Environmental Protection in the Aurubis Group

and Updated Aurubis AG Environmental Statement 2024, Hamburg and Lünen Sites

Aurubis
Metals for Progress

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“With our business activities, we play a crucial role in the energy transformation and the circular economy. Every day, we are committed to making the economy more sustainable, and we are continuing to expand our position as the most efficient and sustainable smelter network in the world by implementing a number of measures and projects.”

Dear readers,

2023 was a challenging year for Aurubis.

Despite these turbulent times, we are staying on track as a company — whether with implementing our growth strategy, decarbonizing our projects, or strengthening our position as a sustainable smelter network.

Because it is clear to us that our sustainably produced metals are crucial drivers of the energy transition, future technologies, and the European raw material supply.

Today, Aurubis already produces many of its metals with less than half the CO_2 emissions of the global competition. Our goal is continued improvement so that our production is carbon-neutral well before 2050. Sustainability and environmental protection are essential components of our corporate strategy and solidly enshrined in it.

Since 2000, we have continuously invested about € 830 million in environmental protection measures, and as such in the highest standards in our industry.

With a number of measures and projects, such as the current expansion of the RDE (Reducing Diffuse Emissions) project at the Hamburg site and improved slag treatment at the Pirdop site, we are always working on improving in all aspects of sustainability at our smelter network sites.

One reflection of our efforts is the CSR (corporate social responsibility) rating from the EcoVadis rating agency: In 2023, we were once again among the best 1% of companies in the non-ferrous metals industry worldwide.

With this Environmental Report, we invite you to learn about environmental protection performance at Aurubis.

Inge Hofkens
Chief Operating Officer
Multimetal Recycling

Company profile and business model

The Aurubis Group

Aurubis AG is a company in the basic materials industry that operates worldwide. As an integrated group, we process complex metal concentrates, scrap metals, organic and inorganic metal-bearing recycling raw materials, and industrial residues into metals of the highest purity. Copper cathodes are our starting product for manufacturing copper products and are used to produce standard and specialty products made of copper and copper alloys.

In addition to our main metal, copper, our metal portfolio also includes gold, silver, lead, nickel, tin and zinc, minor metals such as tellurium and selenium, and platinum group metals. Sulfuric acid, iron silicate, and synthetic minerals round off the Aurubis Group's product portfolio.

The company's headquarters, which is also home to one of our two primary smelters, is located in Hamburg, Germany. Our sites are mainly located in Europe, with larger production sites in Germany, Belgium, Bulgaria and Spain, as well as cold rolling mills for flat rolled products and rod plants in Germany and other European countries. Outside Europe, Aurubis also has a production site in the US, and a global sales and service network. In June 2022, Aurubis began construction on the first secondary smelter for multimetal recycling in the US in Augusta (Richmond County, Georgia, US). The first stage of the state-of-the-art plant is scheduled for commissioning in fall 2024. Commissioning of the second stage is scheduled for 2026.

Business model and Group structure

Metals play a pivotal role in a number of forward-looking applications. Following industrialization, automation and digitalization, the transformation to a sustainable, carbon-neutral economy and society is currently posing significant challenges. Many of the solutions in this area — such as electric vehicles and wind turbines — are based on the use of metals. With approximately 20 metals right now, we are a key part of the transformation toward a more sustainable global economy.

The Aurubis Group's business rests on our decentralized smelter network with its three fundamental pillars: the processing of raw materials from the mining industry, the processing of recycling materials, and product business. Within the smelter network, the sites utilize their specific processing capabilities and continuously optimize their material flows to enhance the recovery of marketable metals and generate valuable products from all input materials. This allows the sites to reduce waste streams and leverage scaling effects, for instance in the large tankhouse and in precious metal processing in Hamburg. This provides Aurubis with a great deal of efficiency and flexibility in managing raw material procurement, production and sales. Different market cycles influence each of the three fundamental pillars as well.

We process copper concentrates that are obtained from ores and are offered by mining and trading companies on the global market. The necessary input materials for our two primary smelters in Hamburg and Pirdop are purchased worldwide. The production sites do not hold any stakes in mines and have a globally diversified supplier portfolio. We source a significant portion of our copper concentrates from South American countries such as Chile, Peru and Brazil. Raw materials are also purchased from countries like Bulgaria, Turkey and Georgia. As a buyer of copper concentrates, the Aurubis Group competes here with other international primary smelters, particularly in China and Japan. Copper concentrates for the Hamburg site are primarily transported by waterway and are transshipped via the port terminal in Brunsbüttel. There the different copper concentrates are pre-mixed in accordance with the requirements of our production process. Concentrates reach the site in Pirdop, Bulgaria, by land and sea via the port of Burgas.

In addition to copper concentrates, copper scrap and various types of organic and inorganic metal-bearing recycling raw materials, industrial residues, and bought-in metallurgical intermediates are used as feed material. The four secondary smelters in Lünen (Germany), Olen and Beerse (both in Belgium), and Berango (Spain) source most of the copper scrap and metal-bearing recycling raw materials used as input on the European and North American markets. Furthermore, we use copper scrap with high copper contents for cooling purposes in both of our primary smelters in Hamburg and Pirdop. The primary site in Hamburg also processes small quantities of precious metal-bearing recycling materials. Metal trading companies are the main recycling material suppliers, though some of these recycling materials also make their way to us directly from industry to our production cycles through our closing-the-loop approach.

On the demand side, the Aurubis Group's main competitors for these input materials are other copper and metal smelters, as well as metal processors that also utilize recycling materials. Most of the copper scrap reaches us by land.

In the course of our production processes, copper concentrates and recycling materials are converted into copper cathodes. This is the standardized product format that is traded on the international metal exchanges. Copper cathodes are the starting product for fabricating additional copper products, but they can also be sold directly. The Aurubis Group's product portfolio mainly comprises standard and specialty products made of copper and copper alloys. In terms of processing capabilities, we have manufacturing capacities for continuous cast copper wire rod, continuous cast shapes, rolled products, strip, specialty wire, and profiles.

Additional products result from processing the elements that accompany copper in the feed materials, which are in some cases purchased specifically by the respective production sites. In particular, these include other metals such as gold, silver, lead, nickel, tin and zinc, minor metals like tellurium and selenium, and platinum group metals. Iron silicate and synthetic minerals are also produced.

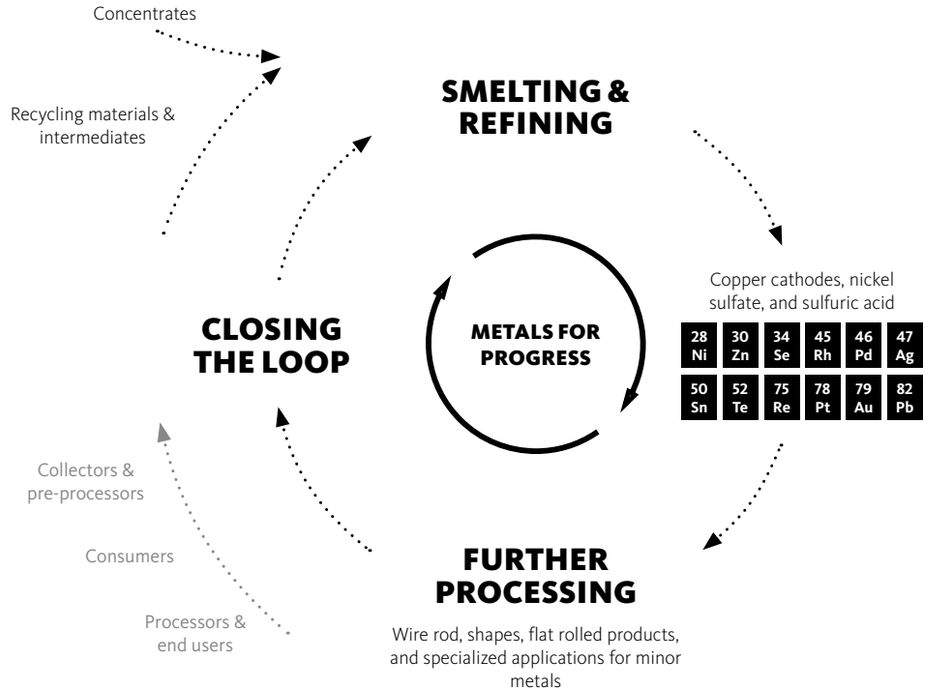
Sulfuric acid forms as a by-product of copper concentrate processing. Sulfuric acid customers are very diverse and include international companies from the chemical, fertilizer and metal processing industries.

The sales markets for our products are varied and international. The production sites' customers include companies from the copper semis industry, the cable and wire industry, the electrical and electronics sector, and the chemical industry, as well as suppliers from the renewable energies, construction and automotive sectors.

To close the value chain for copper and other metals, we place a high priority on the closing-the-loop approach. The focus of this approach is on materials such as production waste and residues that accumulate along the copper value chain in production, for example with our production sites' customers. The materials range from copper scrap with very high copper content, which can be directly fed into the copper fabrication process again, to stamping waste containing precious metals and high levels of copper, alloyed scrap, slags from foundries, and other industrial residues.

We hedge fluctuations in metal and energy prices and the US dollar exchange rate in accordance with our hedging strategy for the most part.

Fig. 1.1: The Aurubis AG business model



Our Group structure
In the reporting period, the Aurubis Group's organizational framework was based on the underlying business model. Since fiscal year 2021/22, the two Multimetal Recycling and Custom Smelting & Products segments have formed the fundamental organizational structure.

The **Multimetal Recycling (MMR) segment** comprises the recycling activities in the Group and thus the processing of copper scrap, organic and inorganic recycling raw materials containing metal, and industrial residues. The segment mainly includes the sites in Lünen (Germany), Olen and Beerse (both in Belgium), and Berango (Spain). The secondary smelter, Aurubis Richmond, currently under construction in the US state of Georgia, is also included in this segment.

The **Custom Smelting & Products (CSP) segment** comprises the production facilities for processing copper concentrates and for manufacturing and marketing standard and specialty products such as cathodes, wire rod, continuous cast shapes, strip products, sulfuric acid, and iron silicate. The CSP segment is also responsible for precious metal production. The sites in Hamburg (Germany) and Pirdop (Bulgaria) manufacture copper cathodes. Together with the copper cathodes produced in the MMR segment, they are processed further into wire rod and continuous cast shapes at the Hamburg (Germany), Olen (Belgium), Emmerich (Germany), and Avellino (Italy) sites. The Buffalo (US), Stolberg (Germany), and Pori (Finland) sites produce flat rolled products and specialty products.

Our environmental policy — Company guidelines on environmental protection

In order to ensure that our environmental protection standards are safeguarded throughout the Group and continuously optimized, we have established the following principles as our company guidelines:

- The continuous improvement of environmental performance, in particular of water pollution control, soil protection, and immission control, is a key target of the Environmental Protection division.
- For reasons of accountability, environmental and climate protection should be developed in such a way as to conserve natural resources, protect nature and biodiversity, and prevent or minimize, as far as is technically possible, strain on the environment and our employees.
- Issues of environmental protection should be taken into account equally in the planning and development of new products and production processes.
- Processed raw materials and intermediate products should be brought into the economic cycle as completely as possible, and unavoidable waste should be properly recycled or harmlessly disposed of. Raw material suppliers are advised on issues related to environmental protection if needed.
- Technical and organizational measures to avoid accidents and operational disruptions are in place to prevent or minimize environmental hazards for our employees and neighbors, as well as impacts on the environment.
- Our employees' sense of responsibility in environmental protection should be strengthened and objective, open, and respectful dialogue should take place with them, the relevant authorities, and the public.
- Our customers are appropriately informed about the features of our products and necessary safety measures and are advised on questions related to product disposal.
- Contractors working for us must be selected, informed and advised in such a way as to ensure that laws and our environmental protection standards are observed.

Compliance with legal regulations is the basis and minimum standard for our activities. Ongoing improvement in environmental protection is enshrined in our corporate strategy and is one of our key responsibilities.

Environmental protection in the Aurubis Group

Environmental protection is part of the corporate strategy
For Aurubis, responsible corporate governance is an integral contribution to securing the company's future.

The previous company strategy was updated in fiscal year 2020/21 and is now expressed by our "Metals for Progress: Driving Sustainable Growth" motto. The key elements of the strategy are securing and strengthening the core business, pursuing growth potential, and expanding our industry leadership in sustainability. With the development of the company strategy, our sustainability aspirations will be integrated even more strongly into all areas and activities of the company.

The key element "industry leadership in sustainability" includes the focus areas of people, the environment, and the economy, with our nine action areas. For each action area, new or continuing targets were defined for 2030.

More information on sustainability in the Aurubis Group is available in our current Sustainability Report *aurubis.com/en/responsibility/environment-energy-and-climate /reporting-kpis-and-esg-ratings*.

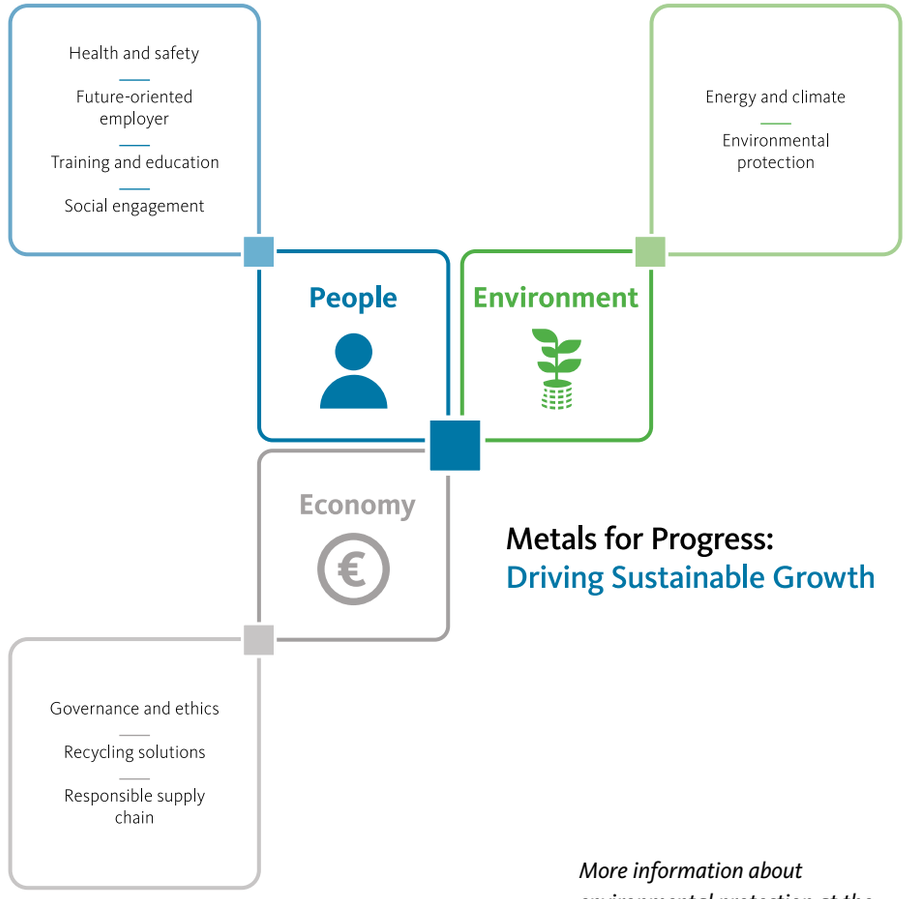
We are leaders in our industry and are continuously improving. Environmentally sound multimetal production from primary raw materials, such as iron concentrates and recycling, are the foundation for a responsible and demand-oriented metal supply. By doing so, we are safeguarding our sites and creating the basis for forward-looking investments.

As a multimetal group, Aurubis assumes responsibility for protecting the environment and the climate. The efficient use of natural resources and energy as well as the reduction of CO_2 emissions are an important part of the company's ecological and economic responsibility and have been part of our corporate culture for many years. Aurubis views the value chain as a whole and pursues the goal of striking a balance between the economy, the environment, and people.

For all production sites and across all business processes, Aurubis places an emphasis on modern and energy-efficient plant technology that complies with high environmental standards. We also develop innovative and energy-efficient technologies in environmental protection that often set new benchmarks worldwide and form the basis for establishing best available techniques (BAT) at the European level.

Metals are necessary for technical progress and a high standard of living. Rising demand worldwide is met with limited resources, however. Metal recycling is therefore an important source of raw materials — especially for a country like Germany that lacks natural resources. It makes an important contribution to supply security, to environmental and resource protection, and to decarbonization. It is becoming more and more important to recycle products after their life cycle is over. Valuable raw materials are used efficiently, resources are conserved, and environmental pollution is avoided. Our core product, copper, has the best conditions for achieving this because it is a metal that can be recycled as often as desired without a loss of quality. This means that copper of the highest purity can be produced from recycling materials again and again. We at Aurubis have created an internal function for this as well: Customer Scrap Solutions unites copper product sales and the sourcing of recycling raw materials. This is how customers also become suppliers. In the spirit of resource protection, nearly all raw materials are converted into marketable products, and waste is effectively avoided and — wherever possible — recycled.

Fig. 1.2: Our key topics



More information about environmental protection at the Aurubis sites is available at:
www.aurubis.com/en/responsibility/environment-energy-and-climate/environmental-protection-at-the-sites

Environmental management organization

Chief Operating Officer for Multimetal Recycling Inge Hofkens and Head of Corporate Environmental Protection Dr. Karin Hinrichs-Petersen are responsible for the strategic positioning of environmental protection in the Group. Environmental officers oversee the environmental protection duties at the individual sites under the technical supervision of Corporate Environmental Protection management. If an impacted site falls under another member of the Executive Board's remit, they are brought in.

With the involvement of employees, plant managers/managing directors, and the Executive Board, uniform environmental protection standards were developed, established in a corporate policy, and implemented across the Group as part of the environmental management system (ISO 14001 or EMAS).

The EMAS (Eco-Management and Audit Scheme) environmental management system fulfills the ISO 14001 environmental management standard. However, it extends beyond a pure management system and is geared toward performance: The intention is for the organization to improve beyond the requirements laid out under environmental law. The system and the internal documents, including a report (the Environmental Statement), are audited by external, independent, state-approved, monitored environmental auditors. This environmental protection report includes the Environmental Statements for Aurubis AG, and therefore for the Hamburg and Lünen sites as part of the EMAS registration.

More information on the topic is available at www.emas.de/en.

Moreover, energy management systems in accordance with ISO 50001 have been implemented and certified at all sites. The annual external audit in the scope of the certifications offers us the opportunity to have the successful environmental protection measures confirmed by an independent third party and to recognize additional potential for improvement.

The Corporate Environmental Protection Policy defines areas of activity and responsibility, specifies information and reporting requirements, and establishes the duties of Corporate Environmental Protection, as well as cooperation with the local environmental protection officers and the managing directors/plant managers. This ensures a uniform approach to environmental protection within the Group and in terms of public image. The Group headquarters supports the sites with expertise and technology transfer. All of this makes an important contribution to implementing our new Group strategy in environmental protection.

Compliance with legal regulations is the basis and minimum standard of our activities. The regulations that are significant for our production include in particular the German Federal Immission Protection Act, the Closed Cycle and Waste Management Act, the Water Management Act, and the European chemical regulation, REACH. The results of internal and external assessments confirm that the legal regulations and guidelines from the permits are fundamentally adhered to.

In 2017, an integrated management system (IMS) was developed for Aurubis AG for the areas of environment, energy, quality management, and occupational health and safety. It has since been certified for all the areas mentioned. The IMS utilizes synergies, harmonizes processes, and improves management in these areas.

Furthermore, we determine key environmental protection factors (KPIs), which are uniform within the Group and are reviewed and certified by external auditors annually.

In the future, there are plans to introduce a software program Group-wide to simplify compliance with all laws and standards. At the Hamburg site, the software is already in use for certain sub-areas. The plan is to gradually expand the roll-out to the individual sites and at Group level.

Environmental discussions take place continually across the Group and employees are regularly trained on environmentally relevant topics.

Emergency plans and alarm and danger prevention plans have been established for emergencies and accidents. These measures ensure that environmental impacts are effectively avoided and that employees and the community are protected. We carry out training sessions and emergency drills regularly, documenting and evaluating the procedures. Emergency plans are developed in coordination with the responsible authorities. The corporate environmental protection guidelines also include the tasks to implement the European chemical regulation, REACH.

Supported by the Aurubis Operating System (AOS) introduced in 2017, production processes are systematically analyzed and continuously optimized with environmental aspects in mind. The environmental management system therefore ensures that, in addition to production targets, environmental protection targets can also be achieved and development opportunities can be utilized.

To prepare ourselves for future developments, we regularly evaluate opportunities and risks that the company faces. When we see opportunities, we use them by implementing projects. Risk management exists to prevent environmental damage, non-compliance and unexpected costs. Thus, environmental risks are investigated regularly and minimized by establishing precautionary measures. For this purpose, we regularly carry out environmental risk assessments at every production site through an external expert. Topics of the assessments include emissions to air and water, water management, and handling hazardous substances, but also the challenges that climate change poses. In the past several years, we expanded the assessment to include the additional topics of biodiversity and nature conservation, along with water availability and water stress.

In 2023, the environmental risk assessment was updated for all production sites majority-owned by Aurubis.

Fig. 1.3: Environmental management in the Aurubis Group

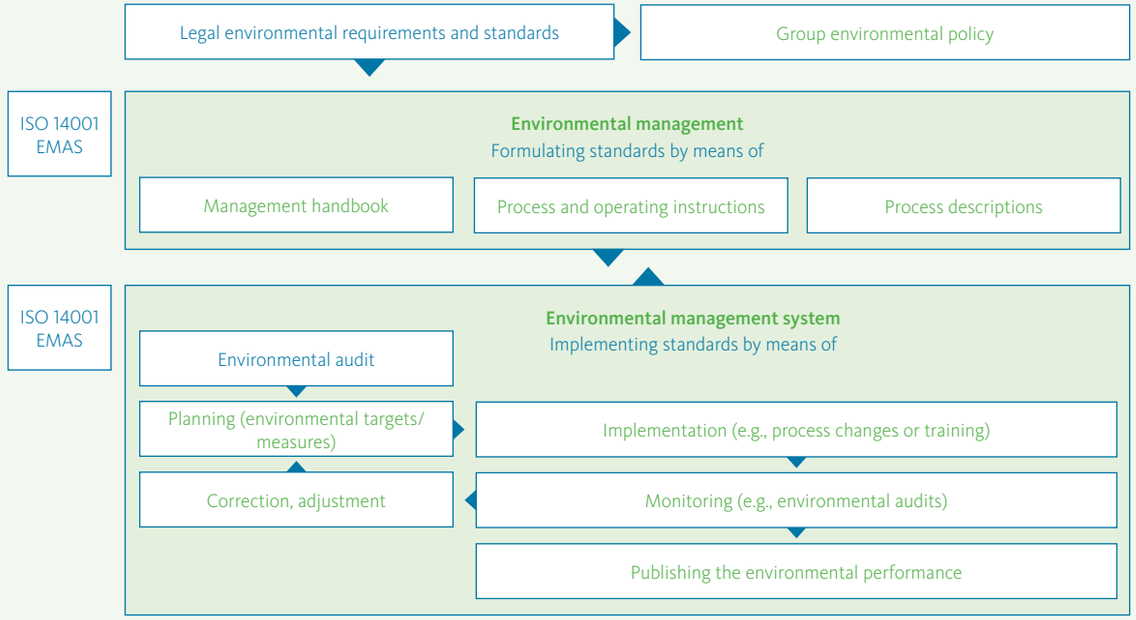


Fig. 1.4: Site certifications

Site	EMAS	ISO 14001	ISO 50001	ISO 45001	ISO 9001	ISO 27001	IATF 16949	EfbV	WEEELABEX[4]	Copper Mark
Hamburg, headquarters (DE)	x	x	x	x	x	x				x
Lünen (DE)	x	x	x	x	x	x		x	x	x
Pirdop (BG)		x	x	x	x	x				x
Olen (BE)		x	x	x	x	x				x
Beerse, Metallo (BE)		x	x	x	x	x				
Berango, Metallo (ES)		x	x	x	x	x				
Emmerich, Deutsche Giessdraht (DE)		x	x	x	x	x				
Avellino (IT)	x	x	x	x	x	x				
Hamburg, E.R.N. (DE)[1]		x	x	x	x			x		
Röthenbach, RETORTE (DE)		x	x	x	x	x				
Hamburg, Peute Baustoff (DE)		x	x	x	x[3]	x				
Buffalo (US)		x	x	x	x	x	x			
Pori (FI)		x	x	x	x	x				
Stolberg (DE)		x	x	x	x	x	x			
Stolberg, Schwermetall (DE)[2]	x	x	x	x	x					

[1] Operations ceased on December 31, 2023.
[2] Not majority-owned by Aurubis (50 % stake).
[3] For the sale of iron silicate granules used to produce blasting abrasives.
[4] WEEE LABel of EXcellence.

EMAS: system of specifications for environmental management systems and environmental audits
ISO 14001: standard for environmental management systems
ISO 50001: standard for energy management systems
ISO 45001: standard for occupational safety management systems
ISO 9001: standard for quality management systems
ISO 27001: standard outlining requirements for information security management systems
IATF 16949: standard for quality management systems in the automotive industry, based on ISO 9001
EfbV: Ordinance on Specialized Waste Management Companies (German certificate)
WEEELABEX: standards for the collection, sorting, storage, transport, preparation for reuse, treatment, processing and disposal of waste electrical and electronic equipment
Copper Mark: quality seal for the copper sector for responsible copper production based on 32 internationally recognized sustainability criteria

Dialogue with interested parties and commitment

We have determined and evaluated the interested parties that are relevant for Aurubis: Governmental authorities, non-governmental organizations, customers, and employees play an important role in particular. Aurubis continued to maintain an open dialogue with authorities, citizens and other interested parties across the Group in the past year. This helps us understand the expectations and requirements that those around us place on us and to take them into account in our activities. We also took part in various environmental projects.

In 2013, the European Commission recommended the methods of the Product Environmental Footprint (PEF) and the Organisation Environmental Footprint (OEF) for measuring environmental performance on the basis of reliable, verifiable and comparable information. Since then, Aurubis has actively participated in the pilot and transition phases, helping to test the procedure and bolster the methodological approach. In 2018, we successfully developed specific product calculation rules for metal plates and organization calculation rules for copper production together with other stakeholders. The organization calculation rules for copper production were further adapted to the latest developments and adopted by the Technical Advisory Board in February 2024. We continue to use our experience to improve the environmental performance of our company and our products.

In Hamburg, we have been a member of the Environmental Partnership since 2003, and a member of the Partnership for Air Quality and Low-Emission Mobility, which is coordinated by the city of Hamburg. The goal of the latter partnership is to reduce nitrogen dioxide emissions, which are caused by transport in particular. For this purpose, back in 2016 we also joined the German Mobil.Pro.Fit.® model project in collaboration with the B.A.U.M. e. V. environmental organization, which has led to different measures for low-emission mobility. For instance, bike boxes with locks were provided for employees at nearby train stations and a bike rental station was set up in front of a plant entrance. We have sponsored the JobRad bicycle leasing program at the site since 2021.

Since 2015, Aurubis has successfully participated in the Carbon Disclosure Project (CDP), which surveys companies about risks and opportunities related to the climate, as well as about CO_2 reduction potential. Aurubis' ambitions were awarded an A- in 2023. The Sustainability Strategy and the transparent presentation of Aurubis' approach to the opportunities and risks of climate change contributed to the good performance. This distinction includes the copper products that help increase efficiency in applications, as well as the effective production processes, energy management, and investment in energy and CO_2 efficiency optimizations. For Aurubis, this award is proof of its innovation capacity and at the same time an incentive to keep up its efforts in CO_2 reduction and energy and resource efficiency.

2021 was the first year we took part in the CDP Water Security questionnaire, which deals with current and future water-related risks and opportunities. Initial participation involved an unassessed basic version of the questionnaire, and since 2022 completing the full version includes a subsequent assessment by the CDP. Aurubis' ambitions were awarded a B in 2023.

Targets and successes in environmental protection

When determining the environmental protection targets as part of our updated Sustainability Strategy, we consider the company's transformation from a copper to a multimetal producer. As described in the 2023 Environmental Report, our specific reduction targets and the associated reporting of specific emissions will only be based on our multimetal indicator — the copper equivalent — starting this year.

The calculation is based on an approach that has already been established at European level within the framework of an EU project on the life cycle assessment (environmental footprint) of organizations and products, the Organisation Environmental Footprint and the Product Environmental Footprint. The copper equivalent describes all the metals Aurubis produces. It standardizes the entire metal production using a weighting factor based on the respective average metal prices. The observation period for the relevant metals ranged from seven to nine years. To prevent the influence of value fluctuations, the average prices used for the metals are fixed for the entire target timeframe of the Sustainability Strategy. The calculation method was verified by external auditors in 2021.

Fig. 1.5: Our environmental and climate targets

Noise

» **Target: Reducing noise emissions, especially in new technical projects**

Nature conservation & biodiversity

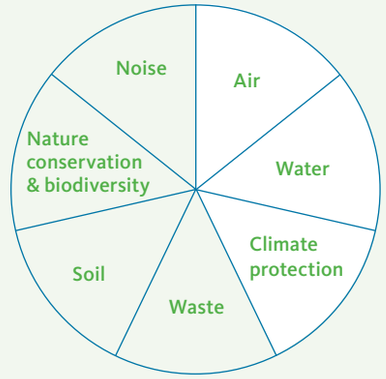
» **Target: Improving nature conservation at the production sites**

› Example: Participation in the NABU project UnternehmensNatur in Hamburg

Soil

» **Target: Reducing input of harmful substances into soil**

› Example: Extensive paving of plant premises in Lünen



Waste

» **Target: Increasing recycling rates**

› Example: Stronger marketing of fayalite in Pirdop

Targets of the 2030 Sustainability Strategy

Air

» **Target: Reducing specific dust emissions in multimetal production by 15 % by 2030 compared to 2018**
25 % reduction achieved in 2023[1]

› Example: Reducing fugitive emissions

Water

» **Target: Reducing specific metal emissions to water in multimetal production by 25 % by 2030 compared to 2018**
29 % reduction achieved in 2023[1]

› Example: Optimizing existing water treatment facilities

Climate protection

» **Target: Reducing absolute Scope 1 and Scope 2 emissions by 50 % compared to 2018**
19 % reduction achieved in 2023[1]

› Example: Implementing decarbonization projects

› **Target: Reducing specific Scope 3 emissions by 24 % compared to 2018[2]**

[1] The Aurubis sites in Beerse and Berango have been included since 2020.

[2] Data for calendar year 2023 is not available yet. Aurubis will report the Scope 3 emissions for 2023 at a later date. To calculate the Scope 3 emissions for calendar year 2022, we were able to draw on mine data for the category of purchased goods and services for over 60 % of the copper concentrate purchased. This allowed us to use more exact supplier-specific data. For the remaining volume, we used the ICA average, which was adjusted in September 2022 and is significantly lower. In transport, more differentiated data was available on the type of transport. This made it possible to better differentiate the modes of transport and evaluate them using the associated, more specific emission factors. The resulting Scope 3 emissions are significantly lower, so the targets are currently being revised.

Our environmental and climate targets as part of the 2030 Group Strategy

Within the scope of the 2030 Sustainability Strategy, we have set Group-wide targets in environmental and climate protection and defined concrete targets for the individual sites. The effectiveness of these targets and measures is reviewed continuously.

In 2023, dust emissions in multimetal production per ton of copper equivalent output were reduced by 25 % compared to 2018 (target: -15 %). The RDE (Reducing Diffuse Emissions) project with a total investment of about € 85 million so far has particularly contributed to this success *"In focus: our flagship projects in environmental protection" section*. Our goal is now to maintain this low emissions level in the future as well, and to continue improving through technical measures like the expansion of RDE.

In 2023, metal emissions to water per ton of copper equivalent in multimetal production were reduced by 29 % compared to 2018 (target: -25 %). Due especially to improvements in existing wastewater cleaning facilities at the Hamburg plant, we were able to achieve our goal in this area for the first time. We anticipate that implementing growth projects will contribute to emissions, which could impact target achievement. Our objective is therefore to maintain this low emissions level and further reduce it by continuing improvements to our facilities and implementing new improvement projects.

Scope 1 and Scope 2 emissions were reduced by 19 % in 2023 compared to 2018. This positive trend was achieved in large part due to the realization of energy efficiency projects and increasing integration of green electricity in the electricity sourcing strategy.

Data for Scope 3 emissions is not available yet for calendar year 2023; it will follow at a later date as part of Aurubis reporting. To calculate the Scope 3 emissions for calendar year 2022, we were able to draw on mine data for the category of purchased goods and services for over 60 % of the copper concentrate purchased. This allowed us to use more exact supplier-specific data. For the remaining volume, we used the ICA average, which was adjusted in September 2022 and is significantly lower. In transport, more differentiated data was available on the type of transport. This made it possible to better differentiate the modes of transport and evaluate them using the associated, more specific emission factors. The resulting Scope 3 emissions are significantly lower, so the targets are currently being revised.

Fig. 1.6: Specific dust emissions in Aurubis Group multimetal production

in g/t of copper equivalent

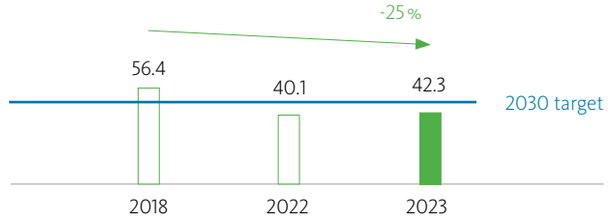


Fig. 1.7: Metal emissions to water in Aurubis Group multimetal production

in g/t of copper equivalent

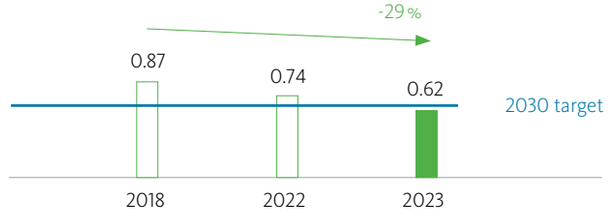
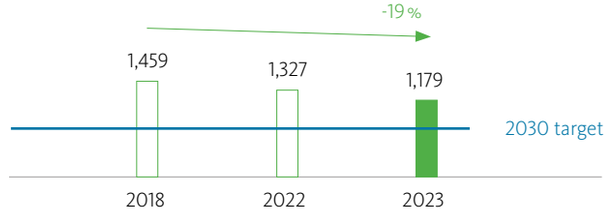


Fig. 1.8: Absolute Scope 1 and Scope 2 emissions in the Aurubis Group

in t CO_2



Biodiversity

We are actively involved in creating and maintaining good conditions for species conservation and biodiversity in our plants and their surroundings. It is clear to us that protecting biological diversity is one of the greatest environmental challenges of our time, which is why we adopted it as an additional dimension in our sustainable development. It has been part of our environmental targets for a number of years and was included in our Company Guidelines on Environmental Protection at the start of 2023. We want to further expand and systematize our commitment in this area and our biodiversity management.

The aspect of biodiversity was also inspected by governmental authorities as part of authorization procedures with environmental compatibility tests. If any impacts on biodiversity were expected, we implemented the required compensation measures. Furthermore, we conserve the habitats of animals and plants in the areas surrounding our sites with our extensive water treatment, air emission reduction, and waste treatment methods.

Wherever possible, we maintain or expand green areas on the grounds of every plant: We take part in the Hamburg initiative UnternehmensNatur to promote biodiversity at our site there, for instance. Due to long-time industrial use, however, there can be soil contamination typical for industrial areas, which we work to prevent from mobilizing and spreading. We commissioned a new sewer line at the Olen site to protect the nature conservation area Olens Broek in late 2015. When we have to expand the usable area on any plant premises, we choose areas that naturally have limited biodiversity.

Additional measures are currently being devised to protect and reinforce biodiversity. For example, a fayalite landfill that was closed at the Pirdop site in late 2018 was ecologically restored. At the Hamburg site, a pilot project to set up a green facade was implemented to promote biodiversity and improve the ambient air.

Generally the options for promoting biodiversity are assessed for every construction or other type of project.

Fig. 1.9: Conservation areas in close proximity to copper production sites

	Name	Type	Distance	Direction
Hamburg (DE)	Hamburger Unterelbe	Natura 2000	200–600 m	Southeast
	Holzhafen	Natura 2000	600–1,000 m	East
	Heuckenlock/Schweenssand	Natura 2000	3,600 m	South
Pirdop (BG)	Tsentralen Balkan — bufer (nature conservation area)	Natura 2000	approx. 1,000 m	North
	Tsentralen Balkan — bufer (bird conservation area)	Natura 2000	approx. 1,700 m approx. 2,300 m	North East
	Sredna Gora[1]	Natura 2000	approx. 2,300 m	South
Lünen (DE)	In den Kämpen, Im Mersche, and Langerner Hufeisen	Natura 2000	<2,000 m	Northeast
	Lippeaue	Natura 2000	<5,000 m	Northwest
	Lippe-Unna, Hamm, Soest, Warendorf	Natura 2000	<2,500 m	Northwest
Olen (BE)	Valleigebied van de Kleine Nete met brongebieden, moerassen en heiden	Natura 2000	approx. 1,000 m	North
	De Vallei van de Kleine Nete benedenstrooms	VEN[2]	approx. 1,000 m	North
	Het Olensbroek en Langendonk	VEN[2]	approx. 1,000 m	North
Beerse (BE)	Eksterheide	Natura 2000	approx. 500 m	West
	Duivelskuil	Natura 2000	approx. 750 m	Southwest
	De Pomp-Poelberg	Natura 2000	approx. 1,000 m	Northwest
Berango (ES)	Ría de Mundaka-Cabo de Ogoño Marine Area	Natura 2000	approx. 3,500 m	North
	Ría del Barbadún	Natura 2000	approx. 10,000 m	Southwest

[1] The nature conservation area Sredna Gora is home to the Dushantsi Reservoir, which was created at the same time the copper smelter was constructed in the 1950s to supply industrial water to the Pirdop plant and is operated by Aurubis.

[2] VEN: Vlaams Ecologisch Netwerk (Flemisch Ecological Network).

Energy, climate protection, and decarbonization

Our climate, our contribution

With the Green Deal, the EU has an ambitious target for 2050: a resilient economy and society that achieve carbon neutrality through high innovative strength and competitiveness. We demonstrate that this aligns with our targets with our affirmation of the Science Based Targets initiative. In 2021, the Science Based Targets initiative (SBTi) validated Aurubis AG's CO_2 reduction targets, thus confirming that our targets contribute to limiting global warming to 1.5 °C pursuant to the Paris Climate Agreement. We have set out to reduce the absolute Scope 1 and Scope 2 emissions, meaning CO_2 emissions generated by burning fuels in internal facilities and those related to purchased energy, by 50 % until 2030 compared to the reference year 2018. We want to reduce Scope 3 emissions, which arise in the upstream and downstream stages of the value chain, by 24 % per ton of copper cathodes during the same period as well. To ensure that our reduction targets are considered in projects, Aurubis reviews the fulfillment of the Group-wide sustainability targets, which include the CO_2 reduction targets, when assessing projects.

We will continue implementing our detailed roadmap to achieve our climate goals. Regarding Scope 1 and Scope 2 emissions, this includes technical measures like decarbonizing plant facilities by using green hydrogen instead of fossil fuels and electrifying our production. The use of industrial waste heat from our production process and the expansion of green electricity purchasing are also included as additional measures. Approaches for reducing Scope 3 emissions include cooperation with actors in our supply chain and increased recycling activities, for example. We aspire to make our production carbon-neutral well before 2050.

Our life cycle assessments indicate that we are already on the right track, as today we are already producing many metals with less than half the global average carbon footprint. The challenge when it comes to decarbonization is that there is not a one-size-fits-all technology that we can rely on. Because our sites all have different requirements, it is necessary to diversify the approaches. Our path to carbon neutrality is multifaceted.

Management approach

The individual production steps in the Aurubis value chain are very energy intensive overall. Accordingly, the effective and efficient use of energy is an issue of ecological and economic responsibility. The use of energy is the main source of CO_2 emissions in the Group. Taking the entire value chain into consideration, over half of the CO_2 emissions are upstream and downstream, i.e., they originate from our suppliers, customers, and service providers (Scope 3 emissions). Most of the Scope 3 emissions originate from the activities of the mining companies from which we source ore concentrates.

At the same time, the products we manufacture contribute to reducing CO_2 emissions in our society because they play an important role in renewable energies, energy efficiency applications, and electric vehicles. Electric cars contain nearly four times more copper than vehicles with conventional combustion engines, and building and connecting an offshore wind turbine to the energy grid requires up to 30 t of copper.

Identifying climate-related opportunities and risks and deriving related measures are two issues that link our risk management and our energy and climate strategy. When doing this, we consider (pending) legal requirements, technological developments, and compliance-related, reputational and physical risks.

The development and implementation of the Group-wide energy and climate strategy and the corresponding coordination of the targets and measures are the central responsibility of the head of Corporate Energy & Climate Affairs, who reports directly to the Executive Board. The corporate department also coordinates the development of the energy management and monitoring systems across the Group, providing for a uniform approach and facilitating the exchange of expertise regarding best practice examples — for instance in the form of an energy efficiency network for the German Aurubis sites' energy management officers and a regular international Aurubis workshop. Topics include completed and planned energy efficiency projects, results of energy audits, the current legal situation, and aid programs and implementation assistance related to new requirements.

Aurubis holds a leading position in energy efficiency. However, as we increase productivity and efficiency, we are also reaching our technical limits. Efficiency enhancements that have already been achieved cannot serve as a blueprint for future development because the more steps that have already been taken in energy efficiency, the more difficult it is to optimize energy demand further. Because there are technological limits to reducing energy consumption and emissions, a continued high level of capital expenditure leads to only marginal improvements compared to past years.

In order to control energy consumption optimally using energy performance KPIs and identify additional energy savings potential with the goal of continuous improvement, all sites are certified in accordance with DIN EN ISO 50001:2018.

The Corporate Sustainability & External Affairs corporate function is responsible for the Group-wide decarbonization strategy. A separate department was created in 2023 that develops the decarbonization strategy and targets further, coordinates site-specific roadmaps, and manages their implementation.

An overview of our energy, climate protection, and decarbonization efforts is available in Our commitment to the climate.

In focus: Our flagship projects in environmental protection

Producing with new, innovative environmental protection technologies

We are a leader in reducing our environmental impact on air, water and soil in multimetal production. We have a long tradition of developing new and innovative environmental protection technologies.

An € 85 million filter system in primary copper production has been reducing diffuse emissions (RDE) at the Aurubis Hamburg site since 2021. The project involved closing roof openings on the building housing the primary smelter and connecting a new, high-performance filter system. For RDE, new technologies are being used and combined in completely new ways. The specially developed, needs-based control of the ridge turrets uses a level of digitalization in environmental protection that is unique in the metals industry thus far, and ensures efficient implementation with the high volumes of exhaust air. This has already resulted in a 40 % reduction in the diffuse emissions discharged from primary copper production.

We will now be expanding the existing facility with an investment of about € 30 million. By doubling its capacity in this way, we are once again significantly boosting the facility's efficiency to 80 %.

With this project, we are once again proving that modern urban development and copper production just a few kilometers from downtown Hamburg can sustainably coexist.

Improved slag treatment in Pirdop

Aurubis is investing around € 46 million in improved treatment of slag from copper refining at the site in Bulgaria. The new process involves cooling the slag in pots instead of in pits as before. With the commissioning, scheduled for 2026, Aurubis will be going above and beyond the industry standard. The optimized slag treatment process will considerably reduce the diffuse emissions formed by the current process. This investment represents a key contribution to achieving our ambitious sustainability targets. At the same time, it highlights our dedication to continuously improving our efforts to mitigate climate change and protect the environment.

View of the new exhaust system at the Hamburg site close to the city

In a nutshell: Additional environmental projects

» In cooperation with Hamburg Energie, one of the largest continuous charging parks for electric vehicles in northern Germany was built and commissioned at the Hamburg site in June 2021. A total of 150 charging stations with green electricity were installed in two parking lots at the plant for employees, company cars, the internal company vehicle fleet, and guests to use. Since many places do not have any charging options for electric cars, Aurubis built the charging park in part to motivate its employees to buy electric cars. In addition to e-mobility, additional offers such as bicycle leasing, public transport subsidies, sustainable company car provisions, and the introduction of a minimum distance rule for flights also offer employees incentives for making a contribution to environmentally friendly mobility. We are also updating our internal vehicle fleet. At the Hamburg plant, for example, we replaced about 40 diesel forklifts with electric forklifts in 2022.

» At the site in Pirdop, Bulgaria, a new sand filter was commissioned in the existing treatment facility for industrial wastewater in 2020. This reduces the discharge of undissolved substances into bodies of water.

» After optimized water collection and provision significantly reduced wastewater discharged at the Lünen site compared to 2019, we are working on an additional improvement in sustainable water use as part of a water concept. For the coming years, additional optimizations are planned for internal water use, such as reviewing the further treatment of internal process water (reverse osmosis, evaporation). The goal is to use water internally to the greatest possible extent and prevent the discharge of any process water into the public sewer system. The project is slated for full implementation in late 2025/early 2026.

» To promote biodiversity, a pilot project to add greenery to facades on the plant premises was concluded at the Hamburg site. The Pirdop site is taking the initiative to restore certain areas by planting grasses, bushes and trees. Defunct landfill areas on the premises are renaturated as part of decommissioning.

» To further reduce the emission of volatile organic compounds from smelters, an activated carbon filter is being integrated into the existing off-gas cleaning process at the site in Beerse, Belgium. The studies concluded in 2023 and commissioning is planned for the fourth quarter of 2024.

» In October 2023, a new pilot plant for ultra high temperature hydrolysis (UHTH) technology kicked off at the Lünen site. It separates a gas that can be used as fuel from plastic. Solid carbon is produced in the process, which offers potential for new products — and with it a way to close more material loops. And finally, more recycling materials will ideally be processed efficiently in Lünen — generating more new raw materials for our smelter network.

» To reduce noise and CO_2 emissions, a new facility for loading ships, the Cu-Port, was constructed at the site in Olen, Belgium. Transport that was previously performed by truck is now carried out in an energy-efficient and environmentally friendly manner by waterway. This prevents a total of about 11,000 truck transports per year and thus over 780 t of CO_2 emissions annually. The strategic BOB (Bleed Treatment Olen Beerse) project, which involves a hydrometallurgical electrolyte purification system, will also contribute to reducing noise and CO_2 emissions. Electrolyte that used to be treated at another site in the Aurubis smelter network will be treated at the Olen site in the future. This will prevent a total of about 2,600 truck transports per year and thus around 1,500 t of CO_2 emissions annually.

» Within the scope of an EU project, Aurubis helped develop the Organisation Environmental Footprint for copper production. In this context, rules for determining the environmental footprint were developed and tested. Production at Aurubis has one of the smallest environmental footprints worldwide *A comparison — Life cycle assessments for our metal products*.

Our commitment to the climate

Solar energy for copper production

Since 2021 Aurubis has been investing continuously in expanding its solar park at the Pirdop site (Bulgaria). By constructing a total of four photovoltaic facilities, Aurubis is increasing its captive electricity generation capacities and will be able to cover about 15 % of the site's electricity needs with green energy after completion. The roughly 55,000 MWh of electricity generated annually is equivalent to the demand of a city with 25,000 inhabitants. The investment makes the company more resistant to price fluctuations on the energy market but is also a key step towards carbon-neutral production. Aurubis will prevent about 25,000 t of CO_2 emissions per year once all four stages are finished. The final expansion stage is anticipated to go online in 2026.

New technology for decarbonization

In spring 2021, we became the first company in the copper industry to test the use of hydrogen on an industrial scale at our Hamburg site. Here we used a gaseous mixture of hydrogen and nitrogen in place of natural gas to pole copper melt in the anode furnace during production. Poling refers to a metallurgical purification process or a reduction process in melted metal.

The pilot project, which was awarded first prize in the 2021 Responsible Care competition held by the German Chemical Industry Association (VCI) at the national and state level, went according to plan and tested how the facility reacted to the introduction of hydrogen. We were able to get this production step up and running smoothly. The procedural results of this test series have encouraged us to pursue additional activities related to hydrogen. For example, during the reporting year we decided to invest in hydrogen-ready anode furnaces, one of the first copper smelters in the world to do so.

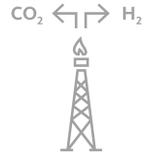
With the investment of about € 40 million, Aurubis is taking another important step in the transformation towards carbon neutrality with the new technology that provides a savings potential of around 5,000 t of CO_2 per year in Hamburg when only hydrogen is used. The conversion in the Hamburg plant will be carried out as part of the plant's routine maintenance shutdown slated for spring 2024. In addition to decarbonizing production, the new furnaces will improve process flexibility as well. Compared to the previous equipment, the new furnace technology enables the processing of complex metal-bearing copper concentrates. This will help Aurubis in Germany extract additional valuable raw materials even more efficiently in the future to satisfy rising demand coming from electric vehicles, for example.

For now, there is still barely enough green hydrogen to cover German industry's huge demand at competitive prices, but with this step, we are leading the way and showing that we are prepared!

The new anode furnaces will help to further decarbonize Aurubis' production even before enough hydrogen comes on the market, as they work more efficiently and consume about 30 % less natural gas, for a potential savings of nearly 1,200 t of CO_2 per year.

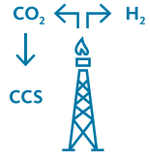
Along with hydrogen, ammonia can also contribute to the decarbonization of industry. Ammonia is not just an ideal hydrogen carrier; it can also be directly used as a fuel. Furthermore, ammonia is much easier to transport over longer distances than hydrogen. We started a pioneering test series on the use of blue ammonia in copper rod production at the Hamburg site. In the production of blue hydrogen, the resulting carbon dioxide is captured and stored underground using the carbon capture and storage (CCS) technique. The blue ammonia used for testing was supplied as part of the deepened hydrogen cooperation between Germany and the United Arab Emirates. The target that Aurubis had envisioned, of directly using ammonia as fuel, proved unfeasible in view of environmental regulations and high product quality standards. As a result, Aurubis does not plan to pursue the direct use of ammonia as a fuel in this application. In addition to its use as a fuel, ammonia has the ideal properties for serving as a hydrogen carrier. The technology used to recover the hydrogen from the ammonia by splitting the gas back into hydrogen and nitrogen is called a cracker. Aurubis is already reviewing the potential for developing an ammonia cracker.

Gray hydrogen



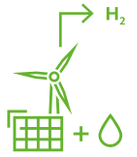
Recovered with the help of fossil energy sources. This creates CO_2.

Blue hydrogen



Recovered with the help of fossil energy sources, but the CO_2 is captured and stored (CCS = carbon capture and storage) or further processed as a raw material.

Green hydrogen



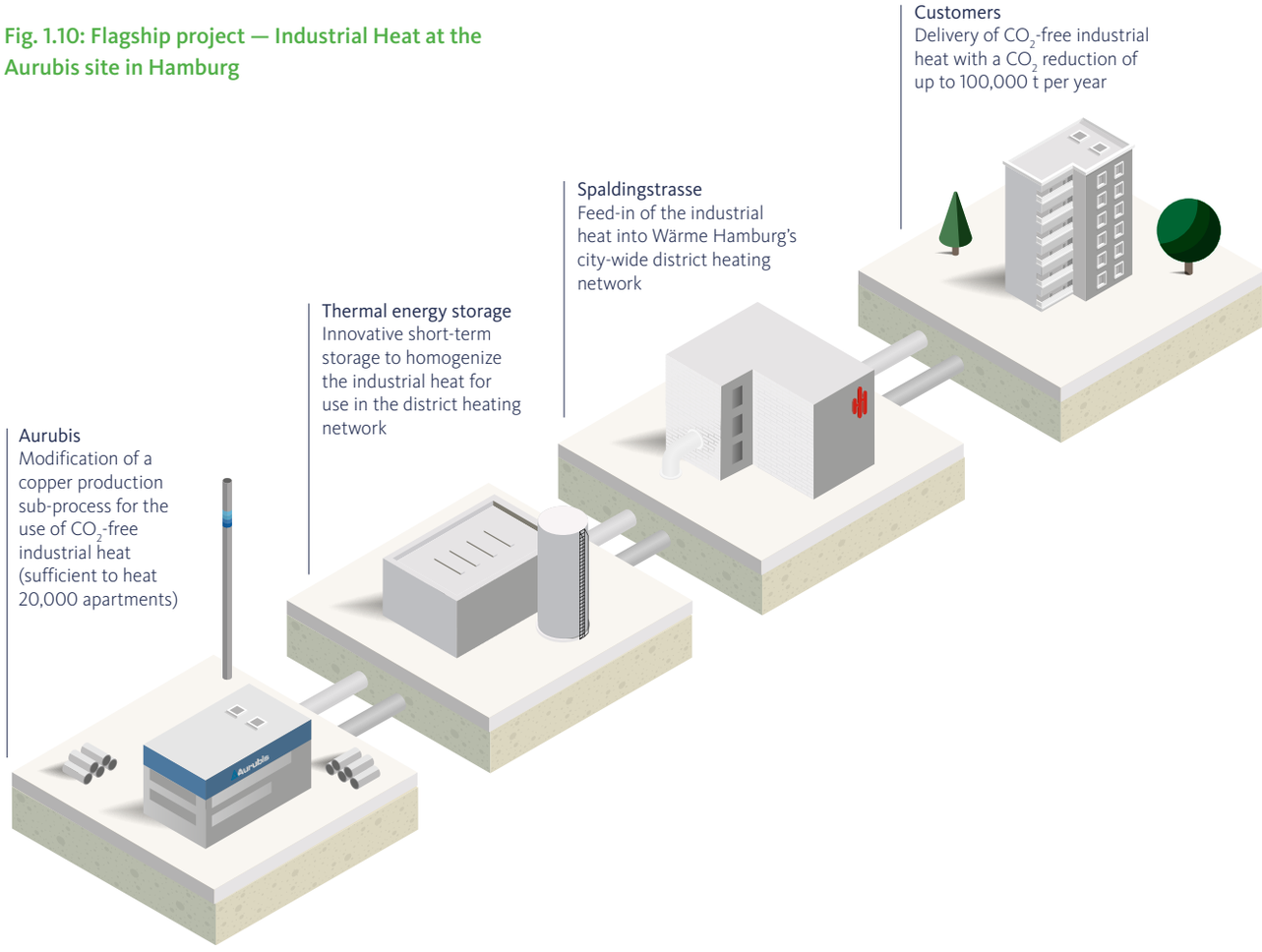
Produced exclusively with renewable energies, so without CO_2 emissions.

Responsible Care – ein Beitrag zur Nachhaltigkeitsinitiative Chemie[3]

Industrial Heat 2.0: Waste heat from Hamburg

Our project to utilize industrial heat from the Hamburg plant facilitates an energy-efficient heat supply for the HafenCity East district. At the same time, 12 million m³ less cooling water and Elbe River water is used each year, as the excess warmth is now used for heating purposes. But there is room for more: The total potential heat volume that could be extracted at Aurubis amounts to up to 500 million kWh per year. We began with the expansion of the Industrial Heat project in Hamburg at the start of 2022. By converting a sub-process in copper production at the Aurubis plant in Hamburg, from the 2024/2025 heating period onward, up to 20,000 additional apartments will be heated each year in cooperation with the Hamburg city energy utility, reducing CO_2 emissions in the city by up to 100,000 t. The Industrial Heat flagship project at the Aurubis site in Hamburg has garnered a great deal of attention nationally and internationally. The second stage of this highly complex project will be implemented in 2024 during the routine, scheduled maintenance shutdown at the Hamburg plant and is the largest project of this kind in Germany.

Fig. 1.10: Flagship project — Industrial Heat at the Aurubis site in Hamburg



Expanding our pioneering role in recycling

The economy, industry and society are facing enormous challenges. As a leading multimetal company, we want to be part of the solution, because without metals, there is no sustainable future.

When it comes to recycling, we are continuing our focus on growth and making significant investments with our updated Metals for Progress: Driving Sustainable Growth strategy, making a key contribution to the circular economy in Europe as well as taking a further step on the path towards becoming the most efficient and sustainable integrated smelter network in the world.


Status: December 2023

Largest multimetal recycling plant in the United States – Aurubis Richmond, US

Aurubis is blazing a trail with its new recycling plant in the US state of Georgia: With the signing of a supply contract for a second plant module in 2023, Aurubis anticipates a total investment of around € 740 million for both project stages in the first secondary smelter specializing in multimetal recycling in the US. The additional equipment will increase the capacity of the metal recycling plant in Richmond, currently under construction, from an annual 90,000 t to 180,000 t of complex metal scrap materials per year. The plant is a key contribution to Aurubis' commitment to the circular economy. Groundbreaking for Aurubis Richmond took place in mid-2022, and construction is currently running at full steam. After commissioning the first module in the second half of 2024, we plan to start module 2 in early 2026.

Growth area of battery recycling

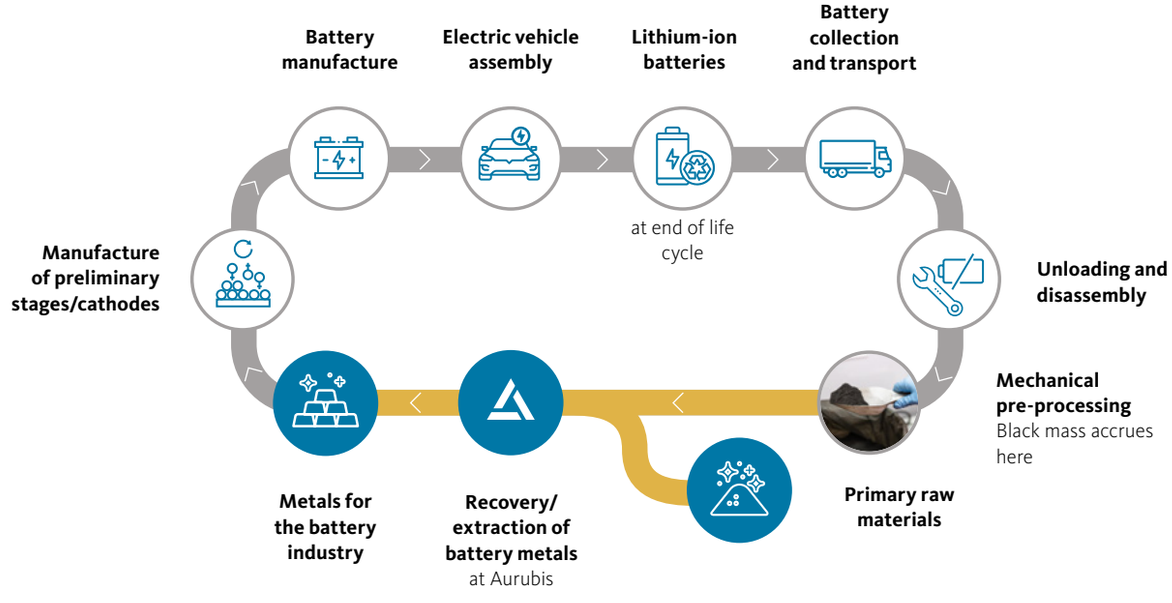
The studies with the pilot plant in operation at the Hamburg site since March 2022 were successful. Our goal is to close the battery production cycle by recovering valuable raw materials from the black mass generated from used lithium-ion batteries from electric vehicles and waste from battery production, and return these metals to battery production.

During the pilot phase, we were able to develop a unique, meanwhile patented technology in a relatively short time. An innovative procedure that is exceptionally effective: Within our smelter network, we recover about 95 % of the battery metals from black mass – including the light metal lithium, which is highly significant from an economic perspective and concentrated in a limited number of mining regions worldwide. The next step – scaling the pilot plant to a demo plant with initial commercial activities at the Hamburg site – has already begun.

Because Aurubis has such a high level of crucial expertise, the speed in developing the technology was very high despite our extensive test work. The result: We can enter the market at exactly the time that the market needs well developed solutions.

Closing the loop

Aurubis extracts valuable metals from the black mass from recycled batteries from electric vehicles.



Recycling plant for nickel and copper in Belgium

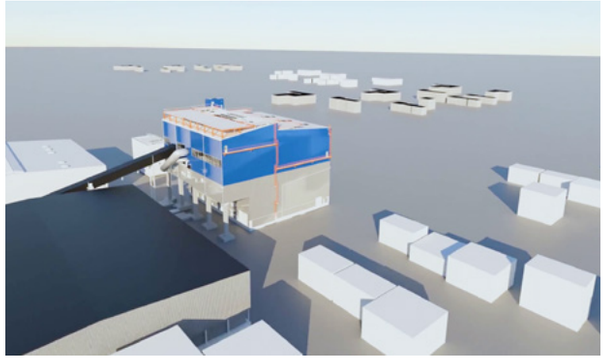
At the Olen site, we are investing around € 85 million in BOB (Bleed Treatment Olen Beerse), a strategic project adding an energy-efficient and effective process step for recovering nickel – an essential metal for lithium-ion batteries and as such an important building block for the e-mobility megatrend. The new facility in Belgium is another excellent example of how Aurubis is realizing synergies in its smelter network and making an important contribution to the circular economy in Europe. The project is in implementation and commissioning is scheduled for the second half of fiscal year 2023/24.

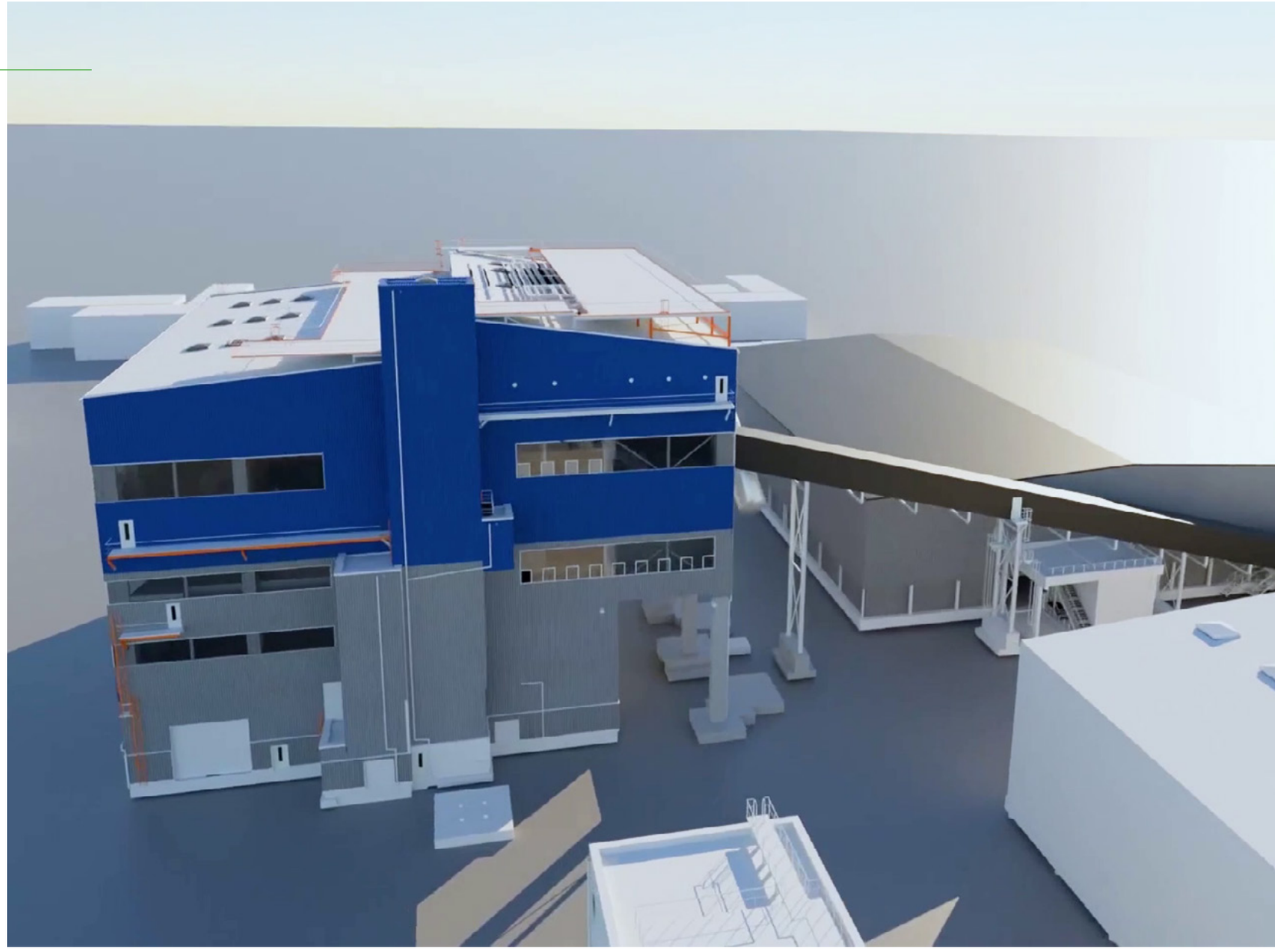
Innovative recycling of metals from residues

At the site in Beerse, Belgium, we are building a state-of-the-art recycling plant: ASPA (Advanced Sludge Processing by Aurubis). In the future, the hydrometallurgical ASPA facility will process anode sludge, a valuable intermediate product from electrolytic copper refining produced at the recycling sites in Beerse and Lünen. The new process will enable even faster extraction of more precious metals, such as gold and silver, but also tin, from the anode sludge. Total investment in the project amounts to € 33 million. Groundbreaking took place on December 15, 2022 and commissioning of the facility is scheduled for fiscal year 2023/24.

Expanding recycling expertise and optimizing material flows in Hamburg

With the Complex Recycling Hamburg (CRH) project, we announced another investment in securing and strengthening Aurubis' core business in December 2022. With an investment volume of € 190 million, Aurubis will be able to process around 30,000 t of additional recycling material and internal, complex smelter intermediary products on a larger scale starting in 2025, making a valuable contribution to the circular economy of metals in Europe. The investment in the Hamburg location will keep significantly more added value in the company and create additional metallurgical capabilities in the future.





Our raw materials – Responsibility in the supply chain

We take responsibility for sustainability standards, and not just in our own production processes and in our own actions, but in our supply chain as well. This is all the more important because we source raw materials from around the world. The extraction of the raw materials we process can have a direct or indirect impact on social and ecological aspects. Our suppliers' raw material extraction and production processes can affect biological diversity, the climate, or the conservation of air, water and soil quality, for example. Other environmental aspects such as the handling of mining waste and the use of energy and water are relevant as well. As a result, we systematically analyze the risks of our suppliers and supplier countries.

In addition to copper concentrates, we use copper scrap and various types of organic and inorganic metal-bearing recycling raw materials, industrial residues, and bought-in metallurgical intermediates as feed material. Most of the copper scrap and metal-bearing recycling raw materials for our four secondary smelters in Lünen (Germany), Olen and Beerse (both in Belgium), and Berango (Spain) are sourced on the European and North American markets. Furthermore, we use copper scrap with high copper contents for cooling purposes in both of our primary smelters in Hamburg (Germany) and Pirdop (Bulgaria). Unlike primary raw materials, secondary raw materials are largely purchased on the basis of short-term supply contracts, which is customary for the market.

To close the value chain for copper and other metals, we place a high priority on the closing-the-loop approach. The focus of this approach is on materials such as production waste and residues that accumulate along the copper value chain in production, for example with our customers.

To fulfill our due diligence obligation with regard to all of our material topics in the supply chain area, we implemented a Business Partner Screening system based on OECD guidelines. In our risk analysis, we consider both abstract country and sector risks and the concrete risks actually associated with the business activities of our business partners. The central issues here include anti-corruption, upholding human rights, occupational safety, and environmental and climate protection, as well as OECD obligations and third-party certification. The results of a media search and assessments from an external rating provider are also included in the screening. In the 2022/23 fiscal year, all procurement processes, including those for conflict minerals, were revised with a particular focus on supply chain due diligence. The new Responsible Sourcing Policy entered into force on August 1, 2023.

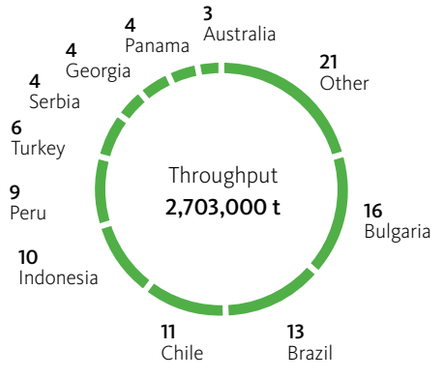
The Aurubis Business Partner Code of Conduct outlines our environmental, social and governance standards for our business partners. Compliance with these standards is the most important requirement for our successful collaboration with business partners. To obtain contractual reassurance from our suppliers, we have also adopted human rights, environmental and security clauses in 100 % of our long-term primary raw material contracts.

Aurubis' declaration on compliance with human rights and environmental obligations pursuant to Section 6(2) of the German Supply Chain Act (LkSG) summarizes Aurubis' human rights strategy. It describes Aurubis' processes for adhering to legal requirements, outlining the human rights and environmental risks identified as part of an annual risk analysis and the resulting expectations for our employees and suppliers.

We expect our business partners to report substantiated suspicions of human rights violations, for example using our Compliance Portal, also referred to as the whistleblower hotline. Complaints about sites that are taking part in the Copper Mark process can also be submitted through the Copper Mark's grievance mechanism.

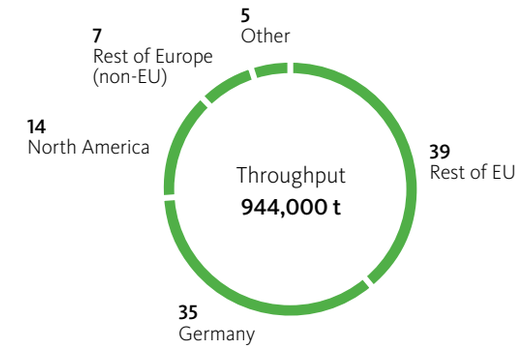
www.secure.ethicspoint.eu/domain/media/en/gui/107757/index.html ***and*** *www.aurubis.com/en/responsibility/whistleblower-hotline*.

Fig. 1.11: Origin of concentrates and throughput
for the Aurubis Group in 2022/23,[1] in %



[1] Percentages have been rounded.

Fig. 1.12: Origin of recycling materials and throughput
for the Aurubis Group in 2022/23,[1] in %



excluding FRP

[1] Percentages have been rounded.

Regulations and standards for responsible metal production

When it comes to carrying out human rights and environmental due diligence, Aurubis is subject to the requirements of the German Supply Chain Act (LkSG). Pursuant to the LkSG, Aurubis conducts a systematic risk analysis in the supply chain to identify, prevent and mitigate risks related to the destruction of natural habitats due to environmental pollution, prohibited production, use and/or disposal of mercury (Minamata Convention), prohibited production and/or use of substances within the scope of the Stockholm Convention (POP), and prohibited import/export of hazardous waste under the Basel Convention. Incidents that are potentially relevant for the LkSG are included in the subject-specific reporting to the Federal Office for Economic Affairs and Export Control (BAFA). Furthermore, to monitor human rights risk management in accordance with the stipulations of the LkSG in fiscal year 2022/23, we set up two committees that serve the role of human rights officer in the business sector and in the supply chain. The Corporate Sustainability & External Affairs department is represented in both committees and functions as an interface.

We have participated in the United Nations Global Compact since 2014 and are committed to working towards implementing its ten principles related to human rights, labor standards, the environment, and anti-corruption. We have pledged to comply with the OECD Due Diligence Guidelines to promote responsible supply chains. As part of the Copper Mark certification process at our sites in Hamburg, Lünen (both in Germany), Olen (Belgium), and Pirdop (Bulgaria), we underwent audits in accordance with the Copper Mark criteria on human rights and labor and social standards. This audit verified our human rights approach to our business activities and in the supply chain. The plant-specific audits can lead to concrete recommendations or plans for improvement that provide Aurubis AG motivation and guidance in boosting performance related to the 32 sustainability criteria of the Copper Mark. The Beerse and Stolberg sites started the Copper Mark certification process in fiscal year 2022/23.

In February 2023, Aurubis was one of the first companies in the world to commit to the new Copper Mark Chain of Custody Standard, which defines the requirements for certified copper-containing products in the supply chain and is the first standard that will cover the entire copper supply chain. The Copper Mark published the standard, a more detailed version of the previous guidelines, at the beginning of 2022. It also helps fulfill the standards of the London Metal Exchange (LME). This standard is currently being reviewed by the OECD for conformity with its due diligence requirements.

Since 2013, Aurubis' gold production has been annually certified as conflict-free according to the standards of the London Bullion Market Association (LBMA). This certificate verifies that we carry out our due diligence processes in accordance with the OECD standards. This certification option has been available for silver since 2019, and Aurubis' silver production has been certified as conflict-free since then as well. Tin production at our Beerse and Berango sites has been certified as conflict-free in accordance with the Responsible Minerals Assurance Process (RMAP) standard since 2015. This standard is also based on the OECD standard for conflict minerals.

The regulatory audit of the sites in Germany and Bulgaria for compliance with the due diligence requirements in accordance with the EU Conflict Minerals Regulation began in fiscal year 2022/23. The audit of the Hamburg site has already come to a successful conclusion. This legislation makes due diligence and auditing obligations along the supply chain binding for EU importers of tin, tantalum, tungsten, and their ores, as well as gold.

Risks and opportunities

Risk management in the Aurubis Group (risk management system)

Our objective in risk management is to manage and monitor the risks associated with our business with the help of a risk management system (RMS) tailored to our activities. Identifying and observing risk development early on is of major importance. Furthermore, we strive to limit negative effects on earnings caused by risks by implementing appropriate and economically sound measures.

Risk management is an integral component of the centralized and decentralized planning, management and monitoring processes and covers all of the Aurubis Group's main sites, business sectors, and central functions. The planning and management system, risk reporting, open communication culture, and risk reviews at the sites create risk awareness and transparency with regard to our risk situation and promote our risk culture.

Risk management officers have been appointed for all sites, business sectors, and central functions, and they form a network within the Group. The Group headquarters manages the network. Corporate Risk Management has regular discussions with the Corporate Environmental Protection, Sustainability, and Corporate Energy & Climate Affairs departments, for example to report on new legislative proposals, broadly identify risks related to them, and prepare measures to control these risks in good time. These discussions also promote the risk culture and risk awareness in the Aurubis Group. In addition to the risk management officers, a Group risk management function is established in the Aurubis Group. The RMS is documented in a corporate policy.

Standard risk reporting takes place bottom-up each quarter using a uniform, Group-wide reporting format that outlines identified risks and risks that exceed a defined threshold. Their probability of occurrence and the extent of the damage they could cause are evaluated, and instruments and measures implemented to manage them are provided. The risks registered with Group headquarters are assessed, qualitatively aggregated into significant risk clusters by Corporate Risk Management, and reported to the entire Executive Board. The report also establishes the basis for the report to the Audit Committee as well as external risk reporting.

Local risk management and opportunities

Based on the system described above, every site and every centralized function is required to maintain and carry out "local" risk management. For example, the Corporate Environmental Protection and Energy & Climate Affairs departments have codified their own corporate policies that govern the way they handle risks in their specific areas of responsibility – in alignment with the Corporate Risk Management Policy.

Moreover, the environmental risks for all Group sites are regularly analyzed and assessed by external experts. Measures are developed and stipulated to effectively counter possible risks.

Since 2022, risk analysis has also included the areas of biodiversity, water availability, and nature conservation. Opportunities are systematically analyzed as well. The risk assessments of all production sites were updated in 2023. If they exceed the thresholds mentioned above, key results from these analyses are included in the risk reporting that is submitted to Corporate Risk Management.

One opportunity is that Aurubis will substantially contribute to achieving the targets of the European Green Deal. We enable a more efficient use of resources and an increase in recycling in particular. At Aurubis, we produce multimetals using environmentally compatible methods and play a role in a circular, climate-friendly economy. With the ongoing integration of the plants in Beerse and Berango, Aurubis is reinforcing its recycling capabilities and opportunities. Recycling is crucial for a sustainable society.

Aurubis is committed to the target of becoming carbon-neutral well before 2050. In late 2019, we joined the UNGC initiative Business Ambition for 1.5 °C, which requires the Group to set science-based emissions reduction targets and thus to contribute to achieving the 1.5 °C objective from the Paris Climate Agreement. Our metals are a key component of modern environmental technologies; without our products, an energy transition would not be possible. Aurubis is also taking advantage of the opportunity to continue developing the best available techniques (BAT). For instance, we are investing in a new ridge turret suctioning system in our copper smelter in Hamburg to develop innovative, IT-controlled environmental protection technologies and to reduce emissions even further. This project makes us a forerunner that can serve as a role model to other multimetal producers.

Explanation of risks

The main risks in the risk clusters "Energy and climate," "Sustainability," and "Environmental protection," including the specific measures to control the risks, are explained in the Risk and Opportunity Report of the Annual Report *Annual Report 2022/23*. The climate risks in the Annual Report are categorized as physical and transitory risks, in alignment with the definition given by the TCFD (Task Force on Climate-Related Financial Disclosures). A separate climate risk report is included in the Sustainability Report as well. It is drafted in accordance with TCFD recommendations and reports on climate risks using generally accepted global warming scenarios and, in particular, on the physical risks at our sites. In this way, we document that we take climate protection very seriously on the one hand, and, on the other, that we fulfill the heightened interest in information that the readers of the Annual Report have regarding our climate risks.

In addition to the financial risks described, there are also non-financial risks that are reported separately in the scope of the Non-Financial Report *Annual Report 2022/23*. In the process, no non-financial risks were identified that were very likely to cause a serious negative impact on employee and environmental matters, on respect for human rights, on the prevention of corruption and bribery, or on social matters. Nevertheless, it is important to us to handle non-financial risks even if they are evaluated as non-material according to the strict definition of the German Commercial Code (HGB), and we have developed and implemented related management approaches.

Iron silicate: A versatile and sustainable substitute for primary raw materials

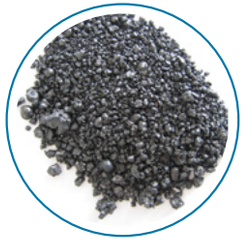
For us, practical resource conservation includes using our raw materials as completely as possible and directing them into the value chain. One example is our synthetic minerals consisting of iron silicate that we produce in our metal refining and recycling processes and whose qualities we specifically adjust and monitor for applications in the construction sector in particular.

What is iron silicate?
Iron silicate is an industrially produced mineral comparable to natural stone from quarries, but without the disadvantage of strong interference in nature. Aurubis is a leading global provider of non-ferrous metals and one of the largest copper recyclers worldwide. Iron silicate has different uses, especially in construction as a replacement for primary building materials.

What does iron silicate consist of?
As the name suggests, it mainly consists of the mineral iron silicate, as well as silicates of aluminum and calcium. It may still contain non-ferrous trace metals primarily included in the silicate phases, which are characterized by high binding stability and low leachability.

There are three basic products, depending on the process:

Iron silicate stone, with edges up to 450 mm in length, comparable to igneous rock



Iron silicate granulate, similar to natural volcanic glass, e.g., obsidian

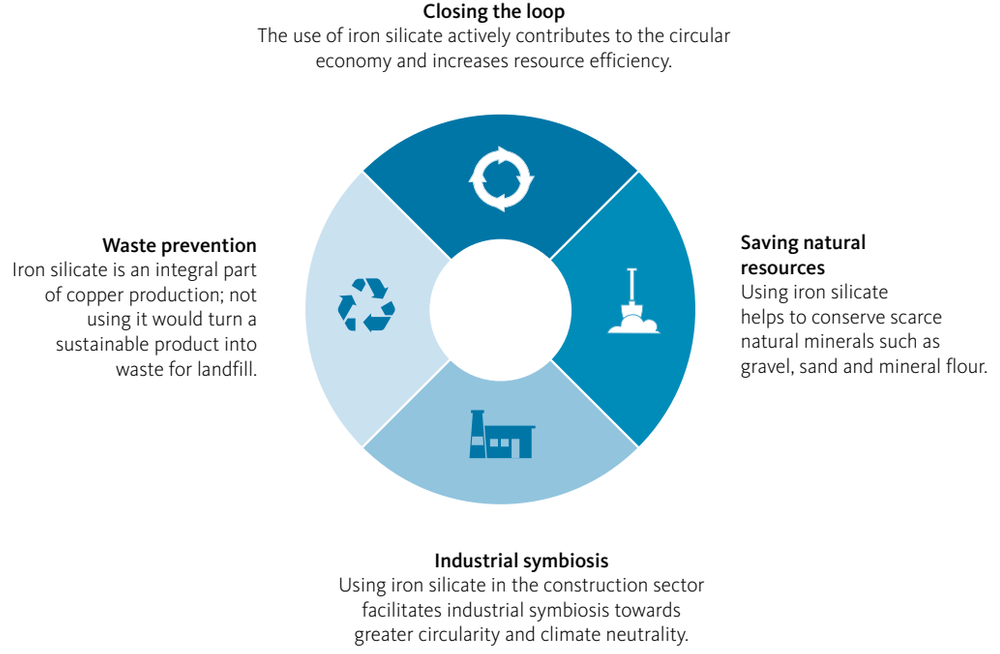
Iron silicate fines, similar to mineral flour

Advantages of iron silicate

- » High dry bulk and specific density
- » Ideal volume stability
- » Optimal surface coarseness
- » Very durable
- » Does not absorb much water
- » Very hard
- » Dense pore structure
- » Very good frost resistance
- » Cubic grain shape
- » High weather resistance
- » No linear deformations

A long-lasting, sustainable replacement for natural building materials

Fig. 1.13: A heavyweight with considerable potential in the circular economy and climate protection



What is iron silicate used for?

Its technical properties enable iron silicate it to be deployed in a wide range of applications. Fifty years of practical experience and substantial testing demonstrate that it is safe to use throughout its entire life cycle. Iron silicate is registered in compliance with the EU's REACH regulation and is available at a consistent quality throughout the year.

Area		Purpose	Special advantages
Hydraulic engineering		Protecting embankments and the beds of rivers, canals and harbor basins against tide and waves.	» Thinner stone layers and less excavation work » Stability through high dry bulk density, cubic particle shape, and optimal surface texture
Road construction		Anti-frost and gravel-bearing layer	» Very good load-bearing capacity » Frost resistance » Water permeability
Cement		Underlay for paving	» Ready-to-use source of iron » Decreases burning temperature and therefore fuel consumption
Concrete production		Versatile use as a substitute for natural aggregates and Portland cement	» Enhances workability in its fresh state, improves mechanical properties, enhances durability » Enables special types of concrete, e.g., radiation protection concrete, heavyweight concrete
Abrasives		Granulate used for blast cleaning	» Provides a perfect grit for blasting steel, stone and concrete

In addition to these examples, **iron silicate can also be used in asphalt, ceramics, dry mixtures, coal flotation, soil stabilization,** and in many other ways.

Aurubis' commitment to innovation for low-carbon construction materials

We are continuously collaborating with EU innovation and research projects to further investigate the potential offered by iron silicate in new applications and to develop less carbon-intensive construction materials.

Project
DuRSAAM

Target: Development of a new generation of construction material/concrete with a low carbon footprint. Application in alkali-activated binders/geopolymers based on iron silicate.

Financing: Horizon 2020

Partners include: Ghent University, Delft University of Technology, Karlsruhe Institute of Technology, ETH Zurich, and 15 industrial partners

Project
SOCRATES

Target: European training network for the valorization of industrial process residues, such as cementitious materials and inorganic polymers.

Financing: Horizon 2020 MSCA-ETN

Partners include: Katholieke Universiteit Leuven, University of Leicester, University of Bonn, TU Bergakademie Freiberg

Project
RECOVER

Target: Upscaling project to produce inorganic polymer building materials from iron silicate, using a modular and mobile upscaling unit. This would result in a lower environmental footprint and would make metallurgical industries an important raw material supplier with integrated zero-waste processes.

Financing: EIT KIC Raw Materials

Partners include: Katholieke Universiteit Leuven, University of Athens, ResourceFull, ZAG

Project
GHRANTE

Target: Development of innovative, recyclable inorganic polymer-based materials, based on slags from non-ferrous metallurgy.

Financing: SIM ICON MARES

Partners include: Katholieke Universiteit Leuven, VU Brussels, BRRC, Flamac

A new raw material for construction that saves natural resources: The first projects using iron silicate as a filler in cement have been realized in Bulgaria

Impressions from a number of constructions sites in Bulgaria that used cement with iron silicate as a filler. With this pilot project, we are pursuing the goal of offering and establishing a new, resource-efficient and — close to our plants — locally available raw material: iron silicate from our copper production.

Floor slab

of a private house

Primary construction
of a building

Supporting walls

Soil fortification

on a farm

Buildings

A comparison — life cycle assessment for our metal products

The EU has introduced an ambitious industrial shift aimed at achieving a green and digital transformation. Copper, tin, silver, gold and other metals number among the most important materials for this transition. Almost all green technologies, such as wind turbines, solar energy plants, batteries, network technologies, and hydrogen electrolyzers, require a larger quantity of metals. This means sustainable metal production is growing in importance.

Aurubis assumes responsibility for the global challenges of climate change, environmental protection, and resource conservation. Here our focus includes improving the environmental compatibility of products and promoting sustainability along the entire supply chain. Reliable life cycle assessments help us comprehensively and transparently evaluate the environmental impacts of our products.

We have continued to advance the life cycle assessments of our products. In addition to updating the environmental profiles of our core product, the copper cathode, as well as gold, silver, tin and our continuous cast wire rod and shapes products, we have also completed life cycle assessments for oxygen-free rod (Foxrod) and nickel sulfate based on 2022 data.

Starting in 2023, the environmental impacts of Aurubis products will be exclusively calculated using the Environmental Footprint assessment method (EF 3.0) based on 16 impact categories in order to align with the best scientific and industrial reporting practices. The results based on the CML method (Institute of Environmental Sciences at Leiden University in the Netherlands) will not be used anymore.

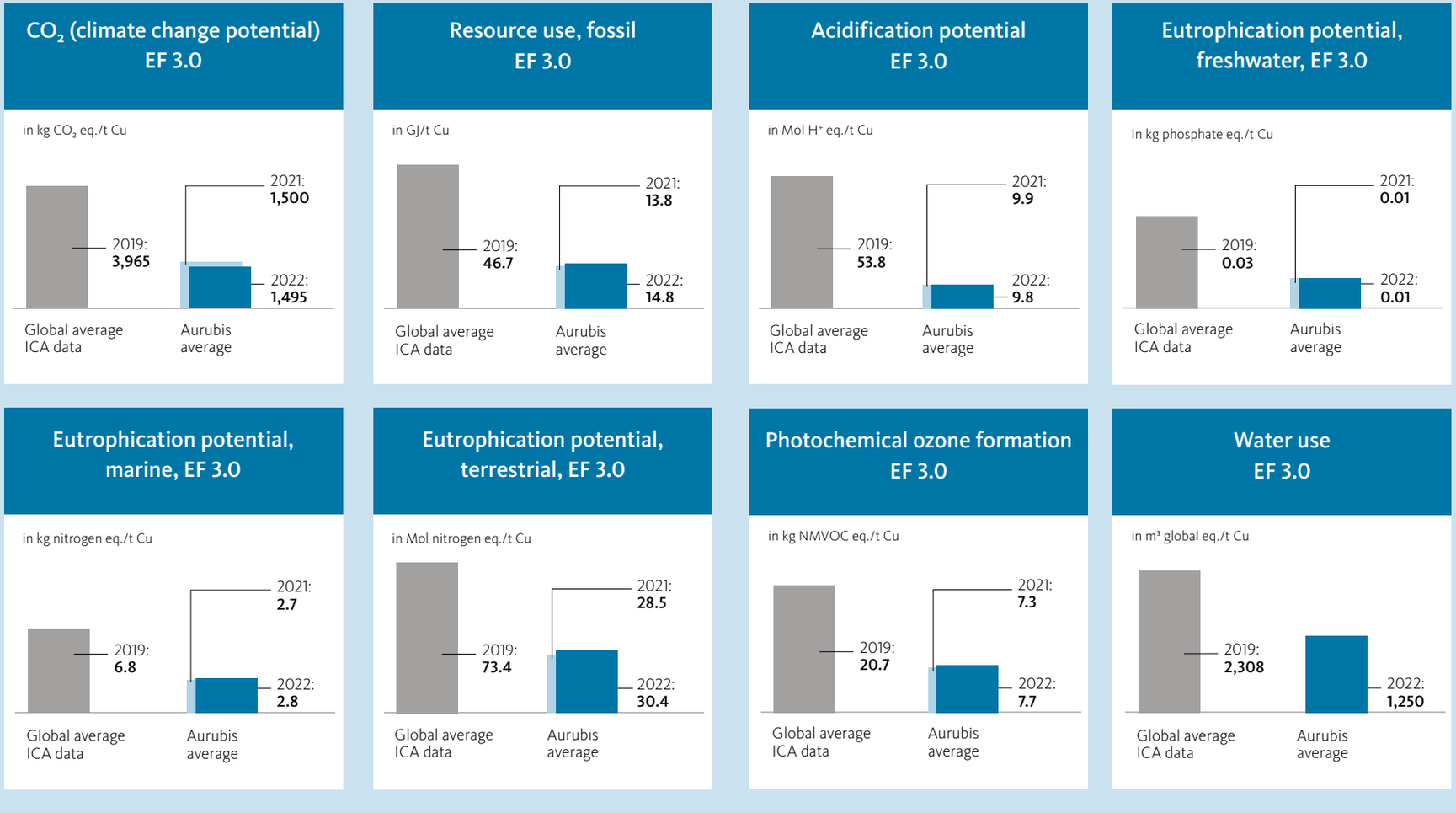
The most important impact categories of the life cycle assessment:

Impact category	Description
Global warming potential	A measure of greenhouse gas emissions, such as CO_2 and methane. These emissions are causing an increase in the Earth's absorption of radiation emitted by the sun, increasing the greenhouse effect. This can in turn have adverse impacts on ecosystem health, human health, and material welfare.
Eutrophication potential	Eutrophication covers all potential impacts of excessively high levels of macronutrients, the most important of which include nitrogen (N) and phosphorus (P). Nutrient enrichment can cause an undesirable shift in species composition and elevated biomass production in both aquatic and terrestrial ecosystems. In aquatic ecosystems, increased biomass production may lead to depressed oxygen levels because of the additional consumption of oxygen in biomass decomposition.
Acidification potential	A measure of emissions that cause acidifying effects to the environment. The acidification potential is a measure of a molecule's capacity to increase the hydrogen ion (H^+) concentration in the presence of water, thus decreasing the pH value. Potential effects include fish mortality, forest decline, and the deterioration of building materials.
Photochemical ozone formation	A measure of emissions of precursors that contribute to ground level smog formation (mainly ozone), produced by the reaction of VOC and carbon monoxide in the presence of nitrogen oxides under the influence of UV light. Ground level ozone can be detrimental to human health and ecosystems and may also damage crops.
Ressource use, fossil	A measure of the entire quantity of fossil, non-renewable resources (crude oil, natural gas, etc.) that is extracted from the Earth and used for primary energy production.
Water use	Water removal potential (method of available water supply). Based on the inverse value of the difference between water availability per area and water demand per area.

The life cycle assessments included all the activities required for manufacturing the products from the cradle to the plant gates. These include ore mining, smelting and refining, transport, energy consumption, and auxiliary materials. The studies were undertaken in accordance with the ISO 14040 and 14044 standards for life cycle assessments. The impact categories were selected to cover a wide range of relevant environmental impacts and were each determined using a well established scientific approach. The results for all 16 indicators are included in the respective reports on the life cycle assessments.

However, it should be kept in mind that the impacts of "abiotic deletion potential" and "toxicity" are not reliable or precise enough to be used for metals.

Global average ICA data, Aurubis average[1]



[1] The diagrams show the industry's global average results for reference year 2019 (left bar) and the Aurubis average results for copper cathodes in 2021 and 2022 (right bar).

The environmental profiles of the Aurubis products were tested by TÜV NORD CERT in accordance with the DIN EN ISO 14040:2021 and DIN EN ISO 14044:2021 standards. The results support what the Tomorrow Metals by Aurubis label stands for. The updated life cycle assessment demonstrates that the ecological footprint of Aurubis copper cathodes in all relevant impact categories is more than 50 % lower than the ICA (International Copper Association) average. The ecological footprint of Aurubis copper cathodes has considerably decreased again in all the impact categories assessed. In 2022, the CO_2 footprint was 35 % lower than in 2013. At the same time, the CO_2 footprint is more than 60 % lower than the current global industry average for copper cathodes from the International Copper Association. The CO_2 footprint of our continuous cast wire rod is more than a third below the global average.

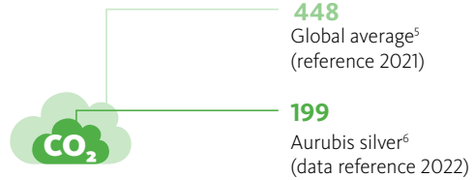
The results from all the other products assessed also underscore Aurubis' pioneering role. Our silver and gold CO_2 footprints are both more than 50 % below the global industry average. Our recycling and the efficiency of our metal recovery contribute decisively to our positive results. In fiscal year 2021/22, the recycling content of Aurubis silver and gold was 56 % for silver and 24 % for gold.

The values for tin are even better with a CO_2 footprint at more than 75 % below the global average of the International Tin Association. Aurubis manufactures tin bars completely from secondary raw materials.

Data sheets and reports on the life cycle assessments of our products are available at:
www.aurubis.com/en/responsibility/environment-energy-and-climate/ecological-footprint-of-our-products/environmental-profiles-of-our-products

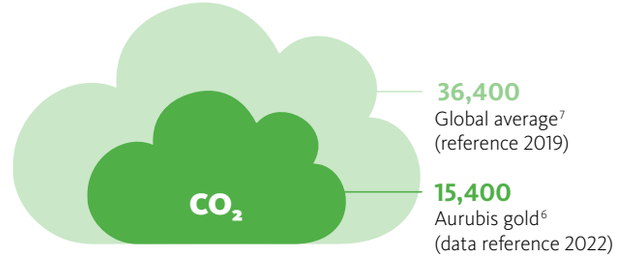
CO_2 FOOTPRINT OF COPPER CATHODES
in kg CO_2 equivalent per t cathode copper

CO_2 FOOTPRINT OF SILVER
in kg CO_2 equivalent per kg silver

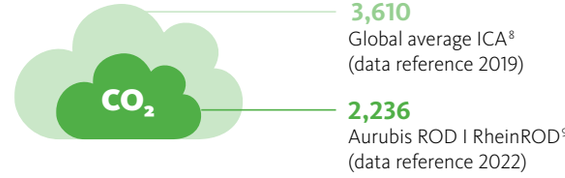


CO_2 FOOTPRINT OF TIN
in kg CO_2 equivalent per t tin

CO_2 FOOTPRINT OF GOLD
in kg CO_2 equivalent per kg gold



CO_2 FOOTPRINT OF AURUBIS ROD I RHEINROD
in kg CO_2 equivalent per kg Aurubis ROD



[1] International Copper Association, Copper Environmental Profile, Global, 2023.
[2] Aurubis, with support from Sphera, report: Life Cycle Assessment of Copper Cathode, Oct. 2023.
[3] International Tin Association, Life cycle assessment of average tin production. Please note that the ITA data is provided pursuant to the CML method, which is only comparable to a limited extent.
[4] Aurubis, with support from Sphera, report: Life Cycle Assessment of Tin, Oct. 2023.
[5] Ecoinvent, 2021 database.
[6] Aurubis, with support from Sphera, report: Life Cycle Assessment of Silver and Gold, Oct. 2023.
[7] World Gold Council, Gold and climate change: Current and future impacts, Oct. 2019.
[8] International Copper Association, Life Cycle Assessment of Wire Rod Global, March 2023.
[9] Aurubis, with support from Sphera, report: Life Cycle Assessment of Wire Rod, Oct. 2023.

How we achieved this: Improvements through the continual implementation of environmental and climate protection measures

The targeted improvements were only possible through considerable investments in environmental measures that achieved ambitious environmental standards. In environmental protection, Aurubis also develops innovative and energy-efficient technologies that often set new standards worldwide.

Emission reduction
One approach we have taken to reducing emissions in air is the innovative gas purification plant installed at our primary smelter in Pirdop (Bulgaria). The plant uses a modern process known as Sulfacid that is unique in both Bulgaria and in the entire copper smelting industry.

Energy-efficient technologies
We have also invested in energy-efficient and low-carbon technologies at all Aurubis Group sites, implemented energy-saving measures, supported the switch to renewable energies, and as such enabled decarbonization. This includes the Industrial Heat project, for example, implemented at the Hamburg plant to use the waste heat from our production processes for district heating. The project has made HafenCity East the first quarter close to our Hamburg plant that is now almost exclusively supplied with CO_2-free industrial heat.

Expanding recycling capacities
Expanding Aurubis' recycling capacities and the acquisition of recycling specialist Metallo also contributed to improving our ecological footprint. With the recycling facilities in Beerse (Belgium) and Berango (Spain), Aurubis has considerably expanded the recycling of secondary materials, which results in an even smaller footprint in the LCA results. The proportion of recycled copper in our copper cathodes was 44 % on average across the Group (fiscal year 2022/23).

Improve recovery of multimetals
Aurubis' efforts to transform raw materials into marketable products as completely as possible are also contributing to shrinking our overall footprint. Aurubis will continue to build on this strength in order to further cement our position as the most efficient and sustainable integrated smelter network in the world. This network also includes a metallurgical infrastructure that enables improved multimetal recovery.

Tomorrow Metals
We are ready for the future — are you?

Investments of more than
€ 830 million
IN ENVIRONMENTAL PROTECTION SINCE 2000

Reducing around
35 %
OF THE CO_2 FOOTPRINT OF AURUBIS CATHODES SINCE 2013

Aurubis processes about
1 million t
OF RECYCLING MATERIAL ANNUALLY

Today
4
AURUBIS SITES ARE CERTIFIED WITH THE COPPER MARK

Everything we do, we do with passion and the highest quality standards. This is also true of one the most important goals of our time: sustainable economic activity. As an energy- and resource-intensive company, we recognized the need to act quite early and have done a lot to make our products and processes more sustainable. This places us among the best in the industry. We make this commitment tangible by summing it up in a product label: **Tomorrow Metals**.

This label is our promise to our customers and all our stakeholders that our entire product range is manufactured and delivered using only the highest ecological and social standards — today and in the future. This is especially true of our responsibility in the supply chain. Our life cycle assessments also show, using comparable figures, that we are much better than the industry average *page A-32*. Tomorrow Metals therefore serves as the responsible, robust foundation of the significant societal transformations of our time, transformations that require our metals: They pave the way for producing renewable energies, for digitalization, for sustainable mobility, and much more.

Tomorrow Metals stands for our efforts to continuously create more value with a lower footprint, in all areas of sustainability: Environment, People and Economy.

Tomorrow Metals

Our goal is to create **more value** with a **lower environmental footprint**.

By decarbonizing our production, we are contributing to the **1.5 °C target of the Paris Climate Agreement**.

We are consistently expanding our **multimetal recycling** to make a considerable contribution to the **circular economy** and to conserve **natural resources**.

Responsibility: Everything we do focuses on the balance among the **Economy, Environment and People**.

Environmental protection — Facts and figures

As in previous years, this year's Environmental Statement is based on internationally recognized guidelines and reporting standards, in particular the guidelines of the Global Reporting Initiative (GRI) and EMAS.[1]

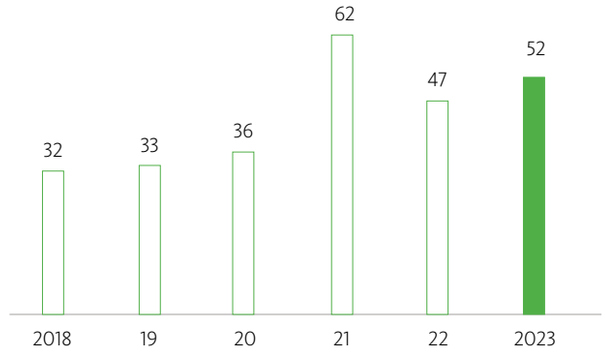
As described in the 2023 Environmental Report, our specific reduction targets and the associated reporting of specific emissions will only be based on our multimetal indicator — the copper equivalent — starting this year *Targets and successes in environmental protection*.

Reporting on additional environmental KPIs will also continue to be based on copper production to represent medium- and long-term trends.

» We have invested more than € 830 million since 2000 and about € 430 million since 2012 in measures to improve environmental protection throughout the Group *Fig. 1.13*.

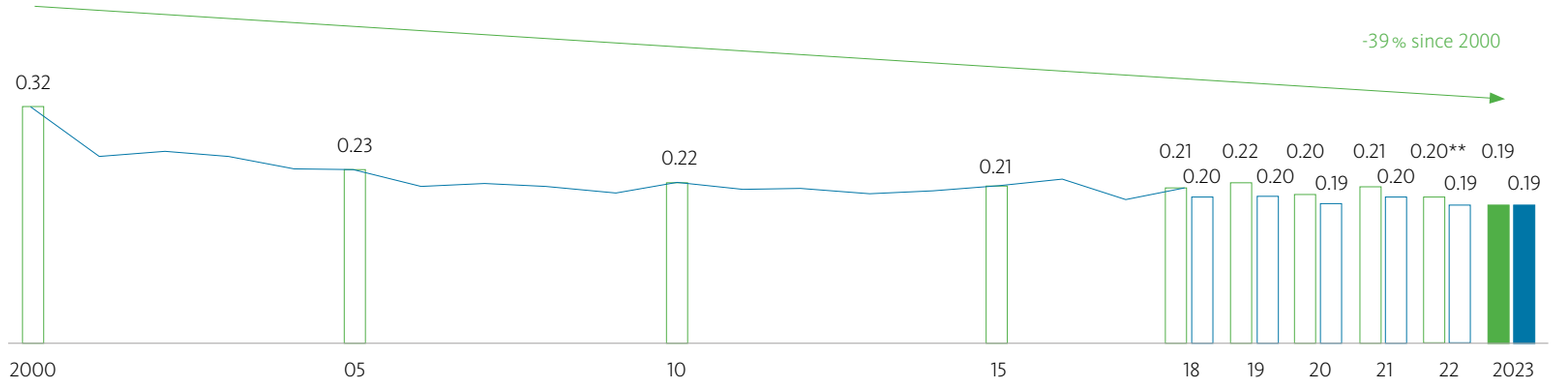
At 0.19 ton of CO_2 per ton of copper output, emissions from fuels were at a low level in 2023. Product-related emissions have been reduced by 39 % since 2000 *Fig. 1.14*.

Fig. 1.13: Capital expenditure for environmental protection in the Aurubis Group*
in € million



* Environmental investments of all production sites that are majority-owned by Aurubis (>50 %). The Aurubis sites in Beerse and Berango have been included since 2020. The data relates to environmental investments per fiscal year. Single years are provided for readability, for example 2023 for fiscal year 2022/23.

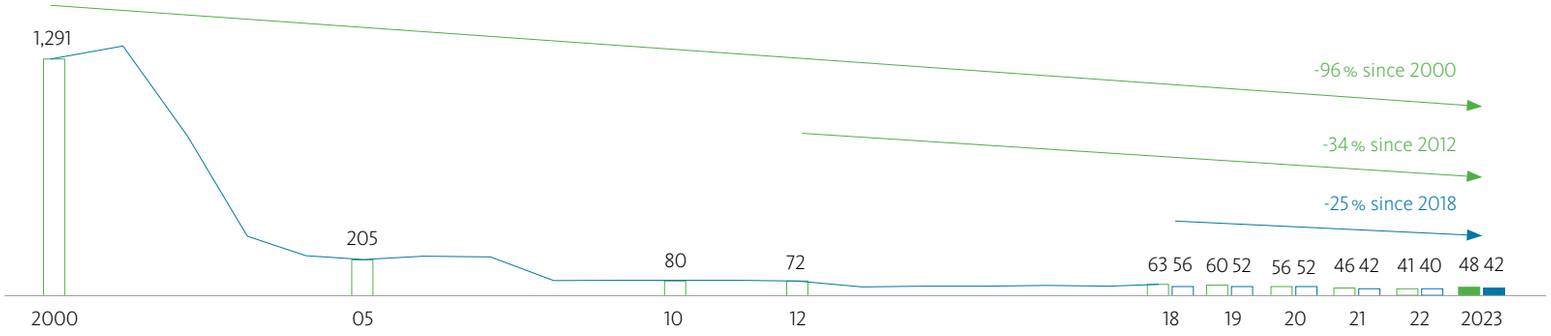
Fig. 1.14: CO_2 emissions from fuels in Aurubis Group copper production*
CO_2 emissions in t/t of copper output and in g/t of copper equivalent



* The Aurubis sites in Beerse and Berango have been included since 2020.
** KPI was corrected after the fact.

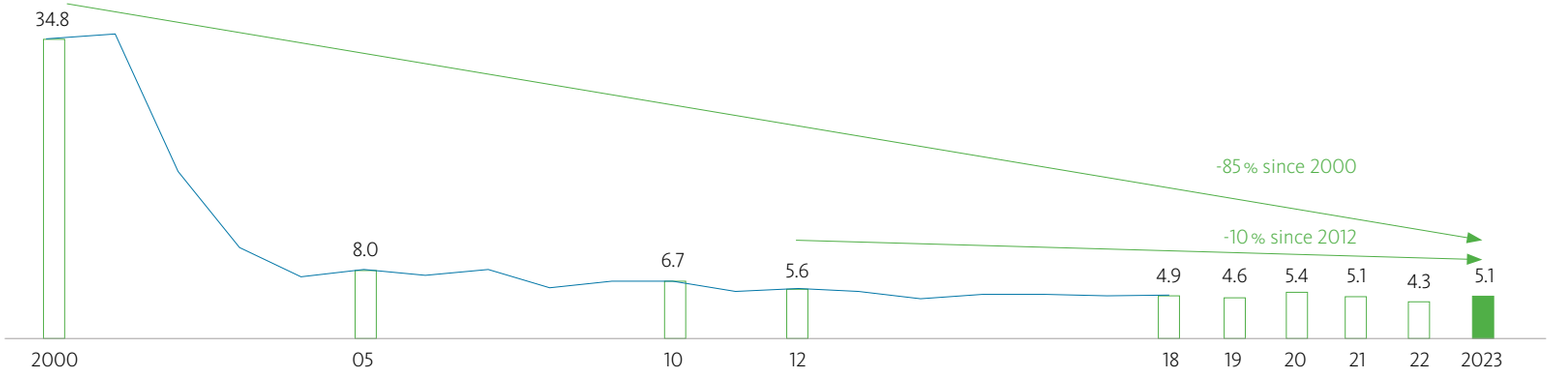
[1] This report may include slight deviations in the totals due to rounding. Some of the data is preliminary since it had not been validated externally as of the editorial deadline.

Fig. 1.15: Successful reduction of dust emissions in Aurubis Group copper/multimetal production*
Dust emissions in g/t of copper output and in g/t of copper equivalent



* The Aurubis sites in Beerse and Berango have been included in the assessment of specific emissions based on copper production since their acquisition in 2020. With the changeover to and target-setting based on the copper equivalent, the Aurubis sites in Beerse and Berango have been included in the representations since 2018.

Fig. 1.16: Sulfur dioxide emissions in Aurubis Group primary copper production
SO_2 emissions in kg/t of copper output



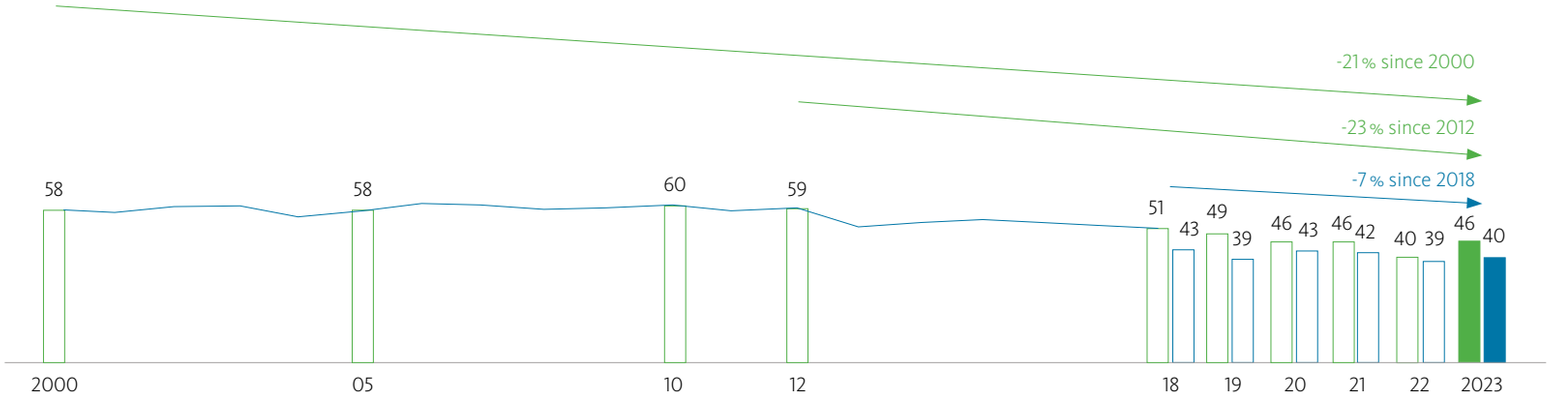
The dust emissions arising during copper production can contain metals and metal compounds. The consistent use of the best available plant techniques has led to a 96 % decline in dust emissions in copper production per ton of copper since 2000.

Compared to the reference year 2012, dust emissions per ton of copper were reduced by 34 %. The reduction based on the copper equivalent was 25 % since 2018 *Fig. 1.15*.

One of the main focuses in the 1990s was the use of state-of-the-art filter technologies for all directed emission sources, such as chimneys. Today, projects to reduce fugitive emissions have high priority. For example, fugitive emissions can arise around hall openings — such as gates, doors or ridge turrets — and during material storage and handling. We have already achieved a great deal in reducing directed dust emissions with technical measures and have nearly exhausted the technical possibilities. Further developments related to non-directed emissions pose additional challenges for the future. It will be necessary to develop innovative technologies and break new technical ground.

Apart from copper, sulfur is one of the main components of the copper concentrates in use. The gaseous sulfur dioxide produced when concentrates are smelted is converted into sulfuric acid in the sulfuric acid plant using the modern double catalysis process. When compared internationally, Aurubis is a forerunner in reducing sulfur dioxide emissions: Emissions per ton of copper output have been reduced by 85 % since 2000 *Fig. 1.16*.

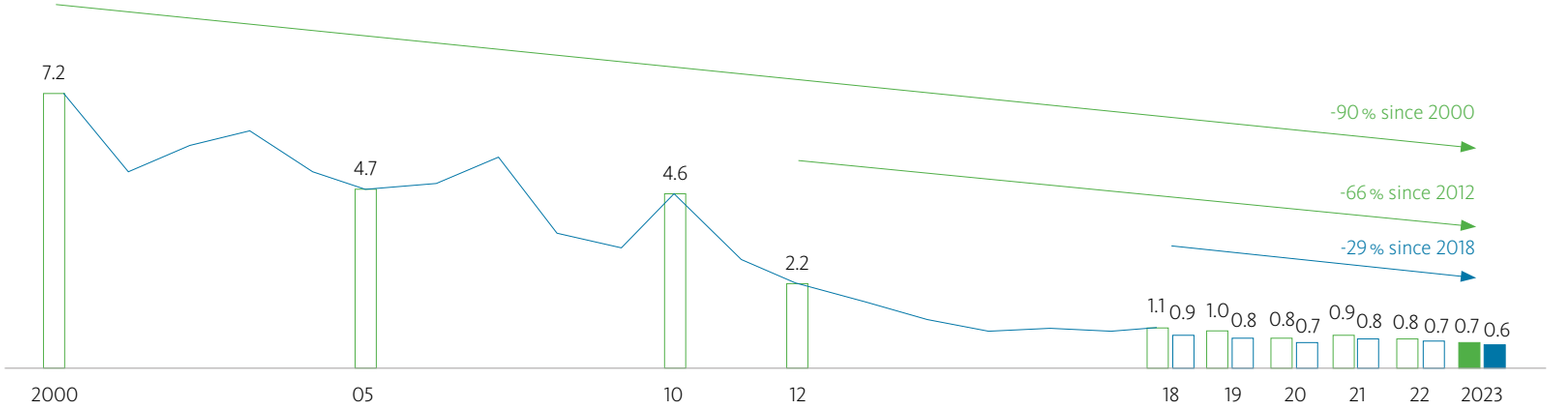
Fig. 1.17: Water withdrawal in Aurubis Group copper production*
Water withdrawal in m³/t of copper output



Copper
Copper equivalent

*The Aurubis sites in Beerse and Berango have been included since 2020.

Fig. 1.18: Metal emissions[1] to water in Aurubis Group copper/multimetal production*
Metal emissions to water in g/t of copper output and in g/t of copper equivalent



Copper
Copper equivalent

*The Aurubis sites in Beerse and Berango have been included in the assessment of specific emissions based on copper production since their acquisition in 2020. With the changeover to and target-setting based on the copper equivalent, the Aurubis sites in Beerse and Berango have been included in the representations since 2018.

[1] KPI includes the following metals: Cu, As, Cd, Hg, Pb, Ni, Zn.

Apart from conserving water, treating wastewater and thus avoiding environmental pollution is one of our fundamental responsibilities in industrial environmental protection since water may contain metals after use. We have reduced metal emissions to water in copper production processes from 7.2 to 0.7 g per ton of copper output since 2000. This is a decline of 90 %.

Compared to the reference year 2012, metal emissions to water per ton of copper was reduced by 66 %. The reduction based on the copper equivalent was 29 % since 2018 *Fig. 1.18*.

At a glance – Environmental KPIs for the Aurubis Group[1]

	Unit	2019	2020	2021	2022	2023
Emissions to air						
Dust	t	93	102	86	77	81
NO_x	t	769	863	820	877	805
SO_2	t	4,154	5,424	5,212	4,789	4,799
Water consumption						
Total water withdrawal	**million m³**	**71.0**	**78.3**	**77.9**	**70.7**	**73.2**
Water withdrawal by source						
Surface water	million m³	67.7	74.6	74.2	67.4	69.8
Rainwater	million m³	0.3	0.6	0.6	0.6	0.9
Groundwater	million m³	0.5	0.6	0.7	0.4	0.4
Municipal water	million m³	2.1	2.2	2.1	2.0	1.8
Other	million m³	0.3	0.3	0.4	0.3	0.4
Total water discharge	**million m³**	**66.1**	**71.9**	**70.3**	**66.4**	**67.5**
Water discharge by destination						
Surface water	million m³	64.7	70.5	69.1	65.3	66.5
Municipal wastewater system	million m³	1.3	1.3	1.2	1.1	1.0
Wastewater to third parties	million m³	<0.1	<0.1	<0.1	<0.1	<0.1

[1] These KPIs include all production sites that are majority-owned by Aurubis (>50 %). The Aurubis sites in Beerse and Berango have been included since 2020.

Some of the data is preliminary since it had not been validated externally as of the editorial deadline. The table may include slight deviations in the totals due to rounding.

	Unit	2019	2020	2021	2022	2023
Waste						
Hazardous waste	**t**	**48,659**	**50,970**	**50,543**	**47,361**	**44,392**
Landfilling	t	36,429	36,473	36,653	36,333	31,976
Disposal (thermal)	t	123	370	1,254	159	79
Thermal utilization	t	391	441	445	659	721
Recycling	t	8,731	11,638	10,338	8,035	10,117
Storage	t	1,682	1,899	1,417	257	1,248
Internal utilization/recycling	t	1,303	149	436	1,919	253
Non-hazardous waste	**t**	**46,992**	**81,705**	**41,984**	**38,740**	**38,496**
Landfilling	t	1,739	17,491	4,439	2,731	2,032
Disposal (thermal)	t	682	624	583	643	628
Thermal utilization	t	590	435	950	802	939
Recycling	t	38,354	57,068	34,970	33,828	33,721
Storage	t	89	133	211	71	290
Internal utilization/recycling	t	5,537	5,955	832	664	885
Construction waste	**t**	**122,503**	**17,887**	**28,554**	**126,730**	**94,359**
Energy and CO_2						
Total energy consumption	**million MWh**	**3.47**	**3.72**	**3.79**	**3.62[4]**	**3.51**
Primary energy consumption[1]	million MWh	1.69	1.72	1.85	1.76[4]	1.74
Secondary energy consumption[2]	million MWh	1.78	2.00	1.94	1.85[4]	1.77
Direct CO_2 emissions[3]	kt CO_2	503	540	559	555[4]	558

[1] Including energy consumption for on-site vehicle traffic.
[2] Including electricity for oxygen generation.
[3] Excluding CO_2 emissions from vehicles in line with the emissions trading system.
[4] KPI was corrected after the fact.
Some of the data is preliminary since it had not been validated externally as of the editorial deadline. The table may include slight deviations in the totals due to rounding.

Hamburg Site

The Hamburg plant

The largest Aurubis AG production site and the Group headquarters is located on the Elbe island Peute, only about four kilometers, as the crow flies, from Hamburg's city hall. At the Hamburg plant, Aurubis AG operates facilities for producing copper and other non-ferrous metals as well as for processing copper.

The plant was constructed in 1908 on an area of about 870,000 m² in Peute, an industrial inland harbor area in the Veddel district. Following reconstruction after World War II, the production facilities were continuously expanded and steadily modernized. Today, Aurubis AG's Hamburg site is one of the world's most state-of-the-art primary and secondary copper smelters and has an authorized production capacity of 450,000 t of copper cathodes each year. A total of about 2,500 people are employed at the Hamburg site, including 191 apprentices.

The individual production sectors at Aurubis AG in Hamburg are divided into three plant areas *Fig. 2.1*. Plant North is mainly comprised of the administrative buildings, the workshops, sampling, the secondary copper smelter, and precious metal production. Plant South includes the sludge decomposition plant, the cracking acid cleaning facility, the wastewater treatment facility, the concentrate delivery area, the chemical plants, workshops and the casting line in particular. Plant East includes the main primary copper production facilities: the primary smelter (RWO), the contact acid plant (KAWO), and the tankhouse. This section also houses the rod plant.

Fig. 2.1: The Aurubis plant in Hamburg — a downtown copper smelter

1 Continuous casting plant 2 Secondary copper smelter/precious metals 3 Rod plant 4 Tankhouse 5 Primary smelter (RWO) 6 Administrative building

Processes at the Hamburg plant

Copper production is based on the use of primary raw materials (copper concentrates) and secondary raw materials (recycled materials, including electrical and electronic scrap).

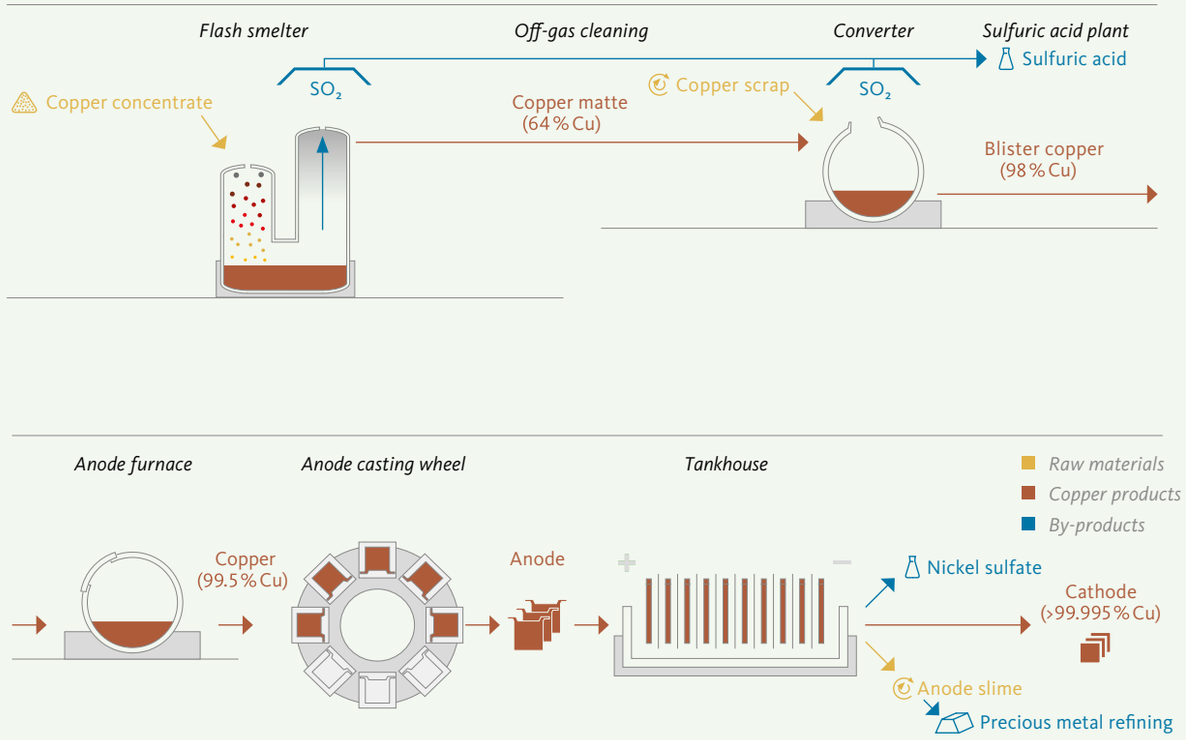
In the primary copper smelter, copper anodes (with a copper content of about 99.5 %) are produced from the primary raw material, copper concentrates, in multi-step pyrometallurgical processes. The metals in recycling materials can be drawn out in each step of the existing processes. The sulfur in the primary and secondary raw materials is oxidized into sulfur dioxide and converted in the downstream double absorption contact acid plant into sulfuric acid and oleum, two marketable products. These products are primarily used in the fertilizer and chemical industries.

Copper cathodes with a copper content of over 99.99 % are produced from the copper anodes in the copper tankhouse using electrochemical methods. The cathodes are used to manufacture copper intermediates (continuous cast rod, copper shapes) *Fig. 2.2*. The cathodes can be traded on the global metal exchanges.

Intermediates primarily produced in copper refining, such as flue dusts and slimes, are further treated in an electrothermal process in the secondary copper smelter's electric furnace.

Minor metals such as zinc, nickel, antimony, selenium and tellurium are collected and enriched in a targeted way in the matrix metals copper and lead. In the subsequent pyro- and hydrometallurgical processes of multimetal recovery, these elements are brought out in metallic form or as metal compounds.

Fig. 2.2: From copper concentrate to cathode



Internal intermediates and purchased recycling materials rich in precious metals are processed to extract precious metals. In the process, primarily internal and external anode slimes from the copper tankhouse, as well as skimmings rich in precious metals and bullion containing sulfur, are used as input in the top-blown rotary converter.

In the precious metal smelter, precious metals (silver, gold, platinum group metals) are separated using hydrometallurgical procedures and then extracted as commercial products.

Environmental protection organization at the Hamburg site

As the operator of facilities requiring a permit in accordance with Section 52b of the Federal Immission Control Act (BImSchG) and Section 58 of the Circular Economy Act (KrWG), the Aurubis AG Executive Board or an appointed member of the Executive Board is responsible for compliance with environmental protection regulations.

All environmental protection issues are coordinated, organized and monitored in the Environmental Protection department to support the different business sectors. The department appoints officers for the fields of immission protection, water pollution control, waste, accidents and harmful substances.

The integrated management system for occupational health and safety, energy, quality and the environment

In 2017, the three separate management systems for the environment, energy and quality were combined into an integrated management system (IMS) and jointly certified.

Aurubis AG has had an environmental management system at the Hamburg site since 2002, which is certified in accordance with ISO 14001 and EMAS.

The energy management system at the Hamburg site was implemented in 2005. It was reviewed within the scope of environmental management until 2013. In May 2013, the energy management system was certified for the first time in accordance with ISO 50001 due to the energy policy parameters. The switch to the revised 2018 standard took place in 2019, accompanied by internal workshops and coordinated dialogue about experiences within the Aurubis Group.

The quality management system for the entire Hamburg plant is certified in accordance with the ISO 9001 standard.

Occupational health and safety management was certified pursuant to ISO 45001 as an integral part of the IMS for the first time in 2021.

Tasks of the environmental management system

The environmental management system is responsible for maintaining and improving our environmental performance, ensuring compliance with our legal obligations, and strengthening our market position. Targets and measures are defined, and their implementation monitored accordingly. Situational evaluations form the basis for decisions about the type, extent, suitability and execution of environmental protection measures. The EMAS environmental management system also helps implement the Aurubis Group's defined sustainability targets at the Hamburg site *aurubis.com/sustainabilitystrategy*.

The Hamburg Environmental Protection department tracks changes in legal requirements, reviews their effects on the different areas of our company, and ensures that our facilities are operated in conformity with the law. Because of the high complexity of the legal standards and requirements that have to be applied, the existing legal register has been supplemented by a web-based EHS software.

Management review and internal auditing of environmental management

The effectiveness of the integrated management system is reviewed with internal audits pursuant to EMAS regulations, ISO 9001, ISO 14001, ISO 45001, and ISO 50001.

The management review is based on the status of follow-up measures from past management reviews, targets and KPIs, changes involving the management system, information about the performance and effectiveness of the management system, summaries of the results of internal audits, the status of preventive and corrective measures, risk assessments, and information about resources and potential improvements.

Environmental aspects and performance

Following fundamental investments in filtering technologies in the 1980s and 1990s, about € 390 million has been invested in environmental protection in the Hamburg plant since 2000. With total capital expenditure of just under € 1.7 billion in the same period, environmental measures account for approximately 23 % of overall capital expenditure on average. Among other things, dust emissions have been halved compared to the year 2000 with these investments. This makes a significant contribution to improving air pollution control in the environment. Investments are being made in the areas of water and noise as well *Fig. 2.3*.

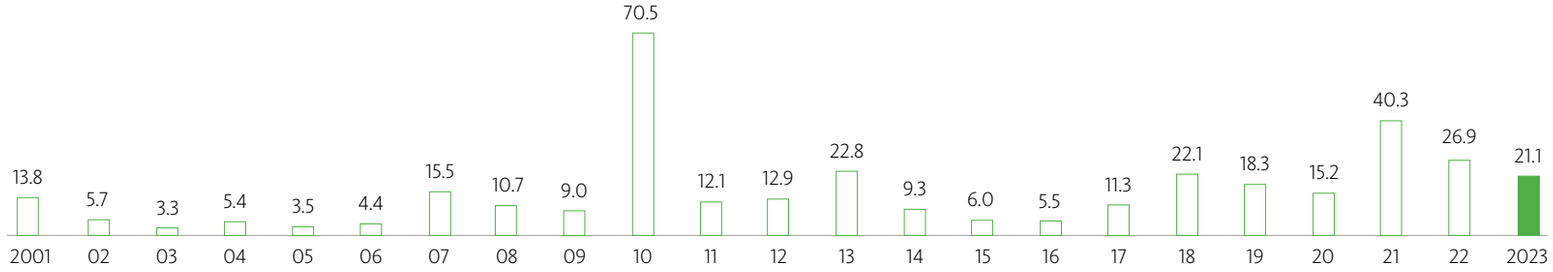
When compared worldwide, Aurubis Hamburg holds a top position in environmental protection that extends beyond staying up to date with the state of the art. Additional improvements require higher and higher capital expenditure for the same level of reduction and the development of modern technologies. The objective of plant management is to continue improving the plant's environmental performance and the expansion of its top position in environmental protection.

Air — Emissions

It is crucial for Aurubis AG to develop innovative technologies for air pollution control and to enter new technical territory in the process. About 70 % of the remaining metal emissions from the Hamburg production site come from fugitive sources, the majority of which stem from hall ventilation facilities.

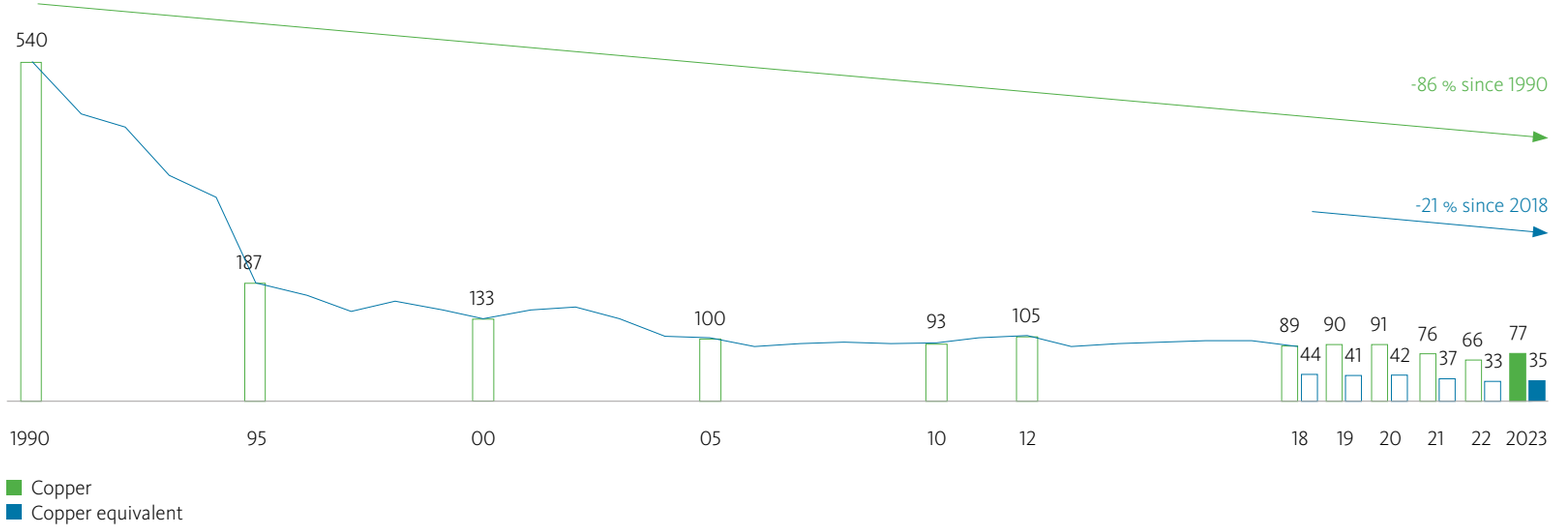
Additional investments in air pollution control were made in both primary and secondary copper production in 2021. The first part of a large-scale investment to continue reducing fugitive dust emissions in primary copper production started up in October 2021.

Fig. 2.3: Capital expenditure for environmental protection measures at the Hamburg site*
in € million



* The data relates to environmental investments per fiscal year.
To improve readability, single years are provided: 2023 for fiscal year 2022/2023, for example.

Fig. 2.4: Dust emissions at the Hamburg site
Dust in g/t of copper output and in g/t of copper equivalent



All of the information in this chapter is based on the current Emissions Report, which is issued annually by the immission protection officer. The values outlined on the following pages are made up of a number of individual recordings. Directed emissions are mostly recorded as classified values from continuous measurements taken with a system provided by Durag data systems GmbH. Fugitive emissions from hall ventilation facilities, etc. are determined on a representative basis in recording campaigns carried out by both external recording institutes and the company's own Environmental Monitoring department and are used to calculate the annual loads. Fugitive emissions due to transshipments in storage areas, etc. are calculated using the corresponding emission factors from the technical literature and from measurements.

Specific dust emissions have been considerably reduced since 1990 and 2010 *Fig. 2.4*.

Targets and successes in environmental protection

Copper is the main metallic substance in the dust at the Hamburg production site. Specific copper emissions have been considerably reduced since 1990 and 2000. The already low level was further reduced when the new emission capture equipment in primary copper production was commissioned, resulting in the changes from the previous year *Fig. 2.5*.

Specific lead emissions have been considerably reduced compared to 1990 and 2000 as well. The commissioning of the emission capture equipment in primary copper production has had a positive effect here, too, and has resulted in further reduction *Fig. 2.6*.

Fig. 2.5: Copper emissions at the Hamburg site
Copper in g/t of copper output

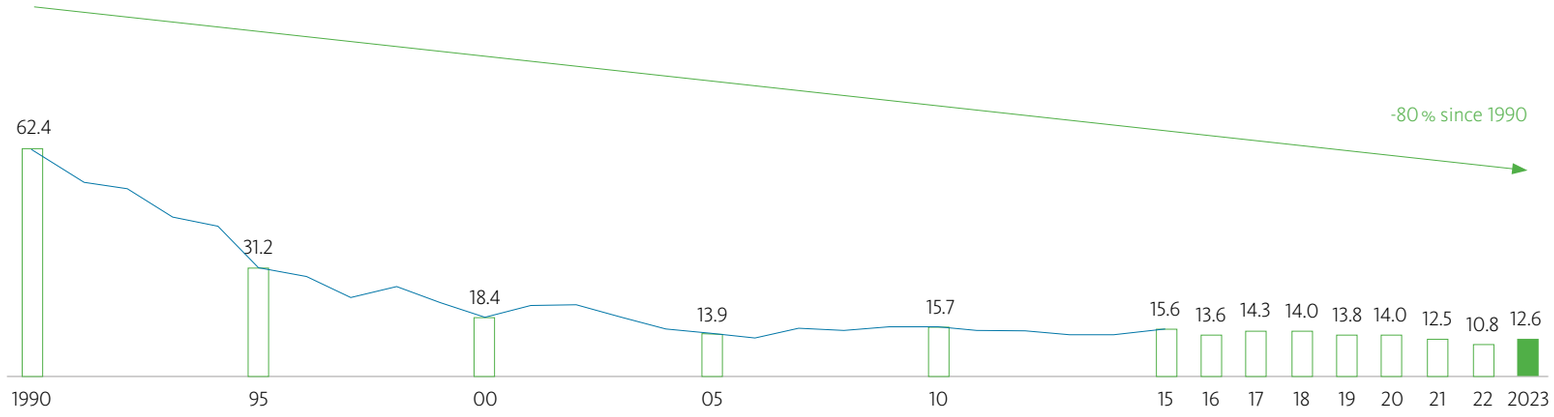


Fig. 2.6: Lead emissions at the Hamburg site
Lead in g/t of copper output

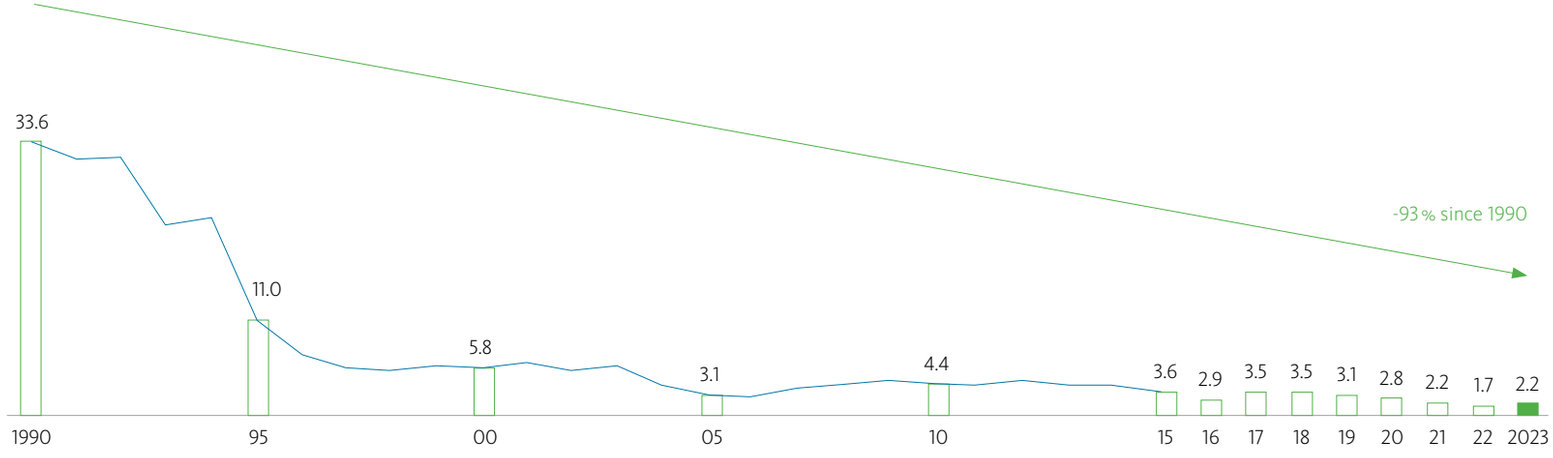


Fig. 2.7: Arsenic emissions at the Hamburg site
Arsenic in g/t of copper output

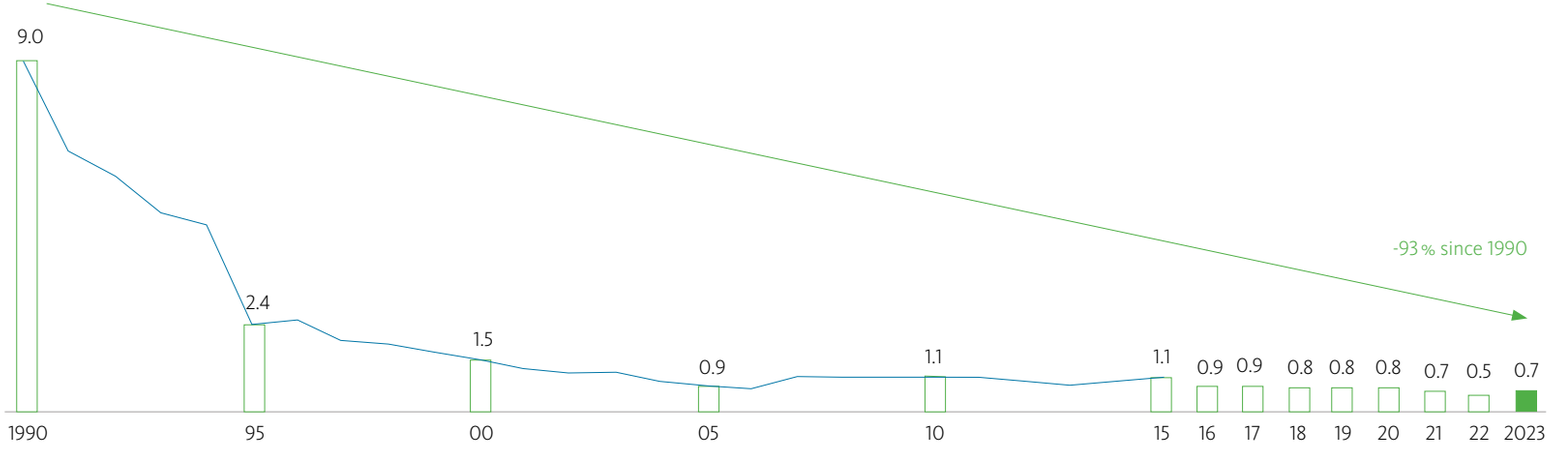
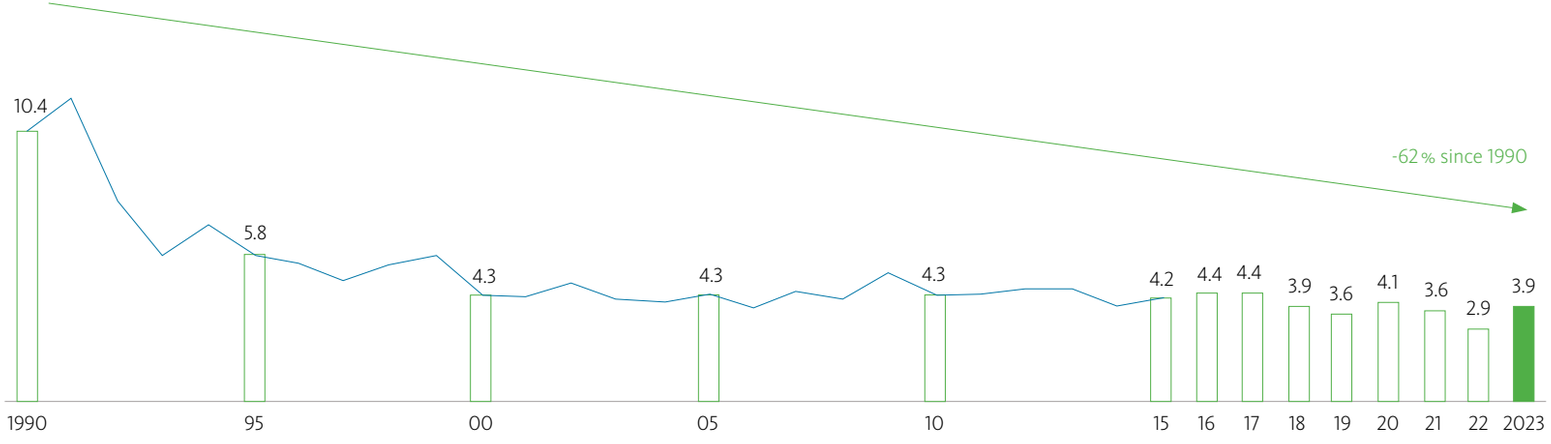


Fig. 2.8: SO_2 emissions at the Hamburg site
SO_2 in kg/t of copper output



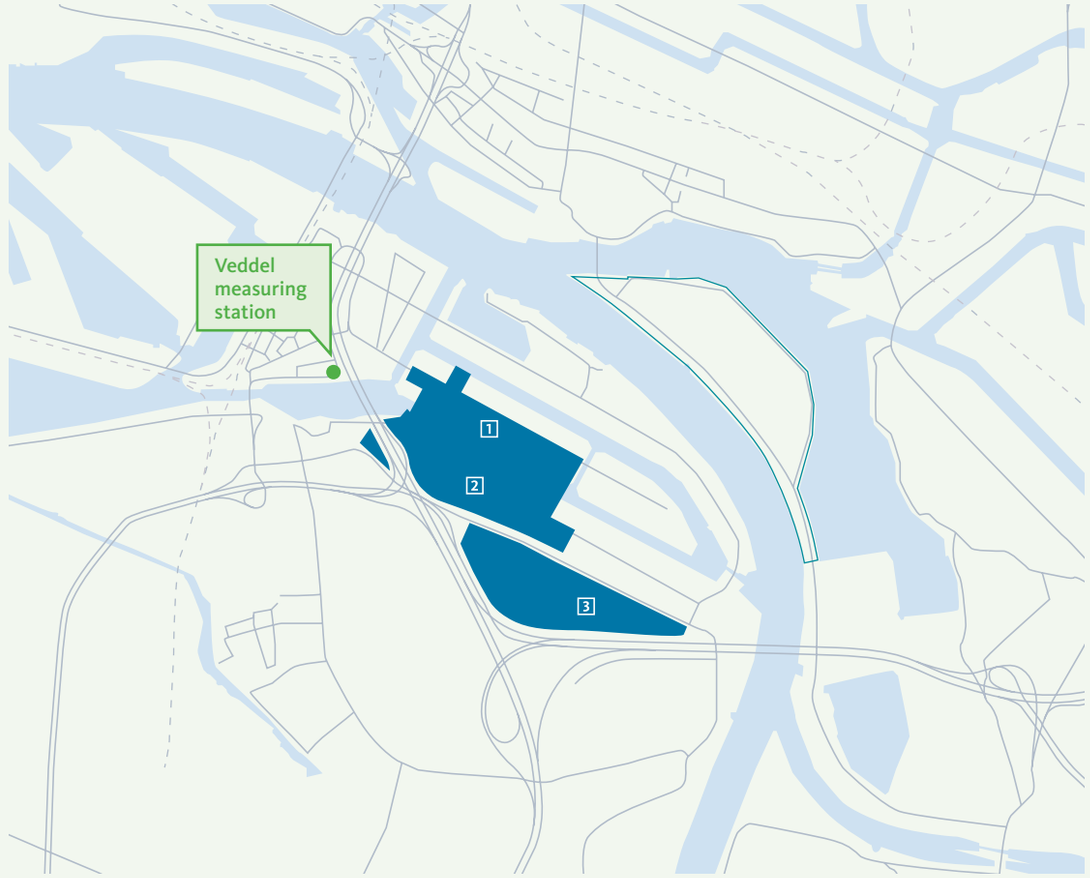
Arsenic is a natural component of copper concentrates. Specific arsenic emissions have been reduced by over 90 % since 1990 in various steps of the copper refining process, further lowering the already low level of emissions here, too *Fig. 2.7*.

Sulfur is one of the main components of the copper concentrates. The gaseous sulfur dioxide produced when ore is smelted is converted into sulfuric acid in the sulfuric acid plant using the modern double catalysis process. The sulfuric acid is mainly used in the chemical industry. Specific sulfur dioxide emissions have been considerably lowered since 1990 and 2000 and remain low *Fig. 2.8*.

As a primary copper smelter, Aurubis AG's Hamburg site continues to be a forerunner in reducing specific sulfur dioxide emissions.

Aurubis again adhered to and fell significantly below the emission thresholds established in the permits based on the Technical Instructions on Air Quality Control (TA Luft) for sources of collected and fugitive emissions in 2023. The limit values from the TA Luft relevant for Aurubis are detailed in chapters 5.2.2, 5.2.4, 5.2.5, 5.2.7, and 5.4.3.3.1 in particular.

Fig. 2.9: Location of Veddel measuring station near the Aurubis plant in Hamburg



1 Plant North 2 Plant South 3 Plant East

Air – Immisions

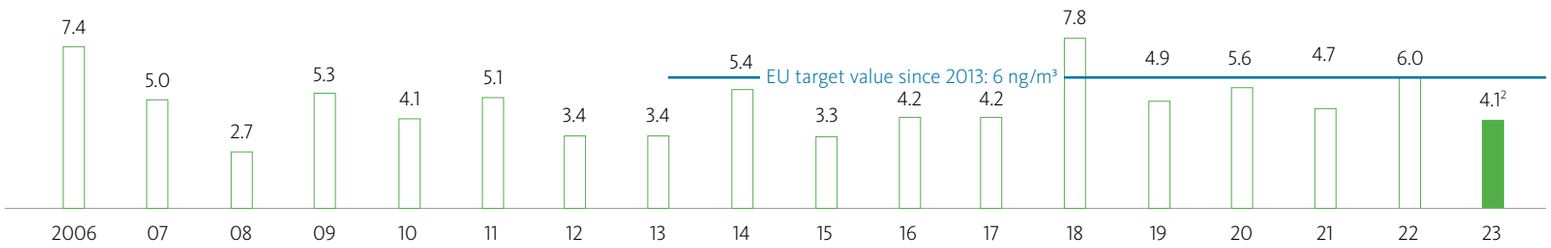
Projects to reduce fugitive emissions have high priority. The success of measures to reduce fugitive emissions is illustrated by the fact that the results of the suspended particulate recordings taken by the Hamburg environmental authority indicate continued low levels. The Veddel measuring station of the Hamburg Air Quality Measurement Network is relevant for the official air quality recordings. It is located in the adjacent neighborhood, about 500 m west of the plant premises.

Due to extensive investments in emission reduction, the immission situation has improved continuously since the 1990s. Limit values for air pollutants in the ambient air have not been exceeded in the area surrounding Aurubis AG's Hamburg site for many years.

The value measured for arsenic at the Veddel measuring station was below the target level (a yearly average of 6 ng/m³) in 2023. Aurubis' goal is to reduce its contribution to the immission values related to particulate matter in the ambient air through additional measures in order to ensure that immission values stay below the limit in the long term, even in the case of declining climate conditions and increasing aridity.

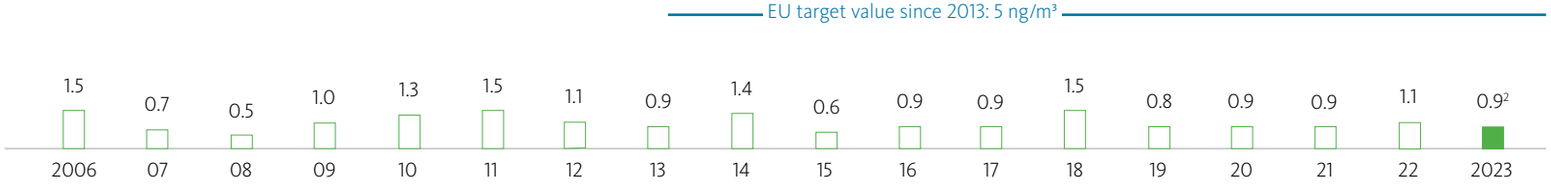
To continue reducing the site's immissions into the surrounding area, a project to capture fugitive emissions from the primary smelter production hall as needed began in 2020. Roof openings will also be closed, the air will be suctioned, and an adjustable amount of over 1,000,000 m³/h will be filtered in an innovative and highly efficient installation. The project has an investment volume of over € 100 million. The first stage was commissioned in October 2021. In addition to equipment to capture emissions on the current ridge turrets (openings in the roof that serve to conduct the heat released in the production process away from the hall), the existing suctioning equipment will be optimized and the flow conditions in the production hall will be improved through an adjusted air intake duct.

Fig. 2.10: Low immission values (arsenic) at the Veddel measuring station[1]
Arsenic immissions at Veddel measuring station in ng/m³



[1] Data published by the State Ministry for the Environment, Climate, Energy and Agriculture.
[2] Preliminary figure.

Fig. 2.11: Low immission values (cadmium) at the Veddel measuring station[1]
Cadmium immissions at Veddel measuring station in ng/m³



[1] Data published by the State Ministry for the Environment, Climate, Energy and Agriculture.
[2] Preliminary figure.

1 gram (g) = 1 billion nanograms (ng)

After the project concludes, the fugitive emissions from the production hall area will be reduced by about 70 %.

Water

The wastewater from Aurubis AG's entire Hamburg plant is composed of precipitation, indirect and direct cooling water, condensate, process wastewater, and desludging water. All of the plant's precipitation is collected separately and cleaned in two separate processing facilities. Precipitation is reused in some cases – for instance, as cooling water. Sanitary wastewater is discharged into the city sewer system.

Direct discharge

In the plant's internal wastewater treatment facility, process wastewater and precipitation are cleaned using state-of-the-art technology. The Hamburg plant has water law permits for direct discharge into the Elbe River and observes their requirements. Compliance with these requirements is closely monitored both as part of the internal company audits and through the audits performed by the governmental authorities.

The metal loads connected to direct discharge, which are related to production volumes, were at 1.4 g/t and therefore within the range of the last few years. This KPI has decreased by more than 30 % since 2000 due to investments and process improvements. Minimizing the wastewater volume and load is a criterion in project implementation. The standard achieved today has made it possible to exploit minimization potential to the highest degree possible. The proportion of heavy metals discharged by AurubisAG's Hamburg plant in the Elbe's total load is currently less than 0.1 %.

An inspection was carried out in 2022 with the goal of optimizing the rainwater treatment plant's process parameters to reduce discharged metal loads by 10 % with the appropriate adjustments. These modified process parameters were successfully tested in 2023. The entire Group plans to reduce the metal loads directly discharged with wastewater by another 25 % by 2030, with the participation of the Hamburg plant.

In this way, we are contributing to the national water strategy in Germany. The intention is to continue developing sustainable water resources management and to secure good water conditions in the long term.

Indirect discharge and potable water

The consumption of potable water has declined by around 40 % since 2000. Potable water for the most part has not been used to produce steam since 2002. Recirculated condensate and available canal water, mainly as a supplement, are used to conserve resources.

Conserving water resources is part of the company guidelines. This applies to potable water in particular. This target also aligns with the national water strategy: The action program includes the development of water infrastructure adjusted to climate change.

All development projects are evaluated with respect to their resource requirements, which are adapted as necessary.

Cooling water

In 2023, cooling water was managed without any disruptions or negative impacts on the water balance. All of the limits for discharge temperature, temperature increase, heating of water, and heat input were maintained. Further limiting the volume of cooling water by 2030 is a part of the Sustainability Strategy.

As in the previous year, over 60 % of the precipitation was used as cooling water prior to discharge in 2023.

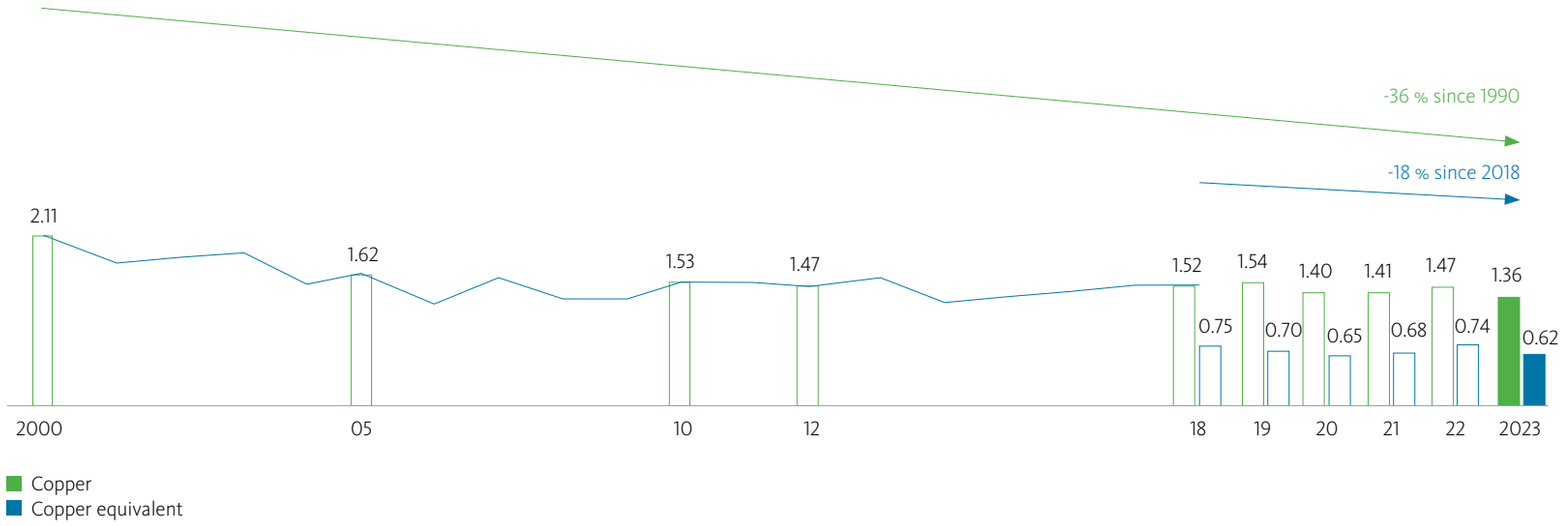
Facilities handling substances hazardous to water

At the Hamburg plant, Aurubis AG operates about 300 installations to handle substances hazardous to water that fall under the scope of the Ordinance on Equipment Handling Substances Hazardous to Water (AwSV). During the technical audits carried out in 2023, the accredited inspection authority once again found no safety-relevant deficiencies whatsoever. Keeping the plants in proper technical order plays a key role in protecting the soil and groundwater.

The Aurubis plant in Hamburg is a certified specialist company in accordance with the German Federal Water Act (WHG). Aurubis was externally recertified as a specialist company under the WHG in 2024.

Fig. 2.12: Metal emissions in water at the Hamburg site since 2000

Metal emissions in g/t of copper output and in g/t of copper equivalent



Soil and groundwater
There are soil impurities typical for industrial areas at the Hamburg plant owing to many years of industrial use. The heavy metal pollution values are so low that no remediation is required from an official point of view. The plant premises are mostly paved so that soil impurities cannot mobilize.

Furthermore, the groundwater is protected from soil impurities by a water-resistant layer of clay. A sheet pile wall was also erected in the primary smelter that effectively prevents backwater from flowing beyond the plant premises. This protective measure is regularly inspected through advisory backwater monitoring to ensure that it is working properly.

To prevent negative changes in the soil and groundwater, Aurubis operates systematic soil and groundwater monitoring, which is also a component of the valid report on the initial condition that was issued on May 4, 2018 for the entire plant premises.

Soil management in connection with treatment capacities on site limit the volume of soil that accumulates during construction measures, for example, and therefore conserves landfill capacities.

Noise
Aurubis constructs and operates its production facilities in accordance with the current noise reduction technology. The noise register developed for the Hamburg site lists all of the relevant noise sources. The local environmental authority has defined noise immission limits for 20 immission areas surrounding the site. These requirements are established in the permits. The impact on the noise situation in the neighborhood is evaluated for all facility modifications and, if necessary, measures are derived and implemented. Aurubis is planning to update the noise register in the scope of an upcoming project. There were no noise complaints in 2023.

Waste
A total of 124,502 t of waste was received and recycled at the Hamburg site in 2023, of which 16,154 t were classified as hazardous waste. A total of 3,409 t of this came from other countries and was registered.

Overall, 9.9 % of the waste accepted was used as a slag former (e.g., spent abrasives, sand and excavation residues), and 90.1 % was used for metal recovery (dust, slimes, slags and precious metal-bearing sweeps).

In 2023, about 1.45 million t of input materials were processed at the Hamburg site. During processing, 10,967 t of production-related waste accumulated, which was disposed of in an environmentally sound manner *Fig. 2.13*.

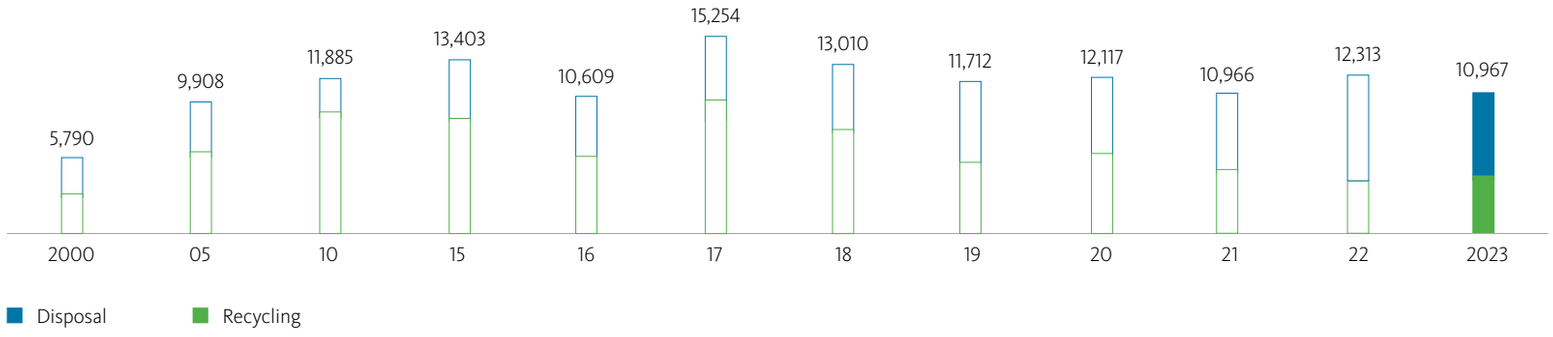
The conversion of raw materials into products thus remained at a high level. Of the entire volume, 4,484 t was directed to recycling and 6,483 t to external disposal. This corresponds to a recycling rate of approximately 41 %. Most of the waste that is disposed of is slimes from off-gas cleaning, as well as washing fluid and emulsions.

A total of 31,736 t of olivine pyroxene rock from the secondary smelter (RWN) and 18,200 t of slag material from the primary smelter (RWO) could not be marketed as product and were taken to landfills. In the process, roughly two thirds of the volumes were recycled for use as landfill construction material.

In 2023, the quantity of construction waste, 25,571 t, was again significantly reduced compared to the previous year.

With an annual output of 438,243 t of refined copper in 2023, the specific waste level is 25.0 kg per ton of product (2022: 25.6 kg/t).

Fig. 2.13: Disposal methods for production-related waste at the Hamburg site
in t/year



Energy and climate protection

We act responsibly towards future generations by economically using raw materials and energy. Our main energy sources are electricity and natural gas. Aurubis AG consumed a total of 1,154 GWh of energy at the Hamburg site in 2023. With an annual copper output of 438,143 t, this amounts to specific energy consumption of approximately 2.63 MWh/t of copper output (previous year: 2.47 MWh/t). It includes the electricity used to produce the oxygen necessary for the processes.

Furthermore, landfill gas was used in the production processes instead of natural gas (2023: 1.7 GWh). Aurubis uses 100 % of the landfill gas captured at the former Georgswerder landfill, though the supply volume from the landfill is continuously declining.

Viewed over the medium term, specific energy consumption has stagnated at the Hamburg site in the past several years despite the energy efficiency measures that have been implemented. Important reasons for this are the higher percentage of multimetal recycling and the commissioning of new facilities, such as the ridge turret suction system in the secondary smelter and in the primary smelter (Project RDE), which increases energy requirements due to the operation of the suctioning and filter equipment.

Taking a longer-term view, specific energy consumption has been significantly reduced at the Hamburg production site in the last few decades, falling by almost 50 % compared to 1990. It has even been possible to reduce fuel-related specific CO_2 output by 70 % since 1990. The reason for this is the strongly reduced use of particularly CO_2-intensive fuels, especially coal.

Fig. 2.14: Energy consumption at the Hamburg site
in MWh/t of copper output

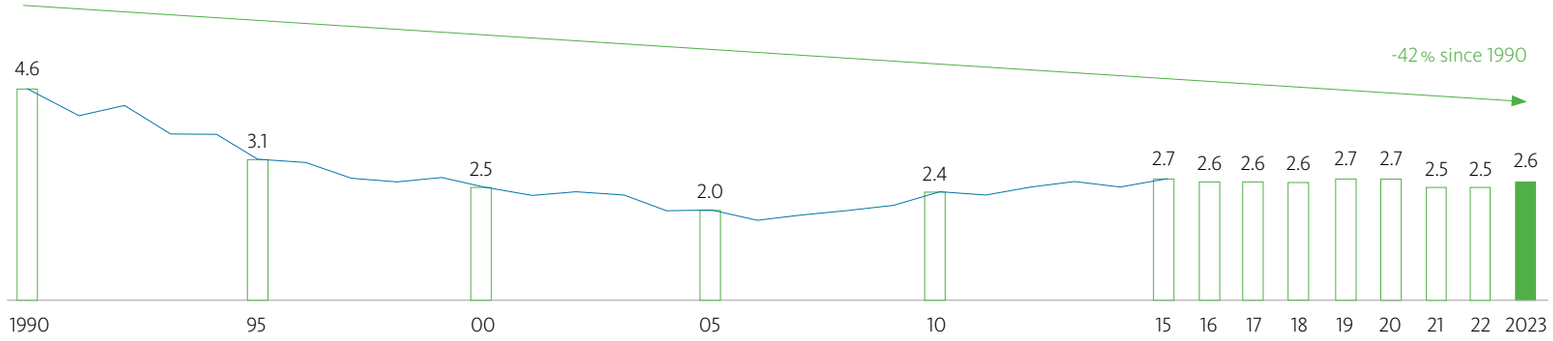
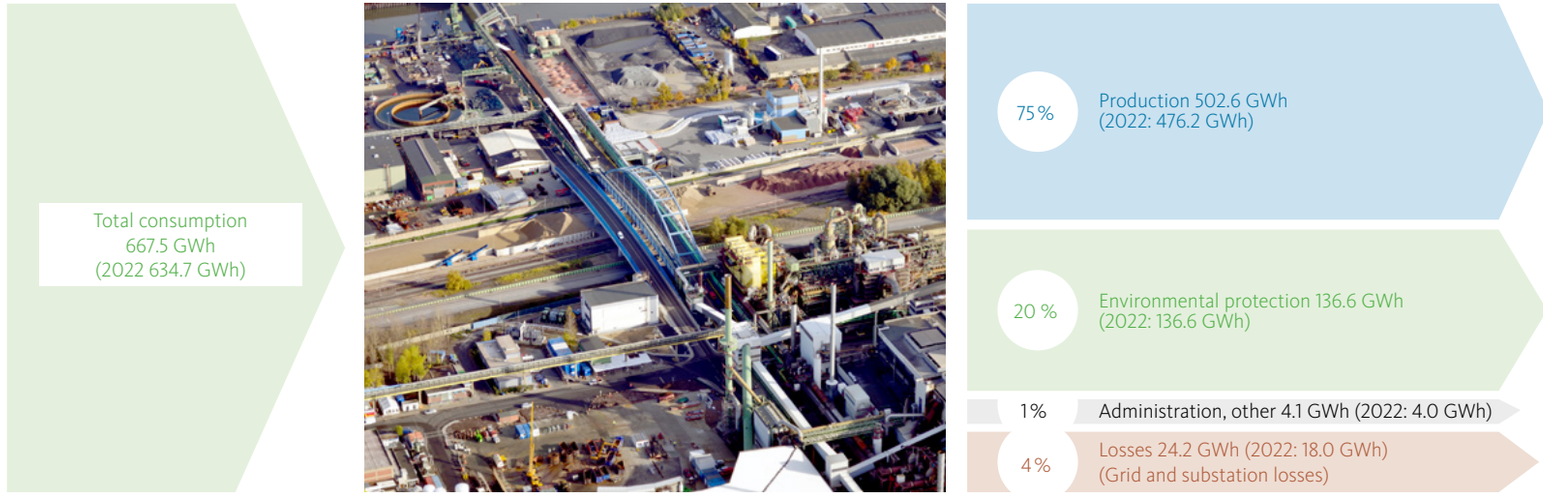


Fig. 2.15: Breakdown of energy consumption at the Hamburg site



With an output of 438,143 t of copper output in the calendar year, specific CO_2 emissions from fuel amounted to 0.26 t CO_2/t of product in 2023 *Fig. 2.16*. This corresponds to 112,245 t of CO_2.

The calculation is based on CO_2 emission factors from the following sources:

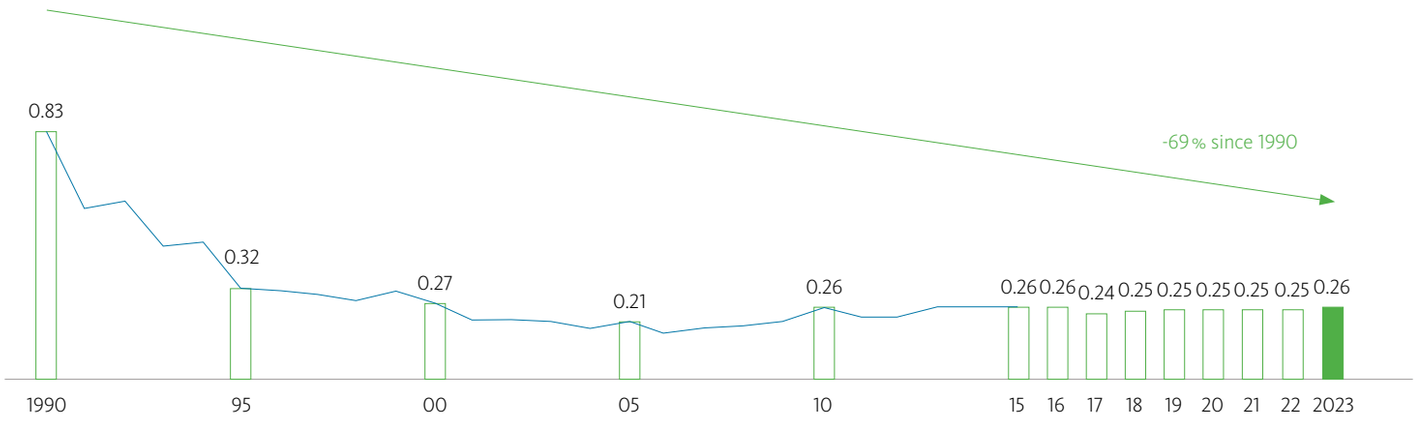
- For natural gas: GasCalc calculation program, Version 2.6, published by SmartSim GmbH
- For all other fuels: German Emissions Trading Authority (DEHSt) data, last reviewed in January 2024

When it comes to maintenance measures and new investments, engines and other energy-consuming equipment with as high an energy efficiency class as possible are used.

To enable the use of renewable energies, we are arranging a more flexible electricity feed-in to be able to react to fluctuating availability. The first power-to-steam installation at the Hamburg plant was commissioned in 2019. This is an electrode steam boiler that can be hooked up to the grid during phases in which there is a surplus of renewable energy. In parallel, the existing steam boilers powered by natural gas are ramped down accordingly. This allows renewable energies to be used instead of fossil fuels to generate a heat output of 10 MW at the site. This reduces the load on the energy grid at the same time.

The power-to-steam plant allows us to respond to energy use with greater flexibility. We continuously monitor the economic and political environment of the energy economy and energy supply, which allows us to respond more quickly and with greater flexibility. A task force is created in special situations like the current war in Ukraine to minimize the impact on our operations.

Fig. 2.16: CO_2 emissions from fuels at the Hamburg site
in t CO_2/t of copper output



New power-to-steam facility in the Hamburg plant

Waste heat use

Aurubis strives to use process waste heat to the greatest possible extent. It is used to heat buildings, to facilitate the production processes, and to generate electricity. With 79 % of the steam required generated from residual heat, very little was produced from fossil fuels in 2023. Copper production from ore concentrates begins in the flash smelter in the primary smelter (RWO). Its exhaust gases have a temperature of 1,400 °C and contain about 35 % sulfur dioxide, which is processed into sulfuric acid in a contact acid plant.

The flash smelter's hot exhaust gases are initially cooled in a waste heat boiler, producing 60-bar steam.

Several steam turbines have been installed at the Hamburg site as an effective energy-saving measure. The 60-bar steam is first depressurized to 20 bar in the Interplant turbine, which was commissioned in 2014. The 20-bar steam serves as process steam for various processes in the plant. The remaining steam volume is depressurized to 3 bar in the first stage of another steam turbine in the thermal power plant. This steam is then available as process and heating steam in the plant and administrative buildings. A total of 1.8 GWh of electricity was produced from waste heat in 2023.

Fig. 2.17: District heating pipeline route from the Aurubis plant to HafenCity East

On October 29, 2018, the supply system for providing the district HafenCity East with industrial heat from Aurubis was commissioned in an inauguration ceremony. With the implementation of this joint project, which is unique in Germany and is supported by the climate alliance between Aurubis and energy service provider enercity, up to 160 million kWh of heat per year can be transferred to consumers via pipeline. This is equivalent to the heat demand of about 8,000 four-person households. Aurubis' production facilities also use up to 40 million kWh. Aurubis and enercity each invested about € 21 million. The project was funded by the German Federal Ministry for Economic Affairs and Energy.

The heat is CO_2 free. It is generated without the use of fossil fuels and released as heat of reaction in sulfuric acid production. This forward-looking use of waste heat can save up to 20,000 t of CO_2 annually. The Elbe River benefits as well: Recovering the heat saves about 12 million m³ of cooling water per year.

The German Energy Agency honored the joint project with the 2018 Energy Efficiency Award in the Energy Transition 2.0 category as a flagship project. Furthermore, the project received the German Renewables Award 2018 from the Renewable Energies Cluster, the ener.CON Europe Award 2019, and the Responsible Care Award 2019 from the VCI. The climate alliance was honored as a finalist for the EUSEW Awards by the European Commission and the Innovation Prize for Climate and the Environment by the German Federal Ministry for the Environment in 2019 and 2020, respectively.

The heat transition is an important part of the energy transition. This is especially true for a metropolis like Hamburg, which has about 900,000 apartments. The energy needed to provide heating, warm water, and lighting to the city's buildings makes up 40 % of the total energy demand and is therefore significantly higher than the energy demand in the transport and industry sectors. Today, the heat supply in Hamburg is dominated by decentralized, gas-fueled heating systems and by a large central district heating network whose thermal output is based on conventional large-scale power plants and heat generation from coal, gas and waste. The implementation of the project is therefore a central milestone on the path to more sustainability and better climate protection.

The pipeline has already been dimensioned to accommodate the entire waste heat potential of sulfuric acid production and additional potential sources of waste heat. We could thus provide up to 60 MW or 500 million kWh of industrially generated, carbon-neutral district heating per year to supply the city. The two Industrial Heat projects will be able to reduce CO_2 by a combined 120,000 t per year as of 2025. The associated supply contract was concluded with the municipal supplier of district heating. The commissioning phase for the new facilities will start in fall 2024.

Direct CO_2 emissions — Emissions Trading System

As an energy-intensive company, the Hamburg site has been required to participate in the European Emissions Trading System (ETS) since 2013, now in the fourth trading period. The direct CO_2 emissions — mainly from natural gas consumption – are verified by TÜV NORD CERT and reported to the German Emissions Trading Authority (DEHSt).

Registered CO_2 emissions amounted to 161,703 t for 2023. More than 70 % were caused by the fuels used, mainly natural gas, while the remainder was caused by the carbon contained in the raw materials, recycling materials, and additives.

Indirect CO_2 emissions

Copper production is an energy-intensive process, so a reliable electricity supply is very important. Aurubis therefore has a long-term electricity supply contract. Electricity production leads to CO_2 emissions, which are indirect CO_2 emissions for Aurubis, and therefore indirect environmental effects. In 2023, these indirect CO_2 emissions totaled 245,955 t (pursuant to the German electricity grid's preliminary emission factor for 2023; source: BDEW; 0.37 t CO_2/MWh).

The electricity producer already reported these indirect CO_2 emissions to the trading authority. Any costs were passed on via the electricity price. Therefore, these indirect CO_2 emissions are not included in the amount reported by Aurubis to the trading authority.

Climate protection agreement with the Hamburg Senate to reduce CO_2

In August 2007, the Hamburg Senate approved the Hamburg Climate Protection Concept 2007–2012 and presented it to the public. A major part of the concept was based on the participation of Hamburg industry.

Aurubis AG was one of the first Hamburg companies to participate in the Climate Protection Concept and implemented a number of projects between 2007 and 2012 that cut CO_2 by 32,000 t each year *Fig. 2.18*.

With the agreement to reduce an additional 12,000 t of CO_2, Aurubis participated in the follow-up agreement for the period from 2013 to 2018.

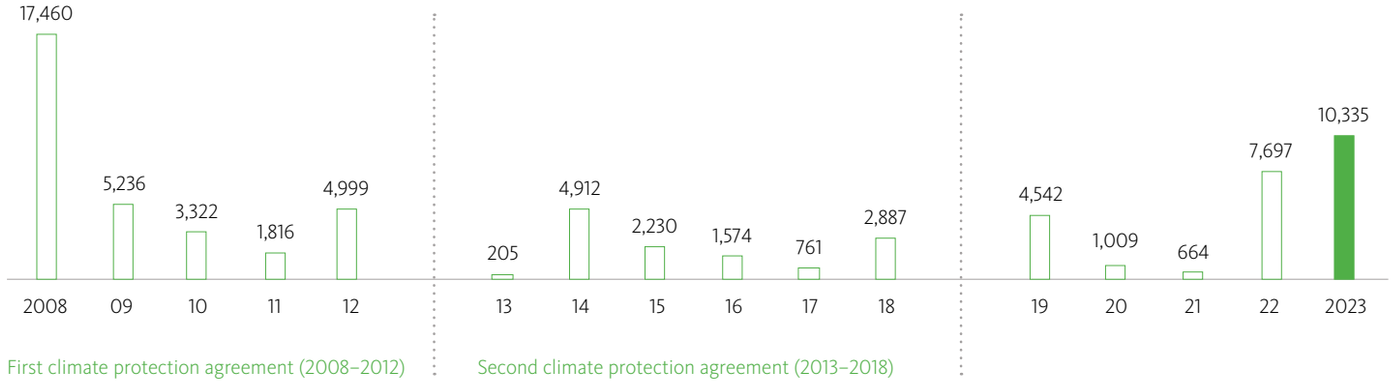
Aurubis achieved a roughly 12,569 t reduction in CO_2 by the end of 2018. The city is not planning an additional follow-up agreement. Nevertheless, additional reduction potential was identified and accompanying measures have been implemented. The site committed itself to implementing energy saving projects between 2019 and 2024 that lead to additional savings of 10,000 t of CO_2 each year, resulting in an additional reduction of 10,335 t of CO_2 per year by the end of 2023, thus meeting the target one year earlier. Nevertheless, we are not letting up in our efforts to reduce CO_2 emissions and continue to implement additional projects.

Aurubis participates in the IVH Energy Efficiency Network of Hamburg Industry. The network serves to create a best-practice dialogue, leading to a mutual innovation boost. The identified potential is coordinated with Hamburg's central climate office.

Our support of the Science Based Targets initiative (SBTi) also demonstrates the Group's tireless efforts to reduce greenhouse gases. We have committed to setting science-based CO_2 reduction targets based on the SBTi, and as such to contributing to the 1.5 °C goal of the Paris Climate Agreement. With the implementation of correspondingly ambitious measures, we want the entire Aurubis Group to become carbon-neutral well before 2050. The aim is to reduce the CO_2 emissions associated with fossil fuels and electricity (Scope 1 + 2) by half throughout the Group by 2030. CO_2 emissions resulting from processes, transport, supply chains, etc. are to be reduced by 24 % by 2030 (Scope 3; reference year: 2018 respectively).

One of the first important steps was to test the use of hydrogen in primary copper production. The use of ammonia in copper processing was also tested.

Fig. 2.18: Annual CO_2 reduction at the Hamburg site in the context of the Hamburg Climate Protection Concept
First and second climate protection agreement, in t of CO_2/year



Audits and inspections by governmental authorities
The production facilities at the Hamburg site are monitored by the relevant governmental authorities as part of inspections and emissions surveillance. The reports on the inspections pursuant to the IED directive have been published online in the city of Hamburg's Transparency Portal since 2016. In 2023, all inspections verified proper operation in accordance with permits.

Emergency measures and crisis management
There are currently 64 so-called "hazardous incident companies" in Hamburg. A hazardous incident is any event in which a fire, explosion or similar occurrence releases hazardous substances that put people and the environment at serious risk. Because of the type and quantity of materials handled, the Hamburg production site is subject to the expanded obligations of the German Hazardous Incident Ordinance. The site is therefore subject to particularly strict safety precautions to prevent serious operational disruptions. Furthermore, for the case that hazardous incidents occur despite the safety precautions, measures to limit impacts have to be adopted. The safety report outlines the technical and organizational safety precautions and is reviewed and updated whenever there are changes to any facilities, at the latest every five years.

There were no incidents or other serious disruptions in operations during the reporting period. A flood protection drill was carried out in 2022.

A new, state-of-the-art sulfur dioxide storage area was commissioned in September 2022. Unloading processes are now carried out in a fully closed room that can be suctioned off. Likewise, the storage tanks are placed in a closed room that can be suctioned off as well. The tanks and pipelines have a double-wall design for an especially high level of safety. On top of that, the sulfur dioxide storage area uses modern, automated process technology made for the hazard potential at hand. The appropriate safety distance from any operations requiring protection was considerably reduced.

All inspections specifically related to the Major Accidents Ordinance were carried out without the identification of any defects. There were no accidents and no disruptions that had to be reported.

Indirect environmental aspects
Indirect environmental aspects arise first and foremost from the transport of material and from the mines supplying Aurubis with copper concentrates. Nevertheless, the supply chain for products and raw materials is very important to the Aurubis Group. In this context, we refer to our Sustainability Strategy and the section "A comparison – Life cycle assessments for our metal products" in the Group portion of this Environmental Report, which provides detailed information about our supply chain management.

Transporting hazardous materials
An external hazardous goods officer was appointed for the Hamburg site.

In the 2022/23 fiscal year, about 1 million t of outgoing hazardous materials were registered at the Hamburg site of Aurubis AG. Of the total amount of hazardous materials, approximately 76 % are shipped by inland vessel, about 12 % by truck, and 12 % by train.

During the reporting period, there were no reportable incidents in the course of hazardous material transports. Monitoring and training were carried out again in 2023 in order to maintain this high safety standard.

Biodiversity
As an industrial site, Aurubis strives to promote urban biodiversity. We want to leave unpaved areas close to their natural state whenever this is feasible, carrying out only the minimum amount of maintenance required. The green areas surrounding the plant premises with bushes and trees serve as a refuge for many bird and insect species and should be preserved. We do not use any chemical pesticides on plants.

By participating in the project UnternehmensNatur supported by NABU, the Hamburg environmental authority, and the Hamburg Chamber of Commerce, we utilize an idea network for useful contributions to promoting biodiversity.

The plant has its own tree registry. Wherever possible, new plants and greenery are integrated into project planning. Because of the limited possibilities within the plant premises, Aurubis promotes biodiversity outside of the plant boundaries as well. For instance, we support the preservation of insects through educational work carried out by knowledgeable nature conservation associations at schools. A vehicle referred to as the Bombus is used for this purpose. The Bombus (Latin for bumblebee) is a converted environmental mobile that has been a fixed component of the environmental education work of the German Association for the Protection of Forests and Woodlands for 15 years. With its unique, boxy shape, the VW bus provides a great deal of space for exhibits and documents for different programs and offers.

Today, emissions at the Hamburg site have already reached a point where there is no negative impact on ecologically sensitive conservation areas. This is especially true when it comes to the acidification of soils and plants and the eutrophication of bodies of water. Aurubis' ecological footprint is improving continuously. The Hamburg plant significantly contributes to this success, providing important support to preserving biodiversity.

We prioritize native plant species when we plant new greenery. Because of the limited amount of space available, we will grow upwards in the future. We plan to spruce up suitable building facades with vertical gardens, improving their appearance and also creating new habitats for birds and insects.

We continue to be proud of the fact that our plant is one of 13 peregrine falcon territories in Hamburg. We continue to preserve the territory by maintaining the nesting aid and keeping the direct flying environment free. Nestlings, which can injure themselves during their first attempts to fly, are given expert assistance by falconers if needed and then released in the plant again.

Furthermore, the plant is a breeding area for a number of songbird species, such as the black redstart. Possible nesting areas in various niches of production buildings' facades are maintained if possible. The proximity to bodies of water provides food sources.

Commitment to the environment – Partnership for air quality and low-emission mobility

In 2012, the city of Hamburg, Aurubis and eleven other companies established the Partnership for Air Quality and Low-Emission Mobility. The objective is to reduce pollution, especially NO_x, resulting from individual transport.

To promote the use of bikes and public transport, a city bike station was set up at the Hovestrasse plant entrance in 2019. The intention is to encourage bike use for employees in their daily commutes between home and work or between home and subway or train stations. The station connects the plant to Hamburg's city-wide bike-borrowing system.

Moreover, Aurubis rents 40 lockable bike spaces each at the closest train station, Veddel, and the new train/subway station Elbbrücken. This provides employees with free bike parking, an option that allows them to travel quickly and conveniently from public transport stations to work.

In order to promote electric vehicles, a total of 150 charging stations were set up at the employee parking lots on Hovestrasse and the Müggenburger Hauptdeich. E-mobility for internal plant traffic is also being emphasized.

Due to the voluntary environmental and climate protection measures it implemented in 2023 again, Aurubis Hamburg is still recognized as an active member of the Hamburg Environmental Partnership and is distinguished for its exemplary environmental performance.

Environmental Program

A revised version of the Environmental Program, which is based on the internal target management system, has been in use since 2024. It is detailed below:

Target	Planned measures	Degree of implementation/date
Reducing emissions		
Ensuring values fall significantly below the target value for particulate matter Veddel 20VE of 6 ng/m³	Expansion of ridge turret suctioning	Project approved by the Executive Board Permit application will be submitted in 2024
Improving water pollution control		
Metal loads to water – 10 kg/a reduction in FY 2023/24 compared to 2020	Optimizing the wastewater treatment plant process parameters	Initial testing of revised process parameters have been completed with positive results.
Reducing energy consumption and CO_2 emissions		
CO_2 reduced by 2,000 t plant-wide in FY 2023/24	Implementing the decarbonization project road map through 2030	Road map has been realized; initial testing of hydrogen use has been completed.
Reducing electricity consumption in the primary smelter (RWO) by 10 % compared to FY 2021/22	Slag reduction furnace's mode of operation successfully optimized in the primary smelter (RWO)	Already completed.
Waste reduction		
At least 3 tests of internal Venturi slime processing	Developing potential internal processing methods for Venturi slime	First test series currently underway with additional test series planned during fiscal year 2024/25.
Reducing the amount of used emulsion from the rod plant to be disposed of by at least 20 %	Implement testing followed by an investment decision	Testing was completed successfully.

Key figures for Aurubis AG, Hamburg site, in the 2023 calendar year

Developments in KPIs are explained in the text

Input	Unit	2021	2022	2023
Financial investments				
Investments in environmental protection	€ thousand	40,291	26,873	21,126
Other investments	€ thousand	76,243	168,520	182,606
Total investments	**€ thousand**	**116,534**	**195,392**	**203,731**
Raw materials				
Copper concentrates	t	1,229,523	1,000,836	1,188,874
Copper scrap/refining material	t	47,603	30,577	41,532
Other Cu-bearing raw materials	t	132,982	190,881	59,064
Precious metal-bearing raw materials	t	13,545	14,519	10,999
Lead concentrate, scrap and waste	t	28,958	22,504	26,159
Other waste for recycling	t	6,062	4,202	6,550
Total TC/RC-earning raw materials	**t**	**1,458,673**	**1,263,518**	**1,333,178**
Operating supplies and materials				
Sand and additives incl. cyclone sand	t	126,704	99,281	114,975
Iron as an additive	t	16,398	16,618	5,043
Total input materials	**t**	**1,601,775**	**1,379,417**	**1,453,196**
Input material per t of copper	**t/t Cu**	**3.3**	**2.9**	**3.3**

The table may include slight deviations in the totals due to rounding.

Input	Unit	2021	2022	2023
Energy				
Electricity consumption	MWh	680,010	634,743	656,919
Additional electricity consumed to produce oxygen (informative)[1]	MWh	10,205	8,797	9,397
Natural gas	MWh	472,628	468,728	412,250
Coke	MWh	71,717	58,726	70,162
Other energy sources	MWh	15,866	15,507	14,740
Total energy consumption	**MWh**	**1,250,426**	**1,177,705**	**1,154,071**
Energy consumption per t of copper[2]	**MWh/t Cu**	**2.5**	**2.5**	**2.6**
Use of regenerative/renewable energy				
Use of electrical energy to generate steam[3]	**MWh**	**5,629**	**20,970**	**12,381**
Water withdrawal[4]				
River water	m³	63,331,000	56,112,223	59,349,421
Potable water	m³	359,000	366,685	392,814
Precipitation	m³	378,000	373,000	479,560
Total water withdrawal	**m³**	**64,067,000**	**56,852,000**	**60,221,800**
Water consumption (withdrawal) per t of copper	**m³/t Cu**	**131**	**118**	**137**
Area used at the Hamburg site				
Total plant area	m²	874,000	874,000	874,000
Buildings and paved area	m²	758,000 (equivalent to 87 %)	758,000 (equivalent to 87 %)	758,000 (equivalent to 87 %)

[1] The air compressors used to produce oxygen have been operated internally since 2021.
[2] Rounded to the first decimal point.
[3] Mainly used at times when there is a high supply of renewable energy in the grid.
[4] Values rounded to the nearest thousandth.

The table may include slight deviations in the totals due to rounding.

Output	Unit	2021	2022	2023
Products				
Copper output	t	489,976	480,665	438,143
Sulfuric acid products as H_2SO_4 (from exhaust gas cleaning, standardized to 100 % acid)	t	994,880	859,990	947,714
Iron silicate stone (incl. granules)	t	781,326	782,635	738,967
Silver, gold and PGMs	t	1,099	1,273	1,227
Nickel sulfate	t	1,018	899	1,015
Other metal compounds	t	437	387	390
Lead	t	11,886	12,999	10,663
Total products	**t**	**2,282,837**	**2,140,834**	**2,138,119**

The table may include slight deviations in the totals due to rounding.

Output	Unit	2021	2022	2023
Waste				
Recycling	t	4,840	4,114	4,484
Disposal	t	6,126	8,199	6,483
Total recycling and disposal	**t**	**10,966**	**12,312**	**10,967**
Hazardous waste	**t**	**8,183**	**9,539**	**8,283**
AVV[1] 16 10 01* Washing water	t	2,418	3,744	2,321
AVV 10 06 06* Waste after off-gas treatment	t	1,809	2,664	3,066
AVV 10 04 04* Lead flue dust	t	1,575		1,201
AVV 12 01 09* Waste emulsion	t		1,354	
Other	t	2,382[2]	1,777[3]	1,695[4]
Non-hazardous waste	**t**	**2,783**	**2,773**	**2,684**
AVV 150103 Scrap wood	t	1,285	1,309	1,151
AVV 190814 Slime from water management	t	532	463	605
AVV 200301 Municipal solid waste	t	410	494	428
Other	t	556[5]	506[5]	500[6]
Waste per t of copper output	**kg/t Cu**	**22**	**26**	**25**
Waste per t of input material	**kg/t**	**13**[7]	**50**[7]	**25**[7]
Construction waste (informative)	t	10,431	56,598	25,571
Total waste	**t**	**21,397**	**68,911**	**36,537**
Conversion into products	**%**	**99.3**	**99.0**	**99.2**

[1] Abfallverzeichnisverordnung (Waste Classification Ordinance, AVV)
[2] Comprises 19 waste code numbers (AVV).
[3] Comprises 24 waste code numbers (AVV).
[4] Comprises 23 waste code numbers (AVV).
[5] Comprises 9 waste code numbers (AVV).
[6] Comprises 8 waste code numbers (AVV).
[7] Corrected after the fact.

The table may include slight deviations in the totals due to rounding.

Output	Unit	2021	2022	2023
Emissions				
Dust[1, 2]	t	37	32[4]	34
Dust per t of copper	g/t Cu	76	66[4]	77
Dust per t of copper equivalent	g/t CuEq.	37[4]	33	35
Copper per t of copper output	g/t Cu	12.5	10.8	12.6
Lead per t of copper output	g/t Cu	2.2	1.7	2.2
Arsenic per t of copper output	g/t Cu	0.7	0.5	0.7
SO_2	t	1,780	1,334	1,722
NO_x per t of copper output	g/t Cu	383	341[4]	385
Direct CO_2 emissions (ETS, excluding diesel)	t	163,347	154,826	161,703
of which CO_2 from fuels	t	124,131	119,133	112,245
CO_2 from fuels per t of copper output	t/t Cu	0.25	0.25	0.27
Direct CO_2 emissions (diesel for vehicles)	t	3,539	3,584	3,295
Indirect CO_2 emissions from electricity consumption (incl. oxygen production)[3]	t	512,292	472,272	498,558
Metal discharge in water	kg	689	707	594
Metal discharge in water per t of copper	g/t Cu	1.4	1.5	1.4
Metal discharge in water per t of copper equivalent	g/t CuEq.	0.68	0.74	0.62
Water discharge				
Direct discharge	m³	59,136,370	55,455,605	57,355,691
Indirect discharge	m³	37,851	37,937	63,149
Total water discharge	**m³**	**59,174,221**	**55,483,542**	**57,418,840**
Water discharge per t of copper output	**m³/t Cu**	**121**	**115**	**131**
Energy supply				
Supply of industrial waste heat to the city	**MWh**	**10,768**	**31,167**	**43,336**

[1] For dust content (metals), see the information provided in the "Air — Emissions" section.
[2] Figure also includes dust from fugitive sources.
[3] The supplier's CO_2 emission factor is taken as a basis.
[4] Corrected after the fact.
The table may include slight deviations in the totals due to rounding.

Updated Aurubis AG Environmental Statement 2024

Lünen Site

The Lünen plant

Aurubis AG's Lünen plant is located on the southern edge of the city of Lünen, just one kilometer from the town hall, and is one of the world's largest copper recycling facilities.

The site was built and commissioned on undeveloped land between the Cologne-Minden railway and the Datteln-Hamm Canal in 1916 as a branch plant of Hüttenwerke Kayser AG in Berlin. After the loss of the Berlin plants and reconstruction after the end of World War II, the production facilities were continuously expanded and steadily modernized. After the then-Norddeutsche Affinerie AG acquired the majority of Hüttenwerke Kayser shares in 2000, the plant was initially integrated into the company structure and expanded to become the Group's recycling center. Today Aurubis AG's Lünen site is one of the largest secondary copper smelters in the world, with a production capacity of around 250,000 t of copper cathodes annually. On the 316,000 m² plant grounds, about 650 employees (including roughly 40 apprentices) produce copper anodes, copper cathodes, iron silicate sand, and a number of co-products *Fig. 3.1*.

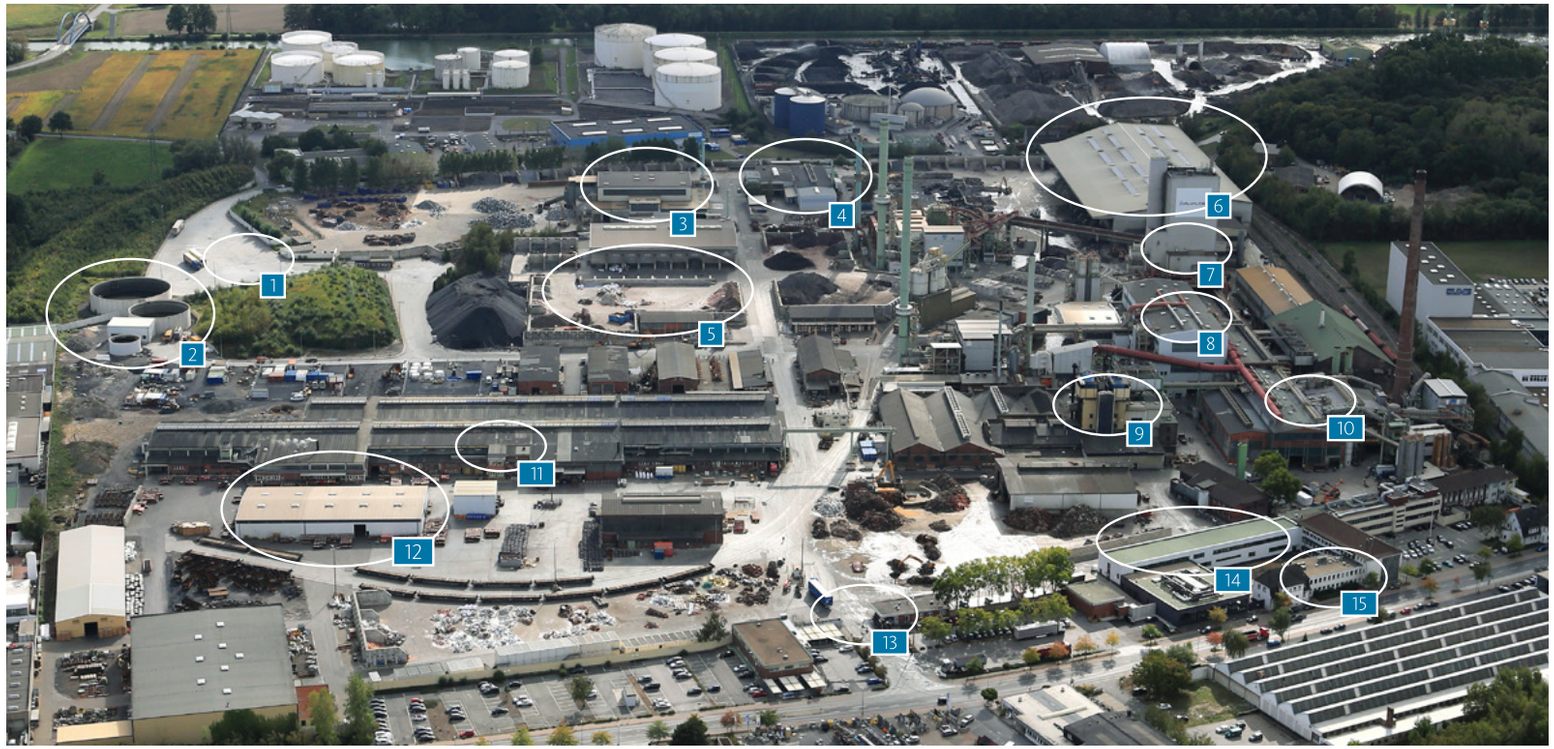
The processes at the Lünen plant

The Lünen site is a multimetal recycling site capable of processing highly complex raw materials in its own smelting and refining processes. Thanks to its options for flexibly using secondary raw materials, the Lünen plant can handle materials with complex compositions, such as pre-processed electronic scrap, old cars, and ashes from waste incineration in addition to traditional materials like copper and alloy scrap, slimes and industrial residues. The recycling process used in each situation depends on the consistency and chemical composition of the raw materials.

After the input materials are delivered (usually by truck), processing begins with sampling, followed by a material preparation step. Depending on quality and composition, the raw materials are crushed, then treated and separated in the material preparation plant or directly conditioned into input mixtures before undergoing a multi-stage metallurgical process.

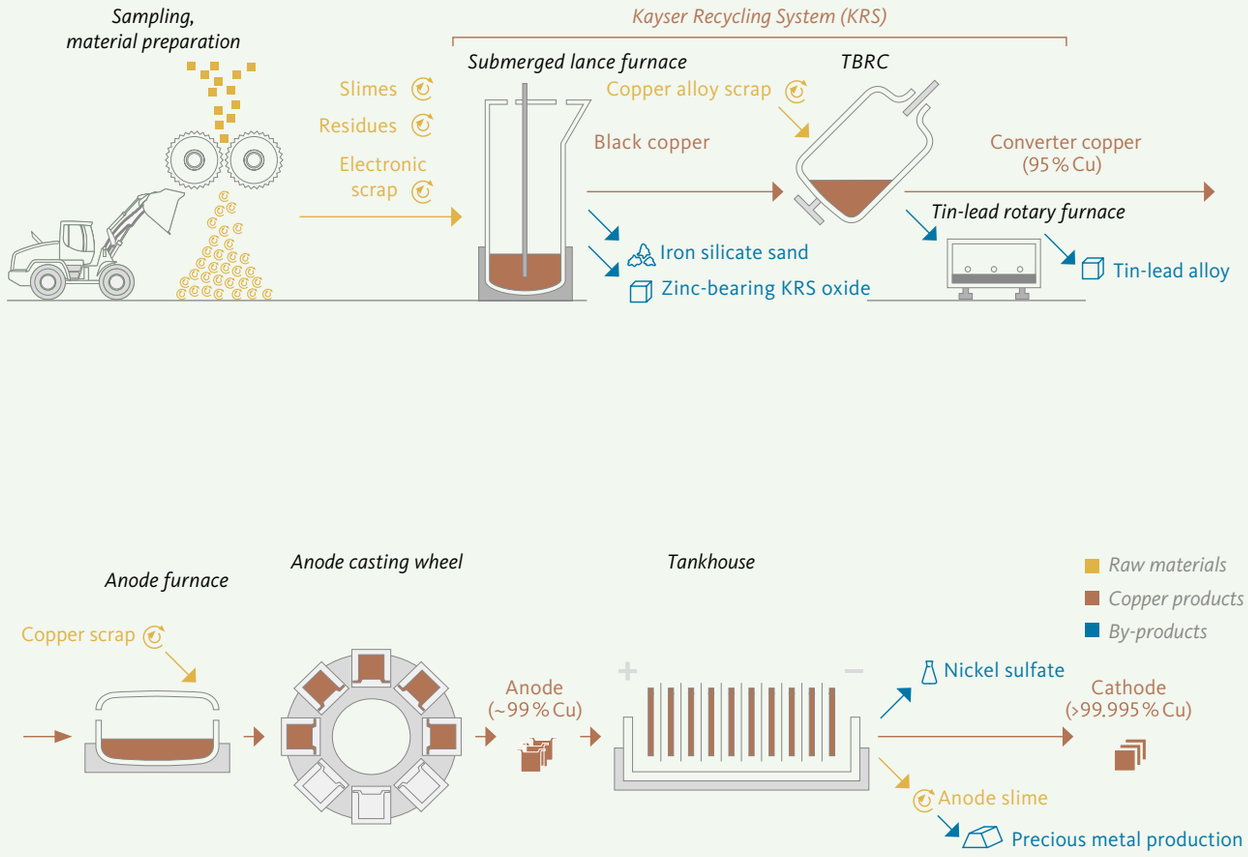
Pyrometallurgical processing starts in the Kayser Recycling System (KRS), which was commissioned in 2002 and gained a TBRC (top-blown rotary converter) in 2011 as part of the KRS-Plus project. The converter copper produced in the TBRC is refined together with copper scrap in the anode furnace and cast into copper anodes in a casting plant. These anodes are then refined electrolytically into copper cathodes – the site's final product. The tankhouse in Lünen processes anodes from other Aurubis sites as well *Fig. 3.2*.

Fig. 3.1: Overview of Lünen site facilities



1 South plant entrance with noise protection wall 2 Rainwater retention facility 3 Material preparation 4 Sampling 5 E-scrap preparation 6 Warehouse 4
7 KRS 8 TBRC 9 Leaching plant 10 Anode smelter 11 Copper tankhouse 12 Cathode warehouse 13 Kupferstrasse plant entrance 14 ATASI 15 Administrative building

Fig. 3.2: Multimetal recycling at the Lünen site



Zinc-bearing KRS oxide, iron silicate sand (slag granules), a lead-tin alloy, nickel and copper sulfate, and anode slimes are produced as by-products of multimetal recycling. At the Hamburg site, precious metals like gold and silver are recovered from anode slimes, together with a PGM[1] solution. The ratio of copper cathodes to by-products is about 1:1, though the increasingly complex recycling raw materials are steadily shifting the ratio to more by-products with minor metals. No process-related waste accumulates.

The integrated management system for the environment, quality and energy

The Lünen site has been certified in accordance with the environmental management systems EMAS and ISO 14001 since 1997. The site's environmental management system, together with the management systems for quality, energy, and occupational health and safety, comprise the integrated management system (IMS). The IMS includes the requirements placed on the Lünen plant as an end processor of electrical and electronic scrap (pursuant to the CENELEC standard TS 50625-5), in part as a waste management facility (Circular Economy Act), and as an initial treatment facility (Electrical and Electronic Equipment Law, ElektroG).

The external audits annually carried out as part of the IMS certification involve reviewing the environmental data, the fulfillment of legal provisions, and the effectiveness of the operating processes. Furthermore, the management systems' efficacy is assessed annually through IMS audits. The results of the company environmental audits and internal audits are compiled in reports and discussed with the plant managers during the annual Management Review. The management systems are evaluated to ensure they are suitable, appropriate and effective and to assess whether the requirements for the integrated management system are being implemented successfully.

[1] PGM = platinum group metal.

Targets and tasks of the environmental management system

The production processes are securely managed through the environmental management system at the Lünen plant. The targets and measures are defined and their implementation is monitored continuously. Environmental management includes the documentation of operational processes, the execution of internal audits, routine recordings, and site inspections.

The environmental management system ensures that the applicable legal requirements are fulfilled with respect to environmental protection. Furthermore, it drives continuous improvement through product and process design that takes the environment and occupational safety into account. Saving energy is also an essential element of environmental protection, supported by the ISO 50001-certified energy management system. This system depicts energy flows transparently and identifies possible optimization potential.

The management systems and organization of the IMS are described clearly and extensively in a handbook available to employees. Consequently, the IMS handbook and associated process and work instructions do not just address environmentally relevant issues and incident prevention, but also quality assurance measures, energy management, and occupational health and safety. This management handbook ensures that all activities that concern environmental aspects and occupational safety issues are planned, managed, monitored and continuously improved with due regard to legal requirements.

Employees are briefed on newly emerging and changing legal requirements in regular environmental protection training courses. Employees can use the operational improvement system to proactively contribute suggestions and ideas for optimizing processes and improving energy efficiency.

The environmental management systems in Lünen support measures that fulfill the new Aurubis corporate strategy as well, which defines new and ongoing targets related to people, the environment, and the economy for 2030.

To guarantee compliance with these targets, uniform environmental KPIs are regularly established and reviewed for the Group, as well as verified by external auditors. Examples of these KPIs include specific metal emissions to air and water.

Environmental management organization

Aurubis AG operates facilities requiring a permit in accordance with Section 52b of the Federal Immission Control Act and Section 53 of the Circular Economy Act. As such, the company's Executive Board or an appointed Board member is responsible for compliance with environmental protection and radiation protection regulations.

The officer functions at the Lünen site, for example:

» Immission protection and accident prevention
» Waste management
» Radiation protection
» Specialist company under the Water Management Act
» Occupational safety

are carried out by Lünen plant employees.

A Group employee located in Lünen fills the role of hazardous materials officer. Corporate Environmental Protection centrally oversees the tasks related to implementing the European chemical regulations REACH and CLP (Classification, Labelling and Packaging). These tasks are laid out in the Corporate Environmental Protection Policy.

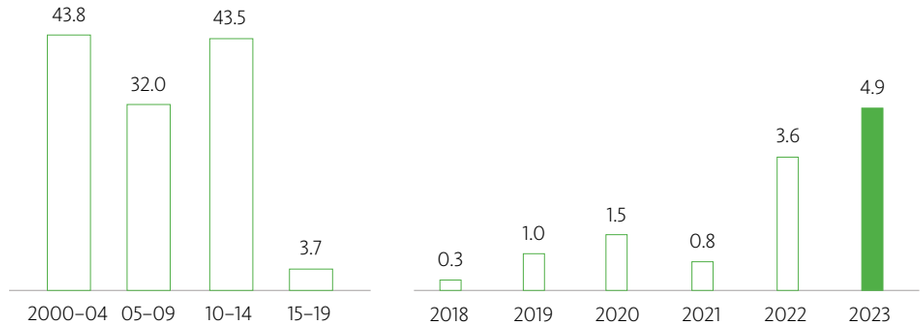
Environmental aspects and performance

Investments in environmental protection measures continue to be of crucial importance in Lünen. More than € 130 million in total was invested in environmental protection from 2000 to 2023 *Fig. 3.3*.

Following the acquisition of Hüttenwerke Kayser in 2000, Aurubis AG set new standards through extensive investment projects with new and improved facilities, such as the Kayser Recycling System (KRS) with an investment volume of about € 40 million.

The emission reduction concept for the period 2005 to 2009, which was agreed upon with the relevant governmental authorities, was initially estimated at around € 10 million and was later increased by further investments of € 25 million in additional measures (for instance, reducing dust emissions from KRS input materials in warehouse 4 and extensively paving storage areas).

Fig. 3.3: Capital expenditure for environmental protection measures at the Lünen site*
in € million



* The data shows the environmental investments for each fiscal year. Single years are provided for readability, for example 2023 for fiscal year 2022/23.

Between 2015 and 2019, process optimizations were the primary focus at the Lünen plant. At the moment, more investments are planned for optimizing existing facilities (those used for input material storage and handling, for example) and to possibly build new ones, with the goal of achieving additional improvements such as reducing fugitive emissions.

Air — Emissions

Emissions from directed sources (chimneys) are monitored with continuous measuring devices that transfer the emissions data. In addition to dust, substances like sulfur dioxide, nitrogen oxides, hydrogen chloride, hydrogen fluoride, and mercury are measured continuously depending on relevance. Other off-gas and dust components are measured manually.

The emission limits for air pollutants are stipulated in the TA Luft (Technical Instructions on Air Quality Control), with the limits in the permit requirements for some facilities falling well below the TA Luft standards. The limit values ftom the TA Luft relevant for Aurubis are featured in chapters 5.2.2, 5.2.4, 5.2.5, 5.2.7, and 5.4.3.3.1. Emissions to air comply with the limit values in the permits, or fall significantly below them in some cases. The same applies to additional substances listed in the permits, such as NO_x, HCl and HF.

The long-term goal of the Lünen plant is to achieve a continued reduction in emissions despite the input materials, which are becoming ever more complex. The difficulty in this regard is that the measured levels are already far below the detection limit in many areas, which could also be a reason for emission fluctuations in the calibration of the measuring devices. Because the emission level is already very low, significant reductions like those in the past cannot be expected through individual technical measures anymore. The goal is to continue maintaining this very low level and to improve it wherever possible.

Emissions of dust and especially dust components (copper, lead, arsenic, etc.) have been considerably reduced at the Lünen site in the past several years due to mitigation measures. The graphic presented here also incorporates the fugitive emissions including storage and handling. The dust emissions in 2023 were again at the same low level of the past several years *Fig. 3.4*.

Due to new, specific reduction targets set throughout the Group as part of the revised Sustainability Strategy, in the future, our new specific reduction targets and the associated reporting of specific emissions will no longer be based on copper output, but rather on a multimetal indicator — the copper equivalent. The approach and calculation method are described in detail in the Group section of the Environmental Report in the *Targets and successes in environmental protection* chapter.

Reporting of dust emissions in the Lünen plant is therefore made for the first time based on the new KPI for the past five years. Until the target horizon of the original Sustainability Strategy 2018–2023 has been reached, emissions will also continue to be reported on the basis of the amount of input material *Fig. 3.4 – Fig. 3.7*.

The Lünen plant uses complex recycled materials. As technical devices become smaller and smaller, and the number of processing stages increases as a result, copper production is lower, but there are more by-products per ton of material input. As a result, the new multimetal indicator provides an optimal depiction of the Lünen plant and its complex input materials since it includes the value created from all metal categories.

In 2020, an innovative method for recording fugitive emissions using drones was used for the first time in close collaboration with the University of Düsseldorf. Drones with installed dust measuring devices fly around the plant buildings and provide live evaluation data on the existing dust pollution. This method enables precise measurement of the current fugitive emissions. This helped identify potential emission sources in the anode furnace area. For instance, a building adjoining the boiler of the anode furnace area was better dust-proofed and a roof section in the anode furnace casting area was equipped with a water sprinkler for dust abatement. In the future, drones will be used to measure fugitive emissions as needed.

Fugitive emissions in particular have been determined or calculated in accordance with the methods used at the Hamburg site since 2004.

Emission measurements
with drones at the Lünen plant

Fig. 3.4: Dust emissions at the Lünen site
Dust emissions in g/t of input material and in g/t of copper equivalent

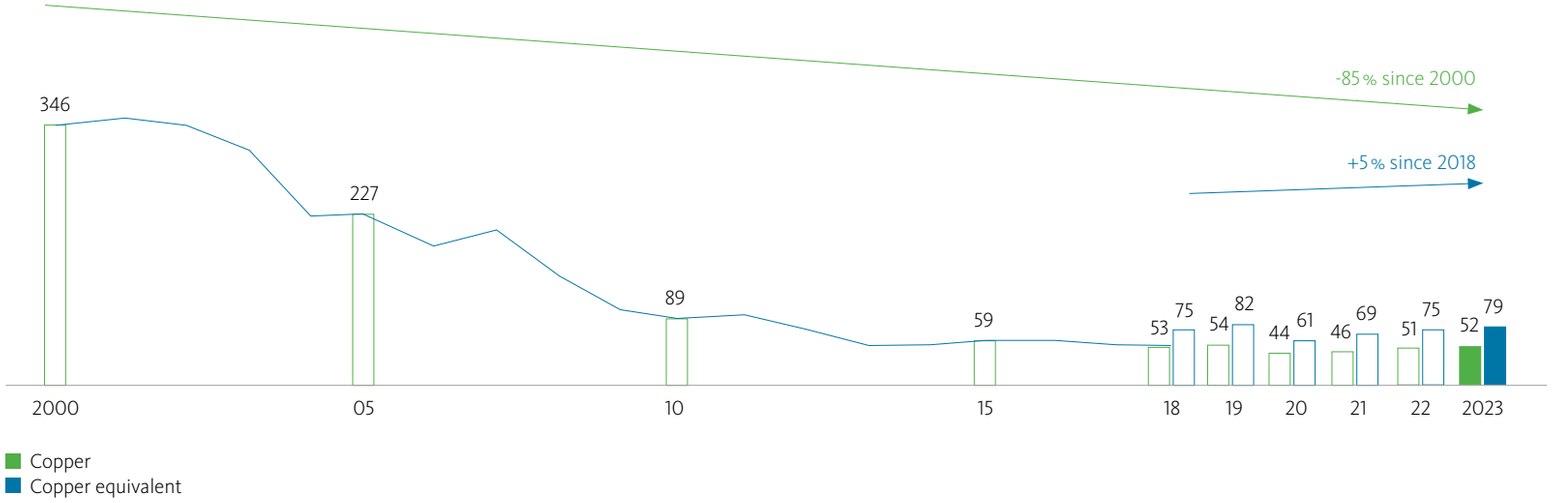


Fig. 3.5: Copper emissions at the Lünen site
Copper in g/t of input material

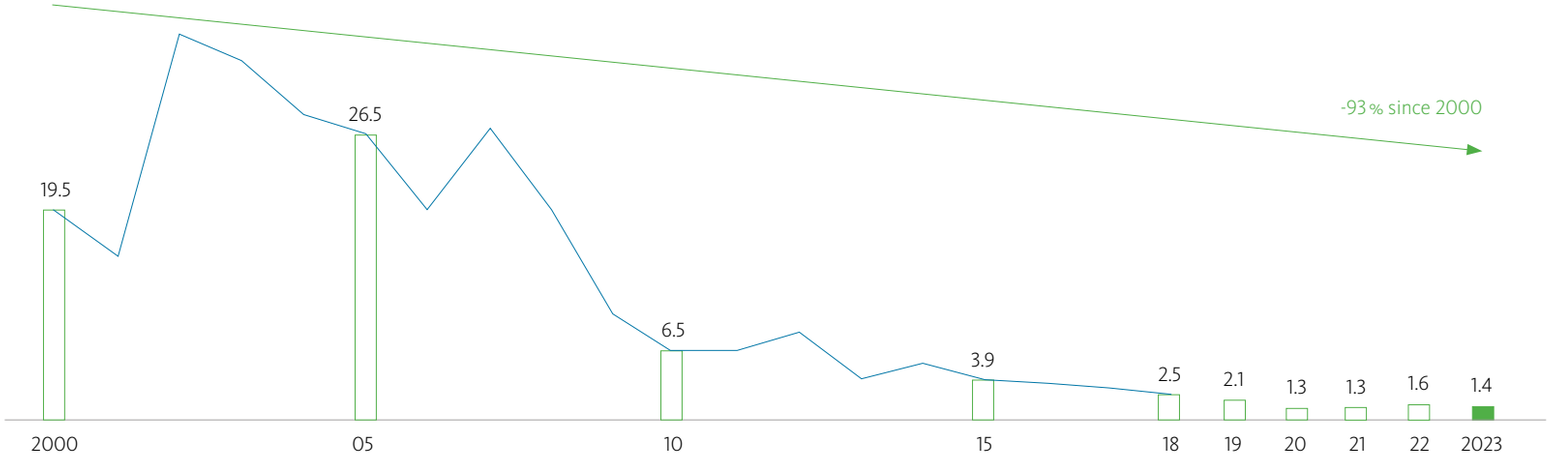


Fig. 3.6: Lead emissions at the Lünen site
Lead in g/t of input material

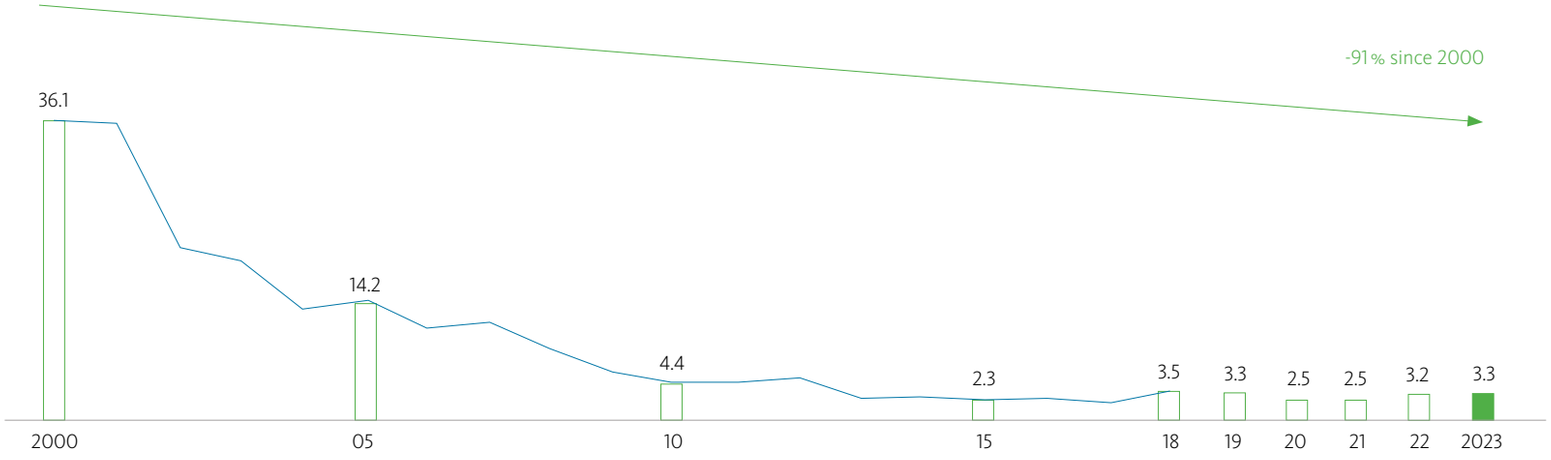
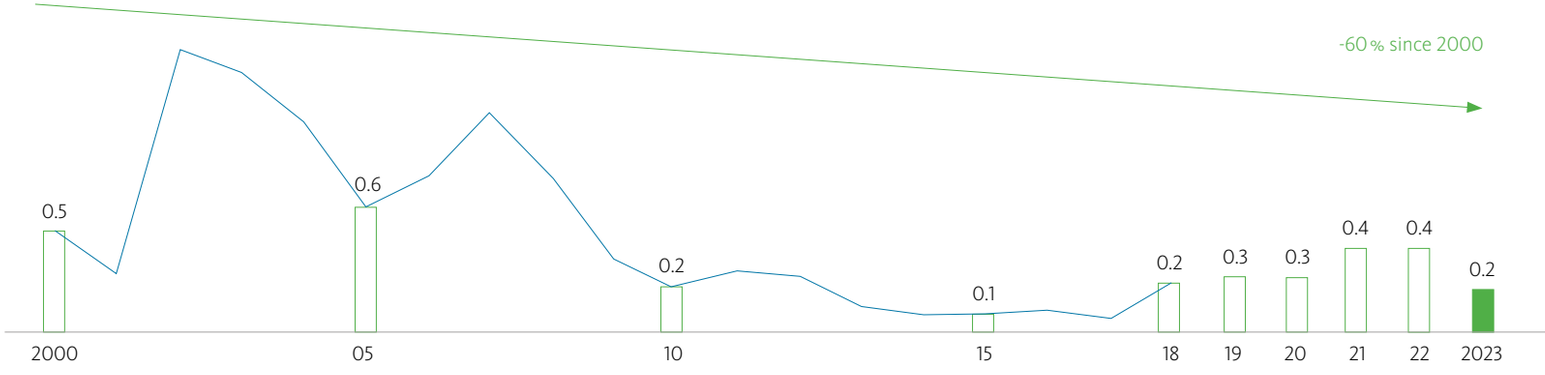


Fig. 3.7: Arsenic emissions at the Lünen site
Arsenic in g/t of input material

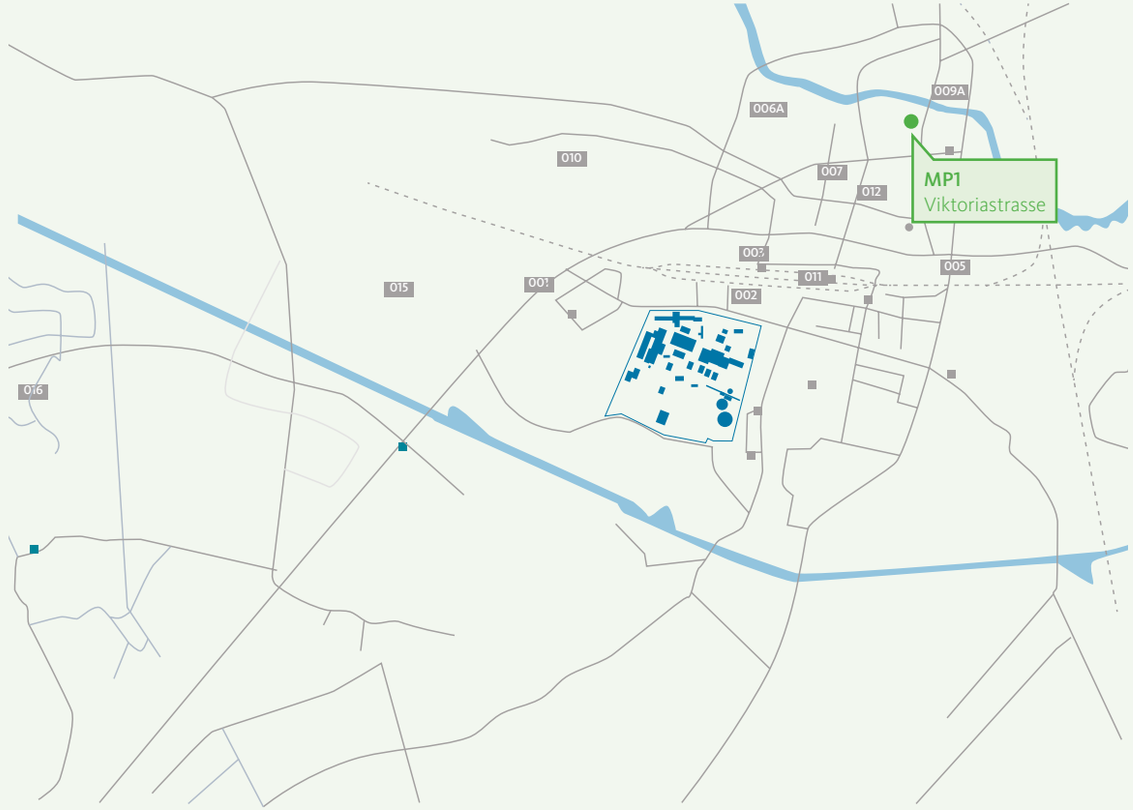


Air – Immissions

To measure the immissions of dust precipitation including metallic components, the LANUV (NRW State Agency for Nature, Environment, and Consumer Protection) operates a network of currently 11 "Bergerhoff" measuring points in the area surrounding the Lünen plant *Fig. 3.8*.

The closest LANUV measuring station for recording concentrations of particulate matter (PM10) is located on Viktoriastrasse (northeast of the plant). The position corresponds to that of the plant's calculated immission maximum *Fig. 3.9*.

Fig. 3.8: Locations of immission measuring points near the Aurubis plant in Lünen



"Bergerhoff" measurement points in Lünen

001 Buchenberg
002 Kleine Bergstrasse
003 Bergstrasse 48
005 Bebelstrasse/Süggelbach
006A Rail line/mosque
007 Lünen South freight yard
009A B 236/Lippebrücke
010 Im Wiesengrund
011 Builders' association/building yard
012 Rail line/Kantstrasse
015 Im Engelbrauck/north side
016 Im Siepen

Aurubis plant building

Source: LANUV

In the last ten years, there has been a significant reduction in dust immissions, primarily dust components. While isolated deposition values of the TA Luft were exceeded in some cases, the distribution of the deposited substances resulted from a number of specific emission parameters, such as meteorological conditions and properties of the substances, so immissions and depositions cannot be directly attributed to individual emitters. With regard to the immission situation in the Kupferstrasse industrial area, Aurubis communicates with the relevant governmental authorities and the other companies on site to identify and implement suitable reduction measures. Consequently, the Lünen plant reassessed the situation in an open dialogue with the authorities in early 2023 and planned additional emission reduction steps in conjunction with the TBRC 2 project, including closing the roof of the KRS building, installing an off-gas cleaning system for optimal suctioning within the scope of the project, cleaning and directing emissions through a directed source, closing the ridge turrets of the anode casting hall, and optimizing slag handling in the slag breaking area.

The measurements of air quality for suspended particulates and their components indicate that the levels are significantly and consistently below the limit values for both PM10 and lead, as well as below the EU target values for arsenic, cadmium and nickel *Fig. 3.9–3.13*. The LANUV measuring point at Niederaden is listed for comparison; it serves LANUV as a reference measuring point without industrial impact.

The LANUV measuring program, which investigated leafy vegetables from small gardens in Lünen near the plant, was discontinued because the measurement values stabilized at a low level in 2020.

Fig. 3.9: Immissions of particulate matter (PM10) compared to the plant's calculated immission maximum
Comparison of dust immissions in µg/m³ at the Lünen site, Viktoriastrasse, and Niederaden

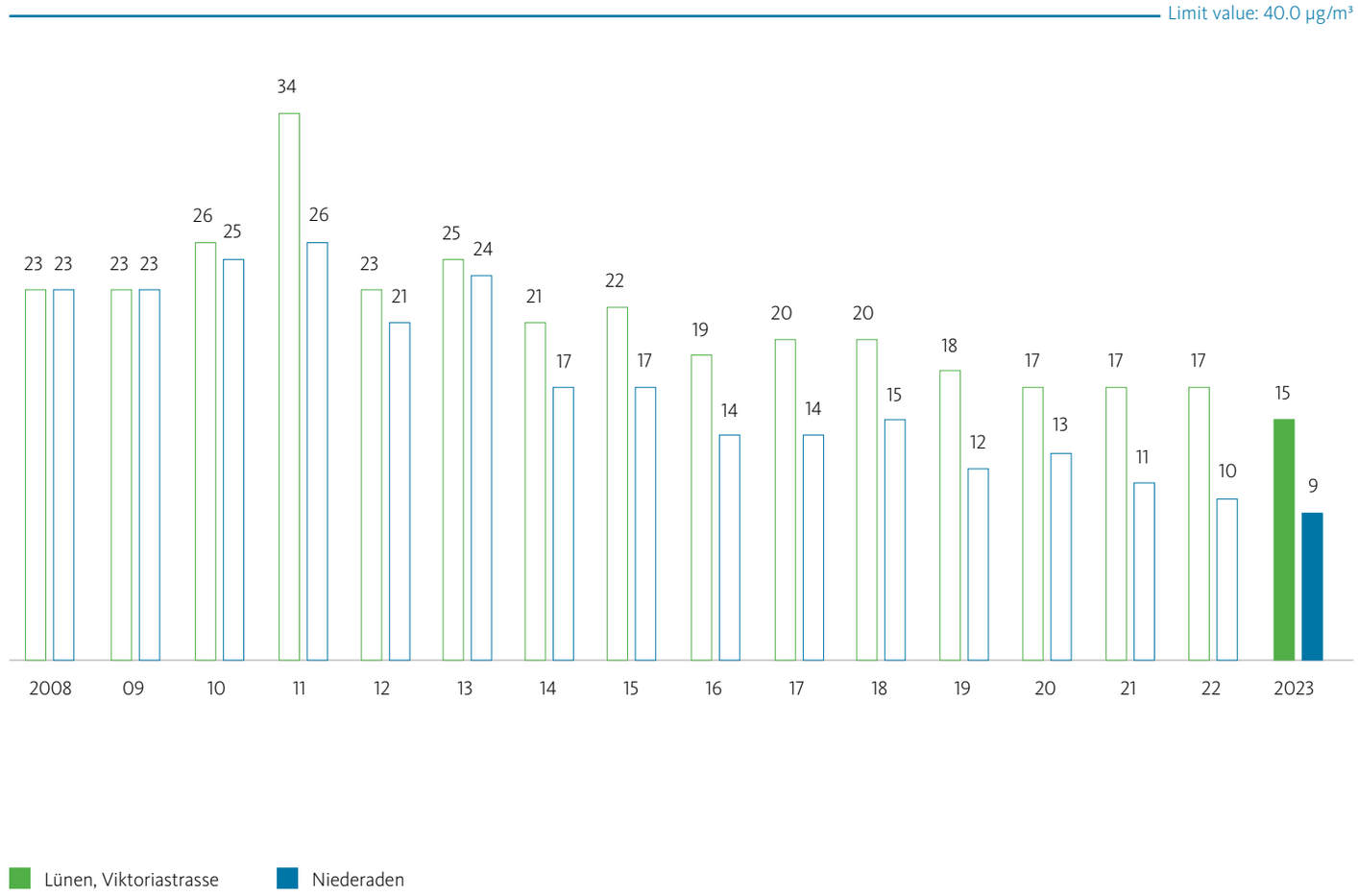


Fig. 3.10: Lead
Lead immissions in µg/m³

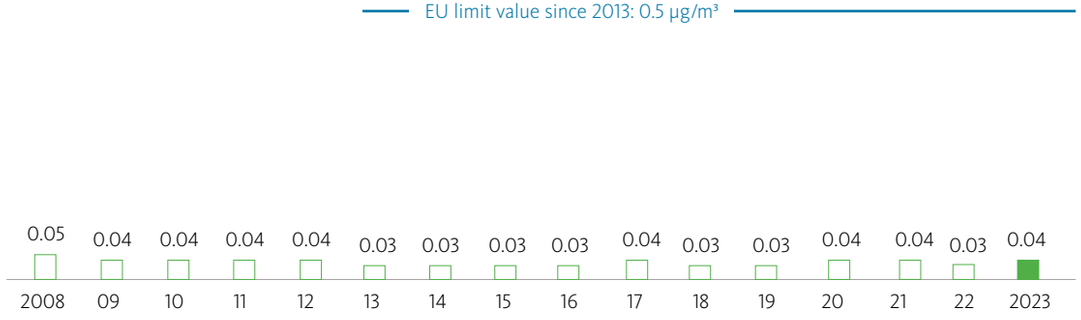


Fig. 3.11: Cadmium
Cadmium immissions in ng/m³

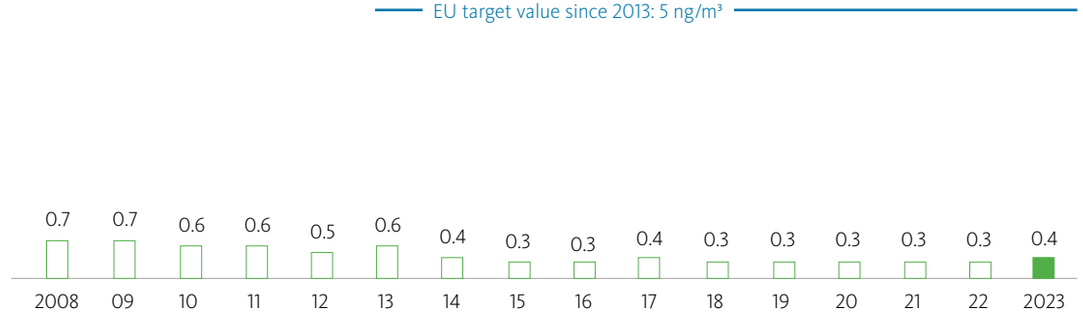


Fig. 3.12: Arsenic
Arsenic immissions in ng/m³

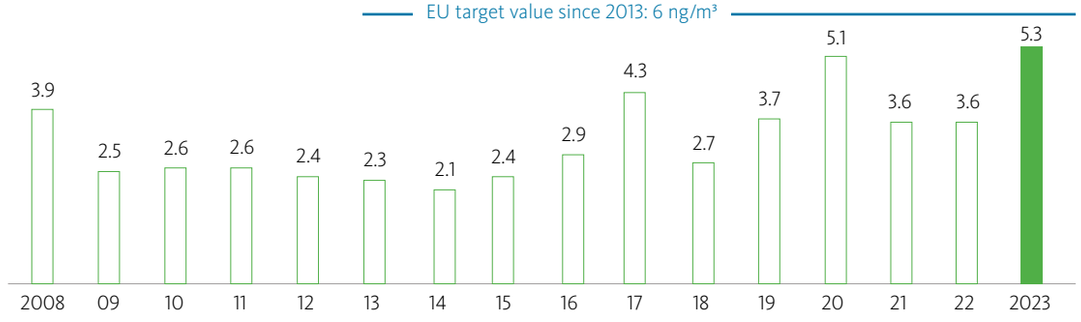
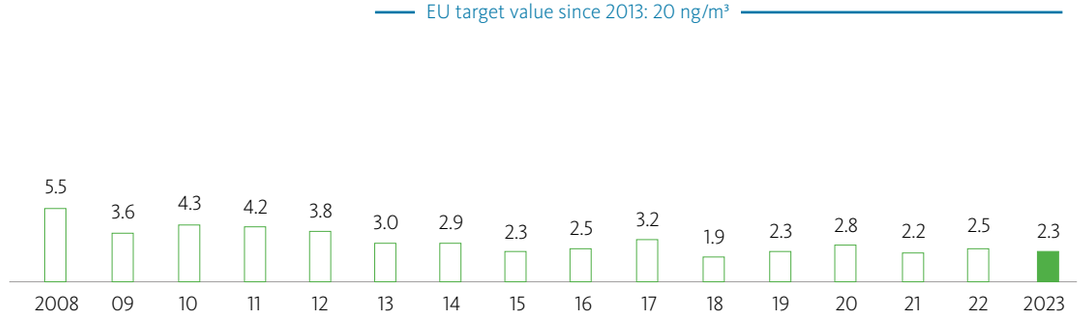


Fig. 3.13: Nickel
Nickel immissions in ng/m³



Water

Water is used in the Lünen plant for various cooling purposes, including anode cooling and slag granulation, as feed water for the steam boiler, and increasingly for operating several sweepers, as well as sprinkling driveways, plant/storage surfaces, and input materials. Particularly these latter measures to reduce dust emissions make it difficult to significantly reduce water consumption.

To conserve water resources as much as possible, the Lünen site operates a facility for rainwater retention, treatment and utilization, which covers a large part of the internal cooling and process water needs with collected rainwater.

The rainwater volume used in this way has increased continuously during the past several years, and water consumption from the public water network has decreased accordingly. In 2023, just under 170,000 m³ of process water was used for internal purposes. Overall, the rainwater-use project has significantly surpassed the projected quantities. In 2023, water consumption and wastewater discharge were at a good level similar to the past years *Fig. 3.14 and Fig. 3.15*. There were no notable incidents in 2023 that had any significant impact on the site's water consumption. Water withdrawal and release depend on different factors, however, including weather-related factors (e.g., precipitation volumes and evaporation) and production-related factors (e.g., increased evaporation in production processes and measurement deviations), and can fluctuate as a result.

For the coming years, additional optimizations are planned for internal water use, such as reviewing the further treatment of internal process water (reverse osmosis, evaporation). The goal is to use water internally to the greatest possible extent and prevent the discharge of process water into the public sewer system.

Fig. 3.14: Water consumption at the Lünen site
Water consumption in m³/year

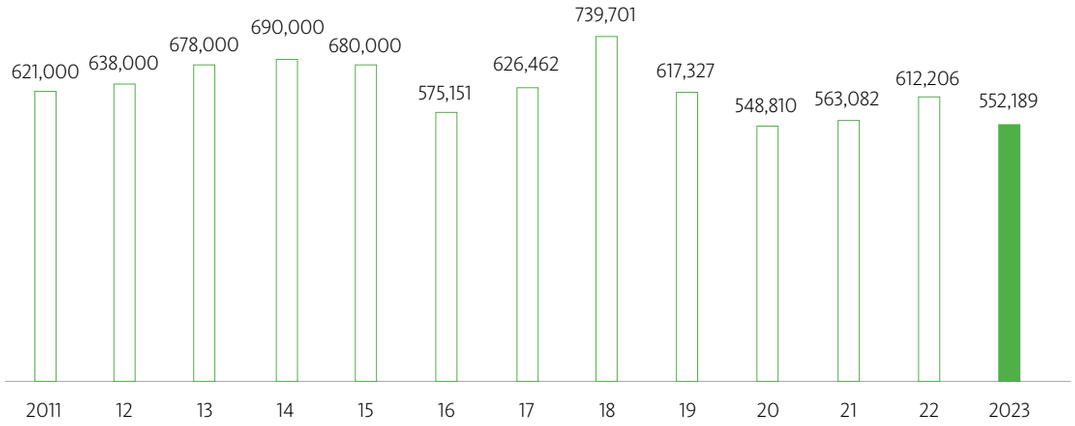
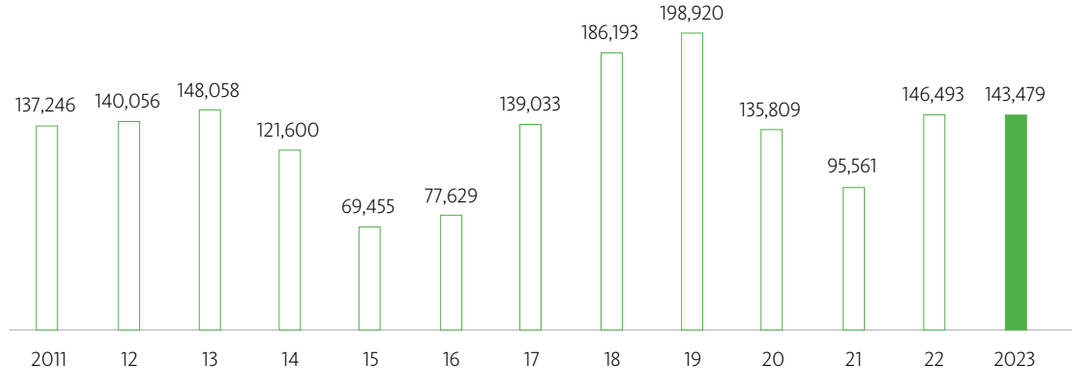


Fig. 3.15: Wastewater discharge at the Lünen site
Wastewater discharge in m³/year*



* The wastewater discharge from the rainwater retention has been recorded since 2017; as a result, the 2015 and 2016 figures are substantially lower than in comparable years.

Soil – Remediation measures
Since the plant opened in 1916, facilities producing non-ferrous metals have been operated continuously at the site. In conjunction with war damage, this led to soil pollution in the past.

On the basis of comprehensive tests, a remediation plan was developed and coordinated with the responsible authorities. In late 2014, a remediation agreement was signed with the Unna district describing the further agenda and the steps planned to remediate the soil and groundwater at the Lünen site.

The remediation concept includes encapsulating the contaminated area with the help of a sealing wall, as well as a drainage facility that requires the discharged water to be purified. Part of the sealing wall and some extraction wells have already been completed in the run-up to construction measures. An alternative concept is currently being drafted and will then be coordinated with the authorities.

The oil damage remediation system, the first measure implemented to remediate an oil phase in a former oil storage area, went into regular operation in 2020. This system cleans the extracted groundwater, which is then used as internal process water; the separated oil phase is disposed of externally by a specialized company that operates the system for Aurubis. In addition, the remediation progress is monitored externally with regular reports to the authorities.

For the other remediation measures, the goal is to use the remediated water in a similar way to sensibly combine remediation with further resource conservation.

Soil – Preventative measures
For decades now, preventative measures have been developed in order to eliminate future contamination of the soil. They are primarily related to the facilities dealing with materials hazardous to water, such as the tankhouse and oil storage. Furthermore, the storage spaces for input materials are being designed so that not even traces of deposits or components of input materials hazardous to water can end up in the soil.

Noise and odors
Noise protection measures take high priority in the conception of new facilities in particular. The goal is to ensure that any additional noise pollution in the area, as defined by the TA Lärm regulation, is only marginal, i.e., the levels should be at least 10 dBA lower than the TA Lärm immission reference values. This requirement was fulfilled in the last few years in all projects, and noise reduction measures are continuously carried out at existing facilities as well.

There were few noise complaints in 2023. For those that were attributed to sources on the Aurubis plant premises, the sources were immediately remedied. No limit values were exceeded in any measurable way.

In the course of 2023, two complaints were made regarding dust or material precipitation, one complaint regarding odor nuisance, and four noise complaints. After a thorough examination, these complaints could not be traced back to Aurubis as the source.

Biodiversity
Aurubis AG Lünen's plant premises are adjacent to agricultural land and are just a few kilometers from multiple Natura 2000 nature conservation areas (In den Kämpen, Cappenberger Wälder, and Lippeaue). Respecting and promoting biodiversity are therefore high priorities for us. For example, Aurubis has reviewed larger expansion projects such as the KRS-Plus project with extensive FFH[1] assessments in order to identify possible impacts on biodiversity. In smaller projects in the plant and in the neighborhood, we continue to take active steps to promote and preserve biodiversity – such as by planting greenery on plant surfaces that are not in use (noise protection wall).

Waste
The waste from the Lünen plant mainly results from packaging from delivered materials, from construction measures, and from spent potlining from the KRS, anode furnaces, etc. The externally marketed contingents of the material preparation plant, such as aluminum for continued recycling, are also inevitably among the waste from the site, as they do not lose their waste properties through preparation. In the meantime, sorting in the facility has become nearly homogeneous, making it possible to deliver all contingents completely as raw material for recycling to the respective industries for several years now.

A total of 348 t of hazardous waste accumulated in 2023, mainly spent furnace lining material. All of this waste was sent for recycling.

Additionally, a central waste collection point began operating in 2023. This centralization allows the waste streams to be channeled better, prevents impurities, and lowers waste costs. In addition to the information shown in *Fig. 3.16*, the table of KPIs in the Appendix provides a detailed breakdown of hazardous and non-hazardous waste streams.

[1] Flora Fauna Habitat Directive (EU Habitats Directive).

Fig. 3.16: Waste generated at the Lünen site

	Unit	2018	2019	2020	2021	2022	2023
Non-hazardous waste	t/year	5,467	4,842	19,712	8,944	5,206	4,045
Hazardous waste	t/year	362	458	402	329	372	348
Construction waste	t/year	3,234	9,639	3,015	14,638	58,349	36,256
Total waste volume, incl. construction waste	**t/year**	**9,063**	**14,939**	**23,129**	**23,911**	**63,725**	**40,649**

Energy and climate protection

Energy is required first and foremost for the metallurgical processes (primarily heating oil and natural gas), as well as for the tankhouse (electricity). Steam or thermal energy for leaching and electrolysis is mainly produced in the waste heat boilers of the KRS submerged lance furnace and anode furnace. There are also two auxiliary boilers primarily fueled with natural gas.

Since 2015, a two-stage condensation turbine has been in operation to produce electricity for internal use from waste heat steam through cogeneration. The steam from the process waste heat is initially depressurized from about 18 bar to 5 bar in the first turbine stage. Steam is removed for thermal use and the remaining volume is then depressurized to 0.1 bar in the second turbine stage. The German Federal Office for Economic Affairs and Export Control (BAFA) licensed the turbine in accordance with Section 5(2) of the German Act on Combined Heat and Power Generation (KWKG). For this project, Aurubis won the German Energy Agency's (dena) award for Best Practice in Energy Efficiency at the end of 2015. Turbine capacity for captive power generation was around 7.2 GWh in 2023. It should be noted that the turbine was not online for a longer period of time from September to the end of the calendar year due to overhaul and repair work. An additional 3 to 4 GWh would have been generated had this not been the case.

Developments and background on the use of primary energy sources:

- In 2023, the plant's total energy need was 496 GWh, which was below the 500 GWh threshold and roughly the same as in the previous year.
  The main influencing factors were:
  - A 10 GWh reduction in electricity demand due to the ongoing renovation of the tankhouse
  - A 7 GWh reduction in heavy fuel oil consumption
- Continued high input of energy-intensive, complex raw materials such as shredder materials and residues

The electricity required for environmental protection measures remains unchanged at roughly one-third of total electricity demand.

The site's absolute energy demand has been relatively constant for ten years. At 347 GWh in 2023, the primary energy input is around 0.1 % lower than the five-year average of 349 GWh. At about 159,000 t, direct CO_2 emissions fell just below 160,000 t again. According to the reporting methods pursuant to DEHSt standards, the organic components in the raw materials still contribute more to the site's CO_2 emissions than the main energy source, heavy fuel oil.

Copper cathode output fell from about 156,700 t in 2022 to 140,570 t. At the same time, in 2023 roughly 10,000 t of converter copper and around 17,000 t of copper anodes, or about 20 % of the copper output, was delivered as intermediate products to other Group sites for refining. The goal of the Lünen site is still to push the use of complex raw materials, which require more energy-intensive processing.

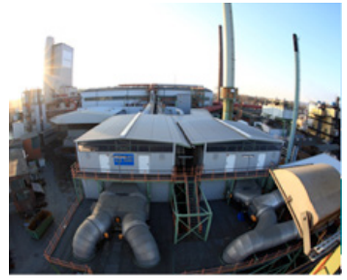
Fig. 3.17: Energy consumption[1] at the Lünen site

	Unit	2015	2016	2017	2018	2019	2020	2021	2022	2023
Primary energy consumption	MWh	404,317	390,734	391,679	360,990	337,970	352,437	352,519	339,461	346,889
Secondary energy consumption	MWh	161,167	155,212	165,117	164,593	155,067	163,553	153,145	155,021	148,584
Total energy consumption	MWh	565,485	545,946	556,796	525,583	493,036	515,990	505,664	494,482	495,473
Energy consumption per ton of copper output	MWh/t Cu	3.04	3.05	2.89	2.73	2.79	2.83	3.00	2.69	2.98

[1] Calculated using DEHSt (German Emissions Trading Authority) standards.

Fig. 3.18: Breakdown of energy consumption at the Lünen site

Total consumption
150.8 GWh
(2022: 155.0 GWh)



38.5 % Tankhouse 58.0 GWh (2022: 63.4 GWh)

22.5 % Tankhouse 34.0 GWh (2022: 31.9 GWh)

37.1 % Environmental protection 56.0 GWh (2022: 57.3 GWh)

1.9 % Administration, other 2.8 GWh (2022: 2.4 GWh)

Environmental protection facilities are very energy intensive; Aurubis uses more than 30 % of the electricity at the Lünen site for environmental protection measures. As part of required emissions trading, the primary and secondary energy quantities consumed and the resulting CO_2 emissions are also externally certified and validated annually.

Fig. 3.19: Direct CO_2 emissions at the Lünen site

	Unit	2015	2016	2017	2018	2019	2020	2021	2022	2023
Direct CO_2 emissions	t/year	174,549	176,067	186,544	169,415	163,572	162,166	164,854	156,794	161,596
Biogenic CO_2	t/year	0	480	324	300	295	313	379	334	295
CO_2 subject to DEV 2020[1]	t/year	171,858	173,202	183,839	166,918	161,113	159,739	162,276	154,294	159,218

[1] 2020 Data Collection Regulation for the third emissions trading allocation period.

Fig. 3.20: Energy consumption at the Lünen site
in MWh/t of copper output

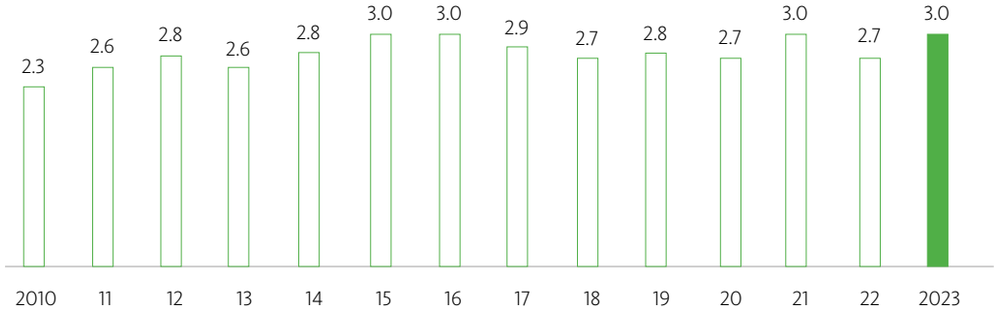
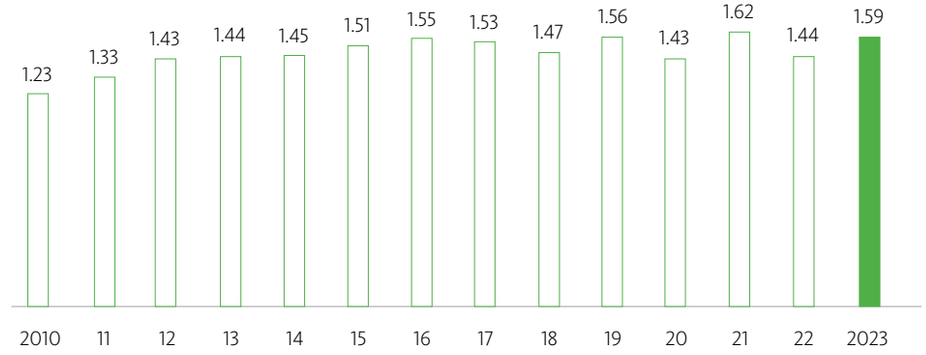


Fig. 3.21: Direct CO_2 emissions at the Lünen site
in t CO_2/t of copper output



Sustainability
Aurubis AG is dedicated to treating the environment and limited natural resources with care as part of its sustainability targets. Furthermore, long-term company success is to be secured through responsible business practices and stable growth. Aurubis AG has also pledged to reduce its CO_2 footprint by 50 % for Scope 1 and 2 emissions by 2030.

These Group targets are broken down according to the respective site. As a secondary copper producer, the Lünen site faces a particular challenge. Around 50 % of the site's CO_2 emissions arise from the complex secondary materials used as input materials. More efficient pre-treatment and improved sorting lines can be used to initially convert some "unavoidable" CO_2 emissions into "avoidable" CO_2 emissions. The 50 % target can also be achieved in Lünen by replacing fossil fuels such as oil and gas with green energy sources and planning and implementing energy projects such as the expansion of photovoltaics at the site.

Audits and inspections by governmental authorities
The following environmental inspection was carried out by the relevant governmental authorities in 2023:

» IED[1] Plant inspection, focus: Newly built filter system with the furnaces and exhaust gas collection systems operated in connection with it by the Sampling Operating Unit (formerly Sampling), Nov. 8, 2023

The inspection was completed without any deviations. The reports are available online on the Arnsberg District Council website.

Indirect environmental aspects
Nevertheless, the delivery of most input materials and auxiliary materials with trucks cannot be avoided. The main reason is that the type of delivery is the supplier's choice. About 70 % of deliveries arrive through the "Buchenberg" entrance, which is completely located in an industrial area of the Lünen city harbor and is separated from residential areas with an effective noise protection wall. An increase of deliveries by rail via the side track at the plant is planned for the future.

Emergency measures and crisis management
Because of the type and quantity of materials handled, the Lünen site is subject to what are called the expanded obligations of the German Hazardous Incident Ordinance. Aurubis therefore developed a comprehensive safety report together with external experts and in close coordination with the responsible governmental authority, in which all incident scenarios are addressed and concrete safeguards are derived from them. The safety report is revised regularly and is adjusted and expanded to reflect the results of hazardous incident inspections. The hazardous substances register indicates the locations of these substances in the plant as well as potential incident scenarios.

The Lünen plant's incident information is provided to neighbors near the plant and can also be accessed online on the Aurubis website at any time.

There were no incidents or malfunctions with significant environmental effects within the definition of the Hazardous Incident Ordinance at the Lünen plant during the reporting period.

[1] Industrial Emissions Directive.

Environmental Program

The targets set in the context of the Environmental Statement 2023 were reviewed to determine the extent to which they had been achieved and implemented. Discussions with employees, training, audits and quality circles served as a basis for discussing and evaluating the environmental protection measures, as well as developing a new environmental protection program for 2024. The results are presented in the following Environmental Program.

Target	Planned measures	Degree of implementation/date
Air pollution control		
Concept for better dust control in storage areas throughout the entire plant	Setting up new Legio walls, boxes with slanted roofs, semi-automatic water sprinklers with the help of central technical containers and various water sprinklers and misting machines	The concept was developed and presented to the governmental authorities. Implementation began in 2023 and is scheduled to be completed in 2025
Reducing emissions and improving odor immissions in the plant surroundings	New filter in sampling with extraction ring in the sampling hall	The filter was commissioned in 2023
Water pollution control		
Optimizing wastewater flows	Separately treating sanitation water, improvement in the ratio of used surface water to drained surface water close to 100 %	The previous targets were achieved and the water usage concept to prevent unused process water from being discharged was developed. A schedule of the preliminary inspections is being drawn up. Next steps: » Pump trials » Testing the treatment procedures
Waste management/polluted areas		
Renaturation of the internal, defunct blast furnace slag (HOS) landfill	The historic HOS landfill has been partially remediated. The remaining part of the landfill has been secured and a restructuring plan is being drawn up	The safety measures were completed at the end of March 2024. Restructuring is targeted for the end of 2026
Energy optimization		
Enhancing energy efficiency	Developing an assessment basis that takes the following aspects into account » Form of energy » Raw material structures » Raw material availability » Raw material composition (complexity) » Price volatility	The Energy Performance Indicators (ENPIs) are reliable and sound. In the coming years, standards-based assessment benchmarks will be introduced for the entire process in order to better monitor sustainable development
Development of a steam storage facility for optimized use of steam	The goal of steam storage is to minimize energy losses and optimize the supply of process steam for the boilers and plant facilities	The project is in the engineering phase and is scheduled to be budgeted and tendered this year

Key figures for Aurubis AG, Lünen site, in calendar year 2023

Developments in KPIs are explained in the text

Input	Unit	2021	2022	2023
Raw materials				
Recycling raw materials	t	350,855	336,862	326,112
Blister, etc.	t	15,938	12,549	10,728
Copper anodes from other Aurubis sites	t	0	5,394	1,480
Bleed	t	45,482	44,582	44,115
Total raw materials	**t**	**392,414**	**399,387**	**382,435**
Input material per t of copper	**t/t Cu**	**2.33**	**2.17**	**2.30**
Operating supplies and materials				
Oxygen	million m³	43	32	41
Rhine sand	t	17,879	16,746	19,528
Limestone	t	2,154	1,205	1,661
Energy				
External power sources	MWh	146,595	147,930	141,246
Internal power sources	MWh	6,549	7,502	7,338
Natural gas, oil, coal	MWh	352,519	321,977	346,889
Total energy consumption	**MWh**	**505,664**	**494,482**	**495,473**
Use of regenerative/renewable energy				
Use of process heat	MWh	6,549	7,502	7,200

The table may include slight deviations in the totals due to rounding.

Input	Unit	2021	2022	2023
Water withdrawal/uptake				
Potable water	m³	563,082	612,206	552,189
Precipitation	m³	128,636	149,568	269,912
Other sources (e.g., raw materials)	m³	39,547	36,412	39,099
Total water uptake	**m³**	**731,265**	**798,186**	**861,200**
Water consumption (withdrawal) per t of copper output	**m³/t Cu**	**4.3**	**4.3**	**5.2**
Area used				
Total plant area (incl. south plant entrance)	m²	316,000	316,000	316,000
Buildings and paved area	m²	252,784 (equivalent to 80 %)	252,784 (equivalent to 80 %)	252,784 (equivalent to 80 %)

The table may include slight deviations in the totals due to rounding.

Output	Unit	2021	2022	2023
Products				
Copper products sold (cathodes, anodes and blister)	t	168,332	184,070	166,324
KRS oxide	t	22,841	22,667	24,260
Iron silicate sand	t	173,904	160,615	160,872
Other (tin composite, nickel sulfate, etc.)	t	23,428	21,679	21,353
Total products	**t**	**388,505**	**389,031**	**372,762**
Waste				
Total waste volume, including construction waste	**t**	**23,911**	**63,927**	**40,649**
Construction	**t**	**14,638**	**58,350**	**36,256**
Hazardous waste	**t**	**329**	**372**	**348**
AVV[1] 16 11 03* Spent potlining	t	267	223	248
AVV 17 02 04* Plastic waste	t	0	54	34
AVV 13 05 08* Waste emulsion	t	19	22	20
Other	t	43[2]	73[3]	46[4]
Non-hazardous waste	**t**	**8,944**	**5,206**	**4,045**
AVV 19 12 04 Plastic waste	t	1,185	1,185	1,333
AVV 19 10 02 Aluminum	t	1,839	1,839	1,310
AVV 15 01 03 Wood (pallets)	t	511	604	593
Other	t	5,409[5]	1,577[6]	810[7]
Total waste per t of copper output	kg/t Cu	55	30	26
Total waste per t of input material	kg/t	24	14	11

[1] Abfallverzeichnisverordnung (AVV).
[2] Comprises 5 waste code numbers (AVV).
[3] Comprises 7 waste code numbers (AVV).
[4] Comprises 9 waste code numbers (AVV).
[5] Comprises 15 waste code numbers (AVV).
[6] Comprises 17 waste code numbers (AVV).
[7] Comprises 12 waste code numbers (AVV).

The table may include slight deviations in the totals due to rounding.

Output	Unit	2021	2022	2023
Emissions				
Input material per t of copper output	t CO_2/t Cu	0.96	0.84	0.96
Dust per t of copper output	g/t Cu	107	110	121
Dust per t of copper equivalent	g/t Cu eq.	69	75	80
SO_2 per t of output	kg/t Cu	6.5	5.5	5.4
NO_x per t of copper output	kg/t Cu	1.8	1.7	1.7
Water discharge				
Wastewater (indirect discharge)	m³	95,000	146,000	143,000
Water discharge per t of copper output	m³/t Cu	0.57	0.80	0.86

The table may include slight deviations in the totals due to rounding.

CERTIFICATE

EMAS
VERIFIED ENVIRONMENTAL MANAGEMENT

IHK Hannover als EMAS-Registrierungsstelle
für die Industrie- und Handelskammern
in Norddeutschland

Aurubis AG

Hovestr. 50, 20539 Hamburg
Kupferstr. 23, 44532 Lünen

Registration-No.: DE-131-00035

Date of first registration: 1st November 2005

This certificate is valid until: 19th May 2026

This organisation has established an environmental management system according to Regulation (EC) No. 1221/2009 and EN ISO 14001:2015 (sections 4 to 10) to promote the continual improvement of environmental performance, regulary publishes an environmental statement, has the environmental management system verified and the environmental statement validated by an independent and accredited verifier, is registered under EMAS (www.emas-register.de) and therefore is entitled to use the EMAS-Logo.

IHK Industrie- und Handelskammer Hannover
Chamber of Industry and Commerce

Dr. Mirko-Daniel Hoppe

Hannover, 21st June 2023

INDUSTRIE- UND HANDELSKAMMER HANNOVER

TÜVNORD

ENVIRONMENTAL VERIFIER'S DECLARATION ON VERIFICATION AND VALIDATION ACTIVITIES

EMAS

in accordance with the
REGULATION (EC) No 1221/2009 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 25 November 2009
on the voluntary participation by organisations in a Community eco-management and audit scheme (EMAS)

The signing environmental verifier Ralph Meß, licensed for the scope "NACE-Code 24.44 - production and initial processing of copper", declares, to have verified whether the whole organisation as indicated in the environmental statement of the organisation

Aurubis AG
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20539 Hamburg
Germany

Aurubis AG
Kupferstraße 23
44532 Lünen
Germany

with registration number D-131-00035 meet(s) all requirements of Regulation (EC) No 1221/2009 of the European Parliament and of the Council of 25 November 2009 on the voluntary participation by organisations in a Community eco-management and audit scheme in the version amended by regulation (EU) 2017/1505 and regulation (EU) 2018/2026 are fulfilled (EMAS).

By signing this declaration, I declare that

- **the verification and validation has been carried out in full compliance with the requirements of Regulation (EC) No 1221/2009,**
- **the outcome of the verification and validation confirms that there is no evidence of non-compliance with applicable legal requirements relating to the environment,**
- **the data and information of the environmental statement of the organisation reflect a reliable, credible and correct image of all the sites' activities, within the scope mentioned in the environmental statement.**

This document is not equivalent to EMAS registration. EMAS registration can only be granted by a Competent Body under Regulation (EC) No 1221/2009. This document shall not be used as a stand-alone piece of public communication.

Hannover, 21.05.2024

Ralph Meß
Environmental Verifier
DE-V-0300

TÜV NORD CERT
Prüf- und Umweltgutachtergesellschaft mbH
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Imprint

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LAYOUT
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PHOTO CREDITS
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EDITORIAL DEADLINE
This report describes calendar year 2023. Current events were included up to the editorial deadline of May 2024.

This Environmental Statement comprises Aurubis AG, which includes the Hamburg and Lünen sites.

aurubis.com

Metals for Progress

EN_24/06

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