Terrafame

TOWARDS CARBON NEUTRAL BATTERY CHEMICALS

Sustainability Review – June 2022

Terrafame

SUSTAINABILITY REVIEW 2022

Contents

About Terrafame Ltd

Terrafame reduces the carbon footprint of transport by delivering responsibly produced battery chemicals to the global battery industry. One of the world's largest production lines for chemicals used in electric vehicle batteries is located on Terrafame's industrial site. The plant can produce nickel sulphate for around 1 million electric vehicles per year. The carbon footprint of the nickel sulphate produced by Terrafame is among the smallest in the industry.

Terrafame's integrated, unique, and energy-efficient production process from the mine to battery chemicals is located on a single industrial site. It provides customers with a transparent, traceable, and truly European battery chemical supply chain.

Terrafame Ltd was founded in 2015. Its net sales in 2021 were EUR 378 million. Around 1,500 people work on its industrial site, half of whom are employees of partner companies.

About the Sustainability Review

This Sustainability Review complements the non-financial report published as part of the 2021 Board of Directors' Review. The 2021 Board of Directors' Review and Financial Statements, as well as the Reports on Corporate Governance Statement 2021, Remuneration Statement 2021, and the company's remuneration policy, all based on the Finnish Securities Market Association's Corporate Governance Code 2020, are available on the company's website at www.terrafame.com.

Terrafame

Business model

Enhancing low-carbon mobility with responsible battery chemicals

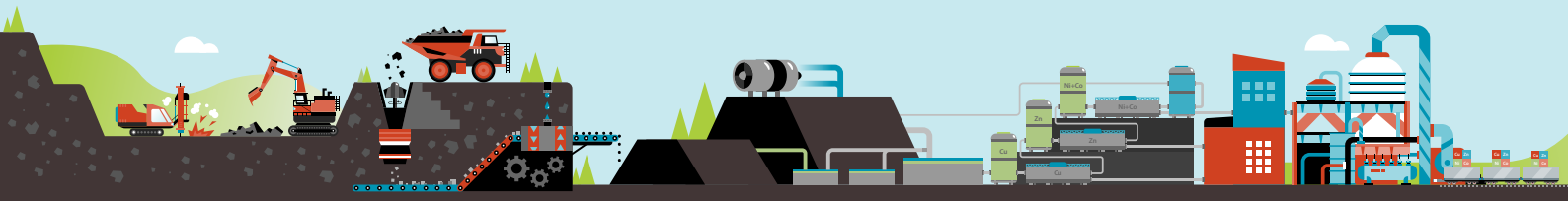
IMPACTS

Economic value-added – Committed personnel –
Safe working environment – Solid customer experience

TRACEABLE SUPPLY CHAIN, LOW CARBON FOOTPRINT

INTEGRATED AND ENERGY EFFICIENT PRODUCTION

Open pit — Materials handling — Bioleaching — Metals extraction — Battery chemicals plant



RESOURCES

Largest nickel ore reserves in Europe – Skilled personnel – Wide partner company network

VALUES

Safety – Commitment – Efficiency

A unique integrated production process

Terrafame's integrated production process – which begins in its own mine and ends with battery chemicals on a single industrial site – is a unique and energy-efficient production chain that provides customers with battery chemicals that have a markedly lower carbon footprint compared to the industry average.

1 The production process starts at Terrafame's own open pit, from which the ore is mined. The ore is then crushed, agglomerated, and transported and stacked to bioleaching heaps.

2 The bioleaching process utilizes microbes to extract metals from the ore. Air is blown into the heaps, and they are irrigated with an acidic production solution. This creates optimal conditions for the microbial activity within the heaps. The stacked ore is first leached in the primary heap for about 15 months. The ore is then reclaimed and conveyed onto a secondary heap for final leaching. Bioleaching is an energy efficient production method.

3 Metals are extracted from the recyclable production solution, which is precipitated in stages into nickel-cobalt, zinc and copper sulphides in a metals recovery plant. Zinc and copper sulfides are filtered and sold for refining.

4 The nickel-cobalt sulphide is fed into the battery chemicals plant which is located at the same industrial site. There the nickel-cobalt sulphide is further processed into nickel and cobalt sulphates i.e. battery chemicals.

CHIEF SUSTAINABILITY OFFICER'S REVIEW

Continuous improvement is at the core of sustainability

Terrafame produces nickel sulphate for electric vehicle batteries. The carbon footprint of this production has been proven to be low. We also provide our customers with a fully transparent production chain, in which the products are traceable from the mine to the battery chemicals.

In addition, Terrafame produces cobalt sulphate for electric vehicle batteries, and the sustainability aspects related to cobalt sulphate are particularly important. Seen from these perspectives, our sustainability is already at a high level. However, this is not enough, because true sustainability also involves continuous improvement.

We are seeking to further reduce the carbon footprint of our products and achieve carbon neutral production by 2039. This is a challenging goal, but we believe it can be achieved. Measures to abandon the use of fossil fuels are a key part of our carbon neutrality goal. In practice, this means, for example, that ore and waste rock will most likely be moved using solutions based on electricity or green hydrogen in the future. In these solutions, Terrafame is actively cooperating with equipment manufacturers and other operators in the field. Because fossil fuels will largely be replaced with electricity-based solutions, electricity consumption will increase. This means that more attention will be paid to electricity production methods. Terrafame's goal is to ensure that the electricity consumed at its industrial site will mainly be produced by using local wind power and on-site solar power.

Continuous improvement is also evident in Terrafame's safety work. We have worked hard to further improve safety since the beginning of our operations. The programme for continuous improvement, which focuses on safety and reliability, continued in 2021 and included several work safety development measures. For example, we made improvements to our work permit practices during the year and introduced safety meetings and discussions based on the new model. These measures enabled us to decrease Lost Time Injury Frequency (LTIFR1) of our own employees. This work continues and will increasingly focus on developing the safety of partners.

Water management and the closure of production areas are key aspects in minimising the environmental impacts of operations. We have developed water management systematically since the beginning of Terrafame's operations. In water management, the focus has increasingly shifted towards long-term planning and impact assessment, particularly with the Kolmisoppi project. The timely and appropriate closure of production and waste areas is a key part of water management and minimising impacts on natural water bodies. During 2021, we built two new large-scale test structures to examine the functionality and safe implementation of structures.

Naturally, continuous improvement is also an element of various management systems. Terrafame has had certified safety, environmental, and quality systems for years. We were among the first Finnish mines to introduce the Towards Sustainable Mining Standard to assess performance in the various areas of sustainability. We have carried out self-assess-

ments related to the standard since 2017. At the end of 2021, our results were verified for the first time by an external expert. Our results were good in terms of crisis management and water management, for example. These are very important aspects of our operations, and we have invested in them heavily since the beginning of Terrafame's operations. Development needs were detected in terms of energy efficiency, for example. Terrafame produces nickel sulphate for electric vehicles and the carbon footprint of this production is ow. In recent years, the company has implemented several significant energy investments, such as the transition to bioenergy in the production of steam and heat, the expansion of the district heating network, and the recovery of waste heat from hydrogen plants. However, during an assessment based on the Towards Sustainable Mining Standard, development needs were detected in terms of the systematic identification of energy efficiency areas.

> In recent years, the company has implemented several significant energy investments.

Terrafame's operations are sustainable, and sustainability also involves the continuous improvement of operations. We strongly believe that by further developing sustainability, we can create added value for our customers and meet the expectations set for us.

Veli-Matti Hilla
Chief Sustainability Officer
Terrafame Ltd

CEO'S REVIEW

We support our customers' value creation

At the core of Terrafame's business model is an integrated and energy-efficient battery chemicals production process. Thanks to this process, the carbon footprint of the nickel sulphate produced by Terrafame is markedly lower than the industry average. This lays the foundation for our contribution to combatting climate change.

Electrification is a key factor in reducing emissions from transport. Various incentives, increased regulation, technological development, and a general increase in environmental awareness strengthen the demand for electric vehicles. The electrification of transport contributes directly to the transition towards a lower-emission society because an electric vehicle does not generate any emissions in transport when carbon-free electricity is used to charge its battery. With the electrification of transport becoming mainstream, the electric vehicle industry has also started to invest heavily in the climate sustainability of the entire value chain for electric vehicle manufacturing. We at Terrafame want to support this development.

Thanks to our energy-efficient basic production process, the carbon handprint of our battery chemicals plant, which started operations in the summer of 2021, helps our customers strengthen the climate sustainability of the value chain for electric vehicles. To support our customers' climate work, we are committed to the long-term reduction of our own carbon dioxide emissions. We are in the process of preparing a roadmap to achieve carbon neutral production cost-effectively by 2039.

Mitigating global warming together with our customers is a key part of Terrafame's sustainability promise. However, sustainability is more than just a low carbon footprint for Terrafame. It also means a safe production process, safe products, the continuous improvement of environmental performance and risk management, social responsibility for employees, interaction with our stakeholders, good governance, and transparent reporting.

> Mitigating global warming together with our customers is a key part of Terrafame's sustainability promise.

Well-being at work plays an important role in the company's success. We work to provide our employees with opportunities for continuous learning and success, in addition to ensuring equal treatment and opportunities to have an impact. At Terrafame, cooperation between the employer and the employees is more extensive than the level required by law. For example, the cooperation body between the management and the employees (the Cooperation Committee) convened seven times in 2021.

One of our key goals is to improve occupational, process, and environmental safety throughout our production chain. We started a continuous improvement programme in 2020. It has resulted in new practices for all employees to further develop our safety and management culture and production reliability. These include regular safety discussions and meetings introduced during 2021, for example.

Terrafame's strategic goal is to enhance low-carbon mobility with responsible battery chemicals. The sustainability, traceability, low carbon footprint and reliable deliveries of our own production chain are strengths at the core of our strategy that we want to offer to our customers to support their value creation. Active and open interaction between various operators strengthens the commitment to responsible and sustainable operations across the value chain, from suppliers of battery raw materials to electric vehicle manufacturers.

Ethical conduct is at the core of our business operations. In 2020, we made a commitment to the UN Global Compact initiative and its fundamental values related to human rights, labour, the environment, and anti-corruption. We are continuing to integrate these into our operations as part of our sustainability programme. Terrafame's production facilities are located in Finland, where national laws and EU regulations lay a strong foundation for sustainable operations. In addition to laws and regulations, the company's values – safety, commitment, and efficiency – and its Code of Conduct, policies, as well as external guidelines and initiatives create a framework for us to promote sustainable operations in our production chain as part of the value chain for the electrification of transport.

Joni Lukkaroinen
CEO
Terrafame Ltd

A sustainable battery value chain is an important part of the green transition

This past year has been a turning point in global climate commitments. The Glasgow Climate Change Conference in the autumn of 2021 saw many sectors and business alliances commit to net zero – that is, to halving carbon dioxide emissions by 2030 and eliminating them by 2050. What is needed to achieve these goals is a comprehensive industrial transformation over the next seven years, and according to the organisers of the Glasgow summit and other business alliances, one of the main tools of this transformation is the electrification of transport. The report released by the IPCC in the spring of 2022 is pushing the world to take even bigger steps for the climate and at an increasingly rapid pace. The IPCC also mentions the electrification of transport as one of the solutions for mitigating climate change.

Emissions from road transport account for roughly 15% of global carbon dioxide emissions. Many leading car manufacturers are committed to phasing out the sale of cars that generate emissions in leading markets by 2030, and globally by 2040.

However, electric vehicles are only part of the larger change needed for a true green transition. At the end of the value chain, clean energy production is key to enabling zero-emission electric transport, while at the beginning of the value chain, traceability and overall responsibility are of central importance. In addition to steel and aluminum, the production of one electric car requires more than 200 kg of different metals and minerals such as graphite, copper, nickel, and cobalt. The IEA estimates that demand for these critical minerals could double or quadruple by 2040, and a sustainable transport revolution requires responsibility right from the start, i.e. from the mining of the minerals. It is not enough to switch to electric vehicles. The entire vehicle value chain must be traceable and in order.

Terrafame is part of this effort to build a cleaner low-carbon transport value chain. Terrafame's nickel sulphate already has a 60% lower carbon footprint than battery chemicals produced with conventional production technologies. Thanks to Terrafame's unique integrated production process, the electric vehicle industry can be provided with increasingly traceable European battery chemicals that are responsibly produced, and whose production sustainability is continuously improved. Terrafame's mineral deposits constitute one of Europe's largest known reserves of nickel sulphide and significantly improve the self-sufficiency of European battery chemicals production. Plans to expand the mining concession and exploit the Kolmisoppi deposit, the second deposit located in the mining district, play an important role in this.

In addition to offering products with a small carbon footprint, Terrafame is also exploring opportunities in other areas of responsible production, such as materials efficiency and the use of production side streams. Terrafame's long-term responsibility work furthers the company's competitive advantage and increases responsibility throughout the value chain.

The first year of the battery chemicals plant

A new leaf was turned in Terrafame's history in late June 2021, when the ramp-up of production at the new battery chemicals plant in the Sotkamo factory area began after about three years of planning and construction. Terrafame's battery chemicals plant is one of the world's largest production facilities for battery chemicals used in the batteries of electric vehicles, capable of producing nickel sulphate for about one million electric vehicles per year.

At the battery chemicals plant, the main product of Terrafame's metals production plant, nickel cobalt sulphide, is processed into nickel sulphate and cobalt sulphate, meaning that Terrafame has moved on in the processing chain from semi-finished metal products to the manufacturing of speciality chemicals. The battery chemicals plant's end product is nickel sulphate and cobalt sulphate as high-quality specialty chemicals. Ammonium sulphate, used as a fertiliser, is also produced as a by-product of the process.

Although the ramp-up of production at the battery chemicals plant was delayed for more than six months due to the Covid-19 pandemic, it is now proceeding according to plan. The current year serves as a normal start-up phase for the battery chemicals plant, where the production rate will be gradually increased to capacity. Such multistage and demanding processes always require development work during the ramp-up phase of a full-scale plant. Based on experiences from the ramp-up phase, necessary changes have been made to the processes and equipment to increase production volume and improve quality.

The quality requirements of customers are high, and the related product approval processes have been started. Regular customer deliveries have also begun, and the battery chemicals plant's production volume for the start of 2022 was already double that of the six months of operations in 2021. In January–March, the net sales of the battery chemicals business were EUR 46.5 million, which represents 37% of the company's total net sales. In 2021, the battery chemicals business's net sales were EUR 27.1 million.

Significant steps in emission reductions

In connection with the completion of the battery chemicals plant, Terrafame also took significant steps in reducing its carbon dioxide emissions with the commissioning of a new biofuel-powered heating plant in November 2020.

Much of the heat and steam previously produced by fossil fuels can now be produced using domestic forest industry by-products and recycled wood as fuel. In its first year of operation in 2021, the bio-heating plant accounted for about 60% of the total heating energy needs.

The aim is to minimise the use of fossil fuels through a combination of biofuel use and energy efficiency solutions. Here a major investment was the introduction of an entirely new kind of technology to capture waste heat at the metals recovery plant. In this way, the thermal energy generated by the exothermic – or heat-generating – process can be used for the district heating needs of the plants and mine. In the same context, the district heating network of the industrial area was expanded so that the recovered waste heat could

be used as efficiently as possible. Together, the biofuel boiler and heat recovery account for about 75% of the heat and steam needs.

Energy efficiency was also considered in the design of the battery chemicals plant's process. The technology used in the final process step, the products' crystallisation, is energy efficient Mechanical Vapor Recompression (MVR). In the MVR technique, the cooled steam from the crystallisation is mechanically compressed into a smaller volume, whereby its temperature rises, and it can be recycled back to the crystallisation stage. The recycling technique reduces the need for primary steam in crystallisation by about 75% compared to the traditional evaporation and crystallisation technology. The MVR technology has now been introduced and is working as planned in the process.

The aim is to minimise the use of fossil fuels through a combination of biofuel use and energy efficiency solutions.

Carbon neutrality by 2039

The electrification of transport can contribute to the achievement of significant global emission reductions, given that vehicles can be powered with renewable energy. However, an electric vehicle must be produced sustainably so that the vehicle's manufacture does not offset the emission reduction benefits resulting from its use compared to a conventional internal combustion engine. A vehicle's carbon footprint describes the emissions generated during its life cycle. The carbon footprint of Terrafame's battery chemicals is already 60% lower than that of battery chemicals produced with conventional production technologies.

Terrafame has reduced the emissions of its own production systematically over several years, and now aims to achieve carbon neutrality by 2039. To this end, Terrafame is creating a comprehensive carbon roadmap which defines a cost-effective path towards carbon neutrality. Terrafame has identified and scheduled concrete measures which can significantly reduce Terrafame's greenhouse gas emissions. Significant measures include replacing the fossil fuels used in mining and mobility within the industrial area with electric and non-fossil fuel solutions in the future. As a result, Terrafame's total electricity consumption will increase in the future. To be able to meet the increased need for electricity cleanly and responsibly, projects related to the availability of renewable electricity produced nearby are a key part of the carbon roadmap measures. Measures to reduce the remaining emissions will be investigated in more detail in the coming years. This applies particularly to the use and sourcing of chemicals manufactured elsewhere. It is also possible that emissions that cannot be eliminated or are difficult to eliminate will be offset with high-quality carbon offsets.

Green hydrogen is a key question of the future

The development of the mining trucks used at the mines is progressing rapidly, and the trend there is also moving towards a carbon-free future. In 2021, when Terrafame decided the guidelines for renewing the mining trucks used in ore mining, a lot of weight was given to the potential for significant future emission reductions. Hitachi's mining trucks were selected. Hitachi has a clear strategic path on how to electrify the fleet, and the carbon footprint of transport can be reduced in the future.

The transmission of both existing and new mining trucks is already fully electric, with the generators transferring the power generated by a diesel motor to the electric motors. The mining trucks have a modular structure, so that the diesel generator can be replaced with an electric power source in the future as technology advances. An advanced trolley system is already available for Hitachi's mining trucks. The mine's main ramp in the trolley system has an electric track along which the mining trucks ascend. This allows the most energy-consuming stage of the process to be carried out in a very energy-efficient and environmentally friendly manner without an internal combustion engine. The trolley system is meant to be tested first at the Kuusilampi mine. The ability to take advantage of the trolley system is used as a starting point in the planning of mining truck purchases and the design of the new Kolmisoppi mine.

For mining trucks, the direction of the future is in the hydrogen economy, and hydrogen provides efficient opportunities to store the energy these trucks require. Terrafame also uses hydrogen in the production process. The hydrogen is currently produced using propane. In the future, carbon-free hydrogen production can provide significant opportunities to reduce carbon dioxide emissions. A study is already underway into the construction of a new electrolytic hydrogen production plant, where the hydrogen needed by the company would be produced from pure water with electricity.

> In the future, carbon-free hydrogen production can provide significant opportunities to reduce carbon dioxide emissions.

The cleanness of electric transport ultimately depends on how cleanly the electricity used in the transport is produced. The same of course applies to the green hydrogen economy, which significantly increases the use of electricity. Terrafame is currently investigating how well the wind and solar farms planned for the Sotkamo and Kainuu areas, for example, would be able to meet the company's need for clean and renewable electricity. The goal is that by the end of the 2020s, local wind and solar power could account for a significant portion of the electricity demand.

Significant reductions in carbon dioxide emissions have already been achieved in heat production with the help of biofuels and waste heat recovery. These account for about 75% of the energy needs for district heating and steam. The goal is to increase this portion to 90% by 2024 by identifying and deploying new recoverable sources of heat. In a plant housing an abundance of exothermic reactions, opportunities can be found in many different locations. One of the potential sources of recoverable waste heat identified is the battery chemicals plant's autoclave.

The heat recovered in the future may also further enhance the bioleaching process, which is already highly energy-efficient compared to that of competitors. Even as it is today, Terrafame's bioleaching based production uses significantly less energy than traditional metal refinement technology.

Sustainability programme

Terrafame's operations are founded on sustainability and continuous improvement. Over the past year, we have updated the sustainability programme first developed in 2020, and Terrafame's board of directors has approved the sustainability programme. The following section outlines the progress we have made in the main areas of the programme, as well as the most important sustainability measures of 2021.

Terrafame has a comprehensive approach to sustainability incorporating the environment, social responsibility, and good governance. The themes of our sustainability programme are linked to the UN Sustainable Development Goals as far as applicable. We are also committed to the UN Global Compact initiative, which provides an internationally approved framework for demonstrating sustainability. The initiative's ten principles are based on international human rights, labour, environment, and anti-corruption agreements.

We recognize that there is still room for improvement in our operations, but we are committed to the model of continuous improvement. This commitment is supported by our ambitious and concrete targets, such as our goal to make our production carbon neutral by 2039.

THE FOUNDATION OF OUR SUSTAINABILITY PROGRAMME

COMMUNICATION ON PROGRESS

UN GLOBAL COMPACT

This is our **Communication on Progress** in implementing the Ten Principles of the **United Nations Global Compact** and supporting broader UN goals.

We welcome feedback on its contents.

Terrafame's sustainability programme advances the following UN SDGs: 4, 5, 6, 7, 8, 9, 10, 12, 13, 16 and 17

The goals of the sustainability programme

ENVIRONMENTAL RESPONSIBILITY

- We are combatting climate change together with our EV-producing clients.
- Our production will be carbon neutral by 2039.
- We utilize the side streams from production efficiently.
- We minimize our emissions and impacts on waters and lakes.

SOCIAL RESPONSIBILITY

- Terrafame is a safe place to work for both our own and our partners' personnel.
- We support and respect human rights and labour rights in our own operations. We require the same from our business partners.
- We are continuously developing our personnel's skills and possibilities to succeed.
- We engage in active dialogue with our stakeholders.

GOOD GOVERNANCE

- Terrafame's operations are transparent.
- We ensure the compliance of our operations.
- Terrafame has a strong culture of doing the right things.
- Operations are based on continuous improvement and decisions are made based on facts.

Policies and operating principles guiding our sustainability work

- UN Sustainable Development Goals
- UN Global Compact
- Code of Conduct
- Company policies
- Corporate Governance Code 2020 (Securities Market Association)
- ILO Declaration on Fundamental Principles and Rights at Work
- Towards Sustainable Mining (TSM) Standard of the Finnish Network for Sustainable Mining
- UN Guiding Principles on Business and Human Rights
- OECD Guidelines for Multinational Enterprises
- OECD Due Diligence Guidance for Responsible Business Conduct

Environmental responsibility

Terrafame's sustainably produced battery chemicals are an important part of the transportation sector's wider green transition. For its own part, Terrafame can strengthen the European supply chain for sustainable battery chemicals. Terrafame's production also has an impact on the local environment, and it is important for the company to also minimize these impacts. Equally important is the efficient circulation of the side streams produced through our operations.

GOAL	TARGET 2024	UPDATE 5/2022
We are combatting climate change together with our EV-producing clients. 	The battery chemicals plant's annual nickel sulphate production is sufficient for around 1 million electric vehicles, and its annual cobalt sulphate production for around 300,000 electric vehicles.	The ramp-up of the battery chemicals plant started in the summer of 2021. The sales deliveries of battery chemicals have started. Several significant client negotiations and product approval processes related to battery chemicals are ongoing. The utilisation of the Kolmisoppi deposit and the expansion of the mining concession will enable Terrafame to continue its operations for up to 50 to 60 years. The EIA procedure for Kolmisoppi was completed in early 2022, and the project will continue to the environmental permitting stage during 2022. It is estimated that construction related to the opening of Kolmisoppi can begin in 2024–2025.
Our production will be carbon neutral by 2039. 	Terrafame has recognised and scheduled concrete actions to achieve carbon neutral production in 2039.	Studies from Skarn Associates and CRU in 2020 show that the carbon footprint of nickel produced by Terrafame through its bioleaching process is the smallest among nickel producers globally. An LCA analysis on the carbon footprint of Terrafame's nickel sulphate was carried out by Sphera Solutions GmbH as planned in 2020. The analysis showed that the carbon footprint of Terrafame's nickel sulphate is around 60% lower compared with average production methods. Terrafame is currently building a carbon neutrality roadmap and has already undertaken several measures to reduce carbon dioxide emissions and improve energy efficiency. Central to these actions have been those with the goal of eliminating the use of fossil fuels.

GOAL	TARGET 2024	UPDATE 5/2022
We utilize the side streams from production efficiently. 	Process-based side streams are recycled as efficiently as possible to reduce the generation of waste and the need for its piling. At the same time, the metals contained in the side streams are reused in production.	During the purification extraction phase at the battery chemicals plant, impurities (e.g. copper and zinc) not belonging to the final products are separated from the solution. The reject solution is returned to the bioleaching cycle, and the metals contained in the reject can be recovered at the metals production plant as sales products. Of the process-based side streams, the pre-neutralisation sludge from the metals production plant is also recycled. The sludge is placed in the secondary leaching area to recover and reuse the metals contained in it. The ammonium sulphate generated during the battery chemicals plant's process is sold to the fertiliser industry. Terrafame has an agreement with a partner to make use of plastic waste. In 2021, 4,378 tonnes of plastic waste were delivered to the partner, and the proportion of plastic hose made from recycled material was around 37% of the annual need.
We minimize our emissions and impacts on waters and lakes. 	100% of the sulphate resulting from the process that ends up in water treatment will be recycled back into the leach cycle. The remediation of the local lakes and the old sludge from water treatment has begun.	The two-line run model at the centralised water treatment plant enables the more efficient separation of collected waters. In 2021, sulphate was fully (100%) recycled from the process back into the leach cycle. Only low-sulphate collection waters are treated and directed out of the area. The lakes most significant for recreational use are in good condition. In 2021, the water in the largest deep-water area in Lake Kivijärvi was mixed for the first time in ten years. Only one minor deep-water area remains where there is stratification caused by sulphate in the lake. In 2022, Terrafame will determine together with authorities whether artificial remediation efforts are required for Lake Kivijärvi. The condition of the local lakes is further described in Terrafame's Water Management Review (available in Finnish at www.terrafame.fi).

Social responsibility

The company's personnel and human rights policies are key elements of its social responsibility, and everyone in the workplace community is committed to socially responsible operations.

GOAL	TARGET 2024	UPDATE 5/2022
Terrafame is a safe place to work for both our own and our partners' personnel. 	The Lost Time Injury Frequency (LTIFR1) for Terrafame's own employees and its partners is below 2.5.	In 2021, the Lost Time Injury Frequency (LTIFR1) for Terrafame's own employees was 5.5 (8.3 in 2020). The total Lost Time Injury Frequency (LTIFR1) on the industrial site was 8.9 (9.8). As can be seen from the numbers, the programme for continuous improvement, started in late 2020, is beginning to reflect in the company's safety performance. Accidents involving Terrafame's employees decreased markedly during 2021. Our partner companies' performance has not been satisfactory. In 2022–2024, special attention will be paid to the development of the partner companies' safety culture.
We support and respect human rights and labour rights in our own operations. We require the same from our business partners. 	Terrafame has an effective continuous due diligence process for sustainable operations, including human rights issues, that covers the entire supply chain where applicable. The company will continue to integrate the UN Global Compact principles more closely into its management systems.	In May 2021, Terrafame conducted a human rights survey for its own stakeholders. Based on the survey, a human rights policy was developed, and this policy was approved by the Board of Directors in December 2021. In the spring of 2022, the company's management, supervisors, shop stewards, and employees were provided with training on the human rights policy as part of a more extensive sustainability training programme. By the end of May, 77% of the company's personnel had completed the training. The partner companies operating at the industrial site are regularly audited through a common audit system. In 2021, the processing of human rights issues as part of the audit process was further specified. Terrafame's operating principles, the principles of the UN Global Compact initiative and the zero tolerance rules adopted by the company as part of its enhanced safety work in 2020 were discussed in partner meetings during 2021. The company has not been made aware of any human rights violations in 2021, and no fines or sanctions related to social or economic regulations were imposed on the company. Following the Russian attack on Ukraine, in March 2022 the company decided to transfer all purchases from Russia to alternative sources of supply. Terrafame has invested in the diversity of the work community through internal communications and by developing recruiting methods. Annual salary equality analyses were carried out, and opportunities for hybrid work were developed further.

GOAL	TARGET 2024	UPDATE 5/2022
We are continuously developing our personnel's skills and possibilities to succeed. 	At least 95% of Terrafame's employees have a degree corresponding to their job requirements. Process technology education has been developed for the Kainuu region with support from Terrafame.	Terrafame has used apprenticeship training to meet future personnel needs. Between 2019 and 2022, three training groups were implemented to pursue a vocational qualification in the process industry. A total of 67 people graduated from these programmes. Most of them secured a job with Terrafame after graduation. During 2021, 174 employees studied alongside their work to complete vocational qualifications in the process industry, the automotive industry, maintenance, and the electrical and automation sector, as well as special vocational qualifications in production supervision. Terrafame is involved in the Process Academy project, in which process technology education in Kainuu is developed through cooperation between all levels of education.
We engage in active dialogue with our stakeholders. 	Terrafame has an effective interactive process in place with stakeholder representatives that provides the company with information about stakeholders' expectations, as well as providing stakeholders with information about the company's operations.	Terrafame has maintained active dialogue with its stakeholders. The most significant stakeholder groups have been identified as owners, customers, financial institutions, personnel, partner companies, and the neighbors in the surrounding areas. The board, where the most significant owners are represented, convenes once a month. The company's operations and financial situation is discussed with the most significant financial institutions on a regular basis, at least quarterly in conjunction with the reporting of financial results. Terrafame engages in active dialogue with existing and potential new customers. Quality assurance is developed based on customer feedback. Terrafame also discusses the primary systems that should be used to indicate Terrafame's operational responsibility with customers. Terrafame engages in active dialogue with its personnel so that personnel have the opportunity to participate and influence. Terrafame's Cooperation Committee both initiates and develops matters related to personnel and business development. The management structure also supports engagement. Top management engages with personnel through weekly safety discussions and e.g. quarterly personnel info sessions. The tools of workplace community communication are management structures, personnel info sessions, the intranet, Teams, and digital display boards. During 2021, four separate partner meetings were held for the company's partners operating within its industrial site to discuss Terrafame's operating principles, with representatives from over 100 partner companies present. Terrafame established its own, separate cooperation group with local community representatives in early 2022. The group represents a diverse range of expertise related to the company's sphere of influence.

Good governance

Transparent operations and the commitment of all business partners to the model of continuous improvement are the foundation of Terrafame's sustainability. The company's operating principles in terms of quality, safety, and the environment are specified in its separate, regularly updated quality, personnel, and sustainable development policies. Our goal is that by 2024, Terrafame will prove the sustainability of its business operations through systems to which our customers are also committed. Corporate responsibility will also be demonstrated through international systems based on the ISO 26001 standard.

GOAL	TARGET 2024	UPDATE 5/2022
Terrafame's operations are transparent.	Terrafame proves the sustainability of its business operations through systems based on the ISO 26001 standard and to which its customers are also committed. Level A has been achieved in all aspects covered by the Finnish TSM Standard.	Terrafame is committed to the Finnish TSM Standard. In late 2021, the company conducted a third-party verification of its TSM self-assessment. The verified results were in line with the company's self-assessment. The 2022 self-assessment was carried out in May. The company was able to show improvement in the health and safety assessment tool and its grade rose to level A. After this the company has 3/8 assessment tools that do not yet meet the requirements for level A. During 2022, opportunities to participate in the chemical industry's Responsible Care sustainability system and the mining industry's international IRMA (Initiative for Responsible Mining Assurance) sustainability system will be explored, and preparations will be made to report in line with the new Communication on Progress (CoP) platform of the UN Global Compact initiative in 2023.
We ensure the compliance of our operations.	Terrafame has systematic processes in place to identify business partners and the ethical risks associated with them, even before establishing a partnership.	A systematic compliance process for selecting, identifying, and monitoring business partners will be further developed during 2022. In April 2021, the company introduced a channel through which people working within the industrial site can report any misconduct anonymously (whistleblowing).

GOAL	TARGET 2024	UPDATE 5/2022
Terrafame has a strong culture of doing the right things. 	The company's operating culture is based on continuous improvement, inclusion, personal responsibility, and learning. The partner companies operating within the industrial site follow common rules, and operations are developed in cooperation between Terrafame and its partners.	In 2021, the most significant investment in the development of the company's operating culture was the programme for continuous improvement, which focuses on developing the safety and management culture and production reliability. The project strengthens a culture of continuous improvement through learning, inclusion, and a systematic approach. To further develop our management culture, we introduced monthly training and a communication channel for supervisors, determined our management principles and created a competence map for managers in 2021. Workplace communication was developed in a more inclusive direction through new channels and concepts. In 2021, a total of 8 (3 in 2020) supplier audits were carried out for partner companies operating within the industrial site. In addition, 16 supplier audits were conducted during the year. In 2021, around 150 partner companies were operating within the industrial site. Terrafame's Code of Conduct includes an absolute prohibition of corruption and bribery. Terrafame has not had any violations of social or economic regulations or human rights in 2021.
Operations are based on continuous improvement and decisions are made based on facts. 	Sustainability has been integrated more closely into Terrafame's business planning. Its management culture and practices are further developed and made more systematic in the spirit of continuous improvement. The company has certified management systems in place.	An external audit of the ISO 9001, ISO 45001, and ISO 14001 management systems was conducted in 2021. The company's updated quality, sustainable development and personnel policies were communicated effectively to its employees and its business partners' key people.

Terrafame in numbers

Net sales 2021

378,4 M€

2020 338,3 M€

EBITDA 2021*
(excluding non-recurring items)

24,2 M€

2020 23,8 M€

Lost Time Injury Frequency (LTIFR1), Terrafame's own personnel 2021:

5,5

2020 8,3

Lost Time Injury Frequency (LTIFR1), whole industrial site 2021:

8,9

2020 9,8

*The financial results for 2021 include a net impact of -72,9 million euros due to a change in the provisions for environmental restoration

Key sustainability numbers

ENVIRONMENT		2020	2021
Environmental investments	**M€**	**31,1**	**31,8**
Environmental operating costs	**M€**	**24,2**	**31,5**
Provisions for environmental restoration	**M€**	**159,1**	**232,0**
Collaterals for environmental restoration**	**M€**	**129,6**	**138,4**
Ore mined	**Mt**	**16,9**	**16,1**
Waste rock mined	**Mt**	**16,5**	**24,8**
Process chemicals total	**t'000**	**445,8**	**481,3**
pH adjustment chemicals	t'000	359,2	391,1
Gas plant's raw materials, metals production plant's precipitation chemicals, solvent extraction chemicals at the battery chemicals plant	t'000	70,1	71,0
Explosives	t'000	13,3	14,9
Others	t'000	3,1	4,3
Total energy use	**TJ**	**2 329,6**	**2 643,7**
Electricity	TJ	1 543,3	1 767,1
Fossil fuels (total)	TJ	774,5	645,6
Renewable fuels (total)	TJ	11,9	231,0
Total water use	**Mm³**	**3,5**	**3,7**
Lake Kolmisoppi	Mm³	1,9	2,7
Household water	Mm³	0,03	0,03
Recycled water	Mm³	1,6	1,0
Total water recycled	%	44,5	26,3
Volume of water directed to surface waters	**Mm³**	**8,0**	**8,9**
Nickel loading	kg/a	232,6	141,3
Zinc loading	kg/a	498,8	362,8
Copper loading	kg/a	12,0	15,0
Manganese loading	t/a	8,2	2,3
Sulphate loading	t/a	13 067	14 491,7
Sodium loading	t/a	1 117	612
Conventional municipal and industrial waste	**t**	**4 321**	**3 837**
Hazardous waste	**t**	**527**	**489**
Waste utilised as materials or energy	**%**	**91,2**	**88,5**
Process waste	**t'000**	**16 978**	**25 326**
Gypsum	t'000	346,4	376,7
Precipitation from preneutralization	t'000	118,4	142,7
Waste rock	t'000	16 513	24 807
Utilisation of process waste	**%**	**0,7**	**24,3**

** only those in accordance with the Environmental Protection Act

TABLE CONTINUES ON THE NEXT PAGE

ENVIRONMENT		2020	2021
Carbon dioxide (CO_2) emissions* **	**tCO_2e**	**222 914**	**237 875**
Direct CO_2 emissions (Scope 1)	tCO_2e	91 052	105 037
Indirect CO_2 emissions from purchased electricity generation (Scope 2)	tCO_2e	71 280	82 546
Other indirect CO_2 emissions (Scope 3)	tCO_2e	60 582	50 292
Sources of CO_2 emissions			
Limestone	%	25	21
Electricity	%	30	34
Light fuel oil	%	21	26
Propane	%	6	3
Burnt lime	%	18	10
Heavy fuel oil	%	0	0
Burnt wood****	%	0	0,1
Explosives****	%	-	6
New land used during the year	**ha**	**85**	**80**
Operating areas with a closing plan	**%**	**100**	**100**
Neighbours' environmental observations	**pcs**	**8**	**10**

PERSONNEL		2020	2021
Number of personnel at the end of the year		**870**	**879**
Average age of personnel	**years**	**41,4**	**41,9**
Permanent employees	**%**	**88,9**	**93,6**
Female employees	**%**	**10,4**	**11,6**
Employees from Kainuu	**%**	**84,0**	**79,0**
Training days	**days/person**	**3,1**	**6,1**
Ratio of basic salary women to men		**1:1**	**1:1**

OCCUPATIONAL SAFETY AND HEALTH		2020	2021
Number of lost-time injuries, LTI	**pcs**	**11**	**8**
Lost-time injury frequency, LTIFR1	**pcs/million hours worked**	**8,3**	**5,5**
Total recordable injuries, TRI	**pcs**	**44**	**38**
Total recordable injury frequency, TRIFR	**pcs/million hours worked**	**33,2**	**26,1**
Seriousness of injuries	**days/lost-time injuries**	**22**	**13**
Occupational diseases	**persons**	**1**	**0**
Accidental deaths at work	**persons**	**0**	**0**
Sickness absences	**days/person**	**11,3**	**10,7**
Sickness absences	**%**	**4,8**	**4,3**

LTI = accidents leading to more than one day's absence, does not include accidents during commuting (Lost Time Injury) LTIFR1 = accidents leading to more than one day's absence per million hours worked, does not include accidents during commuting (Lost Time Injury Frequency) TRI = total recordable injuries TRIFR = number of accidents per million hours worked (Total Recordable Injury Frequency)

*** Terrafame's total emissions values are calculated based on actual amounts used multiplied by CO_2e factors for each material

**** New, reported for the first time in the 2021 review

Sources

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Climate Change 2022: Mitigation of Climate Change. Summary for Policymakers (IPCC, 2022)

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Cars, planes, trains: where do CO2 emissions from transport come from?
(Our World in Data, 2020)

COP26 declaration on accelerating the transition to 100% zero emission cars and vans
(UK Government, 2022)

Minerals used in electric cars compared to conventional cars (IEA, 2021)

Lifecycle analysis of Terrafame's nickel products (Sphera Solutions GmbH, August 2020)

Terrafame

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with responsible battery chemicals

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