

# STRENGTHENING A TRANSPARENT BATTERY VALUE CHAIN

Sustainability Review – June 2024



# Terrafame

SUSTAINABILITY REVIEW 2023



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## 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 2023 were EUR 560,9 million. Around 1,900 people work on its industrial site, half of whom are employees of partner companies.

## About the Sustainability Review

This sustainability review describes Terrafame's progress in its sustainability programme. The review also describes actions taken in the first half of 2024 towards advancing the sustainability programme. This Sustainability Review complements the non-financial report published as part of the 2023 Board of Directors' Review. The 2023 Board of Directors' Review and Financial Statements, as well as the Reports on Corporate Governance Statement 2023, Remuneration Statement 2023, 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](http://www.terrafame.com).

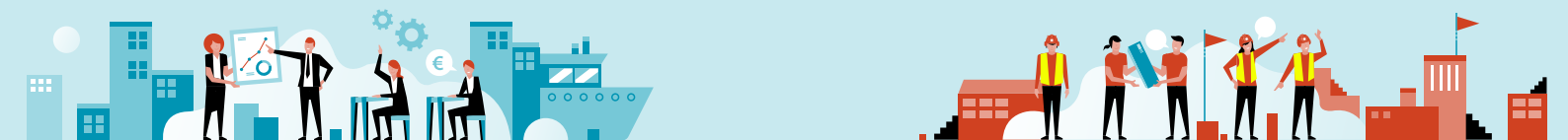
# Business model

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

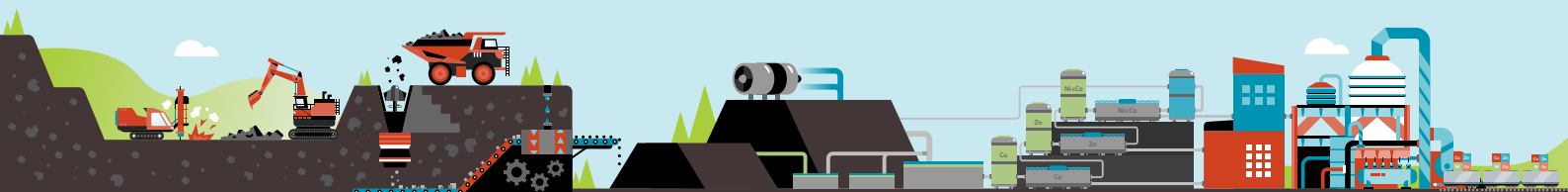
Open pit

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 chain from its own mine to battery chemicals, located on one industrial site, is unique and, thanks to its energy efficiency, produces battery chemicals for customers with a significantly lower carbon footprint than 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.



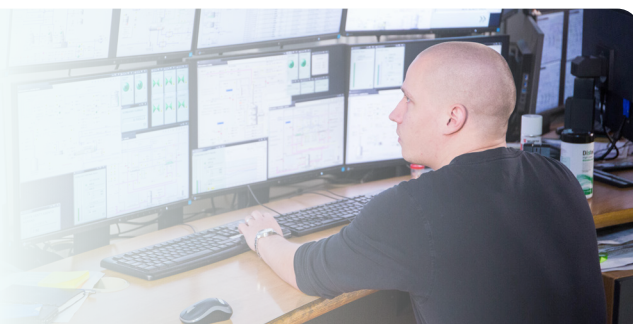
**2** The bioleaching process utilizes microbes to extract metals from the ore. Air is blown into the heaps, and they are irrigated with an acidic production solution. This creates optimal conditions for the microbial activity within the heaps. The stacked ore is first leached in the primary heap for 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

# Working towards more transparent battery chemicals

**Sustainability is a key** business driver for Terrafame. Underpinning this is the local production of low-carbon battery chemicals for the electric vehicle industry, with all operations from mining to downstream processing taking place at the same industrial site in Sotkamo.

During 2023, we further strengthened the foundation of our sustainability work by reviewing Terrafame's key sustainability themes through a double materiality assessment. The assessment and its stakeholder engagement process confirmed that our sustainability work to date has focused on the right issues. The process also provided direction for future development. Transparency, sustainability throughout the value chain, and climate change mitigation will continue to be key sustainability themes for Terrafame.

Over the past year, we also took steps to promote transparency in battery chemicals and by-products, as traceability and sustainability in the value chain add value for our customers. The ongoing development of our Due Diligence process will enable us to identify and prevent potential human rights and environmental violations in our value chain more effectively in the future. At the same time, we are preparing to meet the requirements of the EU Corporate Sustainability Due Diligence Directive.

In addition, we want to report more closely on our carbon footprint and our progress towards our goal of carbon neutral production. That's why last year we began developing a more accurate calculation of the indirect emissions (Scope 3) from our operations. We also began building an energy efficiency system that will help us identify energy saving measures in an increasingly systematic way.

Terrafame wants to collaborate across industries and share best practices to achieve greater impact, which is why in 2023 we joined the Responsible Care program by The Chemical Industry Federation of Finland. This will further support Terrafame's ambitious sustainability work. At the same time, we will continue our commitment to the industry's own sustainable mining scheme to drive forward the sustainability of the mining sector in Finland. Terrafame's goal is to be a forerunner in sustainability. This is a long-term effort that we are working towards step by step and together with our customers and partners.



**Veli-Matti Hilla**  
Chief Sustainability Officer  
Terrafame Ltd.



## CEO'S REVIEW

# Terra fame is helping develop a European battery industry

**As the transport sector** moves towards carbon neutrality, we believe the demand for sustainably produced batteries will increase in the future. At the same time, a regional battery value chain is being built in Europe, in which Terra fame has positioned itself from the very beginning. As a part of this value chain, Terra fame is helping to ensure the future availability of sustainably produced critical raw materials needed for the transition such as nickel and cobalt needed for the transition.

When looking for raw material and battery suppliers, European electric vehicle manufacturers have high sustainability standards for the products, for example regarding the carbon footprint and transparency of the value chain. Terra fame meets these expectations by extracting and processing its battery chemicals at a single site in Sotkamo. Thanks to this, our products already comply with the traceability requirements of the forthcoming EU Battery Passport to be introduced in 2026. We are working to further strengthen traceability of the entire value chain, which is also encouraged by the EU Corporate Sustainability Reporting Directive (CSRD).

In addition to product sustainability, we create value for our customers through the high quality of our products. With the IATF 16949\* standard now being extended to raw material supply chains, including battery chemicals, car manufacturers will require their suppliers to have a process for handling non-conformities. Terra fame began the work to align its own quality management system with the IATF standard in 2023 and this will be continued in 2024.

Strong collaboration is a necessity to reach the ambitious sustainability goals set for the industry. We are in constant dialogue with our customers to help them achieve their sustainability goals and to develop our own sustainability practices. To this end, we have set up joint sustainability forums, where we take ideas forward, share best practices, and listen to our customers' wishes and expectations.

As we strive to continuously improve our overall performance and live up to our core values of Commitment, Safety and Efficiency, we are keen to utilize new technologies. As an example, in 2023, we initiated

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\*the International Standard for Automotive Quality Management Systems







operations of an autonomous hydrogen-powered airship to enhance our aerial monitoring and to obtain accurate and geo-referenced terrain data for the continuous monitoring of our 60 km<sup>2</sup> industrial site. The data is used to create an accurate 3D digital twin of the environment, enabling the monitoring and forecasting of any changes as well as optimizing infrastructure maintenance and production processes. This adds well to our data-driven decision-making process, which is a key component for efficiently and successfully delivering on our strategy.

### **Electrifying the transport sector requires clean energy**

Sustainable electrification of the transport sector also requires clean energy production. That's why the extraction of uranium, which Terrafame began preparing for last year, fits perfectly with our strategy to reduce the carbon footprint of transport. This also allows us to make more efficient use of our extracted ore. The recovery plant is expected to be operating at full capacity by 2026, with an annual uranium production equivalent to half of the Finnish nuclear power plant Olkiluoto 3's needs.

At Terrafame, we are also committed to the carbon neutrality of our own production by 2039 and our work towards this goal continues. As part of our sustainability programme, we will continue to integrate the UN Global Compact and its core values of human rights, labour principles, environment, and anti-corruption into our operations. We also continue to systematically develop our sustainability performance in line with the requirements of the sector-specific sustainability programmes, Towards Sustainable Mining (TSM) and Responsible Care, to which we are committed.



**Seppo Voutilainen**  
CEO  
Terrafame Ltd.

# Terrafame strengthened its sustainability foundation

**Terrafame's sustainability work** is guided by the company's sustainability programme, which will be updated over the course of 2024. To provide a basis for the new programme, Terrafame reviewed the sustainability issues relevant to its operations through a materiality assessment. Material themes were identified according to the principle of double materiality\* taking into account both the impacts Terrafame and its value chain have on people and the environment, as well as the economic risks and opportunities that sustainability topics, such as climate change, may pose to Terrafame's operations.

"We identified broad societal megatrends that we see shaping our business in the future. We also consulted widely with our stakeholders to include their views in the work", tells **Katariina Koikkalainen**, Sustainability Manager at Terrafame, describing the process.

The assessment confirmed that Terrafame has impacts on a number of sustainability issues. The top themes that emerged were climate change, circular economy, biodiversity, and pollution prevention, as well as themes related to Terrafame's own and value chain employees, local communities, and responsible business practices. The evaluation reinforced that Terrafame's work is focused on the right issues.

"Reducing the carbon footprint of our products and our own operations, and supporting the electrification of transport are themes that have been at the heart of our operations from the beginning. We have also worked persistently to reduce the lost time incident frequency and develop our safety culture. In addition, we have long had a comprehensive monitoring programme to track the state of our environment - both aquatic and terrestrial - and to prevent pollution."

## Battery chemicals in a closed loop

The assessment also placed new emphasis on biodiversity and circular economy, where Terrafame sees great potential to create added value for customers, owners, and society.

In 2023, Terrafame started a pilot project with Fortum to reuse metals recovered from electric car batteries in Terrafame's battery chemicals.

\* required by the EU Corporate Sustainability Reporting Directive (CSRD)





**"In 2023, TerraFame started a pilot project with Fortum to reuse metals recycled from electric car batteries in TerraFame's battery chemicals."**

This is part of the process of closing the loop for battery chemicals.

Beyond the pilot project, TerraFame already uses recycled raw materials and auxiliaries such as sulphuric acid in its production process. TerraFame also aims to efficiently use the by-products of its operations and find opportunities for recycling

waste materials. For example, the plastic irrigation pipes currently used in bioleaching by TerraFame are collected at the end of use by a partner company which then recycles the plastic waste into new irrigation pipes used again at TerraFame.

"A shift away from non-renewable raw materials is necessary in the long run for society as a whole and this is reflected, for example, in the new Batteries Regulation. For TerraFame, the cooperation with Fortum is a strategic step towards this goal and further reduces the carbon footprint of our products," says Koikkalainen.

## Improving sustainability beyond the production site

**One of the cornerstones** of Terrafame's sustainability is the mining and processing of metals and minerals on a single industrial site. In addition, Terrafame is involved in a wider value chain that includes, for example, upstream chemical suppliers, contractors working in the production area, and, finally, the downstream battery manufacturers. By incorporating the material sustainability topics as an integral part of its supplier selection and management processes, Terrafame aims to ensure that its battery chemicals are environmentally and socially sustainable, from the initial processing of raw materials to the final use of the product.

In 2023, Terrafame developed a Due Diligence process to identify and prevent human rights and environmental violations in the value chain, not only during the contracting phase but also throughout the co-operation. The new process will be fully implemented during 2024 and will give Terrafame more comprehensive visibility into issues such as human and labor rights in the value chain and corruption prevention.

"Once the due diligence process is in place, we will have a more active role in the monitoring of compliance, for example through the regular supplier self-assessment and audits. Moreover, we will continue to guide our partners on safety and good governance through our Code of Conduct, which is based on international standards, as well as our sustainability and human rights policies", says **Veli-Matti Hilla**, Terrafame's Chief Sustainability Officer.

"Terrafame has developed a Due Diligence process to identify and prevent human rights and environmental violations in the value chain."

### Dialogue with the local community is a prerequisite for Terrafame's operations

Terrafame is a major player in the Kainuu region, which is why Terrafame maintains a close dialogue with local communities. An example of this is the local cooperation group, which continued its activities last year and serves as a regular forum between regional actors and Terrafame. The group includes representatives of local municipalities, local village and





fishing associations, local communities, other businesses in the area, an environmental organization, and the University of Eastern Finland.

The group meets twice a year to discuss issues such as upcoming developments and other issues raised by the different stakeholders. Last year, for example, the group discussed the waste rock area's closure activities: how the closure planning is progressing and what kind of mine reclamation experiments have already been carried out in the area. The aim of this cooperation is not only to exchange information, but also to improve the operation of the site.

According to **Mika Kilpeläinen**, the head of Sotkamo Municipality, the meetings and work of the group are very important, and the stakeholders involved are a representative sample of those impacted by Terrafame's operations.

"The group's work provides important fact-based status reports and detailed clarifications on issues of concern to stakeholders regarding the mine's operations and plans. Being able to discuss these together also helps better understand different points of view. I believe that the group's work reduces confrontation", Kilpeläinen says.

# Terrafame advances its biodiversity work step by step

**Alongside climate change mitigation**, biodiversity is emerging as a key issue for corporate sustainability. The topic was also identified as a material sustainability theme for Terrafame in the 2023 materiality assessment. Terrafame's main impacts on nature are due to the large area of land required for the operations.

As part of past Environmental Impact Assessment processes, Terrafame has carried out extensive nature surveys to identify and characterize nature values in its mining district. This establishes a baseline and enables evaluating the impacts of potential new development projects. Terrafame has guidelines in place for the consideration of biodiversity values in its planning processes. In 2024, Terrafame will continue developing these guidelines as well as preparing a more over-arching nature program. This includes setting concrete goals for the company's nature work and defining both short-term and long-term actions.

"Especially in new areas that are taken into production, we carefully plan how we can take nature values into account right from the planning stage", says **Mari Malinen**, Senior Environmental Specialist at Terrafame.

For example, in the planning of the Kolmisoppi project, different project alternatives were considered during the EIA process and the alternative with the least impact on nature was chosen for permitting. In some instances, impacts cannot be fully prevented and where impacts on protected species or habitats are likely, a permit is sought for weakening that habitat. In these cases, the permit may be granted on the condition that Terrafame compensates for the losses caused by its operations. Such plans are currently being prepared to compensate for the loss of habitat for the Siberian flying squirrel and bats protected by EU directives.

"We carefully plan how we can take nature values into account right from the planning stage."

## Promoting biodiversity requires research collaboration

The closure of production areas creates opportunities for improving biodiversity. In these closed production areas, vegetation plays a key role in preventing erosion and protecting the closure structure. Additionally, the species mixtures can be chosen to create more diverse habitats. Such studies are already being carried out both internally and in collaboration with universities and research institutes.





As another example of research collaboration, Terrafame has started a trial to transplant an endangered species of rim lichen found in the production area. In the experiment, specimens were transplanted on protected land purchased by the company outside the production area, where conditions were found to be favorable for the fragile lichen. If the species thrives in its new habitat, the experiment will be considered a success.

**Osmo Heikkala**, Environmental Expert at Eurofins Ahma, which carried out the transplantation experiment, says the early signs are promising.

"Based on the first monitoring visit, the lichen has started to grow on new stone surfaces. The coming years will show if the species survives and strengthens at the new location", Heikkala tells.

# Sustainability programme


**Terrafame’s operations are** founded on sustainability and continuous improvement. Over the past year, we have continued promoting our 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 2023.

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 global human rights, labour, environment, and anti-corruption.

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**  
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	SOCIAL RESPONSIBILITY	GOOD GOVERNANCE
<ul style="list-style-type: none"> <li>• We are combatting climate change together with our EV-producing clients.</li> <li>• Our production will be carbon neutral by 2039.</li> <li>• We utilize the side streams from production efficiently.</li> <li>• We minimize our emissions and impacts on waters and lakes.</li> </ul>	<ul style="list-style-type: none"> <li>• Terrafame is a safe place to work for both our own and our partners' personnel.</li> <li>• We support and respect human rights and labour rights in our own operations. We require the same from our business partners.</li> <li>• We are continuously developing our personnel's skills and possibilities to succeed.</li> <li>• We engage in active dialogue with our stakeholders.</li> </ul>	<ul style="list-style-type: none"> <li>• Terrafame's operations are transparent.</li> <li>• We ensure the compliance of our operations.</li> <li>• Terrafame has a strong culture of doing the right things.</li> <li>• Operations are based on continuous improvement and decisions are made based on facts.</li> </ul>



## Policies and operating principles guiding our sustainability work

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

# 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 waste and side streams produced through our operations.


GOAL	TARGET 2024	UPDATE 5/2024
<p>We are combatting climate change together with our EV-producing clients.</p> 	<p>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.</p>	<p>The ramp-up of the battery chemicals plant progressed well in a challenging market situation. The downtime caused by the fall in nickel sulphate prices was put to good use by removing bottlenecks in production and focusing on improving product quality.</p> <p>At the beginning of 2023, Terrafame signed multiyear nickel sulphate supply agreements with Stellantis and Umicore. Sustainability forums were initiated with clients to discuss collaboration and dialogue on advancing decarbonization and sustainability agendas.</p> <p>The first permit application for the Kolmisoppi project to mine the land area, was submitted in 2023 .</p>
<p>Our production will be carbon neutral by 2039.</p> 	<p>Terrafame has recognised and scheduled concrete actions to achieve carbon neutral production in 2039.</p>	<p>Analyses published in 2020 by Skarn Associates and CRU show that the carbon footprint of the nickel processed by Terrafame through the bioleaching process is the lowest of any nickel producer in the world. Furthermore, according to the 2020 Life Cycle Assessment (LCA) by Sphera Solutions GmbH, the carbon footprint of Terrafame’s nickel sulphate is approximately 60% lower compared to average production methods.</p> <p>In 2023, Terrafame continued to develop its greenhouse gas inventory to cover full Scope 3 emissions as specified by the GHG protocol and Science Based Targets initiative (SBTi). The results presented in this report cover Terrafame’s full Scope 1, Scope 2 and Scope 3 emissions.</p> <p>In 2023, Terrafame has also modelled tentative GHG emission reduction targets that would be aligned with the Paris Agreement goals of limiting global warming to 1,5°C. The company is currently refining the existing carbon neutrality roadmap and has already identified a number of measures to reduce carbon emissions. At the heart of this are measures aimed at phasing out fossil fuels and purchasing fossil-free electricity. In 2023, Terrafame purchased fossil-free energy for 50% of its electricity consumption. The company is building an energy management system in line with ISO 50 001 and is preparing for its certification. Terrafame’s Energy Efficiency working group has already identified a number of energy efficiency measures during on site workshops and this work will be continued in 2024.</p>


GOAL	TARGET 2024	UPDATE 5/2024
<p>We utilize the side streams from production efficiently.</p> 	<p>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.</p>	<p>The purification extraction process in the battery chemicals plant removes impurities from the solution that are not part of the final product, such as copper and zinc. The reject solution is returned to the bioleaching cycle and the metals contained in the rejects are recovered at the metal plant as saleable products.</p> <p>Of the process side streams, the metal recovery plant's preneutralisation sludge is also recycled and placed in the secondary leaching area, where the metals contained in it are dissolved and recycled.</p> <p>The ammonium sulphate product coming from the battery chemicals plant's processes is sold to the fertiliser industry.</p> <p>Terrafame has an agreement with a partner for the recovery of plastic waste. In 2023, 4 803 tonnes of plastic waste were delivered to the partner and plastic pipes made from recycled material accounted for approximately 70.2% of Terrafame's annual need.</p>
<p>We minimize our emissions and impacts on waters and lakes.</p> 	<p>100% of the sulphate resulting from the process that ends up in water treatment will be recycled back into the leaching cycle.</p> <p>The remediation of the local lakes and the old sludge from water treatment has begun.</p>	<p>The two-line run model introduced at the central treatment plant at the end of 2020 will allow for more efficient separation of the collection waters. As in the previous year, in 2023 99% of the sulphate was recycled from the process back into the bioleaching process. Only low-sulphate collection waters are treated and discharged out of the area.</p> <p>The most important lakes for recreational use are in good condition and the status has remained stable for a number of years. In 2021, the water in the largest basin area in Lake Kivijärvi was mixed for the first time in ten years. In autumn 2022, the monitoring results indicated mixing of the stratified layers also for the second basin, which had remained stratified until then. Monitoring results from 2023 also confirmed that the status of Lake Kivijärvi continues recovering naturally and there is no need for artificial restoration measures. In 2022-2023 combined impacts of two mines operating on the same area have been detectable in lake Nuasjärvi. Terrafame and Elementis have started negotiations on joint monitoring of the lake. The condition of the local lakes is further described in Terrafame's Water Management Review (available in Finnish at <a href="http://www.terrafame.fi">www.terrafame.fi</a>).</p> <p>For the nearby lakes, the remediation of Lake Salminen started in 2022 and continued in 2023. In 2022, Terrafame also submitted an application for an environmental permit to the Regional State Administrative Agency of Northern Finland for the remediation and disposal of old water treatment sediments. This permit process is still ongoing.</p>

## Social responsibility

The company's people 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 5/2024
<p>Terrafame is a safe place to work for both our own and our partners' personnel.</p> 	<p>The Lost Time Injury Frequency (LTIFR1) for Terrafame's own employees and its partners is below 2.5.</p>	<p>The continuous improvement program launched at the end of 2020 continues to show results in the safety work. In particular, the accident frequency of our contractors was a record low at 5.0 in 2023. The accident frequency (LTIFR1) for Terrafame employees was 4.5 (4.3 in 2022). The overall accident frequency rate for the whole site, including employees of partners, was 4.8 (6.4 in 2022).</p> <p>In 2023, all staff of the new uranium plant received safety training and further training will continue during 2024 as the plant ramp-up begins.</p>
<p>We support and respect human rights and labour rights in our own operations. We require the same from our business partners.</p> 	<p>Terrafame has an effective continuous due diligence process for sustainable operations, including human rights issues, that covers the entire supply chain where applicable.</p> <p>The company will continue to integrate the UN Global Compact principles more closely into its management systems.</p>	<p>In May 2021, Terrafame conducted a human rights survey among its stakeholders, which resulted in a human rights policy that was approved by the company's Board of Directors in December 2021. Since then Terrafame has trained all of its staff on this policy and all new employees receive the training as part of their onboarding. Terrafame has also developed its internal processes by introducing human rights indicators and their quarterly reporting to the management to monitor implementation of the policy. Audit process of partner companies working on site has been extended to cover human rights issues. This work continued in 2023 with the development of human rights due diligence process which will be implemented in 2024 and extended to cover other material sustainability issues.</p> <p>The strengthening of our diversity culture continued, and we created a new Diversity, Equality and Inclusion Policy, which was approved by the Board of Directors in March 2023. Employee training on the policy was carried out during the spring and summer of 2023. Diversity has also been emphasised in workplace communication. The proportion of female staff increased slightly, sitting at 12.8% on 31 December 2023.</p> <p>Our commitment to non-discrimination and non-discriminatory treatment is well known to our staff and they actively report any anomalies they detect: in 2023, we received 10 reports (12 in 2022). All reports were investigated, and 4 cases of inappropriate treatment (6 in 2022) were identified and addressed through guidance and sanctions. In the end of 2023, we launched a Responsible colleagues method, including detailed guidance on e.g. responsible behavior in the workplace; classifying inappropriate treatment, harassment and discrimination; how employees should react and notify if they witness such behavior; and what the consequences are of such behavior.</p> <p>In 2023, a new anti-corruption and anti-bribery policy was approved by the board, along with guidelines on accepting business gifts and hospitality.</p> <p>Terrafame has not been made aware of any human rights violations in 2023, and no fines or sanctions related to social or economic regulations were imposed on the company.</p>




GOAL	TARGET 2024	UPDATE 5/2024
<p>We are continuously developing our personnel's skills and possibilities to succeed.</p> 	<p>At least 95% of Terrafame's employees have a degree corresponding to their job requirements.</p> <p>Process technology education has been developed for the Kainuu region with support from Terrafame.</p>	<p>Terrafame uses apprenticeship training both to ensure the availability of skilled personnel and to develop the personnel's professional skills. In recent years, Terrafame has implemented several extensive apprenticeships, which have met the labour needs of both Terrafame and partly also other industrial companies in the region. This has helped people from Kainuu as well as newcomers to the region to acquire a new profession and find employment in industrial companies in the area.</p> <p>In the years 2019-2023, Terrafame has implemented a total of four two-year apprenticeships leading to a professional degree in the process industry in cooperation with the Kainuu Vocational College and the Educational Consortium OSAO. These programs have enabled Terrafame to secure skilled workforce for the company's battery chemical factory. In 2019-2023, a total of 67 students have graduated from the apprenticeship program, the majority of whom have been employed by Terrafame. The fourth group started their studies in the fall of 2023. The group's approximately twenty students are to be employed mainly at the uranium recovery facility, but also in other Terrafame production departments.</p> <p>During 2023, around eighty Terrafame employees developed their skills in various educational fields leading to degrees. The most common degrees were basic, professional, or specialized vocational degrees in the fields of electricity and automation, process industry, maintenance, or vehicles. In addition, the personnel of the uranium recovery facility started maintenance training, which will continue in 2024.</p> <p>The company works closely with organizations and educational institutions to increase the attractiveness of the field. The company engages students to become future employees of Terrafame through internships, summer jobs, and thesis work. Terrafame is also involved in various projects that developed education and the industry's attractiveness, such as the Process Academy project in 2020 – 2022, where all education levels together develop process technology teaching in Kainuu. The Kainuu Vocational College has received the right to train students in a basic degree in process industry, which helps companies in the area.</p> <p>In 2023, we continued with our leadership training program for all team leaders. We also carried out a wide range of wellness campaigns to support our employees' physical, mental, and emotional health, such as sports activities, improvement of workplace ergonomics, mental health campaigns, awareness raising, and provided access to a wellbeing app that encourages taking short exercise breaks.</p>

GOAL	TARGET 2024	UPDATE 5/2024
<p>We engage in active dialogue with our stakeholders.</p> 	<p>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.</p>	<p>Terrafame has continued its active dialogue with its stakeholders. The most important stakeholders have been identified as owners, customers, financiers, employees, and partner companies, as well as neighbours in the immediate area.</p> <p>The Board of Directors, in which the main owners are represented, meets once a month. The company's activities and financial situation are discussed with its main financial partners on a regular basis, at least quarterly in conjunction with the reporting of financial results.</p> <p>Terrafame discusses with both existing and potential new customers, and their feedback is used to develop Terrafame's quality assurance. Terrafame also discusses with customers on their preferred sustainability systems to demonstrate the sustainability of Terrafame's activities. In 2023, we kicked-off a number of technical and sustainability working groups with our clients to discuss and develop our joint performance in these areas.</p> <p>Terrafame maintains an active and development oriented dialogue with its employees, so that they have the opportunity to participate and contribute. The company's management structures support dialogue. Senior management is in contact with staff through weekly safety briefings and quarterly staff briefings. The tools for workplace communication are management structures, staff briefings, the staff magazine, intranet, Teams, and electronic information boards.</p> <p>In 2023, we carried out an extensive employee survey and reached a record high response rate, with nearly 79% of employees taking part in the survey. The level of employee satisfaction was also higher than ever before. Terrafame monitors the development of employee satisfaction with the PeoplePower® index, which was 68.1 (A+) in the 2023 survey (65.5 in the previous survey in 2019). The index has increased in every survey, indicating that the personnel are even more committed to the company than before.</p> <p>In 2023, three partner meetings were held for the partners in the industrial site, with representatives from over 100 partner companies present to discuss current onsite activities.</p> <p>In early 2022, Terrafame set up a separate local cooperation group. The group includes a wide range of expertise from the areas affected by the company's activities, including representatives of local communities, fishing and village associations, municipalities, companies, the Regional Council of Kainuu, academia and NGOs. The main purpose of the meetings is to give up-to-date information to stakeholders on Terrafame's activities and plans, and to give further information on topics the different stakeholder groups need more knowledge on. In 2023, the group had two meetings during which the status of the Kolmisoppi project and closure planning were discussed.</p> <p>Terrafame also hosted a village meeting with its neighbors and hosted various other stakeholder visits during 2023.</p> <p>In preparation to CSRD reporting, Terrafame conducted a double materiality analysis to identify the sustainability themes most material to the company's operations. During this process Terrafame's external partner Gaia Consulting interviewed 21 different stakeholders to gain insights on what they view as most important sustainability issues Terrafame has an impact upon.</p>

## 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 the end of 2024, Terrafame will have proved 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 5/2024
<p>Terrafame's operations are transparent.</p> 	<p>Terrafame proves the sustainability of its business operations through systems that are based on the ISO 26001 standard and to which its customers are also committed.</p> <p>Level A has been achieved in all aspects covered by the Finnish TSM Standard.</p>	<p>Terrafame is committed to the Finnish Towards Sustainable Mining (TSM) sustainability programme. According to the external verification carried out in late 2021, the verified results were in line with the company's self-assessment. The 2023 self-assessment was carried out in April and the internal audit in May. The company has 2/8 assessment tools that have not yet reached level A but plans are in place to close the gap in 2024, in time for the next external verification at the end of the year.</p> <p>In 2023, Terrafame joined Responsible Care, which is the chemical industry's global sustainability program. This involves annual self-assessments and reporting on globally agreed sustainability metrics. Additionally, Terrafame reports annually under the UN Global Compact's Communication on Progress (COP) Report.</p> <p>In 2023, Terrafame started preparing for reporting under the EU Corporate Sustainability Reporting Directive (CSRD). The work started with a forward-looking double materiality assessment, which will lay the groundwork for updating the sustainability program from 2024 onwards.</p> <p>As part of the double materiality analysis carried out in 2023, 21 stakeholder representatives were interviewed to identify the sustainability themes most material to the company's operations. The analysis showed that Terrafame's key sustainability themes are climate change mitigation and adaptation, energy, pollution prevention, biodiversity, own workforce and transparency. The analysis serves as a foundation for Terrafame's CSRD reporting and as input for the development of the Company's sustainability program and strategy. These themes have been central to the Company's sustainability program for the past four years and they were again broadly identified as material by all of our stakeholder groups in this recent analysis. This is encouraging and signals to us that we are on the right track.</p>

GOAL	TARGET 2024	UPDATE 5/2024
<p>We ensure the compliance of our operations.</p> 	<p>Terrafame has systematic processes in place to identify business partners and the ethical risks associated with them, even before establishing a partnership.</p>	<p>In April 2021, the company launched a channel where people working on the industrial estate can report possible wrongdoing (whistleblower), also anonymously. In 2022, the Whistleblower channel was extended to the general public and can be used by anyone via the company's website. During 2023, seven whistleblower reports were made (4 in 2022).</p> <p>During 2022, a systematic compliance process for selecting, identifying, and monitoring business partners was developed. The work continued in 2023 with the development of a value chain-wide human rights due diligence process. This process will be implemented during 2024 and extended to cover other material sustainability topics.</p>
<p>Terrafame has a strong culture of doing the right things.</p> 	<p>The company's operating culture is based on continuous improvement, inclusion, personal responsibility, and learning.</p> <p>The partner companies operating within the industrial site follow common rules, and operations are developed in cooperation between Terrafame and its partners.</p>	<p>In 2022, Terrafame continued a project to develop its safety and management culture and improve the reliability of production. The project strengthened a learning, participative and systematic culture of continuous improvement. At the beginning of 2023, a new Operational Excellence function was launched to ensure that development work continues in the future.</p> <p>Terrafame has more than 100 supervisors. The management culture and supervisors' skills are continuously developed. For example, in 2022, a set of leadership principles, created in collaboration between staff and management, was introduced and used as a basis for training the management team and middle management. The leadership principles ensure a high quality and consistent management approach. During the year, the company started regular training sessions to support the work of frontline supervisors, with a total of 16 sessions. The training continued throughout 2023 (with 17 sessions) and the performance management process was also revised. The development of the culture is particularly visible in work safety.</p> <p>Terrafame's Code of Conduct includes an absolute prohibition on bribery and corruption. In 2022, the company was not made aware of any cases of financial misconduct, corruption, or bribery. All of our staff received training on the Anti-corruption policy and Guidelines for accepting business gifts in 2023.</p>
<p>Operations are based on continuous improvement and decisions are made based on facts.</p> 	<p>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.</p>	<p>In 2022, an external audit of the ISO 9001, ISO 45001 and ISO 14001 management systems was carried out.</p> <p>At the end of 2022, the construction of the ISO 27001 information security management system was started. In 2023, preparations for the construction of an energy efficiency management system were launched.</p> <p>As part of our work towards continuous improvement of our operations and due to the car manufacturing industry's existing product quality management requirements, Terrafame has begun work to implement some of the IATF core tools as part of the company's product quality management processes.</p> <p>The company's updated quality, sustainability, and human resources policies were effectively communicated to both staff and key personnel of business partners.</p>





# Terrafame in numbers

Net sales 2023

**560,9 M€**

2022 584,4 M€

EBITDA 2023  
(excluding non-recurring items)

**99,4 M€**

2022 152,1 M€

Lost Time Injury Frequency (LTIFR1),  
Terrafame's own personnel 2023:

**4,5**

2022 4,3

Lost Time Injury Frequency (LTIFR1),  
whole industrial site 2023:

**4,8**

2022 6,4

# Key sustainability numbers

<b>ENVIRONMENT</b>		<b>2022</b>	<b>2023</b>
<b>Environmental investments</b>	<b>M€</b>	<b>18,5</b>	<b>55,99</b>
<b>Environmental operating costs</b>	<b>M€</b>	<b>31,5</b>	<b>30,24</b>
<b>Provisions for environmental restoration</b>	<b>M€</b>	<b>232,0</b>	<b>247,1</b>
<b>Collaterals for environmental restoration*</b>	<b>M€</b>	<b>155,4</b>	<b>364,5</b>
<b>Ore mined</b>	<b>Mt</b>	<b>17,9</b>	<b>18,0</b>
<b>Waste rock mined</b>	<b>Mt</b>	<b>31,8</b>	<b>30,5</b>
<b>Chemical use total</b>	<b>t'000</b>	<b>521,2</b>	<b>462,7</b>
Process chemicals	t'000	516,0	446,4
Explosives	t'000	3,6	16,3
<b>Total energy use</b>	<b>GWh</b>	<b>793</b>	<b>819</b>
Electricity	GWh	538	521
Share of fossil free electricity	%	30	50
Fossil fuels (total)	GWh	173	182
Renewable fuels (total)	GWh	83	66
<b>Total water use</b>	<b>Mm<sup>3</sup></b>	<b>3,9</b>	<b>4,1</b>
Lake Kolmisoppi	Mm <sup>3</sup>	3,0	3,3
Household water	Mm <sup>3</sup>	0,04	0,04
Recycled water	Mm <sup>3</sup>	0,9	0,9
Total water recycled	%	22,4	21,4
<b>Volume of water directed to surface waters</b>	<b>Mm<sup>3</sup></b>	<b>9,4</b>	<b>10,1</b>
Nickel loading	kg	165,2	290
Zinc loading	kg	356,3	504
Copper loading	kg	14,3	16
Manganese loading	t	3,6	6,5
Sulphate loading	t	12 763	11 056
Sodium loading	t	756	800
<b>Conventional municipal and industrial waste</b>	<b>t</b>	<b>3 342</b>	<b>2 658</b>
<b>Hazardous waste</b>	<b>t</b>	<b>622</b>	<b>543</b>
<b>Waste utilised as materials or energy</b>	<b>%</b>	<b>84,8</b>	<b>71,3</b>
<b>Process waste</b>	<b>t'000</b>	<b>32 006</b>	<b>25 339</b>
Gypsum	t'000	70,3	594,5
Waste rock (black shale)	t'000	31 800	24 744
<b>Main waste fractions utilized in own operations</b>	<b>%</b>	<b>12</b>	<b>26</b>
Precipitation from preneutralization	t'000	135,7	128,1
Iron tailing	t'000	1 262	529,5
Waste rock (mica schist)	t'000	3 650	5 796

\* (only those in accordance with the Environmental Protection Act)

In March 2023, Terrafame put up a collateral of 350,1 M€ in accordance with the new environmental permit decision (87/2022,PSAVI/2461/2016, issued 20.6.2022).

<b>ENVIRONMENT</b>		<b>2022</b>	<b>2023</b>
<b>Carbon dioxide (GHG) emissions**</b>			
Scope 1-3 total emissions, market-based	tCO <sub>2e</sub>		<b>646 921</b>
Scope 1-3 total emissions, location-based	tCO <sub>2e</sub>	<b>497 944</b>	<b>545 717</b>
Scope 1: Direct emissions	tCO <sub>2e</sub>	119 502	130 809
Scope 2: Indirect emissions from purchased electricity generation (market-based)	tCO <sub>2e</sub>		130 693
Scope 2: Indirect emissions from purchased electricity generation (location-based)	tCO <sub>2e</sub>	131 541	29 488
Scope 3: Other indirect emissions in the value chain	tCO <sub>2e</sub>	246 900	385 419
Category 1: Purchased goods & services	tCO <sub>2e</sub>		301 217
<b>New land used during the year</b>	<b>ha</b>	<b>34</b>	<b>52</b>
<b>Operating areas with a closing plan</b>	<b>%</b>	<b>100</b>	<b>100</b>
<b>Neighbours' environmental observations</b>	<b>pcs</b>	<b>6</b>	<b>8</b>
<b>PERSONNEL</b>			
<b>Number of personnel at the end of the year</b>	<b>persons</b>	<b>763</b>	<b>842</b>
<b>Average age of personnel</b>	<b>years</b>	<b>42,2</b>	<b>42</b>
<b>Permanent employees</b>	<b>%</b>	<b>96,2</b>	<b>93,6</b>
<b>Female employees</b>	<b>%</b>	<b>12,5</b>	<b>12,8</b>
<b>Employees from Kainuu</b>	<b>%</b>	<b>86,6</b>	<b>86</b>
<b>Training days</b>	<b>days/person</b>	<b>4,5</b>	<b>4,4</b>
<b>Gender pay ratio for the same jobs</b>		<b>1:1</b>	<b>1:1</b>
<b>OCCUPATIONAL SAFETY AND HEALTH</b>			
<b>Number of lost-time injuries, LTI</b>	<b>pcs</b>	<b>6</b>	<b>6</b>
<b>Lost-time injury frequency, LTIFR1</b>	<b>pcs/million hours worked</b>	<b>4,3</b>	<b>4,5</b>
<b>Total recordable injuries, TRI</b>	<b>pcs</b>	<b>33</b>	<b>32</b>
<b>Total recordable injury frequency, TRIFR</b>	<b>pcs/million hours worked</b>	<b>23,6</b>	<b>24,6</b>
<b>Seriousness of injuries</b>	<b>days/lost-time injuries</b>	<b>26</b>	<b>32,4</b>
<b>Occupational diseases</b>	<b>persons</b>	<b>0</b>	<b>0</b>
<b>Accidental deaths at work</b>	<b>persons</b>	<b>0</b>	<b>0</b>
<b>Sickness absences</b>	<b>days/person</b>	<b>12,3</b>	<b>12,9</b>
<b>Sickness absences</b>	<b>%</b>	<b>4,8</b>	<b>5,0</b>

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 emissions calculation is based on actual quantities and material-specific emission factors or actual spend and spend-based emission factors. In 2023, the emissions inventory was extended to cover all categories of Scope 3. The reported numbers include all relevant categories. Therefore, the numbers between 2022 and 2023 are not comparable as the scope of inventory was significantly greater in 2023.

# Terrafame

Enhancing low-carbon mobility  
with responsible battery chemicals

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