absence

**Total sickness absence in Eramet Norway amounted to 5.9% in 2020 compared to 5.8% in 2019. Sickness absence is thus approximately on a par with the smelter industry in general (6.15% in 2020). In comparison, sickness absence in the sectors which are included in the Federation Norwegian Industries was 4.91%.**



A characteristic and a challenge of our sick leave is that accumulating absence is largely due to long-term, often chronic illness. The short absence (1-3 days) is month by month in the interval 0.8-1.2%. Absence 4-16 days (rest of the employer period) is also low (0.5 -0.7%) while the more prolonged absence constitutes the rest.

Absences lasting more than eight weeks amount to up to 2%. It can be assumed that there is a connection between this and the fact that the average age of our employees is relatively high; about 50 years, as there is a correlation between severe, chronic disease and age. Another factor that offers challenges is that our operations depend on shift work. A significant proportion of our employees work continuous shifts, and unfortunately, shift work can have a negative effect on health, and the burden of working shifts is often experienced as increasing with age. Since our proportion of shift working personnel is high, it is only possible to relocate the person on sick leave to a daytime position as an adaptation measure.

Eramet Norway is an IA company (Inclusive Working Life). We are committed to preventing and reducing sickness absence and avoiding exclusion from working life. An important contribution to further reducing sickness absence is to ensure earlier and closer dialogue between the manager and the person in question. NAV (the Norwegian Labour and Welfare Administration) and the GP together with the occupational health service are used as counsellors and supporters where appropriate.

We believe that a positive working environment characterised by involvement, innovation and job satisfaction is a prerequisite for success, and we strive to be a company that is inclusive and that has high level well-being and a safe working day. As an environmental measure both to reduce the health burden and to increase well-being, continuous efforts are also being made to improve the physical environment, work processes and private protective equipment.



Sickness absence in %



# «Never waste a good crisis!»

**This quote by Winston Churchill is descriptive of Eramet Norway in 2020. Covid-19 hit us, like everyone else. This new reality has required change, and we have had to rethink, cooperate differently and acquire new market shares.**

Unlike many others, we did well in 2020 despite the ongoing crisis. We managed to avoid getting any virus cases at our plants, and we kept our operations going and sold everything we produced.

When the Norwegian society closed down on 12th of March, our crisis team were already assembled. We were particularly concerned about those of our employees who have underlying conditions and therefore at greater risk. It was necessary to contact them directly and assess their work situation. We had an ongoing dialogue with our company health services, and for about 30 people we either adapted their work situation where possible or sent people home until we got a better overview. Luckily, so far, everyone is doing well.

An extensive scheme was introduced which included strict restrictions on the number of people who are allowed to meet and work together, the use of home office working whenever possible, additional cleaning measures and closures of our staff cafeterias. Employees faithfully followed the

guidelines, but for many people, working alone without the daily interaction and meeting colleagues has been very lonely. In addition, the work connected to infection control and practical limitations to work situations have made work harder for our staff.

Many have put in additional hours and stretched themselves far to ensure that we delivered on our commitments. At times, we have had a very high absence rate due to quarantine, caring for children or because the employee was in a risk group. The absence rate peaked at 17%, but we still managed to maintain a high production rate.

We received introductory training in digital tools which have enabled new ways of collaboration. Morning meetings have become digital so that more people can participate, and digital improvement boards have been established. We have also introduced frequent meetings with trade unions and our health services for information and dialogue. Information about the

market, operations and infection control rules has been sent to all employees weekly via SMS. Training activities including brainstorming sessions and reflection exercises have been conducted digitally.

Our IT department has provided good support to the entire organisation, and we have received a technical and knowledge boost that would normally take much longer.

We have evolved as an organization during this unusual year which have forced us to be more efficient and flexible, improve involvement, increase our dialogue with our staff and provide opportunities to do improvement work and training in new ways.



**We have improved internal communication, increased employee involvement, adopted new digital tools and greatly reduced the number of business trips.**

**The Group's CSR roadmap includes specific goals.**

**In HR we are focusing the following:**

- Ensure the health and safety of employees and subcontractors
- Build skills and promote talent and career development
  - Strengthen employee engagement
- Integrate and foster the wealth of diversity
  - Be a company of reference in terms of respect for human rights in our field of activity

**Diversity** is a focus area in the ERAMET Group's «roadmap for corporate social responsibility». A modern organisation mirrors our society and represents all people. Companies that are more diverse are better at innovation, people are more content, and the companies are more profitable.

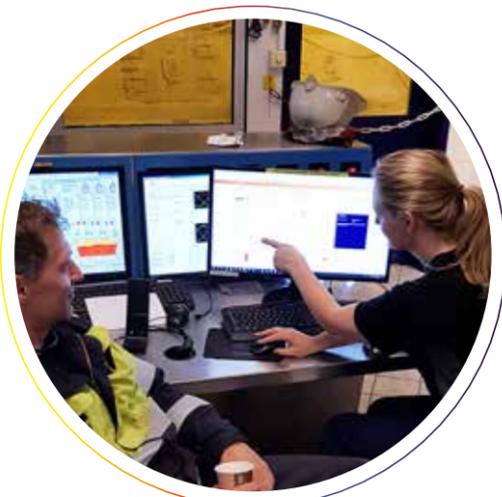
At Eramet Norway, our goal is 30% women, but we are still some way off at 13.5%. The number of female apprentices is about the same, but we have previously had a higher number, so this is an area we need to work on going forward. In the case of female managers and specialists, our share is currently 27%, close to the ERAMET Group's target of 30%.

We are also working to increase the proportion of women through our recruitment work, and by ensuring that women are preferred if qualifications are equal compared to the male applicants.



# Engagement drives improvement

Eramet Norway with its more than 100 years of production would not be here today if the smelters and their organisations had not continuously improved and developed. Today's continuous improvement team are spread across the three plants and consist of six employees who work with the organisation to further develop our company.



As employees of Eramet Norway, we work in what we call an 'everyday learning environment', which describes the interaction between the people who operate and support our plants, the technology that allows us to produce manganese alloys in a resource-efficient way, and the organisation of methods and tasks.

Eramet Norway has a culture built on a participation-based management philosophy. In short, it is about trust, and we know that it is the employees who see the improvement potential and experience the problems in their own work environment. To

succeed with improvement work, we acknowledge that:

- There is always an improvement potential in our processes
- There must be an acceptance of failure in order to improve
- Everyone must constantly look at ways to reduce the waste of resources
- Everyone is encouraged to come up with ideas
- The organisation must be developed continuously
- Everyone must 'go and look' for ways to improve

Improvement work at Eramet Norway can be divided into three categories:

1. Small daily improvements
2. A3 for departments and plants: major improvements with local ownership
3. NeWays projects: major improvement projects with significant financial gains

### «I have a problem» or «I have an idea»

In 2020, Eramet Norway started a project to train employees to describe the problems they encounter and

develop ideas connected to their everyday work life. The training sessions introduced root cause analysis, and arenas were established to present and progress improvement ideas and projects. This work will continue in 2021.

### Quality in everything we do!

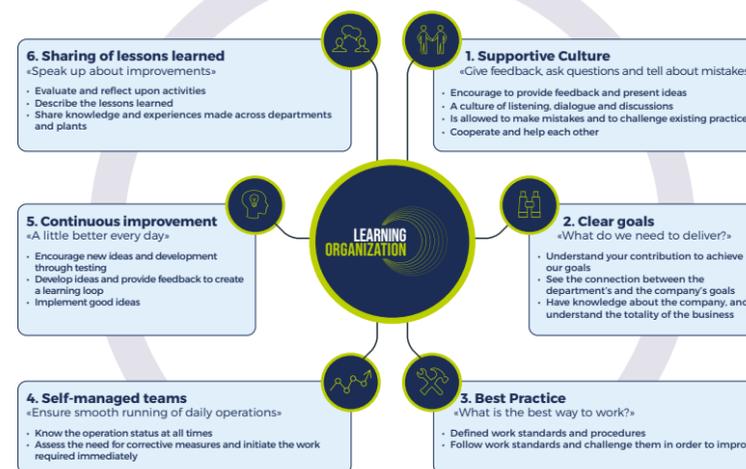
With the goal of having the smallest climate and environmental footprint and the highest energy efficiency in our industry, Eramet Norway is ISO certified on standards 9001 (quality), 14001 (environment) and 50001 (energy management). The team are

responsible for maintaining the quality system, and our compliance with the standards is regularly checked by conducting internal and external audits.

### Eramet Norway's digital journey

There is a great momentum in the implementation of projects related to digital transformation in the ERAMET Group. Projects in progress in Norway are among others: Big data, automation in parts of the production process, the use of machine learning and IO smart sensors.

## OUR WAY OF WORKING



## Big Data in Kvinesdal

Advanced technology improves traditional smelting industry. Eramet Norway has increased the use of digital technology and mathematical modelling to achieve better production processes.

A couple of years ago, Eramet Norway started to learn more about how Big Data and machine learning could be used in our processes, and this was the start of the Big Data project in Kvinesdal. Big Data is, simply explained, new technology that allows you to analyse larger and more complex amounts of data faster and more accurately than before.

Our furnaces are equipped with a variety of sensors and measurements to monitor temperature and pressure,

as well as electrical and chemical variables, which are necessary to ensure that our production is safe and stable. The purpose of the Big Data project is to better control the entire melting process by taking advantage of the large amount of data which is already available from all these measurements.

This project has developed a large computational model that allows you to see how the data co-varies and thereby increase process

understanding. The model helps Eramet Norway control the furnaces better in order to achieve a higher process efficiency and thereby ensure that the furnaces deliver the desired volume of the right quality at the right time.

Production is continuous at Eramet Norway's three smelters. Common practice is that operators monitor all processes via screens in control rooms, while the data from the model views the entire melting

process as a whole. The model presents the main lines, also in a historic perspective, and by using this extensive information, it is easier to identify the best scenarios. Big Data makes it possible to efficiently handle large amounts of data so that the mixture of raw materials and process conditions can be optimised.

The analysis results are used at daily cooperation meetings between operators, managers and metallurgists. At these meetings,

the current state is discussed, and the team agree on the next steps to adjust and further improve the processes. Adopted measures are added to the model to provide continuous learning and ensure continuous improvement of the model, as well as increased process understanding.

This project includes two out of three furnaces in Kvinesdal, and the aim for the future is to include all the furnaces.

## WHAT IS MANGANESE?

Belonging to group 7 of the periodic table, manganese is a metallic element with the chemical symbol Mn. Pure manganese is a hard steel grey metal, but it is readily pulverised.

Manganese is essential for making steel strong and ductile.

### Where do we find manganese?

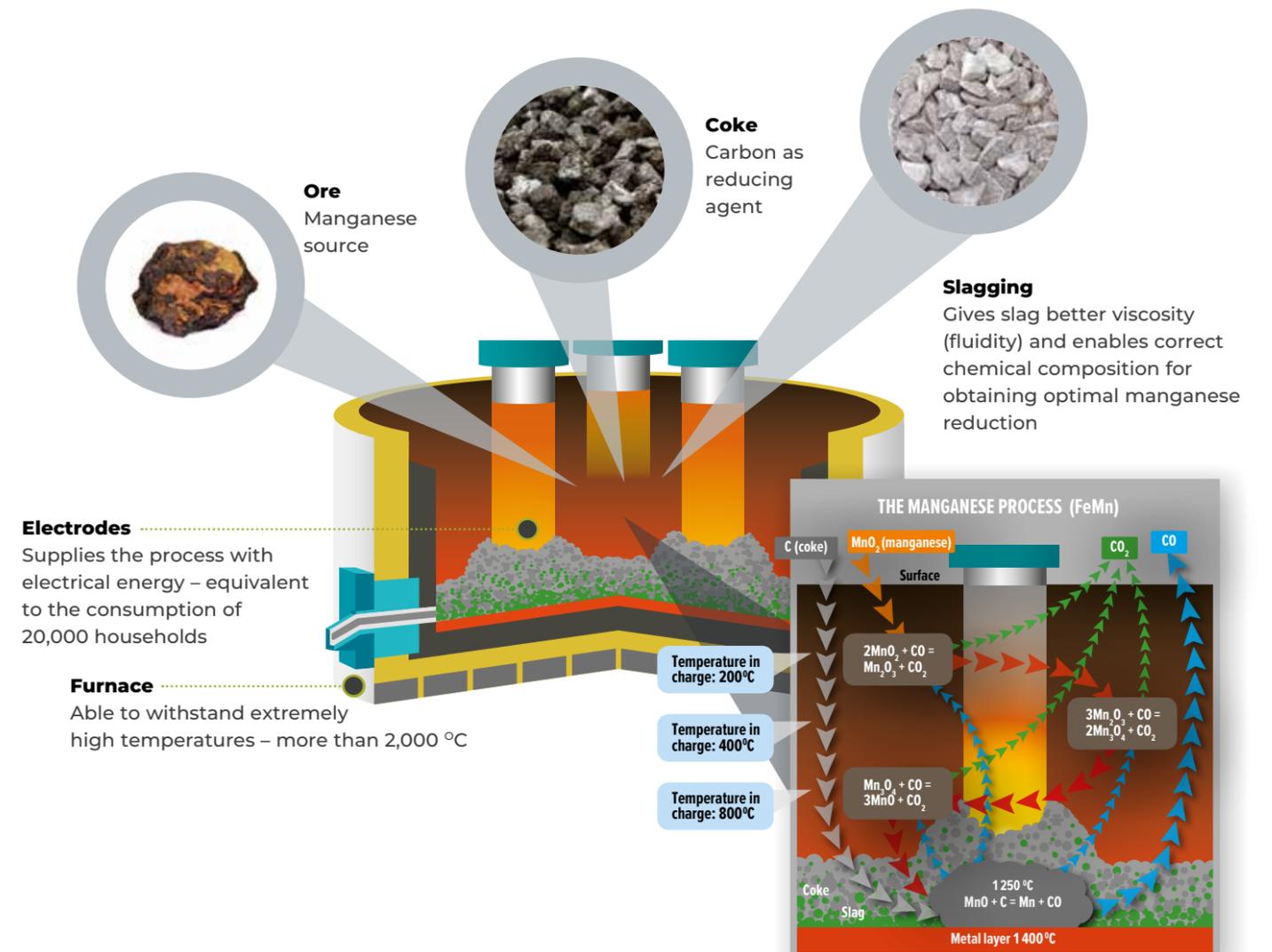
Almost all manganese alloys produced is used as a component in steel to increase its strength, toughness and heat treatment abilities. There are large manganese deposits in the earth's crust, about 900 ppm, making manganese the most common heavy metal after iron. Manganese is extracted mainly from the mineral pyrolusite (MnO<sub>2</sub>), commonly known as manganese ore. More than 80% of the deposits are in South Africa and Ukraine. Other significant deposits are in China, Australia, Brazil, Gabon, India and Mexico. Manganese is also found as nodules on the seabed in deep oceans.

Eramet Norway uses mainly ore from the ERAMET Group's mines in Gabon, as well as ore from suppliers in South Africa.

Our three Norway smelters process the ore into ferro- and silicomanganese alloys, which are largely sold in the European and North American market. Our products are primarily transported to our customers by boat.



## Manganese production



# Our most important factors of production



## Raw materials

Every year Eramet Norway uses significant quantities of raw materials in the production of manganese alloys. The raw materials are mainly provided by foreign suppliers, but we purchase for example quartz and metallic silicon materials in Norway. The main raw materials used in our production are:

- Manganese ore, where about half comes from the Group's mine in Gabon
- Metallurgical coke
- Silicon sources, including quartz

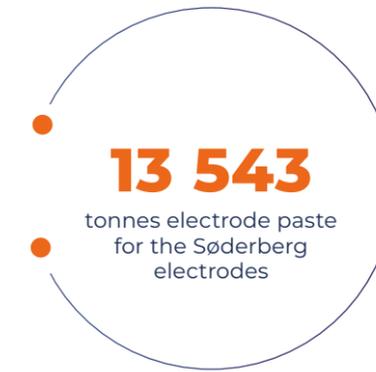
## Energy consumption

The total consumption of renewable electrical energy used in the melting processes and auxiliary power was 1.9 TWh in 2020. As thermal energy sources, the need for natural gas and propane was 938 tonnes. Eramet Norway is also one of Norway's largest consumers of industrial gases, especially liquid oxygen, which is mainly used as a factor input in our refining processes.

## Internal products

The plants also consume internal products generated as part of our production process, including metallic fines, ferromanganese slag and filter dust.

## Key Figures 2020



## World-class technology

Eramet Norway has 100 years of experience in producing various manganese alloys. We are today a world-leading producer of refined manganese alloys due to our talented employees who have gained expertise through several generations and who are willing to rethink, develop and step up to improve.

Although many of our buildings are old, our plants are modern due to the continuous development of processes

and equipment that make use of modern management systems and technology. Our employees master the technology, ensure good utilisation of the equipment and work purposefully to implement improvements. This means that our processing plants have high stability and good capacity utilisation.

The refining process itself is today an advanced, high-tech process: from the optimal mixture of manganese ore and coke combined and filled in the

furnace, to the management of the crucial refining process, precision and experience are essential. With the help of advanced control systems, every small part of production is monitored, and the laboratories continuously take samples to ensure the quality of both raw materials and finished goods.



# The significance of steel in the zero-emission society

The world requires a drastic reduction in emissions to air and water to prevent major changes in the world's climate and environmental diversity, but although the production of steel and manganese alloys is resource-intensive, the products are crucial to society's zero-emission vision.

Steel is the world's most widely used construction material in everything from structures, industrial equipment and cars to consumables. Steel, and thus also manganese alloys that make the steel ductile and durable, is therefore an essential input factor in transforming important sectors such as energy generation and transport.

Robust, long-lasting infrastructure is also crucial to creating economic development and prosperity to meet the many challenges that come with population growth, urbanisation, poverty alleviation and measures to reduce the negative effects of natural disasters.

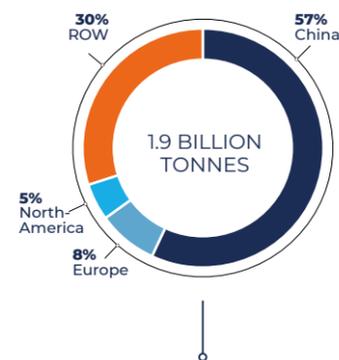
Steel can potentially be recycled indefinitely without losing its properties. On average in one tonne of steel about ten kilograms of manganese alloys are used, and the proportion of manganese increases in accordance with the quality of the steel. Almost 90% of the world's

total manganese alloy production is used in the manufacture of carbon steel, which is of highly valued due to its usability. Global consumption of steel has more than doubled since the turn of the millennium and is expected to increase in the years up to 2050. According to the World Steel Association, the recycling rate is now more than 80%.

The recycling rate is more than 80%

Steel is 100% recyclable and can potentially be recycled indefinitely without losing its properties

GLOBAL STEEL PRODUCTION

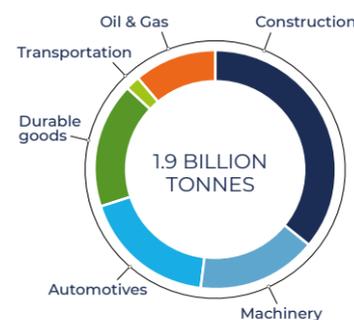


**Steel**

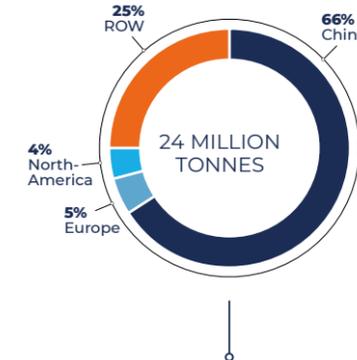
In 2020, the world's total production of carbon steel amounted to about 1.9 billion tonnes. China accounted for 57% of this, while steel production in our main markets, Europe and North America, accounted for 8% and 5% of the total respectively.

More than a third of the world's steel production is used for structures and infrastructure, while about 20% is used for the production of cars.

STEEL APPLICATIONS



CONSUMPTION OF MANGANESE

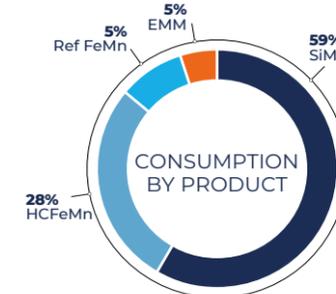


**Manganese alloys**

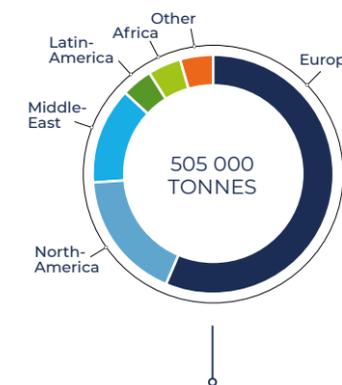
The total consumption of manganese alloys in 2020 was about 24 million tonnes, of which a massive 66% in China. Europe and North America accounted for 9%, while the rest of the world represented about 25%. Eramet Norway does not sell manganese alloys to China.

The consumption of alloys in the world outside China (ROW) distributed among the different manganese alloy products shows that silicomanganese (SiMn) amounts to 59%, High Carbon Ferromanganese (HCFEMn) 28%, refined FeMn 9% and Electrolytic manganese (EMM) 5%. Eramet Norway's main product is refined FeMn.

WORLD EXCL. CHINA



SALES BY REGION



**Our market position**

In 2020, Eramet Norway exported close to 75% of our products to customers in Europe and North America. We work systematically to increase our market shares in other regions and last year we sold more than 25% of our products outside our main markets.

Eramet Norway is part of the Group's manganese business which also includes Eramet Comilog's mine in Gabon, as well as three smelters in France, the US and Gabon. Our market shares of the standard products SiMn and HCFEMn are relatively low, while we are a world-leading player with a high market share of our main product, refined FeMn.



## Our purchases contribute locally

Eramet Norway's smelters contribute significantly to local and regional value creation. Although our raw materials are mainly from foreign suppliers, we purchased goods and services locally for NOK 661 million in 2020.

As part of the ERAMET Group, Eramet Norway achieves economies of scale, and the Group has 15 Lead Buyers who are responsible for the procurement of critical goods and large purchase categories. Lead Buyers work across all the Group's units, and the purpose is to ensure efficiency by gathering purchasing power and market understanding.

**We will use sustainable suppliers.**

### Requirements for sustainable suppliers

The ERAMET Group is a responsible financial player, and there are strict requirements for our activities at all levels, both through internal guidelines and national legislation in the countries where we operate. These requirements are at the centre of our work to exercise corporate social responsibility, and we want to make use of sustainable suppliers.

Below is an overview of our purchasing guidelines:

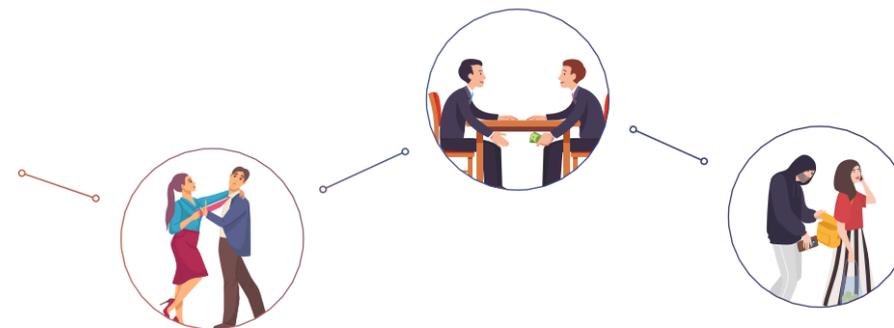
- Climate Change Policy
- Responsible Purchasing Charter
- Eramet Group's Ethic Charter
- Group Energy Policy
- Biodiversity Policy
- Group Health Policy
- Group Sustainable Development Policy
- The Environmental Charter

To read more about each policy, please visit: [www.eramet.com](http://www.eramet.com)

### The way forward: Sustainable procurement "Scope 3"

The supply chain is called the upstream chain in Scope 3 under the international standard "GHG Protocol". It is here the purchasing

## Report breach of regulations



### Who can report?

Employees, contractors, customers, suppliers, neighbours and others who have a connection to the ERAMET Group.

### Examples of unwanted behaviour:

- Corruption, influence peddling, conflict of interest
- Violations of Human Rights and Fundamental Freedoms
- Theft, embezzlement
- Discrimination, unequal treatment, sexual harassment
- Fraud
- Anti-competitive practices
- Violation of procedures: health, environmental regulations and safety
- Crimes

### Three different ways to report:

 Talk to your manager, HR or one of the green helmets

or

 Log the report online at: <https://eramet.integrityline.org>

or

 Call +47 35 69 78 04  
The service is available 24/7

organisation has the greatest influence by setting standards and requirements that support measures based on scientific objectives for the reduction of greenhouse gases (The Intergovernmental Panel on Climate Change (IPCC)).

We welcome that a steadily increasing number of suppliers are establishing targets for reducing greenhouse gas emissions. Innovation is a prerequisite for success, and together with our suppliers we are developing new technological partnerships and reporting practices that highlight the choice of more climate-friendly input factors.

### Anti-corruption

Eramet Norway strongly opposes corruption of any kind and has implemented the Group's anti-corruption directive, which contains clear guidelines for anti-corruption and ethics. Corruption is a risk to the company legally, economically and reputationally, and all forms of corruption are strictly forbidden.

It is important for Eramet Norway to clearly demonstrate its ethical corporate culture at all levels. In 2020, the company introduced a whistleblowing system that allows all stakeholders, both internal and external, to report unwanted conduct, corruption and ethics violations.

In addition to good information and information campaigns, a comprehensive training module on anti-corruption and ethical guidelines is available to all employees of the ERAMET Group.

# Sustainability provides new opportunities

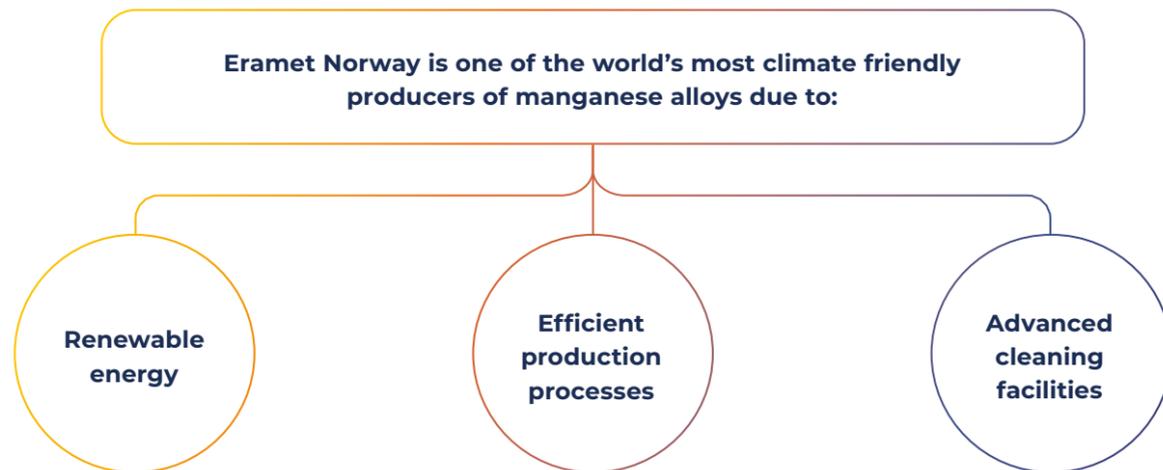
There are increasing demands from governments, investors and consumers to document products' climate and environmental footprint.

As a leading supplier of manganese alloys to the global steel industry, we are prepared to document how our products affect steel's climate and environmental footprint. Steel, the most important construction material in the world, is used in cars and transport systems, industrial and energy systems, tools and appliances etc. In addition, steel can be recycled multiple times without deteriorating.

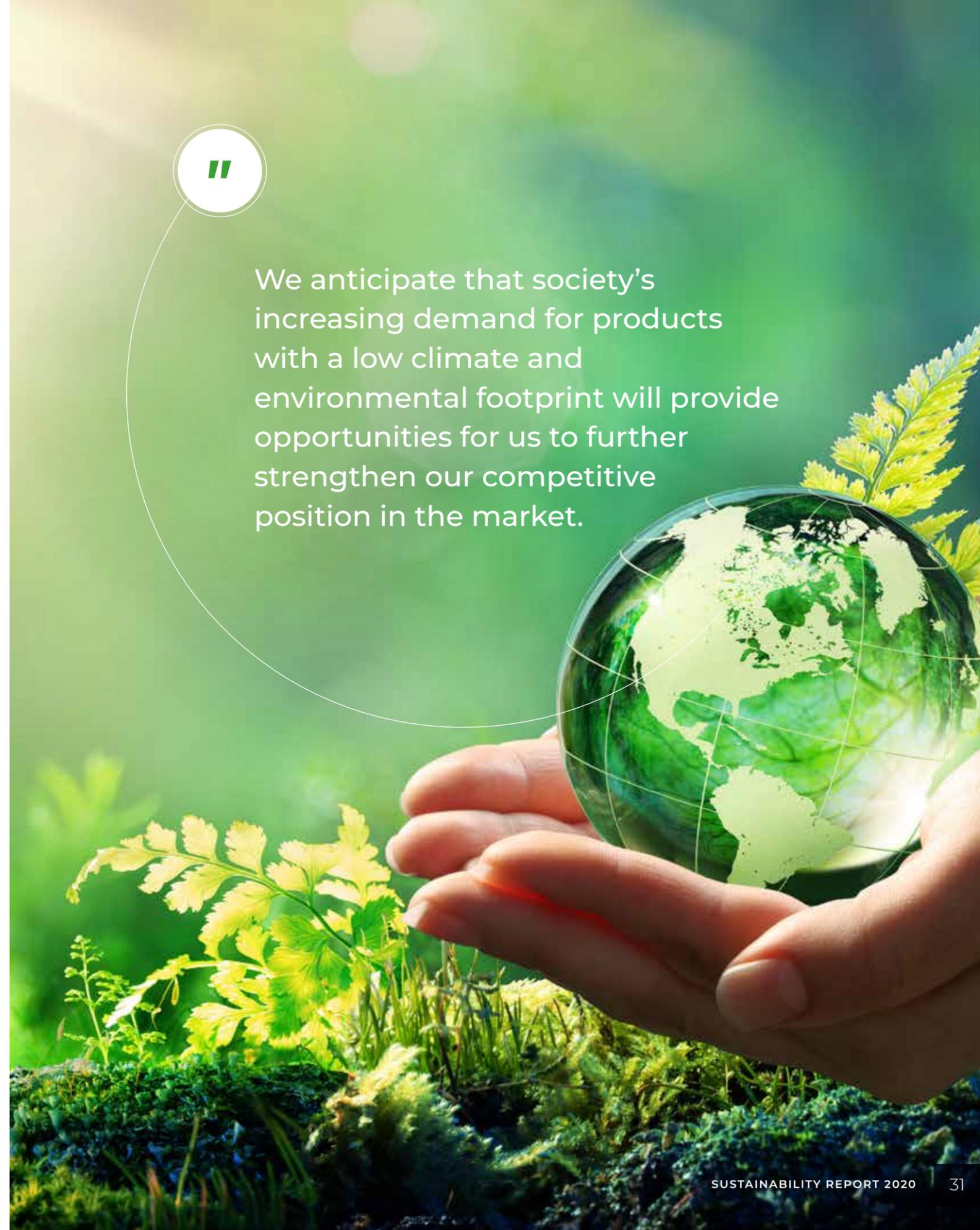
Eramet Norway uses renewable energy, has efficient production processes and uses advanced cleaning systems. This makes us one of the world's most environmentally friendly producers of manganese alloys. We also focus on research, development and competence building in order to continuously improve

all our processes. Eramet Norway produces useful products for the zero-emission society of the future in a resource-efficient way, and we have a clear vision and measurable commitments to in order to care for people and the planet, while being a good economic partner.

We believe that sustainability provides a competitive advantage. As one of the world's most climate-friendly producers of manganese alloys, we will over the next couple of years continue to increase our efforts to make information about the climate and environmental footprint of our products and processes more accessible to our customers, as well as investors and governments.



We anticipate that society's increasing demand for products with a low climate and environmental footprint will provide opportunities for us to further strengthen our competitive position in the market.

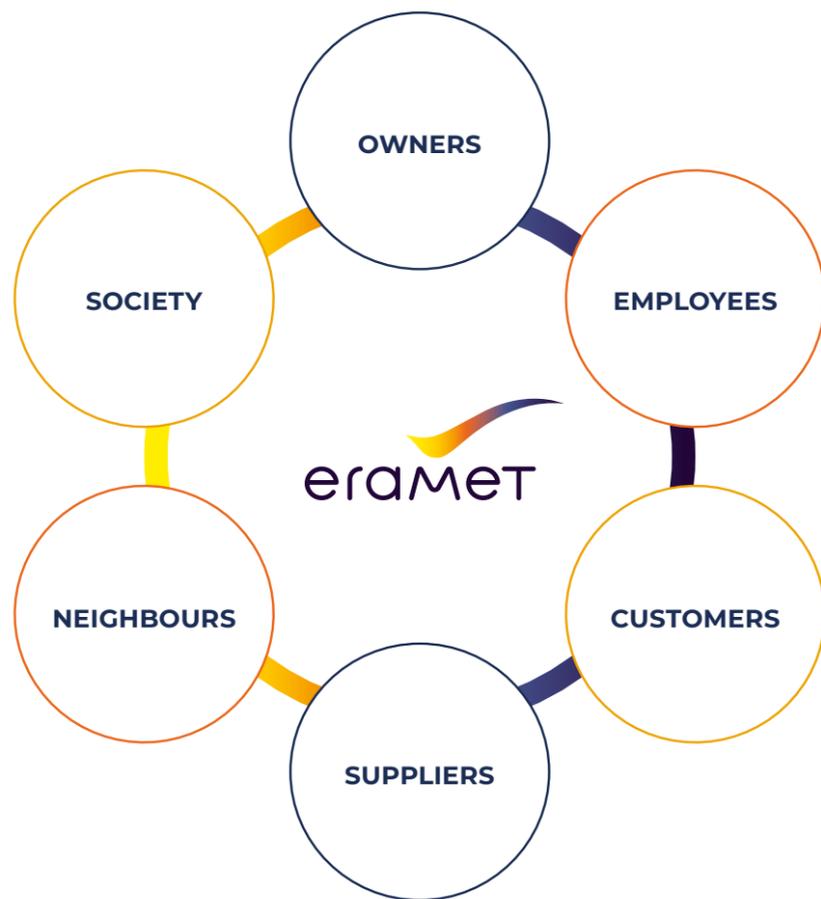


# Our social responsibility

**Eramet Norway is a driving force for community development in the communities where we operate. As part of the ERAMET Group, we focus on all aspects related to corporate social responsibility and sustainability.**

We carry out regular checks to ensure that we have a good balance between what we provide our stakeholders and what we wish to receive in return.

- **Our customers** will get their products at the right time and with the right quality – so that we can maintain and increase our market share.
- **Our employees** must experience a sense of security for themselves and their families – so that we can make the best use of their expertise and commitment.
- **Our owners** must receive a return on investment – so that we are secured resources to further develop our smelters in Norway.
- **We will** be a demanding and predictable customer who offers interesting contracts – so that we can achieve competitive terms from development-oriented suppliers.



- **We will** put minimal strain on the local environment and continuously improve our environmental performance – so that communities and neighbours value our presence and support our development plans.
- **We will** create value based on good access to renewable power and our high competence – so that we are ensured favourable conditions for further development and innovation and we are viewed as an attractive partner for the authorities, competence environments and national public funding institutions.



## ERAMET Group's COVID-19 solidarity project

At the outbreak of the pandemic at the beginning of 2020, preventive measures were implemented to protect the company's employees and their families at all the Group's units. In addition, in April 2020, a solidarity project with an economic framework of EUR 1.5 million was established to support local measures to prevent the spread of infection and reduce the negative consequences of the pandemic. This support came on top of the annually amount to EUR 13 million which is used for other initiatives related to sponsorship and collaboration with organisations in the Group's many locations.

Community engagement has been a part of the smelters' history since the beginning, and Eramet Norway wants to continue to be a value-creating community player and a good neighbour.

In 2020, the company's support for local teams and organisations in Porsgrunn, Sauda and Kvinesdal amounted to NOK 1.8 million, of which NOK 135 000 was part of the Group's solidarity plan. Mental Health and the Red Cross were among the organisations we supported with contributions from the Group's solidarity project. In addition, we chose to support municipal measures aimed at children and young people, public health and school development.

# Robust industrial regions

The Norwegian process industry produces metals, materials and chemicals that are required in order to succeed with the green shift. Many of these companies are now world leading within their industries, both in terms of competitiveness and their climate and environmental footprint. Through Prosess21, the industry has highlighted the potential for doubling value creation towards 2030, while at the same time meeting society's ambitious targets for reducing greenhouse gas emissions.

Norwegian industrial companies are often located in rural areas. It is therefore important for the future of these companies that these regions are considered attractive places to work and live. These communities must be well-functioning and they must offer good quality of life and have health and welfare services.

### A robust industrial region is characterised by:

- Good access to expertise
- Varied job market, accommodation and services
- A competitive and adaptable business sector
- An equitable and stable health and welfare provision

Many industrial companies in Norway today have foreign owners, and the majority of companies compete internationally. This means that it is crucial to preserve and further develop the national competitive advantages that we have.

**In addition, Norway must continue to actively participate in the European collaborations to ensure good competitive conditions and avoid special Norwegian schemes that will weaken the overall position of the process industry.**



### The most important competitive advantages for the Norwegian industry are:

- Good access to renewable power
- Leading technological and industrial environments
- High level of competence at all levels within the companies
- Stable societal conditions and room to maneuver within the national public funding institution schemes

Norway have good conditions for building on these advantages through the design of a comprehensive policy that ensures further development of robust industrial regions and local communities.

**“The Norwegian process industry has contributed to the growth and welfare of the Norwegian industry for more than 100 years. Eramet Norway stands firmly on the shoulders of its history, aiming towards a future where we are in the forefront creating new history.”**

### Conditions for further growth:

#### Increased access to renewable energy

The process industry must be given a high priority when assessing how the nation's renewable energy should be used.

**The green shift puts pressure on the energy balance, Norway must use its renewable energy capacity**

#### Education and competence

The high level of competence and the collaboration ensures good performance.

**We need to strengthen the entire chain of competence, with a closer interaction between upper secondary schools and colleges/universities as a basis for lifelong and decentralised learning.**

#### Climate and environment

The Norwegian process industry have made “green shifts” before, we are still here.

**We must combine extensive R&D and industrial piloting – the green shift takes place at the plants, not on PowerPoint.**

#### Innovation and business development

The process industry represents a potential for increased value creation and new jobs.

**The national public funding institutions must be further strengthened to support circular economy solutions for higher energy utilisation and innovative solutions for the reuse of by-products and waste materials.**

#### Transport and infrastructure

Industry, especially in rural areas, is a driving force for local and regional development.

**High value creation must be taken into account when prioritising transport and road projects to enable larger work, living and service region.**



# A global player with high national value creation

Close to 75% of our manganese alloys are sold to steel mills in our main markets, Europe and the USA. Together with the Group's sales department in France, we are working purposefully to increase our market share in other regions, including the Middle East and Latin America.

Raw materials and energy account for more than 75% of our operating costs. Manganese ore is sourced from Gabon and South Africa, and reducing agents are imported from several countries, mainly in Eastern Europe. Renewable power is our largest national cost element, but silicon sources are also purchased from Norwegian suppliers. Overall, about 60% of our costs are international, and close to 100% of our products are exported.

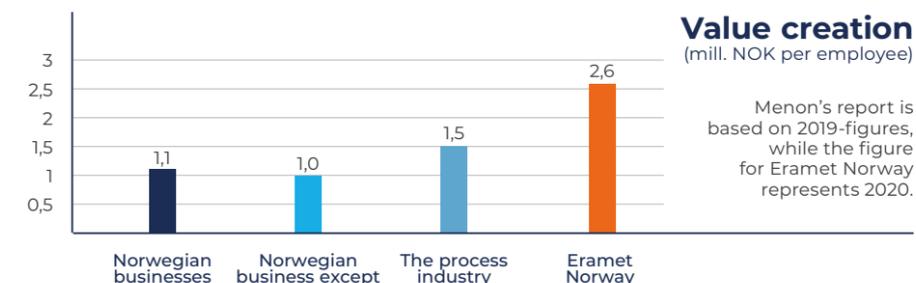
### Local goods and services for NOK 661 millions in 2020

Although we are an international player that imports most of our raw materials and sells our products in a global market, we buy goods and services for approximately NOK 2 billion domestically. More than NOK 650 million of the national purchases take place in the regions where our smelters are located. The proximity

of highly qualified suppliers in various disciplines is important both to achieve safe and stable operation and to plan and carry out development projects at the smelters.

### Solid cost position provides high value creation

Eramet Norway operates in a competitive industry with demanding customers who expect high quality and competitive prices. Continuous focus on development and improvements has led to us achieving a solid cost position. The main report from Prosess21, stressed that the analysis agency Menon has looked at different parts of the Norwegian business sector in several analyses and made it clear that the process industry is significantly more productive than the breadth of Norwegian business and industry.



# The way forward towards a lower footprint and continued growth



**Lars Petter Maltby**  
Head of Secretariat, Prosess21

**On the 8<sup>th</sup> of February 2021, Process21 presented the main report with advice and recommendations to the Prime Minister, Minister of Industry and the Minister of Climate and Environment. The report consists of ten expert group reports and four external papers, as well as the steering group's strategic discussions.**

The report is based on the industry's strategic challenges in a 10- and 30-year perspective and provides strategic advice and recommendations on how the process industry can be further developed to become an even more important contributor to Norway's value creation towards 2050.

## Collaboration required

The main report summarises the overall messages for industry, political authorities and national public funding institutions. However, the recommendations are mainly directed towards the industry itself and emphasise the urgent need for the industry to develop their own climate strategies. Eramet Norway's roadmap is used as a good example in this context. It is the group's view that it will not be possible to realise the industries' climate strategies without extensive cooperation with the authorities through the facilitation of framework conditions.

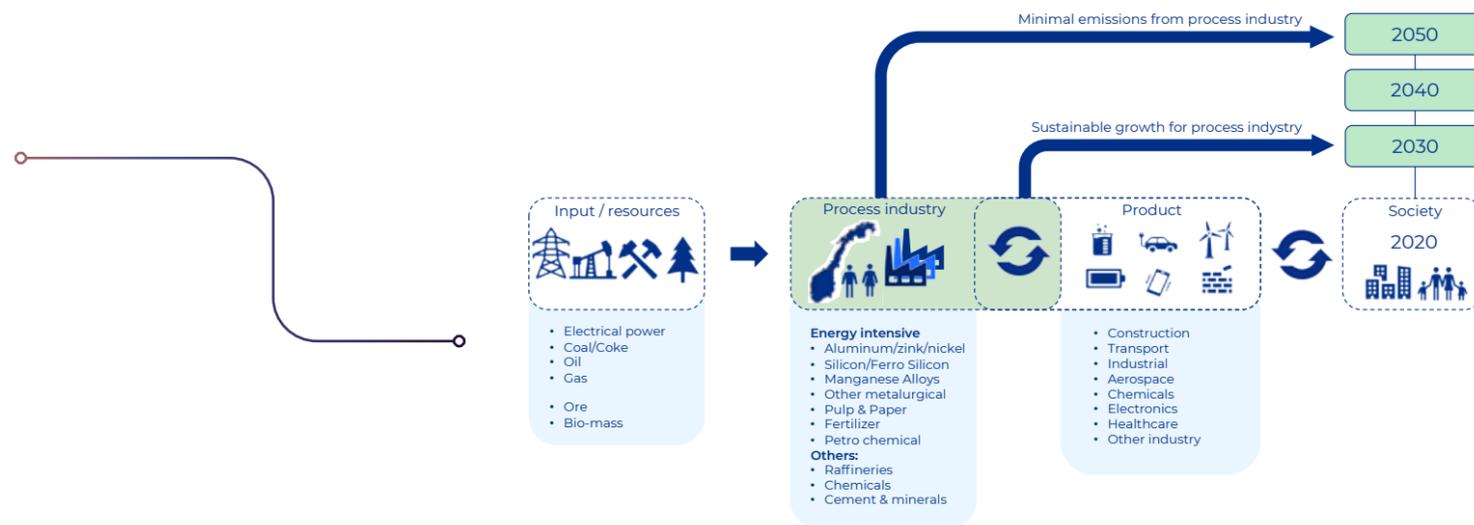
Eramet Norway's climate roadmap and Process21's ambitions are largely consistent as both addresses how the industry can ensure a better environmental footprint while maintaining and increasing value creation. While Process21 describes

these challenges at a national level, there are many similarities between Eramet Norway's roadmap and the recommendations of Process21.

## Recommendations

New process technology, biocarbon, carbon capture and utilisation and energy efficiency are all mentioned. New process technology is featured in a separate expert group report led by Nina Dahl at Sintef. Manganese alloys production is discussed in its own chapter with a distinctive description of barriers for the industry and associated recommendations. The expert group recommends:

- Developing, testing and implementing manganese ore reduction technology
- To further develop current concepts for utilising furnace and process gas possibly in the context of carbon capture



- To continue the development of biocarbon qualities suitable for manganese production and to adopt these industrially
- To establish a larger R&D project for the investigation and development of new processes for manganese production.

As development projects in the process industry are capital intensive and it takes a long time for industrial verification, Prosess21 recommends that R&D activities should be reinforced. It is important to facilitate long, complex and cost-intensive development courses, both through national and international cooperation projects.

## Biocarbon, carbon capture and expertise

Biocarbon has also been addressed through a separate expert group for the bio-based process industry. The group has particularly emphasised the availability of Norwegian bio-based resources. Resource access is expected to be challenging as it is primarily forests that provide abundant amounts. There are opportunities for increased extraction of forests nationally, but imports of biocarbon must also be expected. Process 21 has focused on carbon capture and the extent to which the various industries are ripe for such solutions without having to change the core processes in order to realise an end of pipe solution. In this context, the production of ferro- and silicomanganese is considered unique

by highly concentrated exhaust gases that can enable capture and utilisation.

Finally, it is worth noting that Process21 has also had its own expert group related to competence. Here, three drivers are identified as skills needed in the process industry of the future;

1. Climate change and sustainability,
2. Digitalisation and technology development, as well as
3. Demographics and attractiveness.

The assessment is that industrial companies must ensure a more robust strategic competence management, partnerships with complementary industries and technology suppliers, as well as a continued good utilisation of three-party cooperation between the employers, employees and the government.



Process21 is a strategy work conducted on behalf of the Norwegian process industry and was established by the Ministry of Industry and Fisheries on 25th of April 2018. The main task is to provide strategic advice and recommendations on how Norway can best achieve minimal emissions

from the process industry in 2050 and at the same time facilitate sustainable growth.

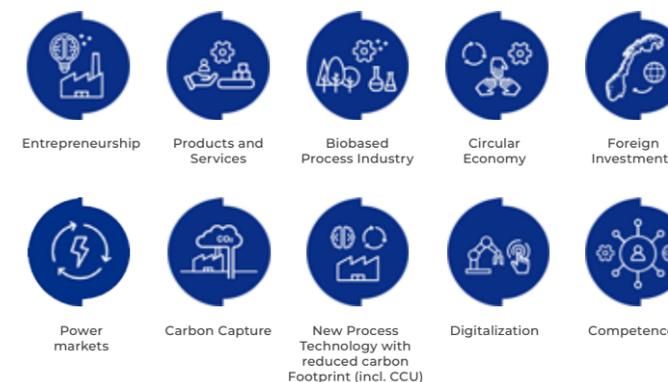
Process 21 has chosen to take into account the opportunities for value creation and reduced greenhouse gas emissions until 2030 and 2050, with specific advice and recommendations for both time horizons.

Process21 has created 10 expert groups. The expert groups have explored areas of strategic importance, and together they have made over a hundred recommendations relevant to the further development of the process industry in Norway.

Each group of experts have consisted of six to twenty people

from industry, academia and national public funding institutions, and each group published their own reports representing independent knowledge bases. In total, more than 1,200 people from over 300 organisations have been engaged in this work.

For more information, visit: [www.prosess21.no](http://www.prosess21.no)



# Finance

Our long-standing green commitment generates solid environmental revenues and provides proof that a strong sustainable strategy can go hand in hand with improved performance and cost efficiency.

## Clear focus on safety & environment investments

Total investments decreased significantly (-37% vs 2019) mainly due to no long maintenance stoppage and the strict monitoring of the cash spending in a context of market downturn. However, a strong focus was put on safety and environment investment.

Figures in MNOK	2016	2017	2018	2019	2020
HESE investments	67	21	69	63	96
Other investments	187	94	199	195	103
<b>Total investments</b>	<b>254</b>	<b>115</b>	<b>268</b>	<b>258</b>	<b>198</b>

### Safety – Key investments:

- Renewal of our buildings and equipment
- Safety nets installation above slag casting areas

### Environment – Key investments:

- New concept for treatment of process water at Sauda
- New slag casting smoke extraction system at Sauda
- Energy recovery unit at Sauda
- Shorepower installation projects at all plants

### Strong rise in R&D spending (+54% vs last year)

In 2020, Eramet Norway spent 24 MNOK (2019: 16 MNOK) on R&D to remain at the forefront of manganese production. Through alliances with external competence societies and companies, we are involved in several cooperation projects with a total yearly budget of approx. NOK 200 million. Climate and environment make out 60% of our total R&D spending.

Through alliances with external competence societies and companies, we are involved in several cooperation projects with a total yearly budget of NOK 200 millions. Climate and environment make out 60% of our total R&D spending.



## Outstanding financial and operational performance in a context of this unprecedented crisis

### Good resistance of production and sales volumes

2020 was marked by an unprecedented health crisis, which caused a deep drop in demand from steel market (-14% in Europe & -17% in US). In this context Eramet Norway's production volumes were down by only 4% (501kt, 21kt below 2019) and sales volumes were down by only 5% (505kt, 25kt below 2019).

This reflects the high flexibility in our production set-up, the agility of our teams and the good cooperation between production, supply chain and sales. We succeeded in gaining new market shares and expanded our geographic footprint in target markets, thus becoming a leading global player in manganese alloys production.

### Significant increase of operating income

Operating income went up from 257MNOK to 670MNOK mainly thanks to favorable input prices, internal operational improvements, higher indirect carbon cost compensation and significant gains in market shares.

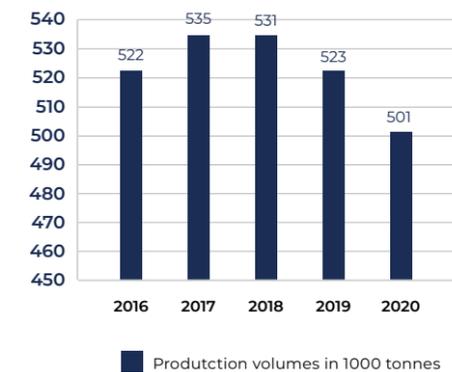
### Strong cash generation

At more than 800MNOK thanks to strict monitoring of working capital and exceptional responsiveness in the second half of the year.

Numbers in MNOK	2020	2019	evol %
<b>Revenues</b>	<b>5553</b>	<b>6339</b>	<b>-12%</b>
Raw materials and energy	-3608	-4629	-22%
Personnel costs	-492	-471	4%
Depreciations	-201	-229	-12%
Other operating costs/income	-583	-753	-23%
<b>Current Operating Income (COI)</b>	<b>670</b>	<b>257</b>	<b>160%</b>
<b>COI margin</b>	<b>12%</b>	<b>4%</b>	
Financial costs	-86	-151	-43%
Corporate taxes	-128	-22	472%
<b>Net Result</b>	<b>456</b>	<b>83</b>	<b>446%</b>



\*Free Cash Flow





**Eramet Norway**

# Sustainability report 2020

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OUR ROADMAPS

**Climate | Energy | Environment | Circular economy**



## Sustainability provides competitive power

Eramet Norway aims to be the most climate and environmentally friendly producer in our industry.

We believe that having a leading position on climate and environment increases our competitiveness and strengthens the company's profitability in the long term, including through:

- Better utilisation of our most important raw materials – ore, reducing agents and energy
- Increased stability and process efficiency in our production processes
- Increased revenues through circular economy solutions for by-products and waste materials
- Reduced environmental costs, e.g. related to quota costs and taxes
- Increased attractiveness that provides better opportunities for recruitment of competent and engaged employees, as well as cooperation with external competence environments
- Access to support and financing schemes for R&D and investment projects.

We aspire to be a preferred supplier, a value-creating corporate citizen, a good neighbour, a respected partner and an attractive workplace.

As an industrial company located in Norway, we are subject to strict national laws and requirements. Our emission permits are closely followed up in close dialogue with government agencies, and we are constantly challenged to deliver even better results.

The UN's 17 Sustainable Development Goals (SDGs) are the world's joint work plan to eradicate poverty, combat inequality and stop climate change by 2030, and Eramet Norway's work on sustainability focuses in particular on four of them: No. 8, Decent work and economic growth, no. 9 Industry, innovation and infrastructure, no. 12 Responsible consumption and production, and No. 13 Climate action.

In addition, as part of ERAMET, we are committed to the Group's Corporate Social Responsibility (CSR) roadmap. These goals are also based on the UN SDGs and are divided into the following main areas:

- Commitment to people
- Be a responsible economic player in daily life
- Commitment to the planet

## PART 2

### In this report, we present our four main goals

Under each of these main goals, we present our targets and status as of 2020, as well as important processes and projects to achieve these ambitious goals.

Climate **10**

Environment **26**

Energy **16**

Circular economy **34**

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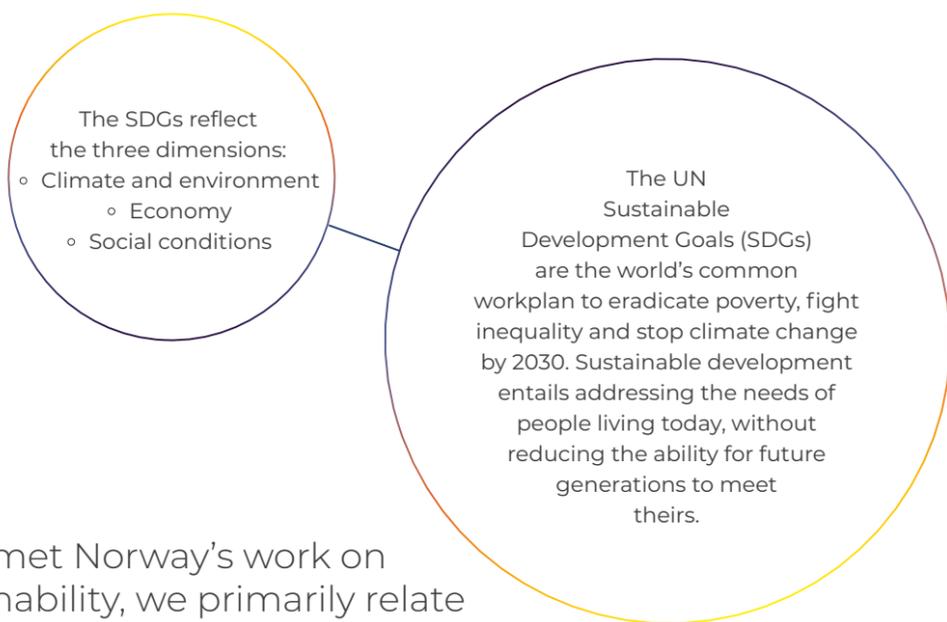
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# UN Sustainable Development Goals lead the way



In Eramet Norway's work on sustainability, we primarily relate to the following of the objectives:

**Sustainable Development Goal No. 8 «Decent work and economic growth»**  
Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.

Eramet Norway contributes to this goal by having a good ethical framework and high focus on safeguarding safety and health of all who work for us. Our procurement processes ensure that suppliers are thoroughly assessed with regard to safeguarding human and labour rights, the environment and other requirements we impose. Suppliers who enter into agreements with us are obliged to provide information about any subcontractors so that we have insight into the entire value chain. Norway have a well-functioning three-party-collaboration between authorities, employee and employer organisations and a comprehensive working environment legislation that together provide a good framework for ensuring inclusive and sustainable economic growth.



**Sustainable Development Goal No. 9 «Industry, innovation and infrastructure»**

Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Eramet Norway contributes to this goal through the production of manganese alloys which are essential components in high quality steel, and steel is required for infrastructure and new industrial operations. Eramet Norway also contributes to economic growth based on sustainable industrialisation through research and development in order to continuously create cleaner and more environmentally friendly production technology. Infrastructure must be upgraded steadily in order to meet the future challenges associated with sustainability. Innovation and prioritising investment in science and technology are a prerequisite for sustainable industrialisation and economic growth.



**SDG No. 12 «Responsible consumption and production»**  
Ensure sustainable consumption and production patterns.

Eramet Norway contributes to this goal through research and development and continuous improvement to reduce resource consumption and emissions. Technological solutions and work processes must become increasingly resource efficient through the recovery and recycling of energy streams and materials as well as handling of chemicals. Sustainable consumption and production involve doing more with less: reduce resource use, avoid greenhouse gas emissions and limit adverse effects on the environment while creating economic growth.



**Sustainable Development Goal No. 13 «Climate Action»**  
Take urgent action to combat climate change and its impacts.

Eramet Norway contributes to this goal through development and implementation of new technology that facilitates the use of other raw materials, in addition to the reuse and capture of CO<sub>2</sub>. We also strive to achieve increased energy utilisation through continuous improvement of our process performance and operational activities, as well as developing new solutions for energy recovery and utilisation.

# Focus on CSR



**ERAMET started its journey of strategic, managerial and digital transformation in 2017 in order to ensure the Group's excellence. In this new ERAMET, Corporate Social Responsibility (CSR) is at the core of the Group's strategic decisions based on the conviction that the mining and metal companies of the future must be exemplary corporate role models.**

The Group's commitment translates into an ambitious CSR Roadmap built around 13 goals on which significant process have been made since its introduction in 2018. The goal is to develop the Group in a sustainable and value-creating manner while helping to preserve a world that benefits the many.

### The strategic vision's the five pillars:



Sustainable value creator



Business partner of choice



Committed and contributive corporate citizen



Home for best talents



Entrepreneur

## The Roadmap 2018-2023:

Provides a framework in order for the Group to organise, define and measure its progress in CSR, and the Group's 13 goals are divided within three main categories: Commitment to people, be a responsible economic player in daily life and commitment to the planet. The Roadmap has been shared with and validated by the Strategy & CSR Committee and the Board of Directors, who review it periodically.



### Commitment to people

1. Ensure the health and safety of employees and subcontractors
2. Build skills and promote talent and career development
3. Strengthen employee engagement
4. Integrate and foster the wealth of diversity
5. Be a valued and contributing partner of our host communities



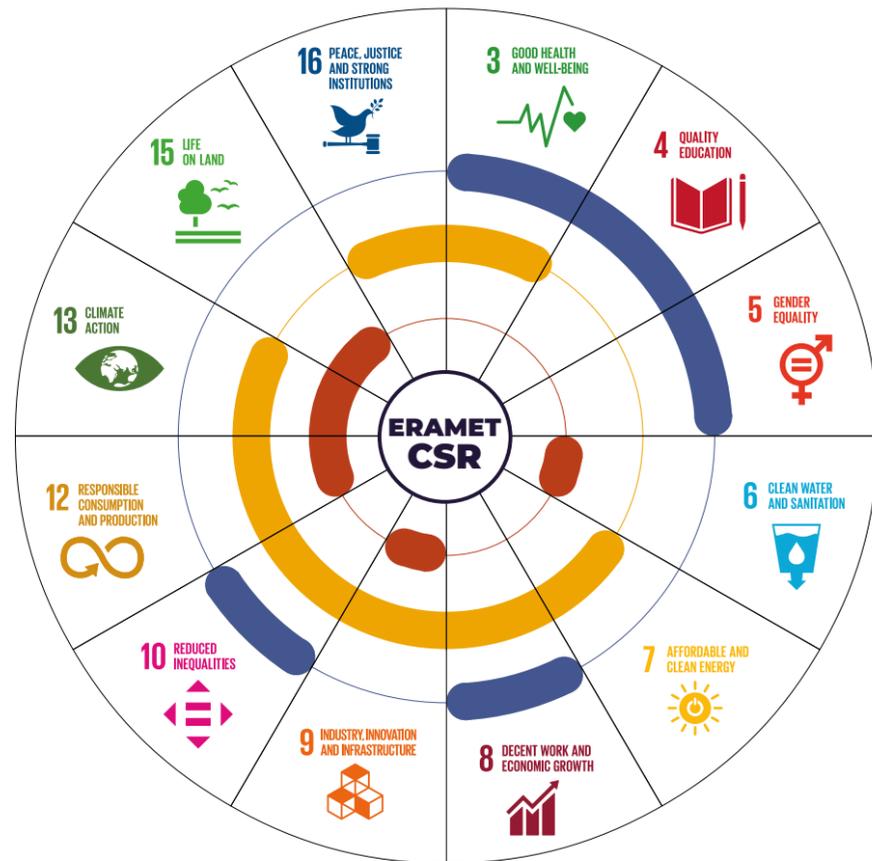
### Be a responsible economic player in daily life

6. Be an energy transition leader in the metals sector
7. Actively contribute to the development of the circular economy
8. Be a company of reference in terms of respect for human rights in our field of activity
9. Be an ethical partner of choice
10. Be a responsible company of reference in the mining and metallurgy sector



### Commitment to the planet

11. Reduce our atmospheric emissions
12. Protect water resources and accelerate the rehabilitation of our mining sites by fostering biodiversity
13. Reduce our energy and climate footprint



- "Eramet committed to people" contribution
- "Eramet committed to economic responsibility" contribution
- "Eramet committed to the planet" contribution

**2020 key figures are:**

- 80% of industrial sites ISO 14001 certified
- 990 kt of low-grade incidental ores and tailings recovered with the circular economy plan
- -25.4% decrease in products CO<sub>2</sub> intensity (CO<sub>2</sub> tonnes per tonne of outgoing product) close to the 2023 target of -26% (2018 ref)
- 67% reduction in serious accidents
- 100% of high-stakes sites with operational grievance mechanisms
- €21.4m spent on community investment and charity including €10m on Covid-19 solidarity
- 20 new social impact indicators for operational excellence

**New climate targets**

40% reduction target in absolute CO<sub>2</sub> emissions by 2035 (vs 2019 levels)

Carbon neutrality (scopes 1 and 2) by 2050

**ERAMET NORWAY**

# Climate and environment – our direction



Long-term goals

**Climate**

We shall reduce our CO<sub>2</sub> emissions by at least 43% before 2030 and 80% before 2050 against the reference year 2005.

**Energy**

We shall increase our energy recovery by at least 27% before 2030 against the reference year 2005.

**Environment**

We shall avoid negative environmental effects in the local communities in which we operate.

**Circular Economy**

We shall increase our resource efficiency through value creation associated with by-product and waste materials, as well as reduce waste deposition of materials by 50% before 2030.





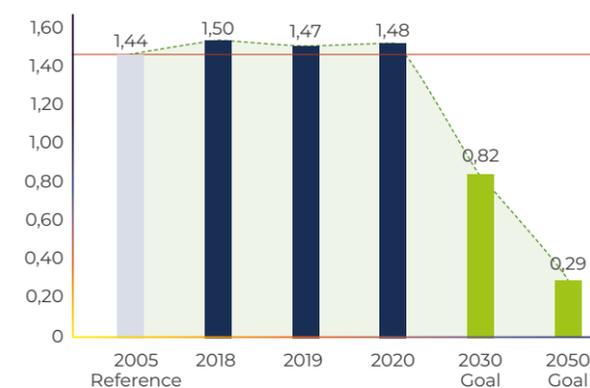
ERAMET NORWAY

# Climate

In 2015, the UN Climate Change Conference in Paris, COP21, adopted a goal of keeping the increase in global average temperatures well below 2°C relative to pre-industrial levels, and strive to limit temperature rises to 1.5°C.

COP21 also decided that global anthropogenic greenhouse gas (GHG) emissions between 2050 and 2100 should not be higher than what can be absorbed in nature and through carbon capture, storage and application. These climate and environmental goals are the basis for the establishment of Eramet Norway's roadmap for climate and the environment.

Climate emissions per tonne of saleable production (tonnes per tonne)



**Eramet Norway's long-term goal:**

We will reduce our CO<sub>2</sub> emissions by at least 43% by 2030 and 80% by 2050, compared with the reference year 2005.

**Status climate emissions**

Eramet Norway's climate emissions have been stable during the last years. Our roadmap describes prioritised projects and processes we need to succeed with to achieve our long-term goals:

- Replace fossil reductants by biocarbon and achieve a reduction of at least 25% within 2030.
- Optimize raw material mix and process conditions to achieve 10% reduction within 2030.
- Develop a technical solution for carbon capture and storage (CCS) with the potential for a 15% reduction of emission within 2030 and 70% within 2050.
- We are also actively working with measures to recover energy and to find solutions for carbon capture and utilisation (CCU)
- In addition, we will explore disruptive technologies for a further reduction of our climate emissions.

## Significant progress in our climate roadmap projects

**Raw materials:** Tests over several months have now established that by adjusting the charge composition, it is possible to reduce both carbon and energy consumptions with about 5 to 10% compared to a typical reference operation of before 2018. This very effective change has been confirmed by tests and implementations in our sister company Comilog Dunkirk and will be rolled out to all SiMn furnaces through best practice..

**Biocarbon:** The strategy for industrial implementation has evolved, towards tailor-making a biocarbon and producing it in industrial quantities, rather than adapting the plants to receiving even the poorest quality charcoal, as was originally planned. Co-operations with different partners both from academia, research institutes and industrial companies are bearing fruits. A first batch of several tons of a new biocarbon was tested at one plant, though further quality improvements are still needed to perform relevant tests at a larger scale in 2021.

**The NewERA project:** Gas engine components for energy recovery were shipped to the Sauda plant in 2020 for installation and test in 2021. The pre-study for the sub-project "Ore drying and Cold agglomeration" was completed, in parallel with starting the industrial tests of the briquettes.

**Pre-reduction:** This project is more long term, targeting through R&D work at our research and innovation center Eramet Ideas, to develop next generation furnace and materials pre-treatment. Two rotary kiln pilot tests in the framework of the Horizon 2020 EU project provided information about residence time and quality of the treated materials.

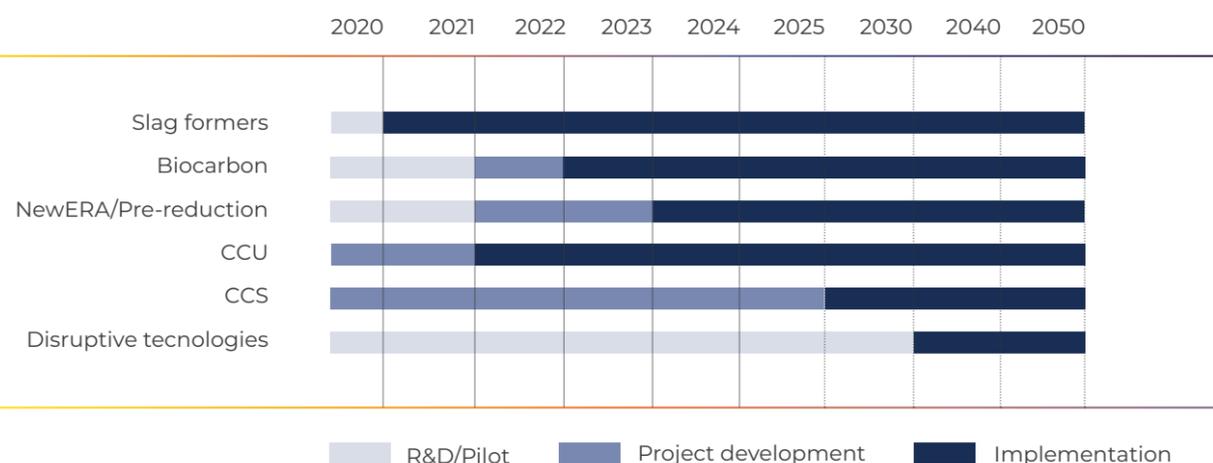
**Carbon Capture and Storage (CCS):** The capture technology was selected, and a letter of intent was signed with a technology partner to perform a pre-study in 2021, aiming for a pilot carbon capture test in Sauda in 2022-23.

**Carbon Capture and Usage (CCU):** Dialogue is on-going with several companies interested in valorizing the off-gas from the Porsgrunn plant.

**Disruptive technology:** Progress was made and a strategy to protect Eramet's intellectual property will be rolled out in 2021.

## R&D projects

- **IPN Pyrogass:** The Research Council of Norway's innovation project for the development of biocarbon adapted to Mn production
- **KPN BioCarbUp:** Research Council of Norway's competence project for the development of biocarbon in metallurgical industry
- **KPN Reduced CO<sub>2</sub>:** The Research Council's competence project to reduce CO<sub>2</sub> emissions in the metallurgical industry
- **EU Horizon 2020 PREMA:** Development of the process for improving resource and energy efficiency through an external pretreatment unit
- **Eramet IDEAS, Pre-reduction in furnace:** Reduction of carbon and energy consumption by process improvement
- **Eramet IDEAS:** Groundbreaking process with zero CO<sub>2</sub> emissions
- **Climit Eyde CO<sub>2</sub> Tek:** Examination of CCS technologies for the process industry
- **Danish collaborative project Waste to Biocarbon:** Development of biocarbon adapted to Mn production
- **Eramet Norway's NewERA Program:** Development and implementation of new climate and energy technology for Eramet Norway's smelters



# The ERAMET Group sets clear objectives



## 2035:

A long-term objective in line with the Paris agreement – reduction of the absolute CO<sub>2</sub> emissions by 40%

Given the progress in the mining activity, with relatively lower emissions compared to metallurgy, the Eramet Group expects to meet its targets of specific emission reduction of CO<sub>2</sub> before 2023. Building upon this momentum, the Group has decided in 2020 to accelerate further the process through committing on a Science Based Target objective. This approach, initiated towards SBTi (Science Based Target Initiative), is current under the status of approval “committed”.

At constant perimeter reference year 2019, Eramet targets emission reductions of CO<sub>2</sub> by 40% for Scope 1 and 2 in 2035, compared to 2019. This target requires to use all available levers, including those still in an R&D phase or the first pilots, e.g. Carbon Capture and Storage (CCS), bio reductants and electrically driven mining trucks.

Eramet’s decarbonation trajectory depends also on the capacity of the Group to develop multi-annual structuring and transversal projects with the following main axes:

- Development of **CCS** in cooperation with other actors: this is the action with the strongest impact on CO<sub>2</sub>, but there is a challenge connected to the costs of such a solution. The ambition is therefore to develop a pilot and identify less costly technologies.
- Use of **bio reductants** for the reduction of the ore: the challenge for this solution is to have bio reductant sources that are grown in a sustainable way and compatible with our processes (mechanical strength, pollutants, productivity).
- Buying **renewable electricity**, coupled with the electrification of the mining operations.
- Development of **disruptive technologies**, for instance using hydrogen as a reductant gas.

This roadmap on Scope 1 and 2 is combined with a qualitative objective of emissions from Scope 3: Eramet commits to promote the reduction of CO<sub>2</sub> emissions at its clients’.



## 2050:

### Carbon neutrality for Scopes 1 and 2

This ambition requires a necessary massive use of CCS and the development of bio reductants. Most of the actions having a significant impact will take place in a middle to long-term timeframe, the coming years being dedicated to confirming the potential gains through pilots. The identified actions will only be implemented if the market reflects the investment costs in the carbon and commodity prices. In this context, it would mean a significant increase of the carbon price and thereby of the alloys.

### Status

The middle-term objective of reducing the specific emissions of the group by -26% in 2023 was almost reached in 2020. This is the result of the significant increase of the mining activity (volume effect). The reduction of energy consumption as well as the decarbonation of the electricity are also contributing to the result.

Finally, Eramet has intensified its research and innovation efforts, to find alternative sources less carbonated. Among the most advanced subjects, we find the development of bio reductants for which industrial tests are planned in 2021 at Eramet Norway.

Other key initiatives include:

- **NewERA project:** The first installation, an energy recovery pilot plant at the Sauda plant, will be commissioned during first half of 2021, while a detailed feasibility study for the remaining sub-projects is planned to be launched in June 2021.
- **CCS:** Eramet has formalised in 2020 an industrial partnership targeting the installation of a pilot in Sauda, to capture the CO<sub>2</sub> from the flue gas of the NewERA energy recovery pilot. A pre-feasibility study will be conducted in 2021, aiming for an installation and test period in 2022-23.



ERAMET NORWAY

# Energy

As a major consumer of electrical energy, more efficient utilisation of energy will benefit both society and us.

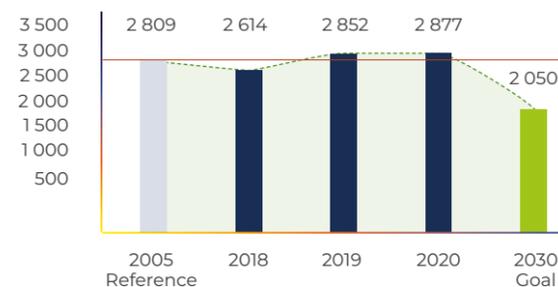
For the global community, energy transition is perhaps the biggest climate challenge, and for us energy efficiency is about further developing our competitiveness.

We will strengthen our continuous work on energy management and at the same time prepare projects and measures that will give us a big boost in terms of value creation and energy position.

**Eramet Norway's long-term goal:**

We will increase our energy utilisation by at least 27% in 2030, compared to the reference year 2005.

Energy utilisation  
(Net kWh per saleable tonne of production)



**Status Energy Utilisation**

Eramet Norway's energy utilisation varies somewhat from year to year. The main historical explanations are variations of our sales of energy rich CO gas in Porsgrunn and the maintenance pattern at our energy recovery facility in Kvinesdal.

## On our way towards a higher energy efficiency

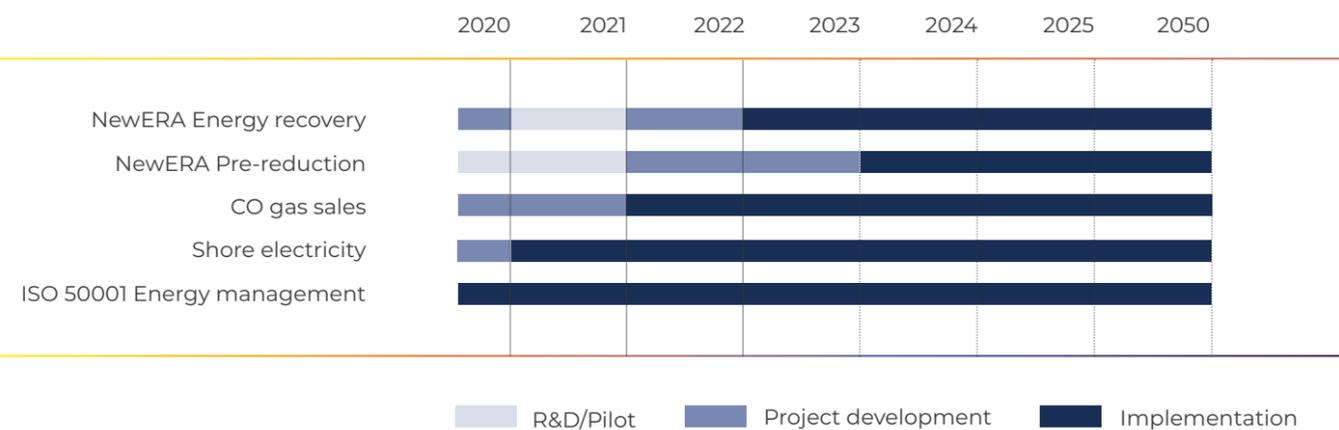
**NewERA Energy Recovery:** In 2020, the modules for our energy recovery pilot plant in Sauda were delivered. The pilot plant with a capex framework of approximately EURO 5 million will be installed in the first part of 2021, with a subsequent testing period as the basis for design of a full-scale facility. The project is supported by Enova.

**Shore power facilities:** Installation at all three of our smelters in 2021. The project is supported by Enova.

**NewERA Pre-reduction:** Thermal energy from the energy recovery plant will be used for ore drying. This will increase process efficiency and reduce specific energy and carbon consumption in the furnace process. We completed the preliminary study (PFS) in 2020 and will proceed with the detailed study (DFS) in 2021 as the basis for an investment application.

**Sales of furnace gas:** Large parts of the furnace gas from the plant in Porsgrunn were historically sold as an energy source to Yara's ammonia factory at Herøya. The agreement was terminated in 2019, and we are now working with several different companies with a view to finding new applications for our energy-rich furnace gas.

**ISO 50001:** In addition, our energy management teams work continuously to identify and realise potentials for reducing energy consumption and increasing utilisation of available energy.



### PROJECTS

- **SFI Metal Production:** The Research Council of Norway's Centre for research-based innovation.
- **EU Horizon 2020 PreMa:** Development of process for improved resource and energy efficiency.
- **FME HighEFF:** The Research Council of Norway Centre for Environment-friendly Energy Research (FME)
- **NewERA Energy Recovery Unit (ERU):** Eramet Norway's project for energy recovery.

# The NewERA Project

The NewERA project is about the development and implementation of climate and environmentally friendly technology with a significant potential for better energy utilisation. The project is an important part of Eramet Norway's roadmap for climate and the environment.

Through the project we will ensure:

- **Increased process efficiency:** Lower specific consumption of electrical energy and reductants, as well as increased process stability and production
- **Better circular economy:** Higher utilisation and increased value creation related to energy, by-products and waste materials
- **Smaller climate and environmental footprint:** Lower emissions and reduced need for deposits



## Subprojects

### Energy recovery:

The furnace gas from the Sauda smelter is currently not well utilised. The plan is to run this gas through gas engines to generate electrical energy for sale, as well as thermal energy for internal and external applications.

### Ore quality:

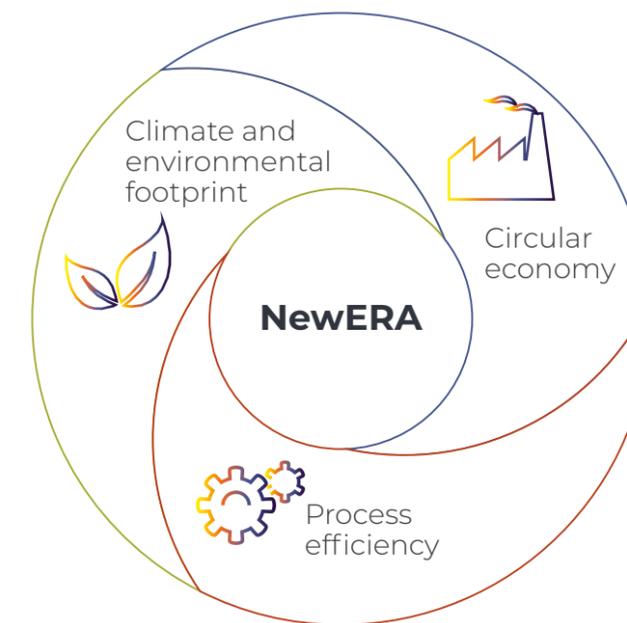
The thermal energy from the energy recovery process will be used to reduce the level of ore moisture. The ore will also be screened, taking down the level of fines before use in the furnaces.

### By-products and waste materials:

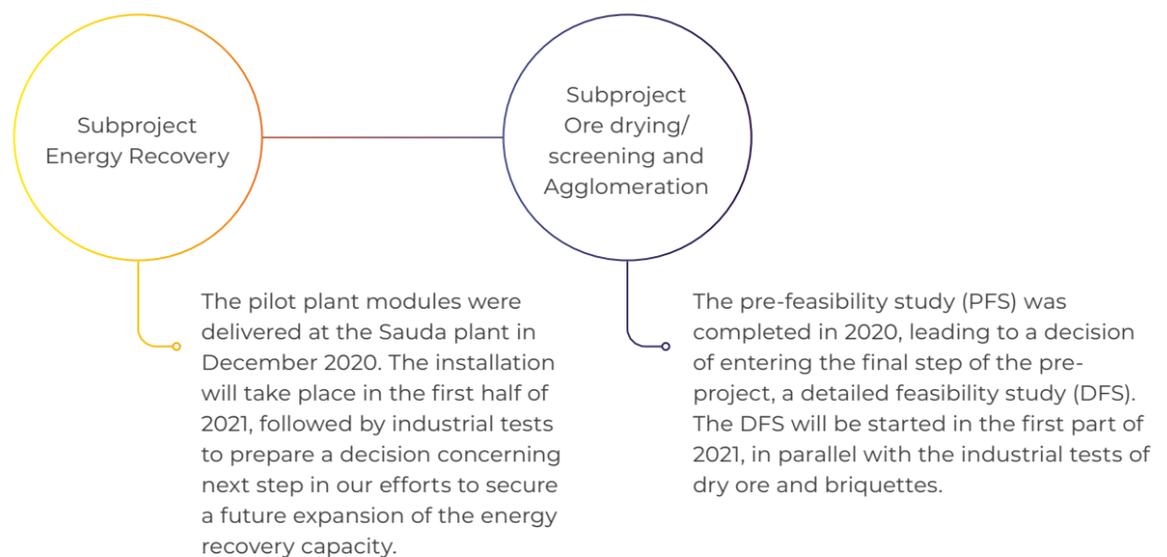
Drying the ore will generate fines that are planned to be briquetted together with fines from metal crushing, filter dust from the cleaning facilities and sludge currently being deposited.

### Main objectives:

- 1 Increase energy utilization by at least 250 GWh – equivalent to the consumption of more than 10 000 households
- 2 Increase the stability of the furnace processes and reduce the specific energy consumption in the ferromanganese alloy production by at least 8% – reduced costs and higher production
- 3 Reduce the specific carbon consumption and thus CO<sub>2</sub> emissions per tonne sold by at least 3% – that is about 10 000 tonnes per year – corresponding to the emissions from about 5000 cars
- 4 Ensure sustainable handling of by-products and waste materials – reduced disposal and lower costs



## Progress in 2020 – further plans





### NewERA Energy Recovery Pilot plant

The pilot project with an investment estimate of approximately NOK 50 million was approved towards the end of 2018. Based on offers received, contact was signed with the multinational company Clarke Energy in the autumn of 2019.

A 1.5 MW gas engine will be installed at the Sauda smelter in the first part of 2021, with a subsequent testing period. The pilot phase will be decisive for the further planning of a full-scale energy recovery facility.

Enova supports the project in Sauda as part of its industrial pilot program.



Eramet Norway Sauda cooperates with the company Sauda Energi to expand the use of waste energy from the smelter. Our energy recovery project will significantly increase the potential for further value creation. Sauda Energi will therefore in the years ahead actively seek opportunities for industrial utilisation of waste energy in the form of production processes that require access to large amounts of thermal energy.

Eramet Norway and Sauda Energi are among the partners in the project «Green Growth», supported by Innovation Norway, where the goal is to develop new industrial activities as a basis for increased value creation and new jobs in Sauda.



### Energy management

Our smelters are large energy consumers. We need about 2 TWh annually, equivalent to the electricity consumption of about 100,000 households, which makes electrical energy our second largest cost element after manganese ore.

All three Eramet Norway plants are certified in the ISO 50001 energy management standard. Our Kvinesdal plant became one of the first companies in Norway certified in 2010, while Eramet Norway Porsgrunn and Eramet Norway Sauda followed suit in 2014/15. The certification confirms that the work on energy efficiency is systematic.

Interdisciplinary energy management teams have been established at each plant. Monthly meetings are held to follow-up of significant energy aspects and improvement measures, while key figures (KPIs) related to energy consumption and utilisation are reported and reviewed in the plant's regular management meetings. The energy management teams contribute to ensuring a focus on efficient energy utilisation, which provides benefits for both ourselves and the society around us.





## Energy balance 2020

**Eramet Norway's three manganese smelters have been ISO 50001 certified for several years. The company has a formal focus on systematic energy management in order to strengthen the basis for our energy intensive smelter business.**



Energy consumption can be divided into three main groups (see illustration), where «electrons» and «hydrocarbons» each represent 45% and 42% of the total of 4.2 TWh for 2020, which is about the same total as for 2019. The remaining share supplied to the processes are related to the energy content of the consumption of metallic material (silicon and manganese) to furnaces and refining plants.

### Energy consumption

The consumption of electrical energy (melting power and auxiliary power) of 1.9 TWh was divided by 0.52 TWh, 0.63 TWh and 0.75 TWh for the smelters in Porsgrunn, Sauda and Kvinesdal. Coke and anthracite primarily act as a reducing material in the furnaces so that oxydic manganese in the ore becomes metallic manganese in our final products, but the energy content is included with 1.8 TWh in the balance sheet.

### Energy use and energy recovery

With salesable production of just over 500,000 tonnes of manganese alloys in 2020, we estimate that 1.87 TWh of energy is «baked in» as energy in these products, equivalent to around 44 per cent of the total energy supplied. The challenge is what we are able to recover from energy in fuels and heat flows. For 2020, we achieved approximately 0.47 TWh, which is around 11 per cent of the added energy.

The energy recovery plant in Kvinesdal produced net close to 85 GWh. In addition, the hot water deliveries to the fish farm and other enterprises in the local area make good contributions which make that plant the best of the three Eramet Norway units on energy recovery.

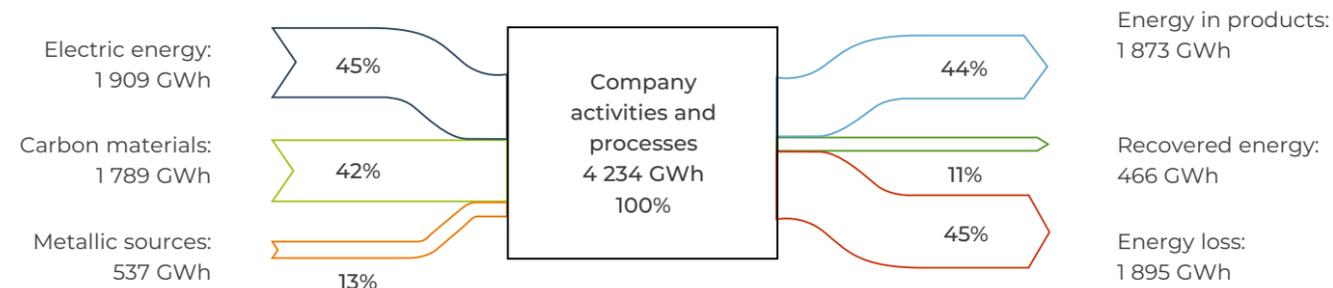
Deliveries of furnace gas to Yara's ammonia plant in Porsgrunn were terminated for commercial reasons in 2019, significantly worsening the energy balance.

Compressor heat recovery and usage of hot water for heating are useful measures but do little in the overall context.

Internal use of furnace gas for refractory activities and building heating, as well as external deliveries of hot water in Sauda are all good contributors to energy recovery. A pilot plant for electric energy production of furnace gas will come into operation in Sauda in 2021.

As a residual item, we ended up with almost 1.9 TWh in energy loss in 2020. Localisation factors have an impact on the possible application and attractiveness of recycled energy. Public funding schemes through Enova support some of our project initiatives.

## Energy Balance Eramet Norway 2020





ERAMET NORWAY

# Environment

Our smelters are located in vibrant communities, close to neighbours and beautiful natural areas, which put additional demands on our environmental behaviour.

In recent years, the plants emission permits have been renewed, and emission limits have been significantly reduced.

We are conscious of our role and will continue to work to reduce our environmental footprint and improve our overall resource utilisation for the benefit of our plants and our surroundings.

At all times a number of activities are underway at each smelter to achieve continuous improvement of production methods and optimisation of the operation of treatment plants. In addition, we carry out studies and R&D projects to acquire knowledge to use new and more efficient treatment methods.

Our current emission permits were updated in 2020 for all three smelters and contain up to 100 limit values per plant for control of emissions to air, sea and ground. The permits are followed up thoroughly through frequent sampling and extensive control by accredited and independent third parties. All results

are reported to the Norwegian Environment Agency and are publicly available on the NMA's website.

Eramet Norway is certified in accordance with the international environmental standard ISO 14001, and has internal improvement goals that are more ambitious than the emission permits.

**Eramet Norway's long-term goal:**

We will avoid negative environmental impacts in the communities where we operate, and we will not have violations of emission permits.

**Assessment of results 2020 and priority areas 2021**

Eramet Norway's overall objective for the external environment is that we should not have exceedances of current permits, and that we will continuously improve our treatment processes to reduce emissions.

All three smelters operate in accordance with emission permits that have changed several times in 2019 and 2020. This means that all smelters received new requirements through both 2019 and 2020 and lower limits in several areas. In 2020, Eramet Norway had a total of seven areas with exceedances, and we are not satisfied with this since our target is zero.

All exceedances are therefore thoroughly investigated to understand causes and implement improvements to ensure lasting improvement. All incidents and results have been notified and reported to the Norwegian Environment Agency, and external and independent experts have carried out an assessment of the environmental impact of the recipient. It has been concluded that none of the situations have had a lasting or significant negative environmental impact.

Eramet Norway is continuously working on improvements to meet the goal that there should be no exceedances on permits and that we continuously improve facilities and operations and achieve lower emissions. Several R&D projects are therefore underway by us or in collaboration with others. It is demanding to move from theory and lab tests to full-scale implementation, and we spend a significant number of hours and a considerable proportion of the budget on R&D activities every year.

One of the research projects concluded in 2020 was a collaboration with Norce on measurement and analysis of dust and dust fall-out in the surroundings around the plant in Porsgrunn. The work has been presented to the Norwegian Environment Agency, the Norwegian Institute of Public Health and neighbours with good response and is discussed in a separate article in this report.

Eramet Norway has great ambitions for 2021 and 2022 to implement improved technology particularly related to a new treatment concept for process water. In 2020, we were able to take the step of starting industrial pilots both for improved treatment of process water from the plant and for sieve water from landfill, and in 2021 projects will be under way for the implementation of several new facilities. In addition, priority areas in 2021-2022 are related to reduced emissions of dust, measurement and analysis methods, sludge and PAH (polyaromatic hydrocarbons).



**R&D PROJECTS**

Collaborative projects (part-funded by the public sector):

- **SFI Metal Production:** Research Council of Norway's Centre for Research-based Innovation
- **IPN PAHssion:** Research Council of Norway's Innovation Project for Measuring Polycyclic Aromatic Hydrocarbons (PAH)
- **IPN DUSTDetect:** Research Council of Norway's Innovation Project for measuring diffuse emissions
- **IPN NextGenSøderberg:** Research Council of Norway's Innovation Project for PAH free electrode mass in Mn industry

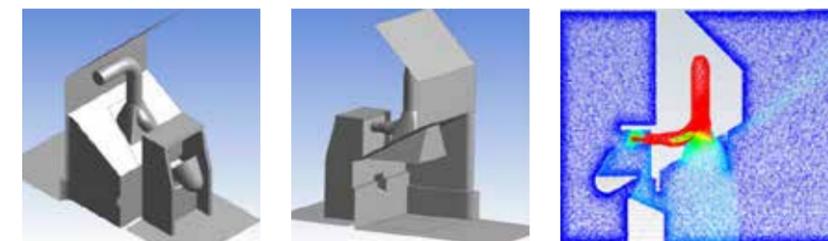
**Implementation of the slag casting smoke extraction system in Sauda**

**Eramet Norway's plant in Sauda was in 2020 the world's largest producer of refined ferromanganese alloys.**

Eramet Norway produces ferromanganese (FeMn) and silicomanganese alloys (SiMn) at its three smelters located in the southern part of Norway. Among Eramet Norway's plants, the plant in Sauda has the highest production of high carbon (HC) and medium carbon (MC) FeMn alloys. HCFeMn is produced through the melting of manganese ore in two furnaces (Sub-merged Arch Furnaces, SAF). As a result of the melting process inside the furnaces, molten HCFeMn metal and slag are generated, as well as exhaust gases. Slag is a valuable by-product of the melting process and contains a high proportion of manganese oxides and residues of the ore. The metal and slag are drained from the furnaces several times a day at defined intervals. The drained slag is cast out and cooled in slag pits and crushed to the desired size. FeMn slag is then used as a raw material in the production of SiMn alloys at Eramet Norway's smelter in Kvinesdal.

Mixing of molten slag and air during casting causes the formation of diffuse discharges that are released to air. Sustainable and environmentally friendly operations is a high priority at Eramet Norway, and therefore in 2018 a measure was initiated to reduce diffuse emissions from the slag casting in Sauda through a collaboration between the plant in Sauda and Eramet Norway's R&D department in Trondheim. The project goal was to create an optimal

*Geometry and CFD simulation of the final design of the slag exhaust system-the pits in ENS*



The exhaust system has shown a very good performance after it was put into operation. A visual comparison between smoke emitted before and after the installation of the system is shown in the images below.



*Casting slag before installing the exhaust system (left) and effective extraction of smoke discharge after installation of the system (centre) and from the pouring point (right)*

design for an exhaust system for the impact slag casting. In order to determine the prerequisites for the generation and dispersion of diffuse emissions, as well as ensure efficient design of the exhaust system, a systematic approach based on a combination of industrial observations, on-site measurements, discussion with involved operators and specialists, as well as theoretical analyses were required. An initial design draft was prepared and

assessed by the project team as the basis for further optimisation and completion using modelling tools and evaluation of the final design after implementation.

The slag pit exhaust system has an extraction capacity of more than 150,000 Nm<sup>3</sup>/hour and captures the generated exhaust gases using two caps located above the pouring point and pit as shown in the figure over.



### Examination of dust and dust measurements in Porsgrunn

Eramet Norway has for many years carried out research and development to acquire increased knowledge, and to continuously reduce negative impacts on the environment around the smelters. In 2019-20, in collaboration with NORCE and senior researcher Hege Indresand, new research was carried out on dust from the smelter in Porsgrunn. In this work, instruments and measuring methods were used that have never before been used together.

**The most important results from the surveys are that no limit values for dust are exceeded, and there is nothing to indicate that dust from Eramet Norway Porsgrunn has negative health effects.**

The Norwegian Environment Agency and the Norwegian Institute of Public Health received the report from the work in the spring of 2020, and then assessed the results. In the autumn of 2020, the results were presented by senior researcher Hege Indresand at a meeting with neighbours in Porsgrunn. Representatives from the

Norwegian Environment Agency and the Norwegian Institute of Public Health participated at the meeting and answered questions from neighbours.

In Norway, local air quality is monitored with permanent measuring stations in several municipalities. In Porsgrunn there are five measuring stations, and all measurement results are publicly available from the Norwegian Environment Agency's website on air quality.

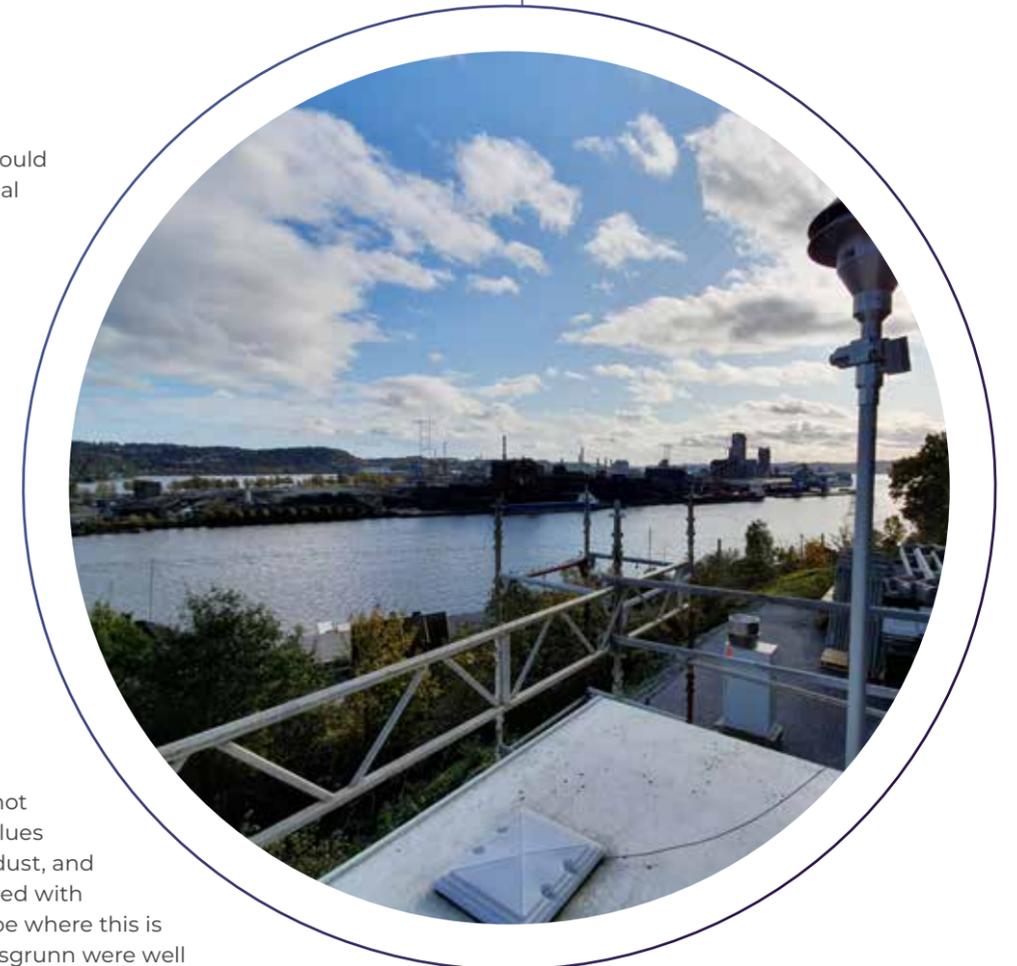
Air quality is characterized by the content of particulate matter in addition to nitrogen dioxide, ground-level ozone and sulphur dioxide. Particulate matter is small, airborne particles, and limit values have been set for the sizes PM 2.5 and PM 10 that are so small particles that they can be inhaled and thus be harmful to health. In addition, there are a number of recommended values for other elements so-called air quality criteria.

Norway have implemented EU air quality regulations (EU air quality

directives) into Norwegian law via the Pollution Control Regulations. The regulations set requirements for how it should be measured and the quality of the measurements. All the measurements Norce has carried out for Eramet Norway is based on this legislation.

For the measurements in Porsgrunn in 2019/2020, three instruments were used to measure the amount of dust and the contents of the dust and three meteorological measuring stations in order to have accurate knowledge of wind speed, wind direction, temperature etc. necessary for complete analysis of the data. The instruments measured dry fallout dust per hour, particulate matter such as mass concentration of PM1, PM2.5, PM4, PM10, and TSP (Total Suspended Dust) per hour, as well as the metals in particulate matter such as mass concentration per hour in PM2.5, PM10, and TSP. The instruments were placed in two different locations and the measurements were carried out over several months.

In order to assess whether there could be harmful properties and potential health risks in particulate matter or fallout dust, the content was assessed against both limit values and air quality criteria. No excesses of particulate matter were measured. This has also been measured in several previous years, and no overruns of these limits have been measured. The measurements also showed values under all guidelines, except for the element manganese at one of the measurement sites. No contents (elements) were found for fallout dust that could be harmful. It was also noted that the fallout dust consisted of large particles (over 50 micrometers), which cannot be inhaled. No Norwegian limit values have been established for fallout dust, and the results were therefore compared with guidelines from countries in Europe where this is found. The levels measured in Porsgrunn were well below these.



New concept for purification of process water – Reduced discharges of metals to sea

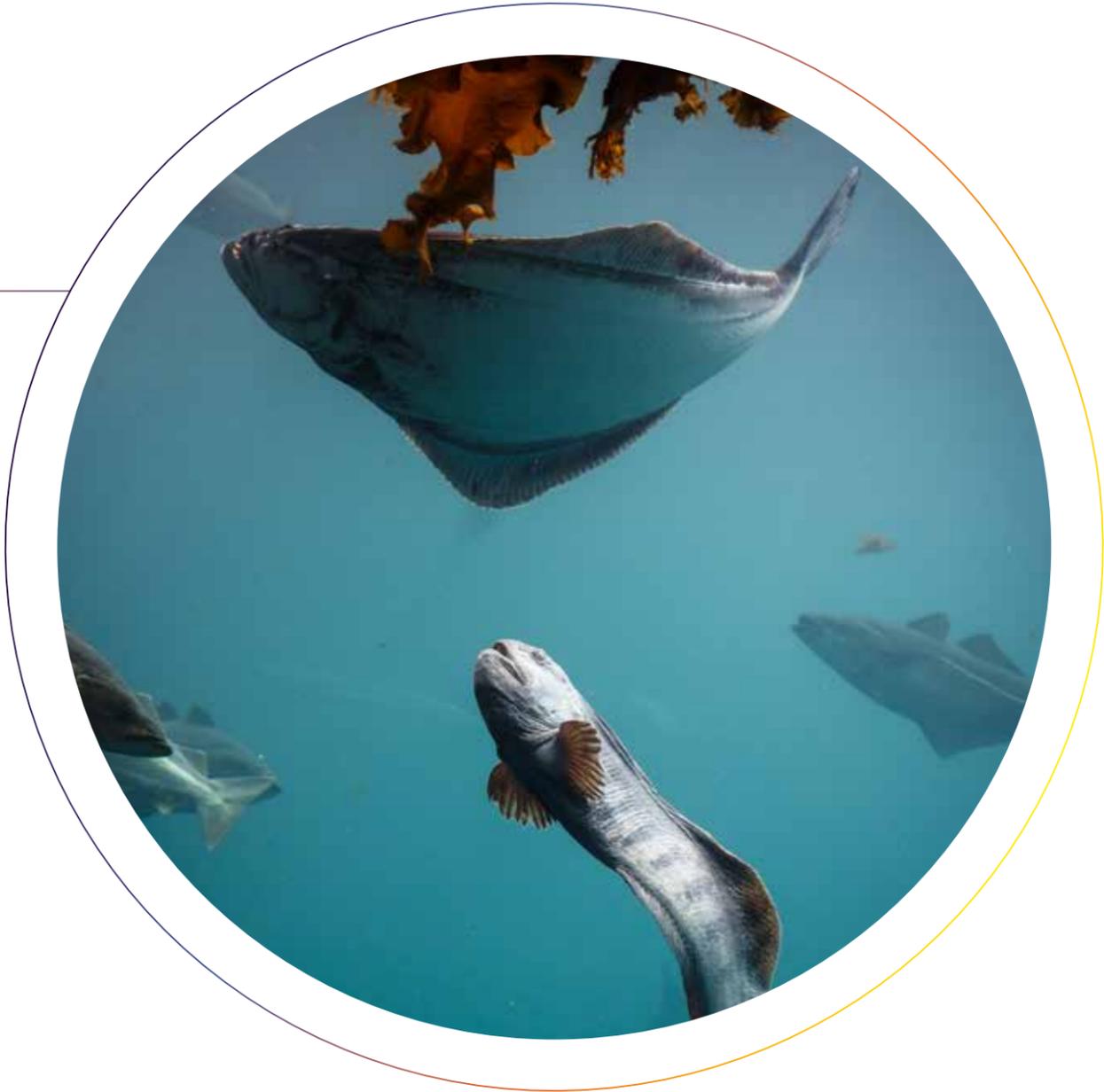
In recent years, Eramet Norway has made great efforts to improve and develop the facilities for purification of process water to reduce emissions of metals to sea. Several years ago, we started searching for better technology and facilities both in the Norwegian research community, at Norwegian suppliers and with major European and global experts in water chemistry and water purification. In connection with an upgrade of one of the treatment plants scheduled to be carried out in 2018, it was considered that the best available technology was based on reverse osmosis. This became a very expensive facility, but unfortunately this technology did not provide us with results that we were satisfied with.

After extensive investigations and lab tests in 2018 and 2019, it was noted that it was most likely difficult to achieve a higher purification rate for metals because these form strong complexes with all elements of the process water. After further development work, it was identified how it could probably be done to

break these complexes. After good results from laboratory testing, it was decided to design and build a pilot plant for industrial testing, and in early 2020 an industrial full-scale pilot was put into operation at the smelter in Porsgrunn.

The concept for the pilot is that metal complexes that cannot be felled out with chemicals that provide metal hydroxides previously used are affected by iron sulphate so that metals are then felled out with sulphide. The result for 2020 compared to 2019, for example, shows an 80% reduction in copper emissions for the smelter in Porsgrunn.

After a long period of research and development work, Eramet Norway has achieved a major breakthrough in how to improve treatment plants for process water and reduce emissions of metals to sea. It has now been decided to build such facilities also at the other plants as well, and engineering has been initiated to incorporate this at all our smelters.





ERAMET NORWAY

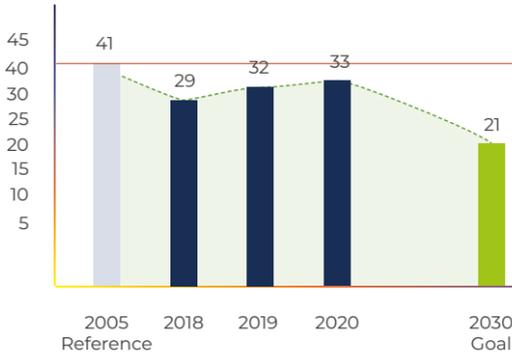
# Circular economy

Circular economy is about resource utilisation. Eramet Norway handles several million tonnes of materials annually through our production processes. Through knowledge development, improvement work and targeted investment projects, we work to achieve the best possible utilisation of purchased input factors, generated by-products and waste materials.

The essence of the circular economy is increased resource efficiency and breaking the traditional link between increased value creation, extraction of virgin raw materials and waste volumes. We work to increase internal reuse and create new value chains based on side streams, by-products and waste materials so that we contribute to increased value creation in society in general. We work with established and new industry partners, the national public policy institutions and educational and research institutions to achieve economic and environmental sustainability in both the short and long term.

Sustainable production and efficient cost management are two sides of the same coin. But it is important to recognise that in circular economy, most low-hanging fruits are already harvested, and new projects require considerable technical, economic and social efforts. Transparency and collaboration are required to map available by-products and side streams, knowledge to identify new areas of application and research and industrial testing to develop new technology. Few projects in the circular economy generate substantial revenues in the short term. Therefore, in order to succeed in this area, it is necessary that business leaders show courage and are willing to collaborate and share information. And that the authorities contribute through changes in regulations, framework conditions and financial incentives.

Volume of deposited sludge (1000 tonnes)



**Eramet Norway's long-term goal:**

We will increase our resource efficiency by increasing value creation related to by-products and waste materials and by reducing deposited volumes by 50% by 2030.

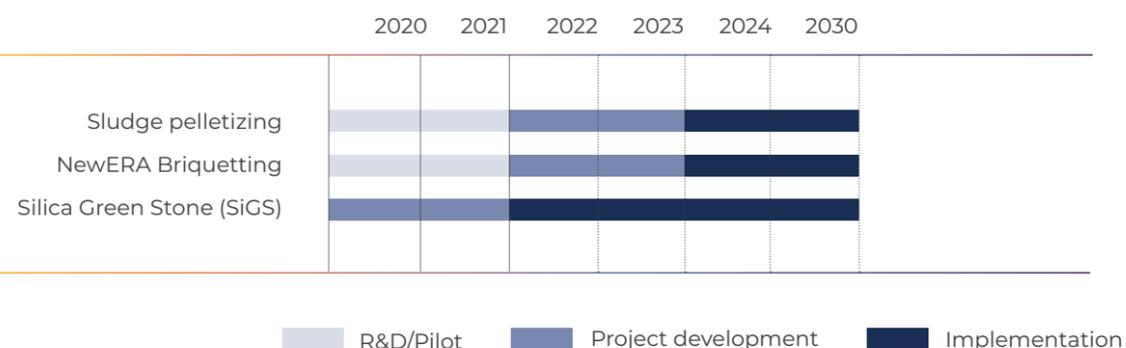
**Status circular economy**

The sludge volume deposited since the reference year has been reduced by more than 20% at the same time as the production has increased by almost 15%. The last couple of years, the plants in Kvinesdal and Porsgrunn have made the greatest contribution, while the volume in Sauda has increased. Prioritised projects that will contribute to further reductions are:

- Making briquettes of sludge (currently in the pre-study phase)
- NewERA (industrial pilots ongoing)

## Pilot testing to develop industrial solutions are ongoing

Eramet Norway's R&D department is developing alternatives to depositing, especially aimed at sludge, which is by far the largest landfill volume. In parallel, we are working to find new applications for by-products, both in terms of increased value creation and sustainability. To assess the impact of our proposals, we plan to connect with relevant professional environments and conduct life cycle analysis (LCA).



### COLLABORATIVE PROJECTS

(part-funded by the public sector):

- **EU EIT Raw Materials TripleLink:** EU-funded project, development of new software for life cycle analysis (LCA)
- **EU EIT Raw Materials GREENY:** EU-funded project, characterization and improvement of crushing of products
- **NewERA Cold Agglomeration Unit (CAU):** Eramet Norway's project for agglomeration of side streams
- **SFI Metal Production:** Research Council of Norway's Centre for Research-based Innovation
- **IPN ValSiGs:** Utvikling for Silica Green Stone

### We consider two main directions when it comes to reusing sludge, dust and fines:

1. For sludge and dust, we plan to produce pellets in a high-intensity mixer at our smelter in Kvinesdal. In the first instance, we want to build a test station to gather expertise and technical data as a basis for establishing a future large-scale facility. The project is partly funded through national public policy institutions.
2. For the treatment of fine matter from manganese sources and other products, we work as part of the NewERA project to develop a production process for briquettes. After successful testing in Eramet IDEAS's pilot furnace in 2019, we started industrial trials at our smelter in Kvinesdal in 2020. The test phase will be completed in the first half of 2021. The results of the tests will provide important input to the detailed engineering study (DFS) to be carried out as a basis for the preparation of investment applications with the aim to realise this project.

Another key area in our work on circular economy is to develop new applications for Silica Green Stone (SiGS).

## Further development of Silica Green Stone

One of Eramet's by-products is silicomanganese slag, which from 2019 has had the product name "Silica Green Stone" (SiGS). Eramet Norway produces approximately 300,000 tonnes of SiGS annually, and until now it has mainly been used in road construction and as a filling material in construction projects.

The ambition to contribute to good circular economy solutions is one of Eramet Norway's four priority areas for improving our climate and environmental performance. The extraction of virgin raw materials requires large areas and is an important reason why species at risk of extinction and biodiversity is threatened. In addition, all production requires energy that contributes to greenhouse gas emissions. Through increased internal reuse and the development of new applications for waste and by-products, we will contribute to increased value creation without increased consumption of virgin raw materials. Reuse of SiGS leads to reductions of confiscated natural areas, energy consumption, greenhouse gas emissions, noise, dust and other contaminants compared to extraction and production from virgin raw materials.

SiGS is through the production process exposed to temperatures up to 1600 degrees and become a stable, strong and clean material comparable to natural rocks. A number of tests and analyses carried out by independent third parties document that SiGS does not contain organic pollutants, and that the content of heavy metals is below the values naturally found in nature. At the same time, the content

of natural minerals such as calcium and silicon contribute to the fact that the product has properties that can be useful in cement and concrete production, as well as soil improvement.

In recent years, the Norwegian cement producer Norcem has used SiGS as a raw material in the production of clinker. In 2020, the collaboration between Eramet Norway and Norcem was expanded to also include use in various blending cements. This work will continue in 2021. The work is partly based on experience from companies that have replaced a share of the clinker with blast furnace slag from raw iron production. In addition to R&D at both Norcem and Eramet Norway, the University of Agder (UiA) has participated in this work. Studies and tests have shown promising results, and it is likely that SiGS can reduce the use of limestone and other materials such as ash from coal-fired power plants, in addition to reduction of greenhouse gas emissions.

Together with several other partners, Eramet Norway started an IPN project («Innovation Project in the business sector») in 2020, which will investigate how SiGS's properties can affect concrete. The research collaboration involves UiA, Sintef and other industrial companies and receives funding from the Norwegian Research Council. The project is due to be completed in 2022 and includes studies of current cement and concrete standards, the possibilities and limitations of these and how to achieve necessary changes to standards. The project also



includes the addition of SiGS in concrete used for non-load-bearing products that are not covered by applicable standards, as well as the calculation of life cycle costs and climate footprint for concrete when adding SiGS.

The third area where Eramet Norway has continued development work for new use of SiGS is in the field of soil improvement. SiGS contains silicon, which can affect growth and reduce plant diseases and thus cause increased crops. Bio available silica is a limited resource in the soil in several places in the world, and it is therefore interesting to get the substance back into the ecological cycle. In addition, manganese and lime in SiGS can also contribute positively to plant growth. In 2020, Eramet Norway conducted several field trials, and new field trials are planned in 2021 based on analyses of new research.

# Environmental data

Porsgrunn

Sauda

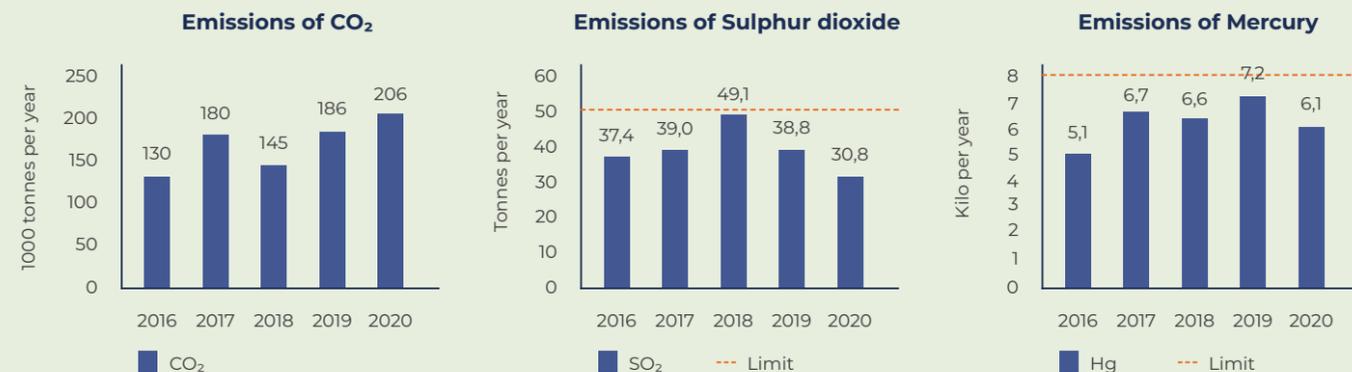
Kvinesdal

All our emission figures are available at [www.norskeutslipp.no](http://www.norskeutslipp.no)

## Eramet Norway Porsgrunn

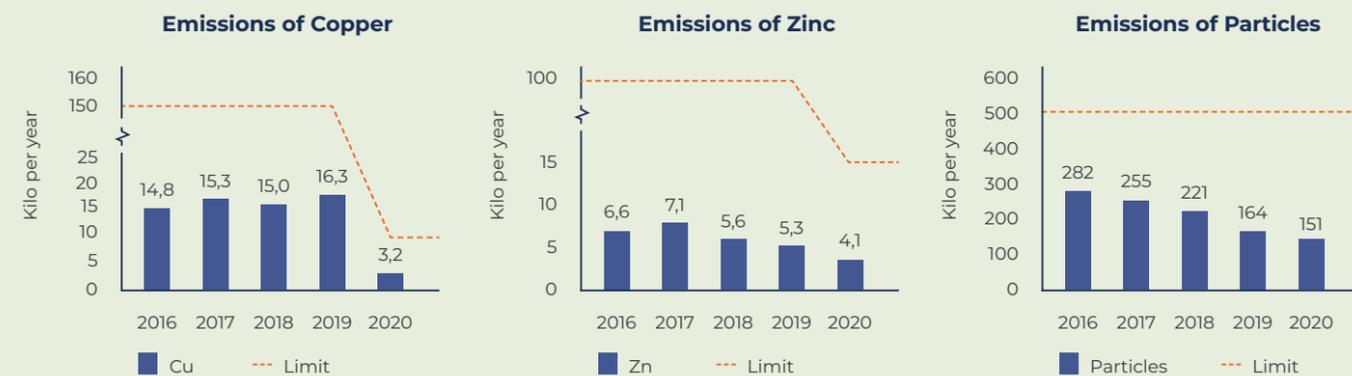
### Emissions to air

Reported CO<sub>2</sub> emissions have increased in recent years. This is mainly due to the fact that deliveries of carbon-containing furnace gas to external customers were unfortunately terminated in the summer of 2019. Work is now under way with other stakeholders who can use this. In addition, our climate and environmental roadmap describes other projects that will help us achieve our goals of reducing emissions. Mercury emissions have been stable and below the permit for many years and are monitored through measurements controlled by external experts.



### Emissions to sea

Copper and zinc emissions were historically low in 2020. In early 2020, a pilot plant was built in Porsgrunn to test and develop a new treatment concept, and new treatment technology will be industrialized and implemented at all works. Emissions of suspended substances have shown a positive development in recent years. This is an area that will be further improved by reducing emissions of dust and fine particles from production and continuous improvement of routines for cleaning outdoor areas.



### By-products and waste materials

CATEGORI	2019	2020
Silica Greenstone	91 943 tonnes	100 892 tonnes
Sludge and dust (deponi)	4 665 tonnes	4 328 tonnes
Residual waste	174 tonnes	189 tonnes
Metal waste	160 tonnes	161 tonnes
Hazardous waste	14 tonnes	29 tonnes
Paper and cardboard	5 tonnes	4 tonnes
Wood waste	143 tonnes	129 tonnes
Mixed rubber waste	26 tonnes	0 tonnes

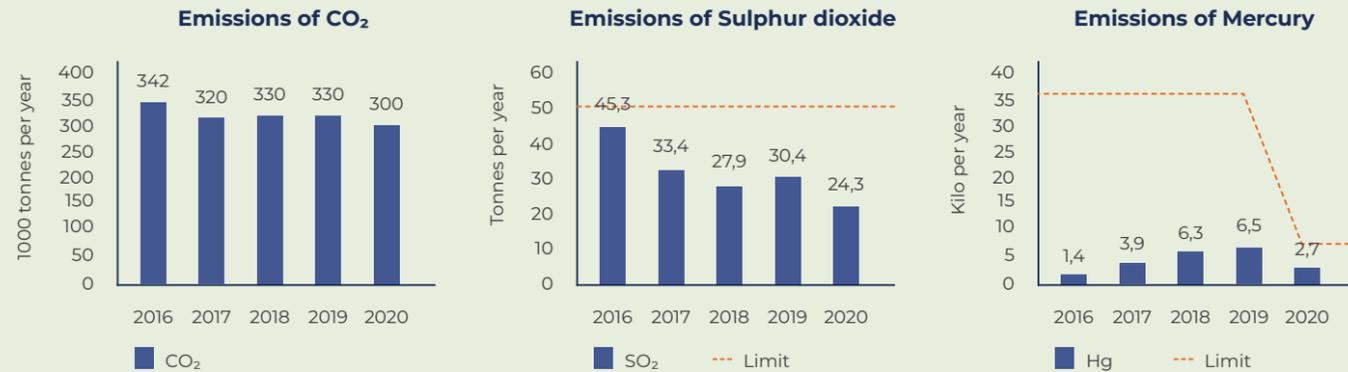
### Key actions 2018-2020:

YEAR	ACTIONS
2019	Surface water collection system (outdoor areas)
2019	Smart irrigation of outdoor areas
2020	Measures to reduce noise: new doors, gates, isolated walls, sound silencers and fans/equipment
2020	Improved extraction at centre chimney furnace 10
2020	Real-time monitoring of channeled dust emissions
2020	Surface water collection system (outdoor areas)

# Eramet Norway Sauda

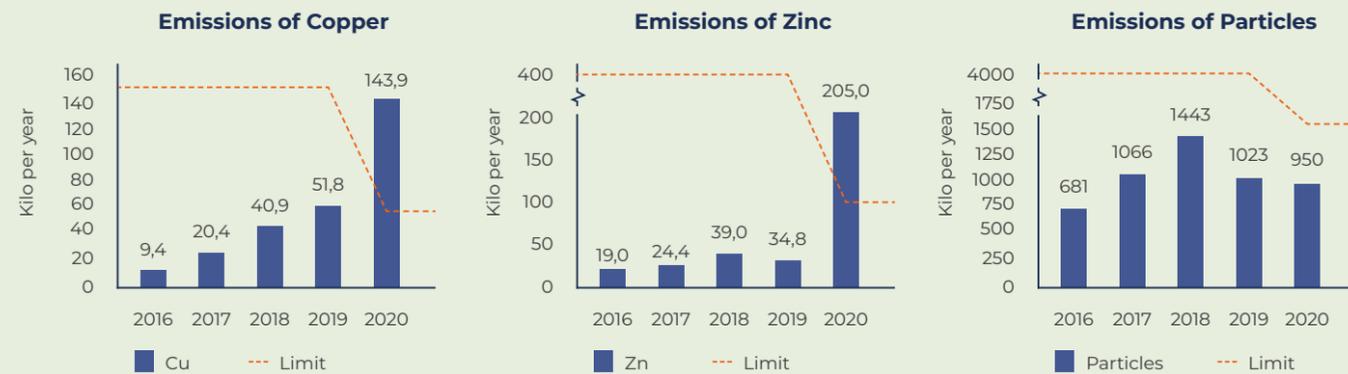
## Emissions to air

CO<sub>2</sub> emissions have been stable in recent years and are closely linked to production volumes. Our CO<sub>2</sub> emissions come from carbon-containing furnace gas, and our climate and environmental roadmap describes projects that will help us achieve our targets for reduced emissions. At the plant in Sauda there is already partial recovery of furnace gas. Construction of a pilot test facility for increased energy recovery has also been initiated. This is an important and socially beneficial measure that will start in 2021. The discharge permit for mercury was reduced by about 80% at the last renewal, and we achieved our best result ever in 2020.



## Emissions to sea

Copper and zinc emissions were above the limit values in 2020. Internal investigations have been carried out, and external experts have carried out environmental impact analysis of the recipient. None of the incidents are considered to have a significant negative impact on the recipient. After an extensive development process, we have now planned the implementation of new cleaning technology at all works. Emissions of suspended substances have shown a positive development in recent years. This is an area that will be further improved by reducing emissions of dust and fine particles from production and continuous improvement of routines for cleaning outdoor areas.



### By-products and waste materials

CATEGORI	2019	2020
Silica Greenstone	0 tonnes	0 tonn
Sludge and dust (deponi)	9 333 tonnes	10 072 tonnes
Residual waste	90 tonnes	130 tonnes
Metal waste	324 tonnes	331 tonnes
Hazardous waste	68 tonnes	58 tonnes
Paper and cardboard	7 tonnes	7 tonnes
Wood waste	491 tonnes	203 tonnes
Plastic	5 tonnes	5 tonnes
Asphalt	0 tonnes	0 tonnes

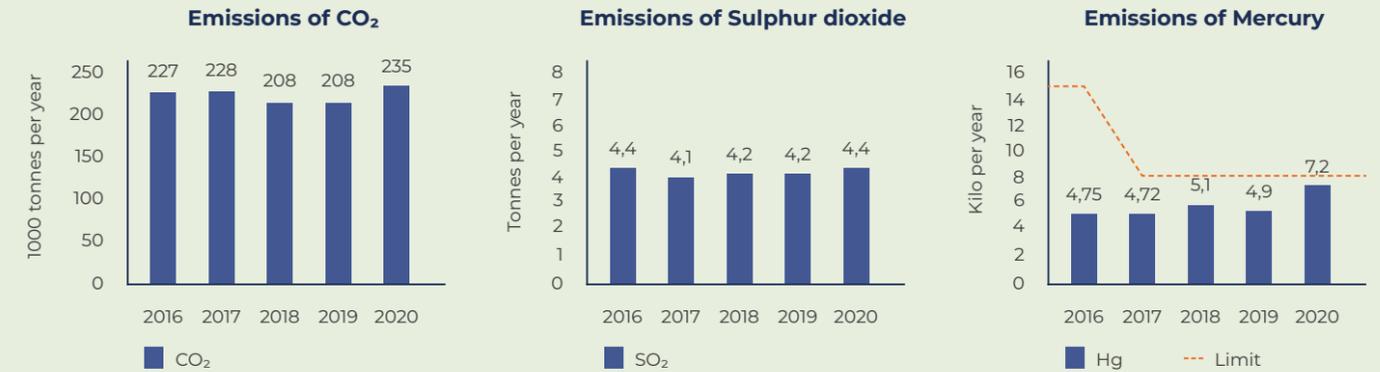
### Key actions 2018-2020:

YEAR	ACTIONS
2018	Smart irrigation
2019	Projects for improving extraction capacity
2019	Water purification and reduction of discharges to sea
2020	Surface water purification
2020	Separation of water for public water cleaning plant

# Eramet Norway Kvinesdal

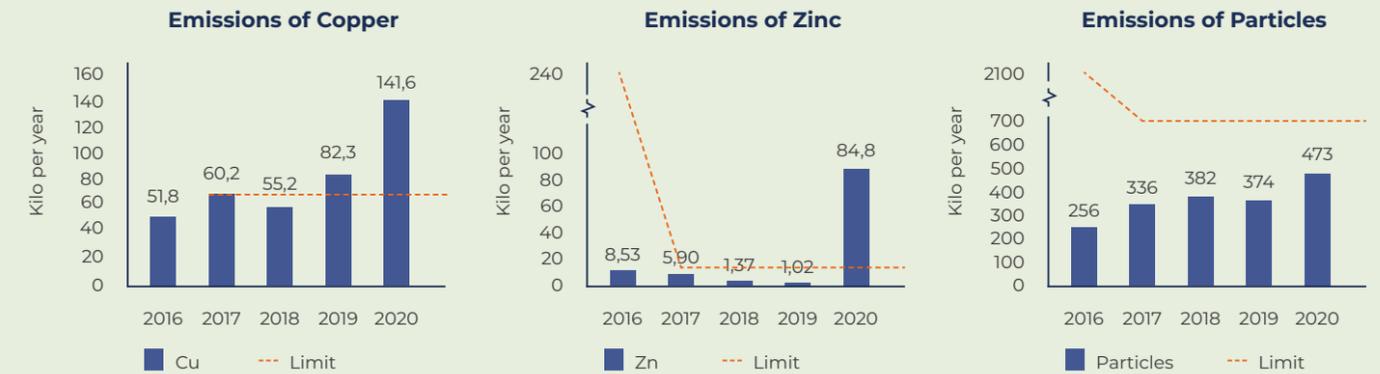
## Emissions to air

CO<sub>2</sub> emissions have been relatively stable in recent years. Our CO<sub>2</sub> emissions come from carbon-containing furnace gas, and our climate and environmental roadmap describes projects that will help us achieve our targets for reduced emissions. At the plant in Kvinesdal, a separate power plant has been built that recycles the energy in the furnace gas, so that today it is recycled and large amounts of electricity and heat are produced. Mercury emissions have been stable low and below permit for many years and are continuously monitored through their own measurements, as well as control by external experts. In 2020, we experienced some challenges with the treatment plant, and a number of activities were carried out to improve the treatment process. Since then, the facility has worked very well, and a new real-time meter for enhanced monitoring has also been installed.



## Emissions to sea

Copper and zinc emissions were above the limit values in 2020. Internal investigations have been carried out, and external experts have carried out environmental impact analysis of the recipient. None of the incidents are considered to have a significant negative impact on the recipient. After a comprehensive development process, we have now planned the implementation of a new treatment concept for all works. Emissions of suspended substances have shown a positive development in recent years. This is an area that will be further improved by reducing emissions of dust and fine particles from production and continuous improvement of routines for cleaning outdoor areas.



### By-products and waste materials

CATEGORI	2019	2020
Silica Greenstone	204 796 tonnes	219 335 tonnes
Sludge and dust (deponi)	17 894 tonnes	17 673 tonnes
Residual waste	101 tonnes	83 tonnes
Metal waste	32 tonnes	0 tonnes
Hazardous waste	110 tonnes	93 tonnes
Paper and cardboard	6 tonnes	7,5 tonnes
Wood waste	96 tonnes	75 tonnes
Plastic	16 tonnes	15 tonnes

### Key actions 2018-2020:

YEAR	ACTIONS
2019	Project for reduction of fugitive emissions from outdoor activities
2019	Surface water collection system (outdoor areas)
2020	Real-time monitoring MRU
2020	Furnace cover upgrade to reduce fugitive emissions
2020	Real-time monitoring of channeled dust emissions
2020	Evaluation of ground conditions

# HESE policy for a sustainable Eramet Norway



## Goals

Eramet Norway will conduct its business to minimise the impact on health, safety, the environment and the climate throughout the value creation chain. The production of metals, materials and other products shall take place through resource efficient processes that safeguard this consideration.

Eramet Norway aims to be an environmentally and energy-conscious company, with a secure working environment that protects its employees, facilities and values while at the same time reducing our environmental footprint. Systematic and continuous improvement of health, safety, environmental and energy performance shall be fundamental goals for all the company's activities.

## Priorities

Health, safety, environmental and energy efficiency activities should be an integral part of operations. Our most important consideration is to protect our employees and others affected by our business from work accidents and health injuries. All relevant laws and regulations, as well as other requirements the company adheres to, must be followed. Environmental, energy and safety aspects must always be considered

and weighted when making decisions on investments, operating methods and changes.

## Responsibility

Managers at all levels have the overall responsibility, this also includes health, safety, environment and energy. They are responsible for planning, organising, training and implementing the activities in their respective areas of responsibility and ensuring that health, safety, environment and energy are an integral part of this, as well as ensuring that practices comply with laws, regulations and recommendations within their area. Managers should in their plans set specific improvement goals and seek collaboration with all employees to achieve them.

All employees are responsible for creating a secure internal work environment, protecting the external environment and safeguarding the company's resources and equipment. Each employee is responsible for protecting himself and his colleagues, adhering to established instructions for completing tasks, and reporting as soon as possible in the event of adverse events or situations.

## Improvement

Health, safety, environment and energy are an integrated part of Eramet

Norway's management system. Adverse events and improvement proposals must be addressed and form the basis for measures and continuous improvement.

Incorporation of undesirable incidents forms the basis for implementing both corrective and preventive measures, and should therefore receive special attention.

## Prevention

Risk assessments should be the basis for procedures and practices, and should be a fundamental part of anticipation of changes and investment planning. Potential hazards must be identified and assessed. Adverse events such as near-accidents, accidents, health damage, environmental damage, energy loss etc should be recorded and investigated to find root cause and prevent recurrence.

## Follow up

In order to ensure compliance with laws and regulations and compliance with Eramet's own environmental goals, policies and guidelines, a system for continuous registration, reporting and auditing shall be in place. Eramet Norway shall annually publish a sustainability report.

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Our goal is that everyone leaves work in as good health as when they arrived and in a good mood after working in a safe environment with committed colleagues.

