

Minimizing environmental impact

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◆ The Arabian Sunbird is regionally native to Arabian Peninsula and present on Aramco BPAs in the western side of the Kingdom. The Arabian Sunbird geographical range spans from west of Arabia to Yemen further south. Sunbirds are not just beautiful – they are an important pollinator of native plants.

◀ **Photographer**
Philip Roberts

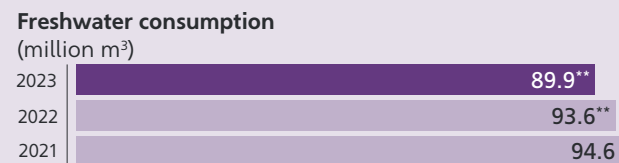
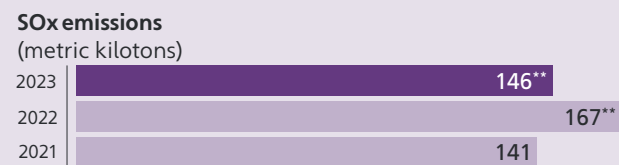
Minimizing environmental impact



Aramco has operated for more than 90 years in Saudi Arabia’s desert sands, and the overwhelming need to protect groundwater has fostered a culture of preservation in all the sectors in which we do business. From air, to water, to waste – we are applying circular economy principles to reduce impact, restore ecosystems and increase biodiversity.

This year we met and exceeded our 2025 target, two years in advance, to increase the biodiversity net positive impact by (NPI) 30% against our base year (2022). In 2023, we achieved an 85.6%^{**1} NPI because of the inclusion of additional Biodiversity Protection Areas (BPAs) in Saudi Arabia and significant expansion (over 700 km²) of our existing BPA in Shaybah.

2023 performance



85.6%^{1}**
Net positive impact

0.02 m³/boe*
Freshwater intensity

100%^{}**
Number of sites with ISO 14001 certification

* Metric reported for the first time externally
** This figure has undergone external limited assurance in accordance to the ISAE 3000 (revised). The assurance report can be found [online](#) on the Sustainability section of our website.
1. Ongoing management and review of the BPAs resulted in exclusion of the Manifa BPA from our NPI metric as a BPA, pending implementation of enhancements to align with the Company’s biodiversity governance.

Performance of our key metrics

Material issue	Relevant metrics	2023	2022	Status
Biodiversity and ecosystem services ■ Read more on page 68	Net positive impact (%)	85.6 ^{**1}	53.0 ^{**}	In 2023, we exceeded our 2025 target, two years in advance, to increase the NPI by 30% against our base year. In 2023, we achieved a 85.6% ^{**} NPI because of the inclusion of additional BPAs in Saudi Arabia and significant expansion of over 700 km ² of our existing BPA in Shaybah. As a result, the total area covered by BPAs is over 1,700 km ² .
	Local environmental impact ■ Read more on page 72	Number of hydrocarbon spills	12	15
	Volume of hydrocarbon spills (barrels)	8,566 ^{**}	142,885 ^{**}	
	Recovered hydrocarbon (%)	88 ^{**}	9 ^{**}	
	Hydrocarbon discharge to water (barrels)	14.3 ^{**}	16.4 ^{**}	
Water management ■ Read more on page 74	SOx emissions (metric kilotons)	146 ^{**}	167 ^{**}	A series of measures, such as continuous improvement in sulfur recovery, operational efficiency, readily available Sulfur Recovery Units, and lower production, resulted in an overall decrease in sulfur oxides emissions from 2022.
	Number of sites with ISO 14001 certification (%)	100 ^{**}	98 ^{**}	In 2023, we achieved 100% ^{**} ISO 14001 certification at facilities under our operational control, i.e., the 52 upstream and downstream asset-based organizations enrolled in our Environmental Management System.
	Freshwater consumption (million m³)	89.9 ^{**}	93.6 ^{**}	In 2023, freshwater consumption was 89.9 ^{**} million m ³ , down 4.0% compared to 2022, due to effective water conservation efforts in Aramco’s upstream and petrochemical operations.
	Freshwater withdrawal (million m³)	135.7	136.6	
Freshwater intensity* (m³/boe) (total freshwater consumed relative to our hydrocarbon production)	0.02	Metric not disclosed previously		
Product stewardship and waste management ■ Read more on page 76	Industrial waste disposed (metric tons)	481,561	318,656	In 2023, Aramco generated 481,561 metric tons of industrial waste, which was disposed of in compliance with regulations and standards. While our efforts to minimize waste have improved, the observed increase in industrial waste from 2022 was attributed to the Company’s expanded operations and our efforts in improving industrial waste reporting system.
	Industrial waste recycled (%)	35.7 ^{**}	39.9 ^{**}	

■ Full metrics table on page 104

Our contribution to the UN SDGs



Given water scarcity in Saudi Arabia, Aramco has a large seawater treatment and injection network of facilities. Seawater is used as the primary source of water for oil production and to ensure clean water is available for our workforce and local communities.



Embracing circular economy principles and business models across our operations and activities. To date, we have trained and certified over 2,800 employees from different segments of our business in circular economy. This is supported by a circular economy guidebook and circularity maturity assessment to guide organizations across the Company in their circularity journey. Over 200 circular economy initiatives have been implemented, adopting circular business models aiming to optimize resources utilization and minimize environmental impact. For more information, please refer to Aramco’s circular economy section on our website.



Aramco has systems in place to manage all discharged water to the sea, meeting Government requirements by investing in maintenance and monitoring systems while proactively managing operations to avoid hydrocarbon leaks and spills by maintaining asset integrity throughout the life cycle.



Aramco aims to deliver biodiversity net gain in support of Vision 2030, SDG15 and the Saudi Green Initiative.



Partnering with organizations, such as Ipeca and WEF, to help promote good industry practice and better environmental performance. We are also working closely with our suppliers and creating incentives to reward them for improvements in their environmental performance.

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Minimizing environmental impact continued

Biodiversity and ecosystem services

Biodiversity

The planet continues to experience a decline in biodiversity due to human activity, and this is increasingly recognized as a significant risk to humanity. The UN Biodiversity Conference (COP 15, 2022) concluded with 196 countries, including Saudi Arabia, signing up to the Kunming-Montreal Global Biodiversity Framework (GBF). The GBF aims to address biodiversity loss, restore ecosystems, and protect indigenous rights, providing a refreshed roadmap for delivering the Global Goal for Nature to halt and reverse nature loss by 2030 and to become nature positive.

Net positive impact by 2030

This principle sits at the heart of Aramco's biodiversity policy and our use of the mitigation hierarchy. These provide the responsibilities and framework to safeguard biodiversity wherever the Company operates and to restore degraded areas, and in so doing, maintain and increase biodiversity and ecosystem services.

Aramco's activities overlap and potentially impact areas of high biodiversity value. To compensate for this, the Company has developed initiatives intended to ensure impactful contributions to biodiversity conservation, which are aimed at identifying opportunities and addressing associated risks.

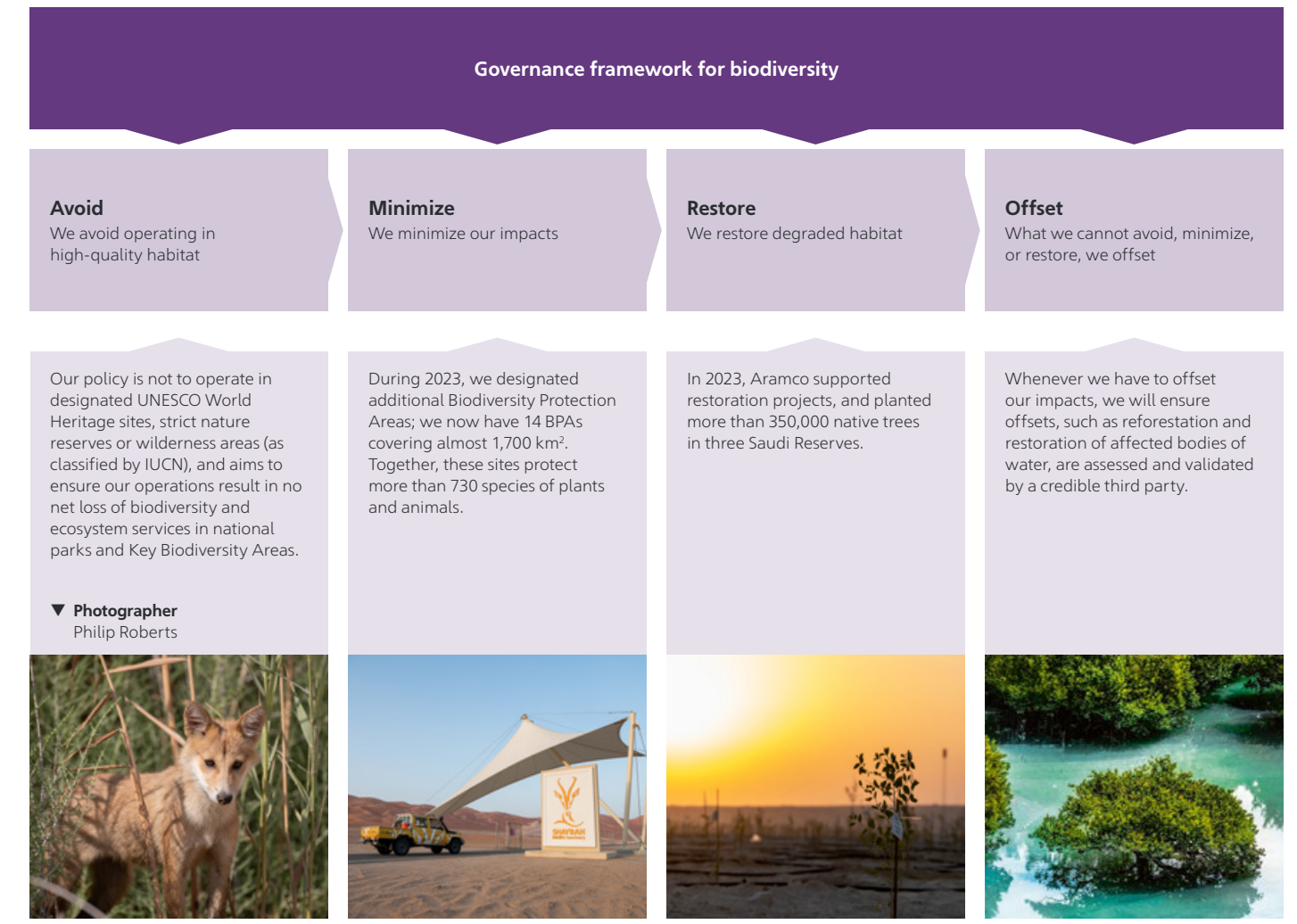
Net positive impact

In alignment with the GBF, Aramco strives to achieve a net positive impact on biodiversity and ecosystem services by 2030. NPI occurs when biodiversity gains through our conservation projects outweigh negative impacts on biodiversity as a result of operations. We measure our NPI by comparing the surface area of our Biodiversity Protection Areas (BPAs) against that of our operational footprint.

An interim target was set in 2022, to achieve a 30% improvement in our NPI by 2025. However, in 2023, we achieved a 61.5% improvement in the year, taking our overall score to 85.6%**¹. This improvement in our performance was achieved due to changes in our BPAs in Saudi Arabia. The inclusion of three new BPAs and significant expansion (over 700 km²) of the existing BPA in Shaybah led to a large increase in the total land in our protected areas. The Shaybah Wildlife Sanctuary expansion was undertaken to match an increase in the number of native animals that are planned to be located in the sanctuary.



Our biodiversity mitigation hierarchy



We map and monitor to understand the biodiversity around us

Aramco's Natural Wetland Strategy aims to restore natural wetlands (more details in case study on next page) to promote biodiversity recovery and ecosystem service provision. An exhaustive remote-sensing, mapping, and prioritization exercise has identified natural wetlands on Company land.

We conduct applied research

Aramco conducts applied research aimed at ensuring its activities do not cause undue impacts on biodiversity, including collaborative research partnerships with King Fahd University of Petroleum and Minerals and King Abdullah University of Science and Technology. For instance, in 2023, we tagged and released nine sea turtles (one juvenile and eight adults) for satellite tracking as part of ongoing studies.

We invest in biodiversity education and awareness

Aramco hosts a Sea Turtle Rescue Center near our Ras Tanura terminal that saves, treats, and releases sea turtles, and educates the local community.

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Biodiversity and ecosystem services continued

Spotlight on Biodiversity at Aramco

Delivering net positive impact

At Aramco, we aim to achieve a net positive impact on biodiversity by 2030. In 2023, we achieved a 85.6%**² NPI, which is a 61.5% increase compared to the prior year, and exceeded, two years in advance, our 2025 NPI target.

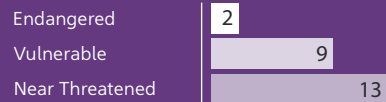
Central to achieving NPI is the Biodiversity Protection Area program. In 2023, we designated new terrestrial areas in Riyadh and Qassim, and Harqus Island in the Arabian Gulf as BPAs, bringing the total number of BPAs to 14 covering over 1,700 km². These new sites were assessed based on the International Union for Conservation of Nature (IUCN) criteria.¹ Additionally, the Shaybah Wildlife Sanctuary was expanded in 2023.

Our BPA network is supported by assessment of the contribution to conservation objectives and delivery of the Company's biodiversity aims to achieve NPI on biodiversity and ecosystem services.

As new sites are added, new species are being recorded. Aramco's BPAs provide a secure habitat for around 40% of all bird species in the Kingdom, including numerous migratory ones. Overall, our BPAs have recorded over 730 plant and animal species, including several globally Threatened and Near Threatened species under the IUCN Red List.



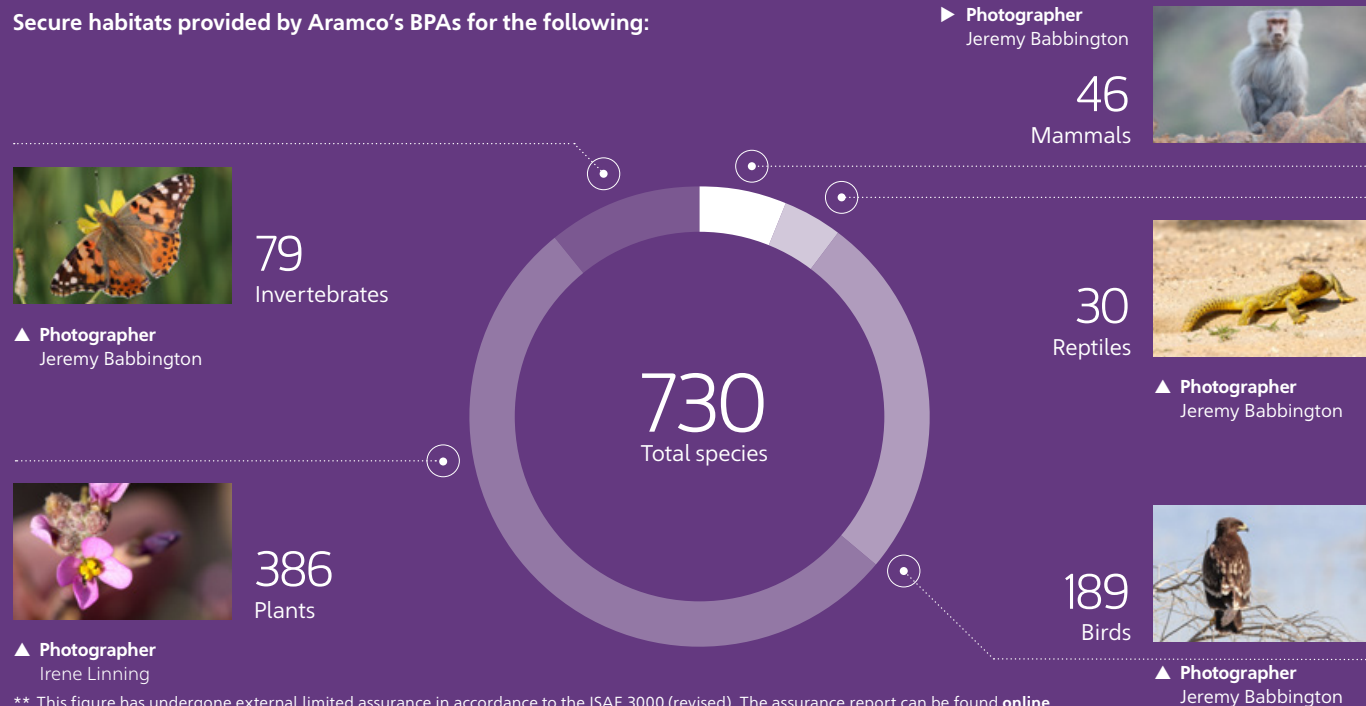
IUCN Red List



List of BPAs:

- | | |
|--|--|
| 1. Shaybah Wildlife Sanctuary | 8. Bahra Biodiversity Protection Area |
| 2. Rahimah Bay Mangrove Eco-Park | 9. Madina Biodiversity Protection Area |
| 3. Abu Ali Island | 10. Khurais Biodiversity Protection Area |
| 4. Tanajib Biodiversity Protection Area | 11. Baga Bird Oasis |
| 5. Abqaiq Wetlands | 12. Riyadh Biodiversity Protection Area |
| 6. Udhailiyah Biodiversity Protection Area | 13. Qassim Biodiversity Protection Area |
| 7. Abha Biodiversity Protection Area | 14. Harqus Island |

Secure habitats provided by Aramco's BPAs for the following:



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 1. Dudley N. 2008. Guidelines for Applying Protected Area Management Categories. International Union for Conservation of Nature.
 2. Ongoing management and review of the BPAs resulted in exclusion of the Manifa BPA from our NPI metric as a BPA, pending implementation of enhancements to align with the Company's biodiversity governance.

Nature-based solutions

To nurture, protect, and restore our environment, Aramco invests in nature-based solutions. Beyond the potential climate benefits of these solutions acting as carbon sinks, nature-based solutions, like mangroves, provide a home to many diverse wildlife species, a nursery for infant marine life, and a vital natural line of defense against natural disasters including shoreline erosion, and storms.

In 2023, we planted approximately 6.5 million mangroves and 1.1 million native trees in the Kingdom. This brought the total number of planted native trees to 4.1 million. To date, our cumulative total of planted mangroves is over 30 million, while the carbon stock of the planted and existing mangroves was validated to be equal to almost 445,000 tons of CO₂e.

Coral reefs

Coral reefs are one of the most diverse ecosystems in the world and we have been proactively promoting the growth of marine life with artificial reefs. Along with our offshore oil and gas facilities acting as artificial reefs by providing substrate for marine communities; Aramco continues to work with the Okinawa Coral Reef Conservation Consortium in Japan. This initiative ensures the future of endangered coral reefs around Okinawa.

Building on 11 years of research, we have conducted studies on how to restore the coral reefs, and have run educational programs reaching out to school children to nurture understanding, as well as appreciation for the natural environment. We are currently scaling up our efforts to focus more directly on coral revitalization by cultivation and planting.

Seaweed

The Yanbu seaweed pilot project to harness the potential of seaweed cultivation was completed in 2023. We have cultivated different genes of seaweed such as Sargassum and Kappaphycus, which are native to the Red Sea in the Western Region. Furthermore, an algae market survey has been completed, to further support potential future seaweed projects. These surveys provide comprehensive data that enable the assessment of investment viability and market potential for evaluating investment opportunities in the algae industry.

Wetlands initiatives

Aramco is cognizant of the ecological significance of wetlands (including their role in carbon sequestration), with many located on its land. Aramco's wetlands strategy focuses on the restoration and protection of natural wetlands on our land, and the creation of constructed wetlands, a cost-effective, energy efficient, and more environmentally benign alternative to traditional wastewater treatment methods.

The top priority natural wetlands will be explored for designation as BPAs, adding to the almost 1,700 km² already protected by Aramco across Saudi Arabia.

Sustainability in action

Supporting the aquaculture sector under Saudi Vision 2030

The construction of Abu Ali Fish Hatchery project was completed in 2023. The hatchery aims to support the biodiversity of the marine ecosystem and safeguard the value of commercial fish stocks for the local fishing community. The project is part of the Company's biodiversity offsetting ambitions and is important to the realization of the Kingdom's aquaculture sector under Vision 2030. This facility also includes planting of 200,000 mangroves to create an important nursery habitat for juvenile fish released to the Arabian Gulf.

Local environmental impact

Air emissions

Since 2012, our operations have been supported by Aramco's Environmental Management System (EMS), which provides a systematic and planned approach to achieve compliance with local environmental regulations and support for adoption of international good practices. In 2023, we achieved 100%** ISO 14001 certification at facilities under our operational control that is the 52 upstream and downstream asset-based organizations enrolled in our EMS, of which 50 organizations are in Saudi Arabia, and two organizations are located outside of the Kingdom.

SOx, nitrogen oxides (NOx), and volatile organic compounds (VOCs)

Aramco monitors its air emissions and, where necessary, establishes measures to reduce their impact on our workforce, local communities, and the environment.

In 2023, we continued our program of upgrading Sulfur Recovery Units (SRUs) with tail gas treatment units. Tail gas treatment is gaining importance as the preferred technology to reduce sulfur oxides emissions, support our efforts in fulfilling our compliance obligations and as we explore economic opportunities for sulfur. This program will continue in 2024.

The combination of continued improvements in sulfur recovery, operational efficiency alongside readily available SRUs, and lower production, resulted in an overall decrease in sulfur oxides emissions from 2022.

Emissions of NOx from our operations are mainly attributed to the combustion of hydrocarbon fuels for generation of electric power and heating required in our facilities. Reductions of NOx emissions are achieved via energy optimization measures, alternative fuels or, most significantly, when hydrocarbon-fueled power generation is replaced with renewable electric power. NOx emissions from our facilities are governed by the emission limits mandated by our corporate environmental standards and the national environmental regulatory standards.

To ensure we continue to meet Saudi Arabia's regulations, many of our facilities have been upgraded with low and ultra-low NOx burners to reduce NOx emissions.

We continue to invest in VOCs control systems and equipping our bulk loading facilities with Vapor Recovery System to minimize associated VOCs emissions.

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environment and health site assessments conducted during 2023

We conducted more than 43 environment and health site assessments during 2023 to manage and mitigate any negative environmental and health risks of our operations around the world.

SOx emissions (metric kilotons)



Award

Abqaiq Plants achieves 1st place in the 2023 King Khalid Foundation Sustainability Award

Abqaiq Plants achieved Gold status in the 2023 King Khalid Foundation Sustainability Award for its commitment to sustainability in governance, social responsibility, economic practices, and environmental stewardship. Abqaiq Plants also adopted advanced technology, including Unmanned Aerial Vehicle (UAV) drone programs for improved environmental monitoring.



Spills to the environment

To meet our aspirational target of zero spills, Aramco employs rigorous inspection programs to assess the integrity of assets, putting fail-safe measures in place, training employees to ensure they are familiar with good practices and procedures.

Some of our key oil spill detection procedures include:

- Utilization of technologies to predict possible failures for rapid decision making and action;
- Regular oil spill drill procedures for hydrocarbon handling facilities;
- An oil spill trajectory prediction system to provide efficient response to oil spill emergencies in the marine environment. The prediction system offers user-friendly interfaces for forecasting oil spills through real-time online queries with their outputs streamed to a dashboard for visualization and analysis;

- Technologies that monitor and enable rapid response to oil spills;
- Local and international knowledge sharing; and
- Collaboration to share lessons learned from incidents and share good practice.

In the event of any spills, we have response plans that enable rapid mitigation. Our management processes focus on mitigating the impacts of hazardous chemicals and air, water, and soil contamination.

In 2023, the number and volume of hydrocarbon spills fell significantly (a 20.0% fall in number of hydrocarbon spills, and a 94.0% decline in volume of hydrocarbon spills compared to 2022).

While we aspire for zero oil spills, we did regrettably have 12 oil spills, which led to a volume of 8,566** barrels being spilled. Following our significant recovery efforts, we were able to recover 88%** of hydrocarbons.

Of these 12 oil spills, nine were onshore with a cumulative volume of 8,551 barrels and three offshore spills in the Arabian Gulf.

All spills were rapidly halted by the response team and the impacted sites were rehabilitated to eliminate further environmental impacts. One onshore oil spill with a volume of 8,335 barrels that was due to a damaged pipe in the East-West pipeline was responsible for more than 97% of the total oil spills. The affected area was remediated.

	2023	2022	2021
Number of hydrocarbon spills	12	15	13
Volume of hydrocarbon spills (barrels)	8,566**	142,885**	14,447
Recovered hydrocarbon (%)	88**	9** ¹	94

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1. In 2022, the largest spill was due to an incident concerning a major loss of containment of crude that caught fire. Due to the combustion of the crude, the majority of it was not recoverable, leading to a low hydrocarbon recovery rate for 2022.

Water management

Water management

Our approach to water

With the country's arid environment, and Saudi Arabia ranked as the eighth most water stressed country in the world¹, Aramco has long recognized the value of water. Since recording measurements began in 1978, Aramco has been able to conserve more than 160 billion gallons of groundwater. More than 1,600 groundwater monitoring wells in 63 facilities assess groundwater quality.

As disclosed in our 2022 Sustainability Report, Aramco is pursuing a water neutrality aspiration to conserve water natural resources and reduce dependency on non-renewable water supply (groundwater). To achieve this goal, across our businesses in Saudi Arabia and abroad, we are reducing our extraction of groundwater by using non-traditional water sources such as seawater, treated sewage effluent, and treated reject streams.

We measure water conservation performance through:

- Reviewing water conservation data and key performance metrics;
- Conducting water optimization studies on capital projects;
- Assessing Company operating facilities for compliance; and
- Following good industry standards and water conservation technologies.

In 2023, freshwater withdrawal fell by 0.7% compared to the prior year. This reduction was due to effective water conservation efforts in our operations. While our freshwater withdrawal fell, our freshwater consumption was 89.9** million m³ in 2023, which is a 4.0% reduction compared to prior year.



Award

North Ghawar Producing Department wins the 2023 Manufacturing Leadership Award for its Hybrid Produced Water Treatment Technology

North Ghawar Producing Department has won the international Manufacturing Leadership Award under the engineering and production category. The National Association of Manufacturers' Manufacturing Leadership Council recognizes world-class manufacturing companies and individual leaders for their outstanding efforts and projects.

During the year, we introduced a new metric to measure freshwater intensity (m³/boe). The metric measures the total freshwater consumed relative to our hydrocarbon production. In 2023, our freshwater intensity was 0.02 m³/boe. There are no prior year comparatives.

	2023	2022	2021
Freshwater consumption (million m ³)	89.9**	93.6**	94.6
Freshwater withdrawal (million m ³)	135.7	136.6	137.3
Freshwater intensity* (m ³ / boe)	0.02	Metric not disclosed previously	

Wastewater and discharges to water

By virtue of its large operations, Aramco produces significant volumes of wastewater. A comprehensive wastewater effluents management program is implemented to protect the environment and public health.

This is achieved through the following measures:

- Developing and updating the Company's wastewater compliance and engineering standards;
- Optimizing the design of wastewater facilities to adequately treat wastewater; and
- Maintaining a vigilant wastewater discharge monitoring program.

Our approach to wastewater and discharges to water are informed by relevant national and international frameworks or standards, including the Executive Regulations for the Protection of Aqueous Media from Pollution, among other Saudi Arabia Government Environmental Standards; and Ipieca's Oil and Gas Industry Guidance on Voluntary Sustainability Reporting – Discharges to Water.

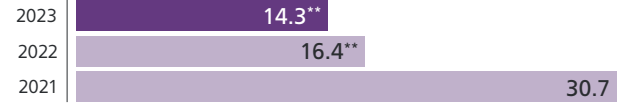
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 1. World Resources Institute.

Assisted by our corporate digitalization vision, we monitor hydrocarbon discharge to water through the hydrocarbon discharge to water (HC2W) dashboard. Performance, since 2021, shows an overall positive trend with a sustained reduction in the

volume of hydrocarbon discharged. This is due to various actions being taken, including:

- Proactive procedures to avoid any incidental discharge;
- Preventive upkeep of aging equipment; and
- Enhanced tracking and monitoring through the HC2W Corporate dashboard.

Hydrocarbon discharge to water (barrels)



Sustainability in action

Aramco's progress towards its water neutrality aspiration

Below are some selected case studies of the various water management initiatives taking place across Aramco in pursuit of our water neutrality aspirations.

Embracing digitization to conserve groundwater

Aramco piloted digital technology to enhance the recovery of the reverse osmosis process at one of our facilities in 2023. Captured data revealed that more than 10% groundwater (i.e. 0.6 million m³ per year) could be conserved by real-time monitoring through alerts and forecasts generated by the tool.

Optimizing water usage with enhanced data systems

Our Drilling & Workover team delivered an enhanced water data gathering and analysis system. All onshore and offshore departments can now monitor and report their water data for drilling, workover and water well rigs in a common electronic platform. This data is used to optimize water usage.

Utilization of ultrasonic technology to conserve groundwater

In our South Ghawar production facility – part of the largest conventional oil field in the world – Aramco demonstrated the application of ultrasonic cleaners as an alternative to conventional high-pressure jetting cleaning of valves and piping. This demonstrated that efficient utilization of an ultrasonic cleaner can potentially result in substantial groundwater saving.

Groundwater conservation in Abqaiq

We are replacing the use of aquifer water with seawater injection for reservoir pressure maintenance. Upon completion in 2024, the project is expected to supply 76% of the injection volumes from seawater. This share is expected to increase to 100% by 2029.

Achieving water neutrality at Jazan

At the Jazan Refinery Complex, industrial and sanitary wastewater are treated in a centralized wastewater treatment plant equipped with technologies for total reuse, to achieve substantial reduction in groundwater use. The facility manages both the Jazan Refinery pre-treated industrial effluent and sanitary wastewater from the refinery, marine terminal, and our integrated gasification combined cycle power plants.



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Product stewardship and waste management

Industrial waste management

In 2023, we made progress in meeting key milestones in our corporate waste management strategy to minimize and divert landfilled waste. Aramco's operating facilities have been conducting waste minimization assessments to identify opportunities to reduce industrial waste generation and enhance the implementation of environmentally sustainable practices across our operations.

We have continued to implement automatic crude oil tank cleaning technologies to recover hydrocarbons from oily sludge tank bottoms, a practice that is contributing to enhanced industrial waste management system and operational efficiency. We are also collaborating with potential off-takers for spent catalysts for reuse and recovery purposes.

The Company is developing novel circular technology solutions in partnership with its subsidiary SABIC and applying them at scale to reduce single-use plastic waste and meet recycling regulations. These solutions include integrating mixed plastic waste into refineries to produce circular products and creating large-scale plastic sinks such as plastic waste in asphalt.

In 2023, the Company generated 481,561 metric tons of industrial waste, which was disposed of in compliance with regulations and standards. While our efforts to minimize waste have improved, the increase in industrial waste from 2022 was attributed to the Company's expanded operations and our efforts in improving the industrial waste reporting system.

As part of our industrial waste management contractor monitoring program, we have conducted technical site visit assessments to our industrial waste management third-party service providers to ensure that our waste is being managed in line with our industrial waste management standards and as per governmental regulations. The Company has completed the revalidation of existing industrial waste management service providers currently available in the Company's Qualified Supplier List, which included 22 third-party industrial waste management and transport service providers for sustainable management of our generated industrial waste.

	2023	2022	2021
Industrial waste recycled (%)	35.7**	39.9**	39.8
Industrial waste disposed ^{1,2} (metric tons)	481,561	318,656	240,255
Industrial waste disposed – Upstream (metric tons)	253,044	Breakdown not disclosed previously	
Industrial waste disposed – Downstream (metric tons)	174,790	Breakdown not disclosed previously	

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 1. The name of this metric was changed from industrial waste generated to industrial waste disposed in 2023. The definition of the metric remained the same.
 2. Industrial waste disposed number includes operationally controlled affiliates and other waste streams not generated by upstream and downstream operations.

Sustainability in action
 Bringing sustainability to our offshore and marine activities

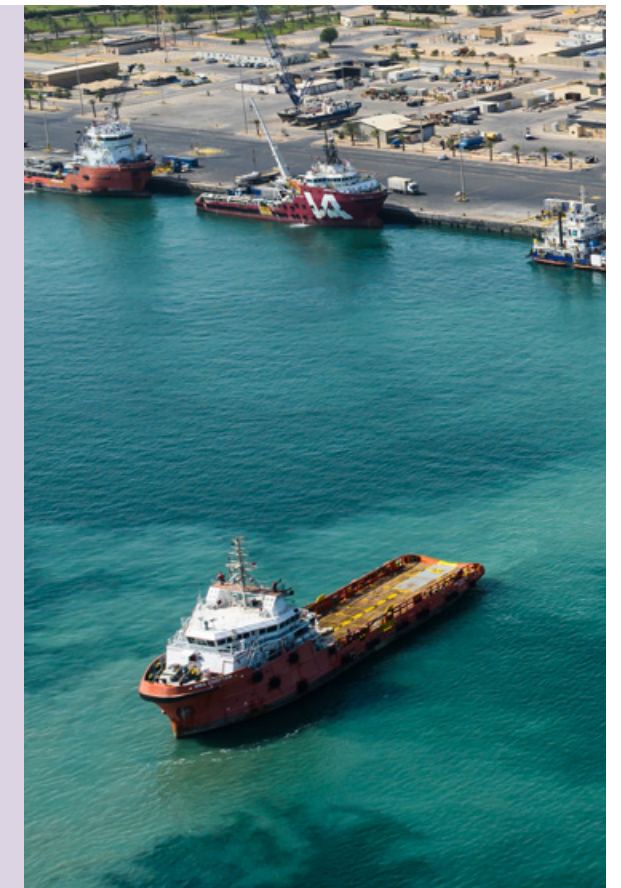
Aramco is focusing on implementing circular economy principles across our operations to lower emissions and provide innovative solutions for a more sustainable future. We have identified a new area for environmental improvement, including offshore waste management, as part of our drive for continuous improvement and operational excellence.

The Marine Waste Recycling Program (MWRP) aims to use offshore waste, as raw materials for future products, and is being implemented at Tanajib Marine Facility, one of the world's largest offshore oil operations, which houses 500 assets in 10 oil and gas fields.

In 2023, the MWRP resulted in more than 1,200 tons of waste materials being successfully sorted and recycled from Aramco Tanajib Marine Facility through nearly 700 collection trips.

Aramco has also improved marine safety and performance by implementing SmartShip technology, which utilizes over 1,000 sensors and artificial intelligence to monitor and remotely access marine vessels, resulting in an 8% reduction in fuel consumption and carbon emissions per ship annually.

We have also introduced Hybrid Vessels technology, which combines traditional propulsion systems with electric battery systems, similar to a hybrid vehicle but on a much grander scale. The technology has helped to reduce GHG emissions, fuel consumption, and maintenance costs since implementation.



Corporate circular economy roll-out

We continue to roll-out the circular economy program across the Company value chain from design and engineering followed by procurement, construction, operation, services, to digitalization and information technology. To date, we have trained and certified over 2,800 employees from different segments of our business in circular economy. This is supported by a circular economy guidebook and circularity maturity assessment to guide organizations across the Company in their circularity journey. Over 200 circular economy initiatives have been implemented, adopting circular business models aiming to optimize resources utilization and minimize environmental impact.

Drilling and Workover (D&WO) circularity program
 During 2023, D&WO implemented adopting circular business models aiming to optimize resources utilization and minimize environmental impact. Circular economy initiatives focused on materials, chemicals consumption, assets utilization, water conservation, and waste minimization in drilling and workover operations.

In 2023, we recycled and reused over 3.9 million barrels of drilling fluids, refurbished over 2,000 wellheads and pieces of well control equipment, reutilized more than 6,000 repaired drilling assets, and refurbished over 8,500 metric tons of oil country tubular goods. We implemented closed loop drilling practices in 257 well sites, which allowed us to reduce water consumption at these wells by 13 million barrels and to reduce wastewater by 3 million barrels.

Procurement and Supply Chain Management (P&SCM) circularity program
 We continue to implement circular economy principles in our procurement and supply chain by adopting circular business models, such as circular procurement and reverse logistics, sharing, and asset's life extension. The P&SCM circularity program consists of circular initiatives that align with our circular economy principles, strategies, and corporate policies. The program includes reverse engineering spare parts, shelf-life extension, refurbishment programs, and scrap recycling.

During 2023, P&SCM circularity programs recycled more than 85,000 tons of materials such as ferrous scrap, plastic drums, and aluminum.