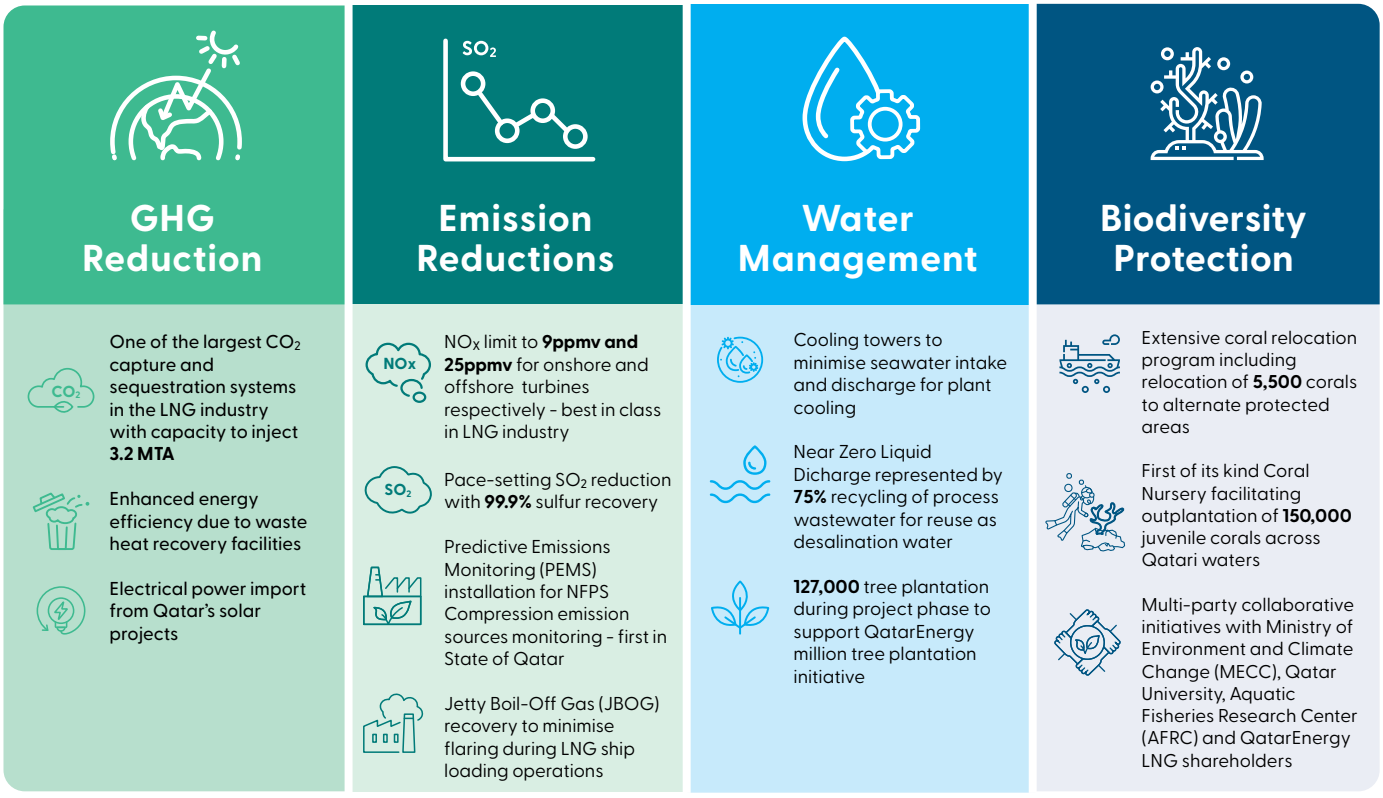
QatarEnergy LNG Major Projects demonstrate world-class environmental design and performance

QatarEnergy LNG's Major Projects, comprising its liquefied natural gas (LNG) expansion and production sustainability facilities, are critical to the State of Qatar's long-term vision to enable the global transition towards cleaner and lower-carbon energy sources. QatarEnergy LNG has made significant efforts and investments in its Major Projects portfolio to incorporate advanced environmental controls and technologies, which ensure that the Company fulfils this key objective for the country while setting the benchmark for world-class environmental performance.



Best-in-class environmental controls are incorporated into QatarEnergy LNG Major Projects design.

QatarEnergy LNG's Major Projects encompass the North Field Expansion (NFXP) and North Field Production Sustainability (NFPS) projects, which demonstrate the State of Qatar's commitment to expanding the supply of cleaner energy in the form of LNG to support global decarbonisation efforts. These projects will increase the Company's LNG production and supply to global markets from 77 million tonnes per annum (MTA) to 142 MTA.

The successful implementation of these major expansion projects required careful consideration of a range of environmental challenges. These included mitigating and minimising construction and operational impacts on air quality, groundwater and seawater, as well as waste generation.

Project operations, such as subsea pipeline construction, drilling, onshore civil works and other activities, also had the potential to affect terrestrial and marine ecology and local biodiversity. In addition, Major Projects development was impacted by rapidly changing environmental regulations both globally and locally.

To mitigate and minimise these impacts, the Company's Major Projects development programme included a wide range of environmental design studies and impact assessments, driven by a stringent Environmental Permitting Programme with regulatory agencies and other stakeholders.

Stringent Environmental Permitting

Environmental Permitting is a vital regulatory element for any new project, which typically requires a comprehensive Environmental Impact Assessment (EIA) and the mitigation of risks to the environment associated with all stages of the project. These can range from early civil works and drilling activities to commissioning, start-up and steady-state operations.

In the State of Qatar, EIAs and subsequent Environmental Permits (EPs) are issued by the Ministry of Environment and Climate Change (MECC), which is the custodian for local, ratified regional and international environmental regulations and their implementation within state boundaries. The MECC can also advise on the use and implementation of international legislation and regulatory standards if local ones are not available.

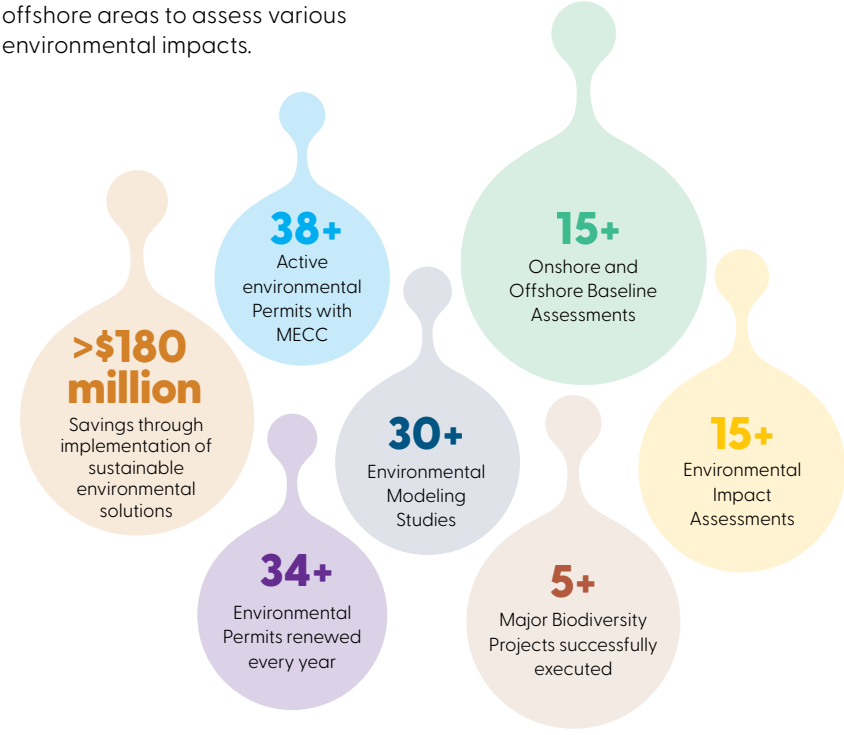
Comprehensive Environmental Studies

A wide range of comprehensive studies and assessments were conducted for each QatarEnergy LNG Major Project development to understand their impact of and mitigate associated environmental risks:

1. Detailed baseline surveys for soil, groundwater, terrestrial ecology, marine biodiversity and air quality were conducted utilising advanced monitoring methodologies and techniques.
2. Comprehensive monitoring of offshore and nearshore areas with remotely operated vehicle (ROV) surveys and towed video surveys.
3. Best Available Control Technology (BACT) assessments for all major emission sources such as gas turbines, heaters, oxidizers, sulphur recovery units (SRUs) and fugitive sources.
4. As part of the quantitative assessments, more than 30 modelling assessments covering air quality and dispersion, hydrodynamic parameters, noise, drill cuttings discharge, potential rupture and emergency release scenarios were performed for onshore and offshore areas to assess various environmental impacts.

9 ppmv
- best in class NO_X emissions for turbines in onshore LNG service

99.9%
- pace-setting sulphur recovery efficiency to minimise SO_2 emissions



Key Environmental Statistics – Studies and Permitting.

QatarEnergy LNG's Major Projects are an important element of the Company's Environmental Strategy which aims to achieve sustainable premier environmental performance as a key contributor to the Environmental Development Pillar of the Qatar National Vision (QNV) 2030.

Key Environmental Achievements

NFXP features world-class carbon dioxide (CO_2) reduction initiatives, supported by one of the largest CO_2 capture and sequestration systems in the LNG industry in terms of its capacity to inject 3.2 million tons per annum (MTPA). This is coupled with the partial use of solar power from the State of Qatar's new solar power plants to further mitigate greenhouse gas (GHG) emissions. Energy efficiency has been improved with waste heat recovery facilities in place on gas turbines that drive refrigeration compression units and generators.

There will also be a significant reduction in nitrogen oxide (NO_X) emissions through the use of Dry Low NO_X (DLN) technology on gas turbine drivers for refrigeration and power generation and Ultra Low NO_X (ULN) for process heaters and oxidizers. These controls are further complemented by a NO_X emission limit of 9ppmv which is the best-in-class for turbines in LNG compressor service.

In addition, there will be a significant reduction in sulphur dioxide (SO_2) emissions footprint through the use of advanced sulfur recovery units with tail gas treatment capable of achieving more than 99.9% sulfur recovery, which is a pace-setting level for the LNG industry.

With the installation of Predictive Emission Monitoring System (PEMS) for the Company's offshore turbines, QatarEnergy LNG is stewarding the introduction of an advanced and more sustainable environmental solution in the State of Qatar that has the potential to result in a step change in emissions monitoring methodology in the country.

With advanced wastewater treatment, QatarEnergy LNG's new LNG mega trains will recycle more than 75% of their process wastewater for reuse as desalinated water within the plant, with additional treated water reused for irrigation, thereby achieving near Zero Liquid Discharge (ZLD) to sea. Furthermore, there will be no stormwater discharge to sea, it will be utlised within the plant premises.

2020-2023: NFE and NFPS EPCOL Coral Management Program
- Fabrication and deployment of scientifically designed hybrid set of Artificial Reef modules
- Scientific selection of recipient site at Al Ghariya
- Relocation of 4,500 Corals
- 22,000 juvenile fish released to coral relocation site

Coral Nursery Program at Aquatic Fisheries Research Center (AFRC)
- Fragmentation of 1,050 corals
- Multiple experiments to study effect of light, temperature, fragment size
- Coral fragments out-planted accross Qatari waters

Three (3) Offset Projects - Compensation Program
- Secured MECC approval on the scope
- Collaboration with ExxonMobil Research Qatar
- Sensitive Map for State of Qatar, Rehabilitation Guide, Coral Assessment as key objective

Major Biodiversity Achievements.

Major Biodiversity Conservation Projects

Biodiversity preservation is another key focus area of QatarEnergy LNG's Environmental Strategy. To support this, QatarEnergy LNG has led and facilitated major environmental initiatives to preserve and enrich Qatar's marine ecosystem.

More than 5,500 corals have been relocated from Major Project areas to alternate protected sites by QatarEnergy LNG. The Company has also pioneered the establishment of a first-of-its-kind Coral Nursery in collaboration with MECC, Qatar University (QU) and the Aquatic Fisheries Research Centre (AFRC). At this nursery, coral husbandry involving the fragmentation and incubation of corals was carried out before approximately 15,000 juvenile corals were out-planted to different sites across Qatari waters.

An enduring commitment

A comprehensive approach to environmental protection has ensured that QatarEnergy LNG's Major Projects has achieved the highest levels of environmental performance and continues to set the pace for LNG developments worldwide.

These achievements by QatarEnergy LNG have demonstrated the Company's commitment to environmental performance excellence and its continued position as a key role player in the ongoing sustainable growth of the State of Qatar.

Proactive Environmental Decision-Making

Benthic (sea floor) surveys conducted at one of the offshore NFXP wellhead platforms revealed the presence of rocky coral outcrops east of the proposed wellhead location. Subsequent ROV surveys showed that the area is of high ecological sensitivity with the presence of both soft and hard coral communities with significantly high coverage.

To preserve this ecologically sensitive area, QatarEnergy LNG relocated the wellhead platform to another location. In collaboration with the MECC, the Company also embarked on a series of proactive annual monitoring campaigns at the original coral outcrop site to ensure that this area remained protected and unaffected by project development activities. Successive annual monitoring programmes continue to show a thriving ecosystem in the area comprising a healthy coral community of 16 species, along with 30 fish and 32 different species of invertebrates and vertebrates.