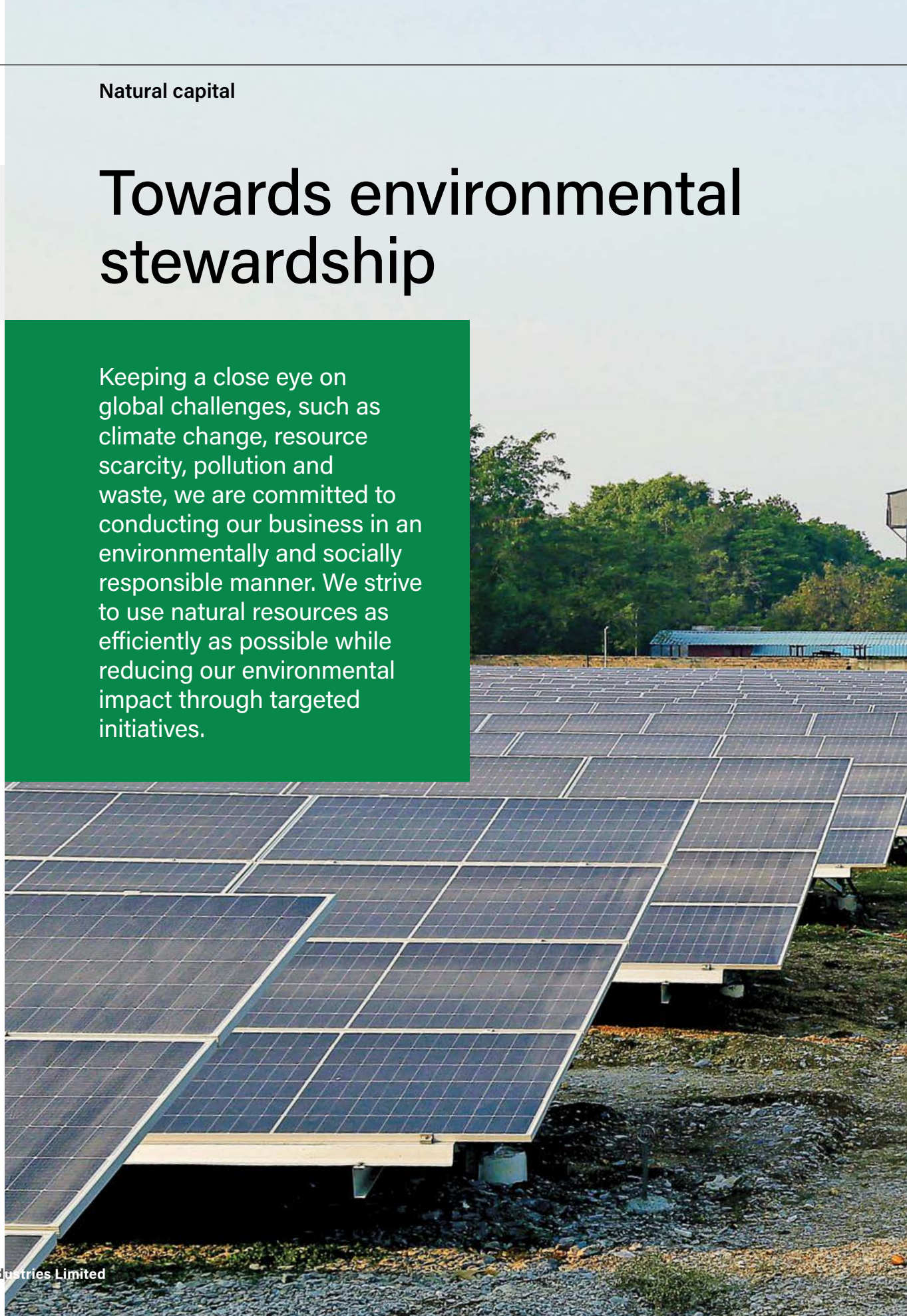
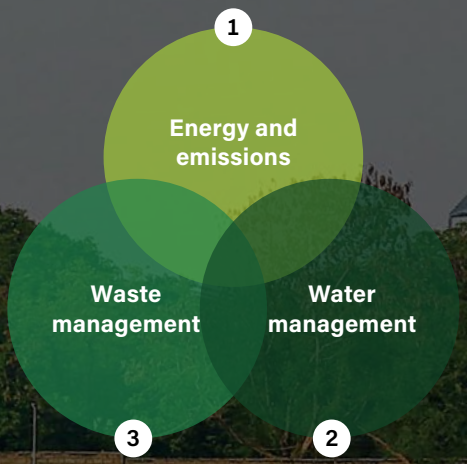
Towards environmental stewardship

Keeping a close eye on global challenges, such as climate change, resource scarcity, pollution and waste, we are committed to conducting our business in an environmentally and socially responsible manner. We strive to use natural resources as efficiently as possible while reducing our environmental impact through targeted initiatives.



Focus areas



Stakeholders impacted

Employees | Communities | Vendors and suppliers | Government and regulatory bodies

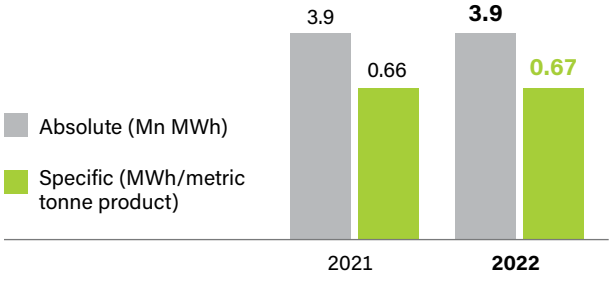
SDGs impacted

1

Energy and climate change

Monitoring our energy usage and greenhouse gas (GHG) emissions data is a crucial step in reducing the effects of climate change.

Energy consumption (primary and secondary energy input plus WHR-based energy produced)



Waste-heat recovery system

To improve energy efficiency, we invest in waste-heat recovery and steam co-generation facilities by utilising the heat generated by our production processes. We use the steam and electricity generated from our waste-heat recovery systems for our plants as well as supply to other businesses. In addition, we help local power grids to reduce their dependence on power generated from fossil-fuel by supplying some of our electricity from our waste-heat recovery plants.

We also link chemical production with energy co-generation at three of our carbon distillation and advanced materials sites, supplying the heat and steam produced by our exothermic processes to third parties or other areas in our production facilities. Five of our carbon calcination facilities, located in India and the US, also co-generate electricity from the waste heat of their operations. We use and are expanding the use of similar technologies to produce electricity from waste heat in our cement-production process in India.

Energy generated from WHR systems

1.1 Mn MWh

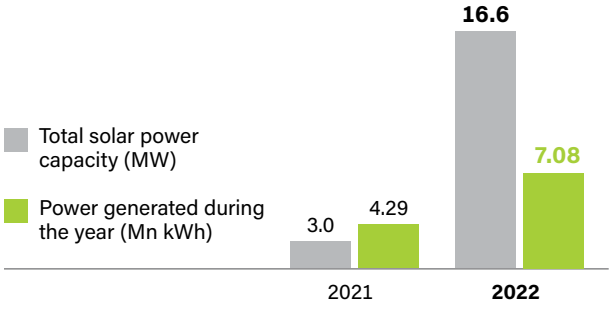
2021: 1.2 Mn MWh

Investing in solar power

Apart from waste-heat recovery, we have made significant investments in photovoltaic solar power generation. Over the past couple of years, this has helped us reduce our CO_2 footprint by lowering our reliance on electricity generated from fossil fuels.

During CY22, we commissioned two additional ground-mounted solar power plants: 3.6 MW in Suryapet, 10 MW in Nandyal.

Solar capacity

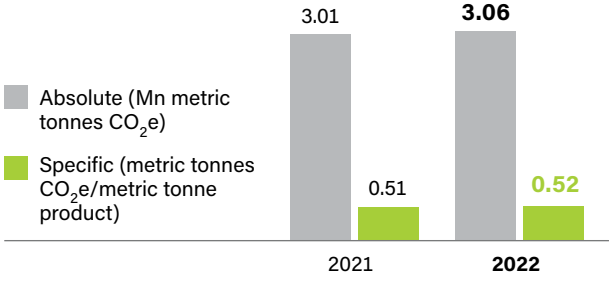


Emission control

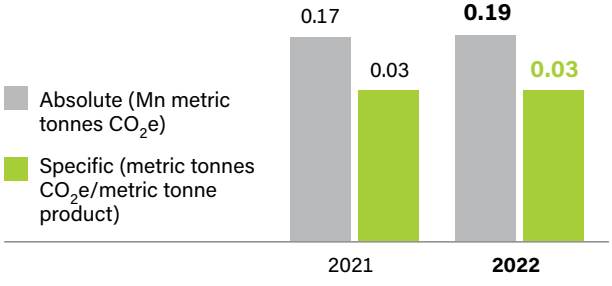
We undertake various emission-control measures to reduce the environmental impact of our operations. To ensure that industrial emissions from our activities are under the regulatory norms, we continuously track and monitor emissions data of our plants.

- Five of our eight calcination plants across India and US are equipped with flue-gas desulphurisation to reduce sulphur-dioxide emissions
- We have implemented leak-detection and repair systems at our carbon distillation and advanced materials facilities to proactively check for fugitive losses of benzene, toluene, and xylene (BTX) emissions on a regular basis
- Most of our coal tar distillation units are equipped with wet scrubbers to lower air emissions. These scrubbers, which are typically found in tank farms, remove particles and gases from waste-gas streams

GHG emission (Scope 1)



GHG emission (Scope 2)



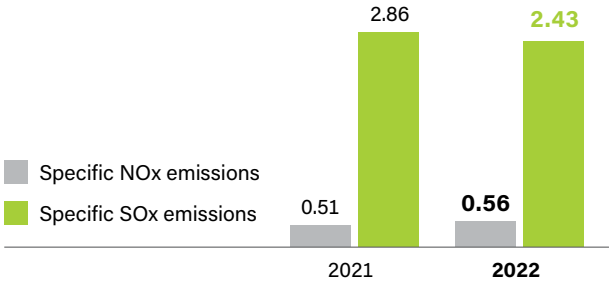
Reducing SOx and NOx emissions

NOx and SOx emissions primarily occur at our carbon calcination sites due to the nature of the various raw materials processed at those manufacturing facilities. To reduce these emissions from our processes, we have been investing in efficient flue-gas treatment systems and in environmentally friendly technologies.

In Germany, our Castrop-Rauxel distillation and advanced materials facility has an integrated waste-gas incineration plant, which includes a denitrification (DeNOx) and a flue-gas desulphurisation (FGD) plant for treating flue gases from exhaust gas combustion. Because of the low-sulphur fuel used, the FGD reduces the SO_2 load of the flue gases from waste-gas combustion by 95%; the other flue gases produce only marginal SO_2 emissions. An activated carbon-filter system cleans the exhaust air from the biological wastewater treatment, significantly reducing volatile organic compounds emissions.

To reduce SOx air emissions, we use a flue-gas desulphurisation system at our Zelzate distillation and advanced materials facility in Belgium. In addition, a DeNOx unit is being built and will be operational by CY23. This unit will cut the Zelzate site's total NOx emissions by 60%.

Specific NOx and SOx emissions
(kg/metric tonne)



Carbon footprint studies of products and facilities

In CY22, we continued to calculate the carbon footprint of our products. The purpose of the evaluation was to be transparent with customers and strengthen our commitment towards developing products with a lower carbon footprint. We conducted carbon-footprint studies of different products including more than 60 resins from our advanced materials business as well as processes for the production of pitch, naphthalene, creosote oil, and carbon black oil by our carbon distillation business.

Additionally, we began evaluating our carbon footprint on a site-level basis. The base models for the Castrop-Rauxel and Duisburg sites in Germany have been established, with preliminary results being evaluated. Going forward, we will be evaluating the carbon footprint of other sites.

Other environmental initiatives during 2022

At our cement business plants, we have undertaken extensive plantation drives using the Miyawaki method. These plantations not only enhance the biodiversity of the regions but also help in reducing our carbon footprint.

10,990 saplings
planted covering an area of 12 acres in Suryapet plant

93,200 saplings
planted covering an area of 27.5 acres in Nandyal

2

Water management

Through sustainable water management, we are making a positive contribution to global water-related challenges, such as availability and quality. We strive to reduce our freshwater consumption by using biological wastewater treatment, water recycling, and cooling circuits at multiple facilities.

Freshwater consumption (Mn m^3)

4.1

Water-treatment systems

To reduce our freshwater consumption, we have water-treatment plants in place at multiple facilities. We continue to add new plants and improve the existing ones by installing advanced water-treatment processes and technologies.

At many of our sites, we perform studies for recycling water and avoiding waste or wastewater by using activated charcoal or reverse osmosis. We also try to divide wastewater streams as early as possible to achieve higher recycle rates. For example, at the Zelzate plant in Belgium, we combine many actions to prevent water contamination such as installing leak-free pumps as well as continuous or periodic measurements of the pumps and piping systems. Installation of closed sampling points and renovation of equipment such as pipe racks and containments are also an ongoing process. This is accompanied by routine inspections.

Achieved a positive water balance index during CY22

1.49
in Suryapet (Unit 1)

Enhancing water treatment processes at Hamilton, Canada

The Hamilton plant in Canada has its own sewage system. To reduce groundwater infiltration even further, the system is inspected on a regular basis and has undergone major repairs in recent years, including pipeline relining and catch-basin lining. These activities reduce the possibility of quality issues and an excessive amount of discharged water.

We also have a stormwater-treatment unit that collects and treats all stormwater at the facility. By adding a reverse-osmosis unit to the stormwater-treatment unit, the site will recycle significant volumes of water and reduce the use of potable water. The unit will be commissioned in 2023.

Our Hamilton facility can now handle all process wastewater generated on-site, rather than shipping it off-site for treatment by a third party. Another advantage is the avoidance of steam production due to a 10-15% reduction in total energy consumption as a result of the installation of vacuum pumps and the elimination of the use of stripping steam in both primary distillation units. Vacuum pumps will be installed in the secondary distillation unit in 2023.

Efficient use of water at Vizag and Gramercy sites

At our Vizag calcination plant in India, all sewage water is treated and used to water the green belt that surrounds the site. Apart from that, the wastewater from our Vizag waste-heat power plant and its auxiliary cooling-tower blowdown water are reused in the flue-gas desulphurisation process. These processes improve our site's water efficiency and reduce our freshwater consumption per tonne of material produced.

At the Gramercy calcination facility in the US, fine particles of green petroleum coke (GPC) that are lost during the calcination process are recovered from settling ponds on the plant site. The reclaimed GPC fines are recycled as feedstock that can be transformed into usable calcined petroleum coke. Since 2018, this water treatment/settling system has minimised raw-material waste at the site and supported our efforts to minimise the loss of GPC.

3

Waste management

At RAIN, we strive to maximise resource efficiency by converting as much raw materials as possible into products, while minimising waste volumes. We have implemented different measures to reduce waste across our global operations.

Resource-efficiency initiatives

At our Castrop-Rauxel facility in Germany, we operate a raw material-recovery plant, where we process the suspensions from the facility's water-purification processes, extracting materials that can then be used as secondary raw materials.

At our Hamilton facility in Canada, drippings from our unloading lines are now collected and fed into our raw material storage units for processing, instead of being disposed off as waste.

Sustainable use of our industrial by-products

At our Vizag calcining facility in India, we supply the sulphate lime by-product to local brick manufacturers, who use it as a key blend component instead of sending it to landfill. This reduces the environmental impact, while also providing employment to the brick industry. At the Atchutapuram vertical-shaft calciner, our newest FGD system employs an ammonia-scrubbing technology, the by-product of which is ammonia sulphate, which can be used as a fertiliser by the local agricultural community.

In the US, the lime by-products from our flue-gas desulphurisation systems are useful in a variety of agricultural and geo-mechanical applications.

We have also implemented a system at our Hamilton plant in Canada where pitch residues are recovered and remelted for use as a saleable product while leading to a reduction of hazardous waste. At our Zelzate plant in Belgium, we collect high-sulphur by-products and transform them into sulfuric acid, which is sold to other industries. These efforts not only benefit the environment but also contribute to the growth of our business.

Zero waste to landfill in the Cement segment

We initiated a sustainable waste-management programme to achieve the goal of 'zero waste' by focusing on regulatory compliance and maximum resource recovery. For this, we have a waste-converter unit in each cement plant.

Recyclable or reusable waste (dry, wet, and unrecoverable/ reject) generated daily at each site is now segregated at the source for compositing, recycling, or upcycling. Non-recyclable waste, such as multi-layered plastic packaging and segregated combustible fractions, is burned in the kiln.

4+ tonnes
Organic wet waste converted to compost in Unit 1

~10 tonnes
Organic wet waste converted to compost in Unit 2