

Climate Positive

We will continue to reduce our carbon footprint and increase our use of bio-based raw materials, whilst the benefits in use of our ingredients will enable more carbon to be saved than we emit through our operations and supply chain.



Climate Positive by 2030

Reducing Emissions			
Objectives	Targets	Milestones and metrics	2021 progress
<p>We will achieve our science-based targets (SBTs) by reducing our emissions in line with limiting the global temperature rise to 1.5°C above pre-industrial levels, maximising the use of renewable energy in our operations.</p>	<ul style="list-style-type: none"> By 2030, we will have achieved our SBTs, reducing scope 1 and 2 emissions by 46.2% from a 2018 baseline, in line with limiting global warming to 1.5°C, and reducing upstream scope 3 emissions by 13.5% Thereafter, by 2050 we will be a net zero organisation 	<ul style="list-style-type: none"> A reduction of 25% in 2018 absolute scope 1 and 2 emissions by the end of 2024 All Croda locations to have a decarbonisation roadmap by the end of 2022 	<p>7 Affordable and Clean Energy SDG 7.2</p> <p>9 Industry, Innovation and Infrastructure SDG 9.4</p> <p>13 Climate Action SDG 13.2</p> <ul style="list-style-type: none"> Absolute scope 1 and 2 emissions have reduced 12.7% since 2018, despite a 5.8% increase in output volume, as we decouple business growth from environmental impact Non-manufacturing sites were engaged in roadmap setting with the support of regional champions, with 25% completed
Carbon Cover			
Objectives	Targets	Milestones and metrics	2021 progress
<p>We will enable the transition to a low carbon economy. We will be Climate Positive, working closely with our customers to develop products that offer carbon saving benefits in use.</p>	<ul style="list-style-type: none"> By 2030, use of our products will avoid four times the carbon emissions (scope 1, 2 and 3) associated with our business – our 4:1 carbon cover 	<ul style="list-style-type: none"> Two million tonnes of CO₂e emissions savings delivered through use of our products by the end of 2024, which will be externally verified 100% of our product portfolio evaluated for downstream scope 3 impact by the end of 2024 	<p>7 Affordable and Clean Energy SDG 7.2</p> <p>13 Climate Action SDG 13.2</p> <p>17 Partnerships for the Goals</p> <ul style="list-style-type: none"> 951,000 tonnes CO₂e were avoided through the use of ingredients attached to verified case studies, giving a carbon cover ratio of 0.8:1 80% of our product portfolio has now been evaluated, identifying further carbon saving benefits in use
Sustainable Innovation			
Objectives	Targets	Milestones and metrics	2021 progress
<p>We will accelerate the transition to bio-based products, moving away from fossil/petrochemical feedstocks.</p>	<ul style="list-style-type: none"> By 2030, over 75% of our organic raw materials by weight will be bio-based, absorbing carbon from the atmosphere as they grow 	<ul style="list-style-type: none"> 71% (rolling three-year average) of our organic raw materials to be bio-based by the end of 2024 	<p>12 Responsible Consumption and Production SDG 12.2</p> <p>17 Partnerships for the Goals</p> <ul style="list-style-type: none"> Our use of bio-based organic raw materials increased by two percentage points from 67% to 69% A multidisciplinary working group identified all current petrochemical-based raw materials that could be replaced with bio-based alternatives

Reducing Emissions

SDG Targets:
7.2, 9.4 and 13.2



The urgent need for society to tackle the climate emergency was highlighted during 2021. The United Nations Conference on Climate Change (COP26) highlighted that governments and businesses must both play their part in moving from ambition to action if we are to limit global temperature rises to no more than 1.5°C above pre-industrial levels and prevent the most catastrophic effects of climate change.

Leadership and advocacy

As a signatory to the UN Global Compact Business Ambition for 1.5°C and member of the Race to Zero campaign, we are demonstrating leadership on climate action in an industry that is recognised as hard to decarbonise.

In September 2021 we signed an open letter to all G20 leaders urging them to keep the Paris Agreement's 1.5°C goal within reach. This was signed by more than 600 businesses across all G20 countries stating that the G20 has a collective responsibility and opportunity to demonstrate global leadership to decisively address climate change.

Lending our voice to urge leaders and other organisations to follow our sustainability leadership is not new for Croda. In 2020 we also signed an open letter to the UK government urging a clean and just recovery plan following the COVID-19 pandemic, and most recently have urged the UK government to set out a comprehensive net zero strategy.

In support of the aims of COP26, we presented at many climate-focused events in 2021, including UNGC UK, discussing the route to net zero for manufacturing.

COP26 saw us not only focus our internal communications on this important event, sharing video clips recorded by our employees in attendance at the Green Zone, we also used it as an opportunity for our STEM team to further engage with schoolchildren on sustainability. We developed new material for our STEM Ambassadors to take into schools, highlighting the importance of COP26 and climate change, encouraging discussion about everyday changes we all can make to reduce our carbon footprint (see People Positive, page 33).

We have also carried out quantitative climate scenario analysis in the last year in alignment with the Task Force on Climate-related Financial Disclosures (TCFD) recommendations (see page 25).

1.5°C science-based target validation

In July 2021 we became only the third major chemical company globally to have a 1.5°C science-based target validated. By the end of 2029 we will have reduced our operational (scope 1 and 2) emissions by 46.2% from a 2018 baseline.

With the majority of our emissions within our supply chain, we also had our scope 3 target approved by the SBT initiative: to reduce our upstream scope 3 emissions by 13.5% over the same time frame. The focus here is to engage and work with suppliers to reduce emissions associated with sourcing raw materials (see Supplier Partnership, page 41) alongside transportation and distribution of products to our customers.

By taking action to achieve these targets within our operations and supply chain we can support our customers and enable them to meet their own GHG emission reduction targets.

Emissions and intensity charts

Since 2018, our baseline year, our total scope 1 and 2 greenhouse gas (GHG) emissions have reduced by 12.7%. Within this, scope 1 emissions increased by 4%, whilst we have seen a 60% reduction in scope 2 emissions. This has been driven by a switch to renewable electricity across our manufacturing sites. In 2021 we engaged with Accenture to help us explore electricity sourcing options for our manufacturing sites in Asia, where availability of green electricity is more challenging. Renewable Energy Certificates (REC) purchases at Thane, India and Singapore have led to a significant reduction in scope 2 emissions this year.

Scope 1 and 2 GHG emissions from our UK operations were 34,559 TeCO₂e in 2021 (2020: 35,692 TeCO₂e) representing approximately 20% of our global GHG emissions.

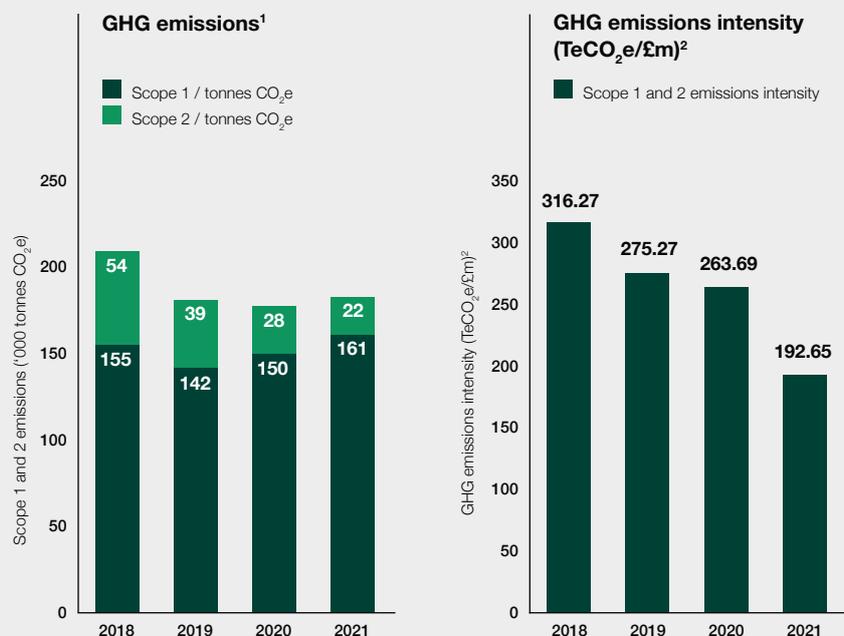
Our chosen measure of GHG emission intensity divides our GHG emissions (market-based scope 2 emissions) by value added², a measure of our business activity. Since 2018, our GHG emissions intensity has improved by 39%, illustrating how we are decoupling growth from our environmental impact.

Our scope 1, 2 and 3 GHG emissions are verified by Avieco. Their formal independent verification statement is available at: www.croda.com/carbonverification

Energy consumption and efficiency improvements

In 2021 we consumed 1,178,117,781 kWh (2020: 1,125,612,495 kWh) of energy across our global operations. This included 219,130,734 kWh (2020: 222,759,173 kWh) consumed by UK operations.

As part of our strategy to improve the efficiency of energy consumption, 36 projects were implemented globally, realising 39,514,274 kWh of annualised efficiency improvements, equivalent to 9,063 TeCO₂e avoided emissions.



1. Our GHG inventory has been completed in accordance with the Greenhouse Gas Protocol, Corporate Accounting and Reporting Standard (Revised Edition). Scope 1 emissions are calculated using Defra Government emission conversion factors for greenhouse gas company reporting. Scope 2 emissions are market-based.
2. Value added is defined as operating profit before depreciation and employee costs at reported currency.

Reducing Emissions *continued*

Decarbonisation roadmaps

In 2021 our manufacturing sites have continued working to develop and refine decarbonisation roadmaps. These will ensure we can achieve our SBT through energy efficiency projects, moving to alternative fuel sources and innovating to find less energy-intensive ways to manufacture. By the end of 2022 every location in the Croda world, including all offices, will have a validated roadmap.

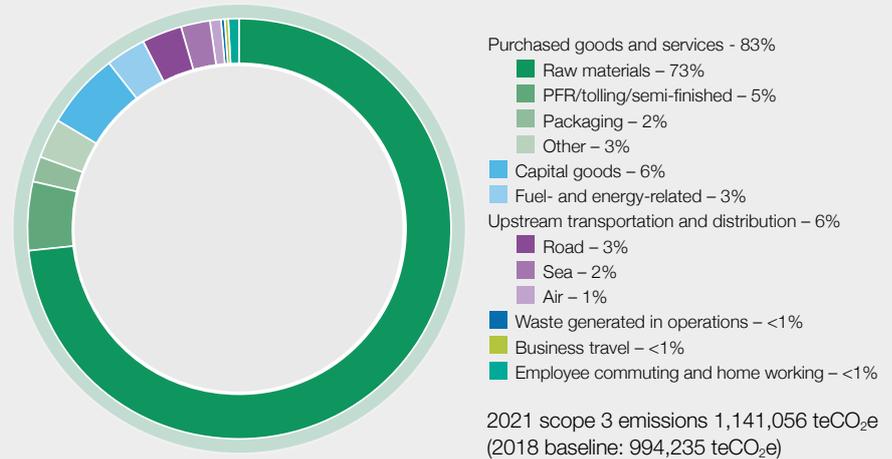
In this way we have started to move from ambition to action, and are seeing projects focused on carbon reduction already being implemented. For example, the biomass boiler at Hull (see case study) and a low carbon sulfate-free surfactants expansion project at our Rawcliffe Bridge manufacturing site (page 4). Use of an internal shadow carbon price (2021: £50/tonne CO₂e) has supported these carbon-focused investment proposals.

Projects at manufacturing sites alone will not get us to our target. We also need our sector teams to develop innovative, low-carbon alternatives to our existing ingredients, for example, looking at the opportunities of moving to biotechnology, as well as evaluating and managing product portfolios for carbon intensity. To enable this, our finance team has developed a methodology to automate calculation of scope 1 and 2 emissions at a product level, using existing product cost and site emission data. We can now provide the major business sectors with scope 1 and 2 product level carbon footprint data.

For the first time, 2021 saw the major sector teams present their carbon budget to the Executive Committee alongside their financial budget. Forecasting their carbon emissions for 2022 based on projected growth, sector teams presented actions to ensure emissions remain within budget and are aligned to achieving our SBT. In 2022 we will add scope 3 emissions associated with raw materials into these calculations, further improving sector visibility of their carbon footprint to enable better decision making.

Cradle-to-gate carbon footprint data for our entire product range will add huge value internally and with our customers.

2021 scope 3 emissions by category



Industry leading visibility of scope 3 emissions inventory

In 2021 we undertook a project to update our scope 3 emissions inventory, working with Avieco. This enabled a clear view of our supply chain emissions and allows us to identify areas for improvement. “The scope 3 enhancement has significantly improved Croda’s footprint reliability through using best practice and more primary supplier data,” said Julie Craig, Chief Commercial Officer, Avieco. “Granularity and repeatability have been key to the process and the improvements will enable Croda to better track their progress.”

In completing this work, we have identified that our 2018 scope 3 baseline is 104,461 tonnes CO₂e lower than originally calculated. This was primarily due to the accuracy of emission factors for our capital goods scope 3 category. Moving to a greater level of granularity and distance-based data for business travel has also resulted in a lower baseline for this category. However, through increased accuracy, we have identified a greater number of emissions associated with our purchased goods and services. This is our largest category, making up 83% of our upstream scope 3 emissions, the majority of which is raw

materials. Through this work, we have also included emissions associated with our packaging for the first time.

Life cycle assessment (LCA) studies for key raw materials were updated in 2021. For palm oil and palm kernel oil derivatives, this now includes the ability to represent the reduction in carbon footprint associated with purchasing RSPO certified palm, avoiding 23,949 tonnes CO₂e in 2021 compared with 2018 purchasing patterns. With strong support from our suppliers, 40% of our GHG emissions attached to raw materials are covered by these supply chain specific studies. We also have volume-based industry-recognised LCA figures attached to a further 35% of our raw material GHG emissions.

Our 2021 scope 3 emissions are 14.8% higher than our baseline year of 2018. This is largely due to greater investment, and increased emissions associated with raw material purchases, due to increased production volumes. Business travel reduced by 75% due to the pandemic. This increased granularity allows us to identify carbon hotspots in our supply chain, and work with suppliers to drive emissions reductions (see page 42).

Purpose in Action



See Embedding our Purpose, Commitment and Difference

P16

Hull biomass boiler

Climate Positive: Our Purpose in Action award winner

As part of our SBT commitment, we have partnered with AMP Clean Energy to install an 11MW biomass system at our Hull manufacturing site, a great interim step on our journey to net zero until alternative fuel sources like hydrogen are viable. The biomass project, which will supply steam for the entire site, is fuelled by locally sourced and sustainably managed forestry residues. There is no impact

on landfill as ash residues are routed into sustainable by-products, such as soil improvers and building blocks. Through a 20-year energy supply agreement reliance on fossil fuels will be reduced, as well as a benefit from low carbon heat over the long term, reducing the site’s scope 1 emissions by 60% and saving 10,000 tonnes of CO₂e emissions annually. The cross-functional project team worked hard to tight deadlines to make this innovative project happen: the first deployment of such technology within the Croda Group. The judges felt they were worthy recipients of a Climate Positive Award at our first Purpose Awards ceremony.

Carbon Cover

SDG Targets:
7.2, 7.3 and 13.2



Over the last three years we have been working to quantify carbon emissions savings through the use of our products, with the goal of reducing or avoiding four times the carbon emissions associated with our business. We are already working towards this target, discovering and accounting for avoided emissions using existing ingredients, as well as developing new products that not only have low carbon footprints but also deliver in-application carbon savings.

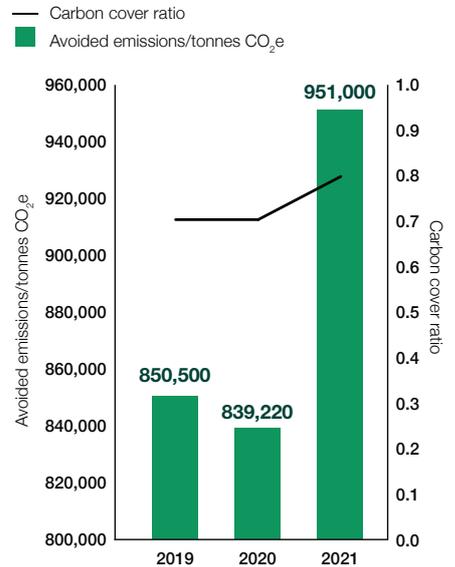
In 2021 we identified five new case studies where emissions were avoided, including a new product launched in 2021. The emissions savings of this new product were revealed during its sustainability assessment, part of the new way of working for our innovation teams to support our Commitment.

The four other products were identified by our Carbon Cover working group, set up in 2021 to drive the discovery of new case studies and identify avoided emissions for larger product and application areas. The group assessed around 80% of our product portfolio for potential carbon savings in use, which led to our first multi-product, multi-application assessment, encompassing all products sold by our Crop Protection, Plant Impact and Incotec businesses.

Our total avoided emissions in 2021 linked to the sales of ingredients from these case studies, and our product case studies validated in 2020 and 2019, is 951,000 tonnes CO₂e. This leads to a carbon cover ratio of 0.8:1. All case studies were aligned with our existing methodology for quantifying and reporting avoided emissions, as externally validated by Avieco.

We have seen an increase in our overall carbon cover ratio compared to 2020. Despite the five new case studies, the increase in avoided emissions is modest, mainly because of a slowdown in the automotive market, where our polymeric friction modifiers in engine oils provide significant emissions avoidance. Grouped case studies that cover larger product volumes, such as the one developed in 2021 on land saving, alongside innovation to develop new products offering avoided emissions in use, will be key to meeting our 2030 target.

Avoided emissions/tonnes CO₂e



Carbon cover assessment

c.80%

of product portfolio assessed identifying further carbon savings in use

Total avoided emissions in 2021

951,000

tonnes CO₂e

The five product case studies validated in 2021:

Coltide™ Radiance (ironing)

Our laundry additive reduces the time required to iron clothes, so reducing overall energy consumption for the task and lowering emissions.



Nutrivent Balance™

Our hair care product helps reduce sebum production, helping hair look cleaner for longer. This offers the possibility for consumers to wash their hair less often, leading to a reduction in water consumption, and so the energy required to power and heat the water.



LoVOCcoat

This surfactant can be used as an emulsifier in solvent-based paints. Emissions are avoided by using lower VOC containing components (water-based) in place of higher VOC (solvent-based) ones, whilst maintaining the performance characteristics of the final paint product.



Tween™ 24

Our Crop Protection adjuvant works by enhancing the bioavailability of the active ingredient within a fungicide formulation. The actives work more efficiently, and additional yield can be attained. Increasing yield leads to more efficient land use, which can in turn reduce carbon emissions, and water consumption.



Land use savings

As explained on page 27, our Crop Protection, Plant Impact and Incotec products were assessed for their impact on land use. More efficient use of land leads to lower emissions, including saving resources such as pesticides, fertilisers, energy for farming equipment, and more.



Sustainable Innovation

SDG Target:
12.2



In 2021 our use of bio-based organic raw materials increased to 69% from 67% in 2020. This was due to increasing sales of our ECO surfactants. Our target is for our use of bio-based organic raw materials to reach 75% by 2030, three times that of the European Chemical Industry target of 25%. Bio-based materials sequester carbon as they grow, so using them allows us to minimise our impact on the environment by designing lower-footprint products, originating from renewable carbon sources.

2021 saw additional progress made towards this target by a new multidisciplinary team, comprising members from our R&D and procurement functions. This team was created to identify new opportunities through innovation and collaboration and further increase our use of bio-based raw materials. The group identified raw materials currently derived from petrochemical sources that could be replaced with bio-based alternatives. Further investigations in 2022 will determine how these changes can be made while maintaining the same or bettering the performance of our products.

In addition to substituting existing virgin fossil raw materials for bio-based ones, our R&D teams have been developing new products from renewable origins. This includes scaling our biotechnology capabilities with the expansion of our biotechnology laboratory footprint in the UK. Offering an increasing number of products made using biotechnology is another way in which we expect the proportion of our bio-based organic raw materials to grow.

We carefully assess the whole biotechnology manufacturing process for each new ingredient to ensure we can support the sustainability benefits demanded by our customers. A Sustainability Impact Assessment (SIA) in 2021 showed that biotechnology could bring further sustainability benefits. Biotech processes use lower reaction temperatures than conventional chemical processes, leading to reduced energy consumption and opportunities to use energy from low carbon sources. Additional benefits include reducing the need for chemical processing, reducing or removing the need for catalysts, and improved process safety.

Research and Development

In 2021 we continued to embed sustainability into our ways of working within our R&D teams. This included assessing the impact of all new R&D projects against the UN Sustainable Development Goals (SDGs) and maximising bio-based content where possible.

Throughout the year our scientists received training on sustainability topics, such as how to assess bio-based content and the science behind biodegradability. Work was also undertaken to align our existing procedures across global R&D teams to ensure sustainable innovation remains at the forefront of all new developments.

This work was led by our Innovation & Sustainability Champions who are helping to embed sustainability across our global R&D team. They play a central role in the adoption of sustainable practices within the function, sharing training, providing regional expertise and helping translate important documents into local languages. For example, our Sustainability Checklist for new products was translated into Chinese for our growing team in the region.

In 2021 the majority of the new, patented and protected products (NPP) that we launched were 75% bio-based or greater, highlighting the crucial role our R&D teams play in meeting our 2030 Commitment. They are not only responsible for designing low-footprint bio-based products that meet our markets' demanding performance and quality needs, but also ones with sustainability benefits in use, as seen with our surfactant LoVOCOat™, which helps to reduce VOCs. In 2022 we plan to launch more products that enable carbon savings in use and have a bio-based content greater than 75%.



Our R&D teams now assess the impact of all new projects against the SDGs.



As Champions, we create awareness, encourage and facilitate the use of our sustainability checklist across R&D teams. This drives understanding of the importance of NPD project evaluation and output to ensure alignment with our sustainability goals.

Anu Chaphekar
Research and Technology Manager

Task Force on Climate-related Financial Disclosures (TCFD)

To help us understand the potential impact of climate change on our business and to inform our future strategy and planning, we have conducted scenario analysis looking at both transition and physical risks across three different scenarios, between a 1.5°C net zero 2050 orderly scenario, up to a hot house world +3°C scenario.



As part of the Task Force on Climate-related Financial Disclosures (TCFD) recommendations, further detail on this scenario analysis can be found in our Annual Report and Accounts page 40.

Transition risks

Of the risks modelled as part of our scenario analysis, the potential cost of increased carbon taxation has the most significant impact so far. The risk is already mitigated to moderate levels due to our 1.5°C SBT, and our commitment to be net zero as an organisation by 2050.

Our current transition plans stretch out to 2030, and we are now beginning work on our 2050 decarbonisation plans, starting at one of our top 10 manufacturing sites, Rawcliffe Bridge in the UK (see case study).

Our use of a shadow internal carbon price (£50/tonneCO₂e) as part of every capital expenditure proposal, helps us to understand the future OPEX impact associated with carbon taxation, and helps support the financial case for pure decarbonisation projects.

Since 2019 we have had an ESG clause within our bank facility. On achieving agreed decarbonisation targets we retain a small percentage of the interest resulting in a fund which must be spent on decarbonisation projects, supporting our transition to a low carbon future, and mitigating these associated transition risks.

UK Government funding at Rawcliffe Bridge for net zero decarbonisation roadmap

In October 2021, we successfully applied for the The Department for Business, Energy and Industrial Strategy (BEIS) Industry of Future Programme (IFP). Qualifying UK manufacturing sites need total carbon emissions in excess of 10,000 tCO₂e/year and following application, our Rawcliffe Bridge site was selected to be part of the study.

This scoping study will involve using an engineering delivery partner to develop a net zero roadmap for 2050 for the site. During this roadmap process, decarbonisation technologies will be identified, these could include commercially available technologies but also those that require further R&D and innovation. Following completion of the scoping study, BEIS may provide further support to sites involved in the programme in the form of follow-up activities/funding.

Physical risks

Of the physical risks assessed so far, the increase in natural raw material pricing, in particular palm, could lead to moderate to high levels of risk by 2045 in a 1.5°C net zero by 2050 scenario, due to increasing demand for palm oil as an alternative to fossil-based oils.

Our Commitment to be Climate Positive means that we will increase our use of bio-based raw materials. Through our Commitment to be Land Positive, we will enable more land to be saved than is used to grow our crop-based raw materials. Through innovation, we will help customers to mitigate the impact of climate change, and increase the availability of land suitable for growing crops, all actions that will mitigate the physical climate related risks associated with crop production within our supply chain and for our customers.

Reducing water use impact at Mevisa

Water is the primary medium through which we will feel the effects of climate change¹. Water availability is becoming less predictable in many places, and in some regions droughts are exacerbating water scarcity.

Situated in a Natura 2000 site² experiencing water shortages due to prolonged droughts, our colleagues at our Mevisa manufacturing site in Girona, Spain, have taken a proactive approach towards building resilience against increasing water stress and mitigating the physical risks of climate change. This includes extensive upstream and downstream ecosystem studies assessing flow regimes, vegetation cover, species richness and trophic structures. The site also monitors the quality of aquifer and riverine water to enhance local water quality through site discharges, evaluating water risks to prioritise future improvements, and exploring rainwater harvesting opportunities.

Since 2018 Mevisa has halved its water use thanks to investments in closed loop cooling towers which operate fully with recycled water, while future investments will focus on increased recycling of high conductivity water reaching the effluent treatment plant.

1. www.unwater.org

2. As defined by the European Commission, Natura 2000 is the largest coordinated network of protected areas in the world, core breeding and resting sites for rare and threatened species.

