NCOC N.V.

ENVIRONMENTAL SURVEYS

AND INITIATIVES

NCOC
NORTH CASPIAN
OPERATING COMPANY

CONTENTS

HSSE DIRECTOR'S **MESSAGE**

The purpose of this brochure is to make the reader aware of certain environment protection activities implemented by NCOC N.V. and current issues related to conservation of the Caspian Sea's biodiversity. This compilation includes data on Caspian seal, fish and bird surveys, impact and emissions monitoring and waste management.

Our Company has set HSE performance targets that are aligned to NCOC's vision of Zero Injuries and Zero Harm to the environment.

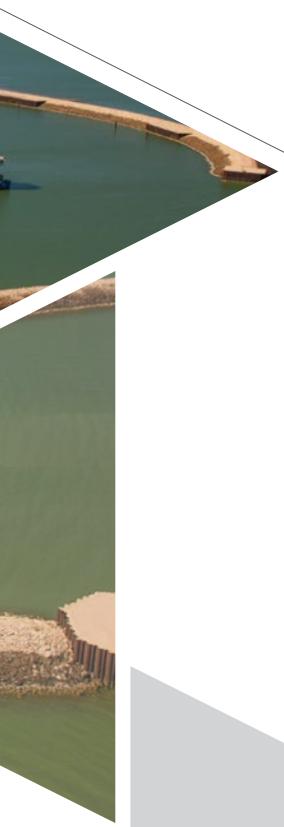
The Company's environmental protection activities cover a range of engineering, process, economic, legal and administrative efforts to protect the environment against operational impacts and to ensure sustainable interaction between human activities and the environment. Various nature protection activities implemented by the Company include introduction of advanced waste water treatment, water re-use, and automatic air quality monitoring technologies.

The Company's structured health, safety, security and environment system focused on safe operations guarantees a rightful place for NCOC N.V. among oil and gas companies recognized in Kazakhstan and internationally.

Yermek Marabayev
HSSE Director

INTRODUCTION

Kashagan is a large oil and gas field in Kazakhstan located 80 km from Atyrau in the north-east area of the Caspian Sea. The field is developed by the North Caspian Operating Company N.V. (NCOC) international joint venture under the Production Sharing Agreement in respect of the North Caspian Sea dated 18 November 1997. Development of the Kashagan field in the harsh offshore environment of the North Caspian Sea involves overcoming a unique combination of technical complexity and logistics challenges. These safety, engineering, logistical and environmental challenges make this venture one of the largest and most complex industrial facilities in the world. The North Caspian Sea is a very sensitive ecological area with the habitat for diverse flora and fauna. Environmental safety and protection are key values in how NCOC operates and the Company continuously improves its environment protection management approach and enhances environment protection programs to achieve the best performance in this area. The Company's Environment Protection Policy is aimed at prevention and mitigation of any impacts on the environment which can be caused by offshore production operations. For NCOC, Caspian offshore development involves not only the exploration and development of hydrocarbon deposits, but implementation of large-scale environmental surveys, properly planned and design of an environment protection campaign. This brochure will introduce the readers to the environmental surveys carried out by the Company.



1. ENVIRONMENTAL IMPACT MONITORING

Environmental monitoring is a highly organized and well-managed environmental observations system that ensures, including the assessment of environmental conditions in human habitats and other biological objects, evaluation of the integrity and performance of ecosystems. Secondly, the system makes it possible to determine a course of corrective actions when deviations from standard environmental parameters are identified.

Environmental impact monitoring is a preventive measure to secure the environmental safety of the surrounding area and is intended to allow NCOC to adjust to current conditions and develop new nature protection programs.

Environmental impact monitoring is a part of Industrial Environmental Control and represents a multi purpose information system intended to identify, describe, monitor and assess the environmental impact sources, and predict their environmental footprint. NCOC monitors such impacts at its offshore and onshore facilities.

The monitoring is carried out at monitoring stations – stationary points with fixed geographic coordinates that are used for observation, measurement and sampling to determine meteorological, hydrological, chemical, physical and biological characteristics of the environment.

1.1. Offshore Impact Monitoring

Offshore impact monitoring covers the entire NCOC license area of Kashagan, Aktoty, Kairan and Kalamkas fields, North offshore section of the main pipeline and the Tupkaragan Bay. The number of monitoring stations totals 242, including 9 long-term monitoring stations used as background stations. These stations monitor chemical and physical properties of the sea water, bottom sediments, (zoo- and phyto-) plankton and zoobenthos organisms, aquatic plants, fish fauna and ambient air quality.

Chemical and physical properties of the sea water and bottom sediments specify the severity of disturbance and pollution of the marine environment. These properties are vital for impact assessment and prediction of possible changes in environmental components.

Zoobenthos (a combination of organisms inhabiting the soil and bottom of a water body) is the best representative object of monitoring: since benthic organisms are motionless (or nearly so), their condition can be easily assessed in terms of quantity over a certain area of the seabed. Many zoobenthos species feed on detritus and they are capable to accumulate pollutants or respond to their presence.

Plankton surveys are useful to analyze the sea water pollution impact on the forage base for fish.

Fish monitoring surveys are carried out to evaluate fish populations in the North Caspian Sea within NCOC's contract areas. The offshore area under survey is assessed to establish the degree of pollution of sedentary goby fish species which do not make lengthy migrations and serve as indicator organisms.

Field observations and sampling for laboratory testing are carried out from specially equipped survey vessels by domain experts: ichthyologists, hydrobiologists, ornithologists and chemical hydrologists. Collected samples are transferred to accredited chemical and biological laboratories for laboratory tests.

The outcomes of multi-year surveys carried out for monitoring of biota, air quality, sea water and bottom sediments within the contract area have shown that concentration of pollutants in various offshore areas remain within the normal range.

1.2. Onshore Impact Monitoring

Onshore monitoring includes soil, ground water, flora and fauna surveys at all facilities of the Company. Such surveys are carried out in autumn and spring seasons by 45 monitoring stations in the Atyrau Region and 11 stations in the Mangystau Region.

The purpose of fauna monitoring is to timely identify, prevent and mitigate any potential negative processes and phenomena for conservation of biodiversity in the region.

The Company conduct fauna monitoring (invertebrates, amphibians, reptiles, birds and mammals) to count populations, determine species composition and their territorial distribution characteristics, assess man-induced factors affecting the populations and distribution of animals. Special approaches are applied for fauna surveys, for instance, many terrestrial mammals and arthopods (spiders, and scorpions) are counted at night time as they are active at night.

Flora monitoring aims to estimate species populations, their general condition and viability, as well as the effects of human impact in the vicinity of Company's production facilities. Flora surveys place special emphasis on rare and indicator species that are common in the area and reflect changes in the environment. One of the rare plant species found in the Atyrau Region is Schrenck's tulip included in the Red Book, and an endemic Linaria leptoceras which is encountered only in the Mangystau Region.

Soil monitoring is a key component of environmental monitoring essential to identifying human-induced soil changes. The purpose of the soil monitoring is to study and assess the current soil quality. Soil monitoring is a regular soil survey system that provides information on soil quality from historical, current and future perspectives.

Ground water monitoring is performed on a regular basis to observe hydrogeological, hydrochemical and other ground water parameters, detect adverse trends, assess and forecast changes in ground water parameters, prevent their harmful effects and determine the efficiency of ground water protection measures. A network of monitoring wells, including 65 piezometric monitoring wells in the Atyrau Region and 47 wells in the Mangystau Region, was deployed to assess the impact of NCOC's production operations on ground water.

2. BIODIVERSITY SURVEYS

The Company developed Biodiversity Conservation Plan in consideration of the long-term value of biodiversity essential to biosphere sustainability and recognizing its potential resources, environmental, scientific, social and economic, cultural and educational, recreational and aesthetically significant, especially in the environmentally sensitive area of the North Caspian Sea.

As part of the implementation of this Plan, the Company conducts studies of the current biodiversity state, explores its dynamics, specificity of the environment of the most vulnerable and ecologically important species of animals and plants.

2.1. Caspian Seal Survey

Caspian seal *(Phoca caspica)* is the only endemic Caspian mammal in the entire Caspian Sea migrating seasonally between the North and South Caspian.

The Caspian seal spends the most important part of its life, namely the whelping and breeding periods, on the North Caspian ice, predominantly in the Kazakhstan Sector.

After ice melting in spring, the entire seal population, with the exception of white coat pups and young moulted pups (current year's offspring), gathers on islands for annual moulting. After the moulting, seals spread all over the Caspian Sea.

In summer, seals have no natural enemies in the sea, but after ice formation in winter their breeding grounds become accessible for wolves, stray dogs and white-tailed eagles that can easily prey on new born pups. In 2008, the International Union for Conservation of Nature and Natural Resources added the Caspian seal to the International Red List as an endangered species.

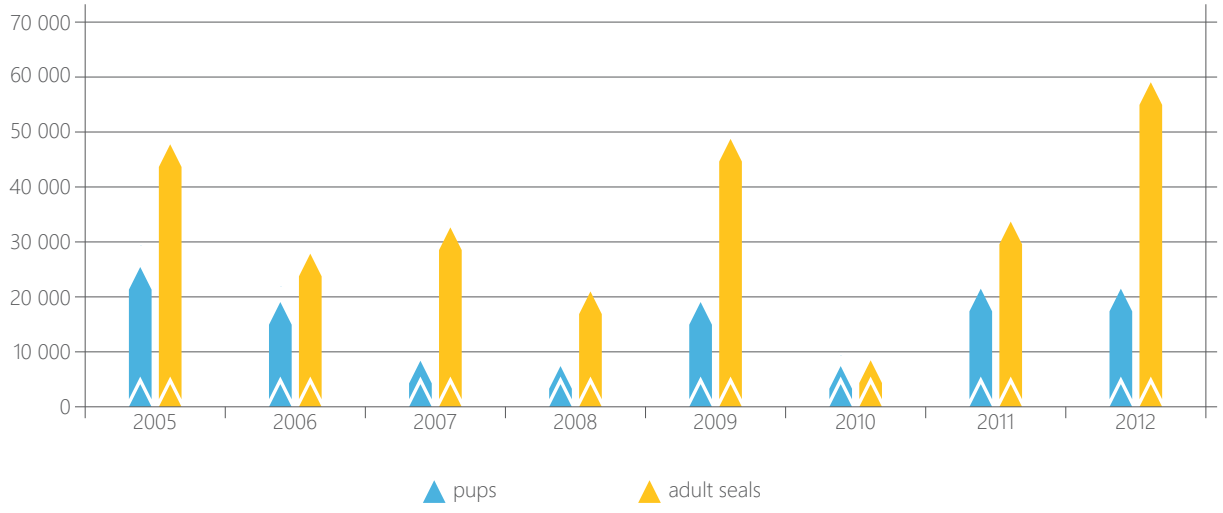
Since 1996, the Company conducts regular studies of the Caspian seal population by employing state-of-the-art technologies to understand seal migratory behaviours, habitats, breeding and feeding grounds. The purpose of these studies is to prevent or mitigate potential adverse effects on seals from navigation and production operations at offshore facilities.

From 1996 to 2005, seal studies were carried out with participation of specialists from CaspNIRKh (Astrakhan, Russia) and the Zoology Institute (Almaty, Kazakhstan). The studies included helicopter reconnaissance flights along the coastline from the Atyrau city to Bautino village. Starting from autumn, seal population census was taken and seal behaviour patterns were surveyed from onboard ice-breaking vessels along their navigation routes in order to determine seals' migration paths to the North Caspian breeding grounds.

From 2005 to 2013, the surveys were conducted by an international team of scientists from Kazakhstan (Hydrobiology and Ecology Institute, Microbiology and Virology Institute, Kazakh Research Institute of Fishery), Russia (Caspian Research Institute of Fishery), Estonia (Estonian Fund for Nature), Sweden (Swedish Museum of Natural History) and the UK (University of Leeds, Tara Research Centre). The international research team developed a comprehensive method for aerial census and ice-breaker supported studies. The activities resulted in recommendations and specific measures were taken to protect safety of seals against navigation of ice-breaking vessels.

From 2008 to 2011, satellite-telemetry-based surveys were conducted using seal tagging. Satellite tracking systems with sensors attached to seals helped identify migration paths of seals and their feeding areas.

Numbers of seals on the ice over the period 2005-2012



Satellite Telemetry

70 seals were tagged from 2008 to 2011. Two types of satellite tags were used: Wildlife Computers (Washington, USA) tags that track only the location of seals, and SPLASH tags which transmit additional information as to how deep the seals are in the water column and how long they stay in the water as they dive for fish. The satellite tags were adhered to seals' heads with special glue. Signals were transmitted only when seals emerged on the water surface. Tags adhered to seals' heads rather than necks had a longer operating time above the water surface which allowed for increasing the number and duration of signals.

Fully molted larger specimens (length of body over 110 cm) inhabiting the reeds were selected for tagging. Reed thickets kept groups of seals isolated from each other, which facilitated capturing them without any disturbance to other animals over a vast area. The tags remained on the animals until the next moult. Tagging of Caspian seals immediately after moulting made it possible to acquire data in 10 to 11 months. The seals were released immediately after being tagged.

Samples of blood, mucous membrane and skin samples were collected from each captured animal to examine their state in the Microbiology and Virology Institute. The studies showed that the majority of tagged seals during the second half of April migrate to their feeding grounds in the south, west and south-west and stay there from May till October and November, and then return back to the north.

The studies identified by the several feeding grounds and periods when seals stay in offshore foraging sites as follows:

- The Komsomolskiy Bay and the area up to 100 km to the north from the shoreline to the area boundary of the Atyrau Region. Seals were located in this area from April through November
- The Ural River delta (the area up to about 80 km from the shoreline): from April through November
- The Volga River delta: from May through August and from November through December
- Ural Depression: throughout the study period, i.e. from April 2011 through April 2012
- The western coast (the area up to about 100 to 150 km from the shoreline between Makhachkala (Russia) and

2. BIODIVERSITY SURVEYS

Sumgait (Azerbaijan) – from April through December

- The Middle Caspian – from May through September
- The eastern coast (the area in the Middle Caspian between the Kenderli Bay and the southern boundary of the Kara-Bogaz-Gol Bay) – from April through November. Seals entered the Kenderli Bay mainly in April to June and November
- The South Caspian (eastern part with depths from 50 to 400 m) – from May through October.

Following the study, the Company has implemented measures to mitigate potential adverse impacts on the seal population and these measures are improved from year to year. These actions include mitigation of the impact of ice breaking operations on the seal population include briefing of captains and crews of vessels based on recommendations obtained during the survey and the best international practice of the marine mammal protection, and also deployment and operation of specially trained seal observers on board of each ice breaking vessel.

The above actions are complemented with helicopter reconnaissance flights over seal accumulation areas. The reconnaissance results are reported directly to the ice-breaker where captains and seal observers select the safest navigation route to protect the animals.

Pilot IR thermal imaging cameras (dual camera units) are also used for early detection of seals along the navigation routes. A thermal imaging camera is used as a night vision tool based on the thermal imaging technology. Thermal imaging is a method for improving visibility in the dark environments which is based on detection of IR radiation and subsequent an imaging. A thermal imager can be operated in an environment without any external lighting. Using the thermal imager during the ice breaking navigations enable to "see" seals at any time of the day and under any weather conditions (fog, smoke, precipitations, etc.) at a distance of up to 1000 meters from the vessel.

All ice-breaking vessels used by the Company are currently equipped with such devices. This measure proved to be efficient and significantly facilitated the vessel route selection at night.

2.2. Fish Survey

While the Caspian fish community is extremely diverse, the North Caspian is the most biologically productive region of this unique landlocked water body with nearly 130 fish species. By classification, habitats and way of life, fish of the Caspian Sea and its coastal rivers are divided into migratory, semi-migratory, sea and river species. Fish conservation, especially in the North Caspian, is a top nature conservation priority pursued by NCOC N.V.

Environmental monitoring in the north-east part of the Kazakhstan Sector of the Caspian Sea, including fish surveys, has been regularly conducted since 2003. Fish surveys are currently performed in spring, summer and autumn within NCOC N.V. contract areas. Catch assessment surveys are carried out using two methods: standard gill nets are applied in monitoring of Nekton* fish species. Benthic fish communities are surveyed using small bottom trawls.

The degree of pollution in the offshore area under survey is assessed using the most numerous and sedentary goby fish species. Goby fish species do not migrate for long distances and therefore are used as indicator organisms. Toxic agents accumulated in their tissues and organs reflect the local level of water contamination.

Fish toxicity testing is performed on a random basis in particular areas in the vicinity of offshore production facilities (artificial islands) and at long-term monitoring stations (points) to make impact comparisons. Such surveys include identifying concentrations of heavy metals and hydrocarbons in the liver, reproductive organs and muscle tissues of gobies to assess the local degree of pollution from NCOC N.V. production operations.

Throughout the monitoring period, all monitoring stations observed irregular changes in the concentrations of hydrocarbons and polyaromatic hydrocarbons (PAH) in fish internal organs and muscles. The available evidence highlights the common causes of toxic agent accumulations in gobies which are not associated with offshore operations in the areas adjacent to oil fields. Accumulations of hydrocarbons in goby fish tissues may be caused by local navigation-related impact (pollution with diesel fuel).

Heavy metal toxicity testing of fish internal organs and muscles over the whole monitoring period has shown minor content of heavy metal and no exceedance of the average detection threshold.

* *Nekton (Gk nektó(s) – swimming) refers to the aggregate of actively swimming aquatic organisms inhabiting the pelagic zone of water bodies and capable of resisting strong currents of water and move independently over long distances.*

Sturgeon Species

Relict sturgeon species have a very long life span relative to the average human lifespan. Adult species reach sexual maturity at a significantly later age. Reproductive ability of sturgeon eggs is very low.

Caspian sturgeons are the most valuable fish present in the Caspian and are represented by 5 species: beluga, starred sturgeon, barbel sturgeon, Russian surgeon and Persian sturgeon, all of which are classified as migratory fish. They live predominantly in the sea and migrate to rivers to spawn.

However, the obstruction of the Volga, Kura and Terek Rivers with a cascade of hydropower plants has changed the natural reproduction environment of many migratory fish species, including sturgeons. The counter-reproductive environment caused a decline in sturgeon populations in the Caspian Sea. The Ural River is the only non-obstructed river in the Caspian basin without any waterworks preventing sturgeons from migrating to spawning grounds. This makes the Ural River highly significant in terms of future sturgeon conservation.

All sturgeon species of the Caspian Sea are now classified as «endangered species» by the International Union for the Conservation of Nature and Natural Resources. Current sturgeon stock levels are estimated as critical, as confirmed by a drastic fall in the number of adult species that participate in spawning.

Such reduction in Caspian sturgeon stock is mainly caused by uncontrolled illegal offshore fishery with a

substantial number of immature fish as incidental catch, resulting in the decline in the natural reproduction levels and habitat pollution.

In 2014, all Caspian states agreed to cease commercial sturgeon fishing to prevent extinction of sturgeon and to restore its populations.

Due to decline in natural sturgeon reproduction, two sturgeon hatcheries were built and commissioned in the Ural River delta in 1998, one of which was commissioned with support of the Kashagan project.

To compensate for the damage to fish resources in the Ural-Caspian Basin and to preserve sturgeon population, NCOC N.V. initiated the Farmed Sturgeon Fry Release Project. The Project is scheduled for 2016 to 2018.

Growth in Caspian sturgeon population by more than 700,000 farmed fry is the Company's contribution to fulfilment of its commitments.

Number of sturgeon fry released in 2016 to 2018.

Number of sturgeon fry released in 2016 to 2018

Work period	Sturgeon fry release per year (number)
2016	234,965
2017	255,965
2018	213,965
TOTAL: from 2016 to 2018	**704,895**

Sturgeon Fry Farming Process at the Ural River Delta Hatcheries

Sturgeon fry is farmed using a combined (pool/pond) method. The fry breeding cycle consists of the following stages:

- Catching and harvesting mature fish species in commercial areas of the Ural River
- Holding mature fish in a cage or pools until the reproductive products are obtained (roe and sperm)
- Injections of pituitary extract, obtaining reproductive products, fertilization and de-adhesion of eggs
- Incubation of impregnated roe and obtaining prolarvae in incubators
- Rearing sturgeon larvae in steel pools on live food until they are transferred to active feeding
- Fry nursing in nursery ponds
- Grown fry census and release into the river through the river discharge channels into the Ural-Caspian Basin.

2.3. Bird Survey

The North Caspian and the deltas of the Volga, Ural and Emba Rivers entering this offshore area are internationally significant wetlands which are very essential to conservation of migratory waterbirds. Birds fly from vast areas of land in the middle latitudes of Eurasia over the territory of Kazakhstan to their wintering grounds in South Asia and Africa with long stopovers for rest, moulting and fat deposition. Twice a year, over 280 migrating birds, including rare and endemic species included to the Red Book, find shelter here. Extensive reed beds serve as a shelter for nesting birds.

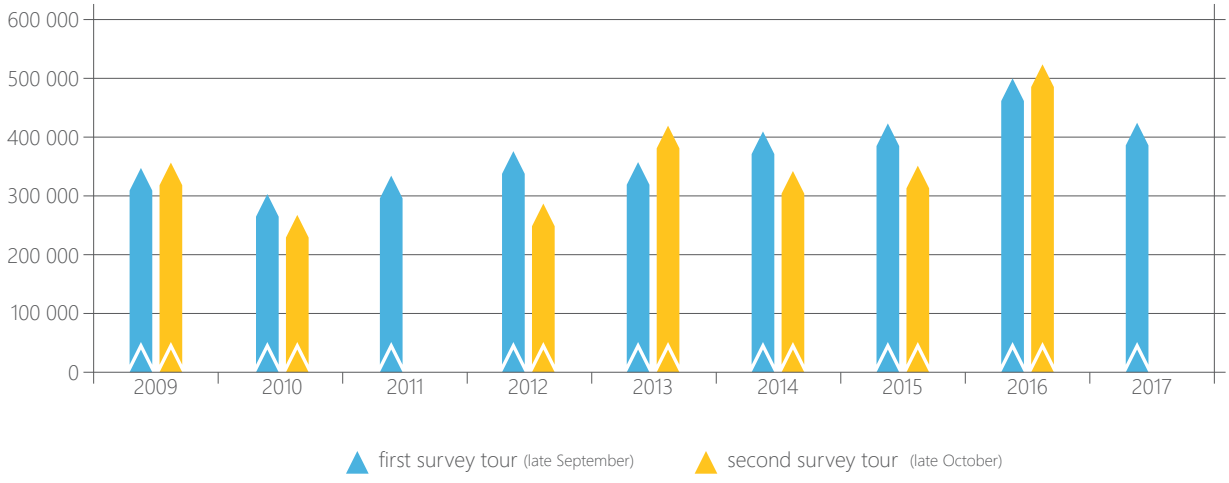
The Kashagan field is located in close proximity to areas of accumulation of birds during their seasonal migrations. For this reason, since 2000 the Company has conducted annual studies involving ornithologists and representatives of governmental authorities.

These studies include a comprehensive work package, such as monitoring of significant accumulations of birds during seasonal migrations (in spring and autumn), studies on the distribution of nesting colonies in the coastal zone during the breeding period, monitoring of wintering grounds for aquatic and semi-aquatic birds, observations around onshore and offshore production facilities.

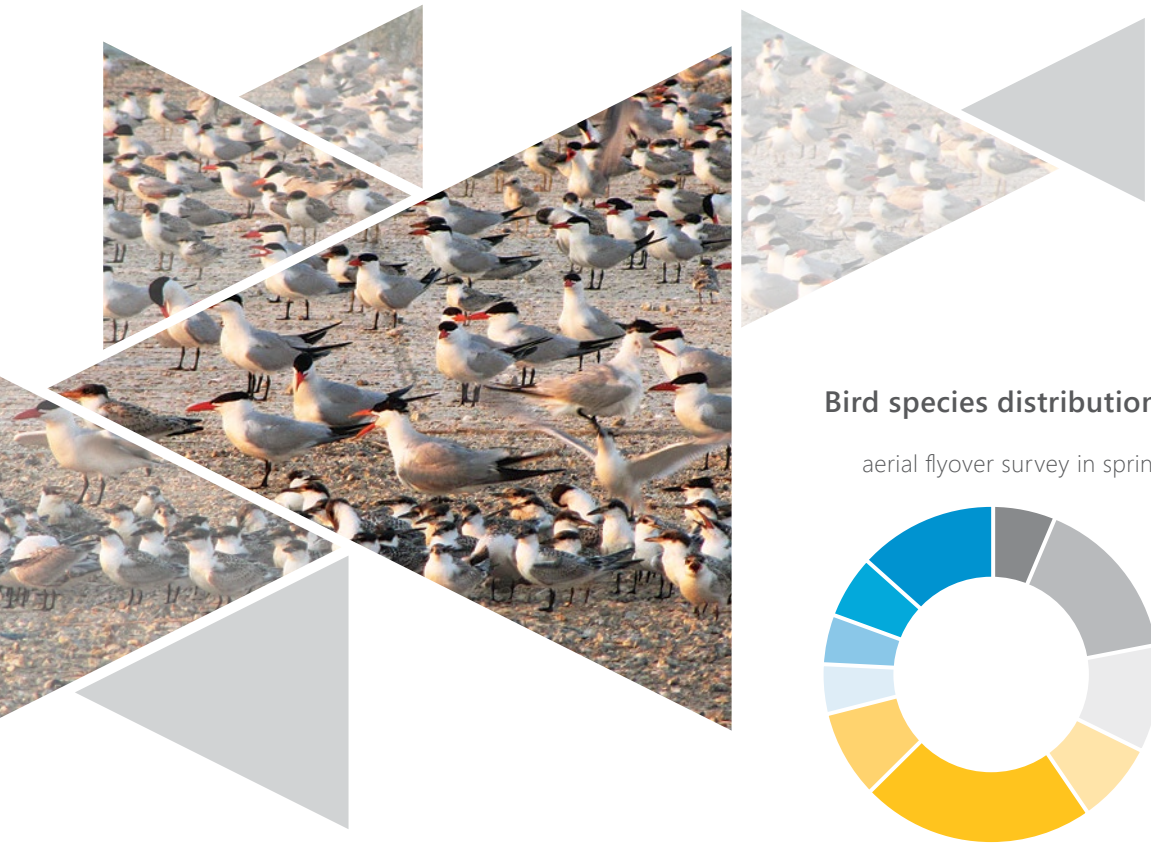
The area covered by surveys includes all man-made islands and the Caspian coast within the Republic of Kazakhstan as well as deltas of the Volga, Ural and Emba Rivers. Both aerial visual and ground observations are carried out as part of surveys.

Aerial visual observations are made by two observers from either side of the helicopter flying at an altitude less than 1000 m above the ground, as per agreement with authorized state bodies. The survey strip covers a distance adequate to identify bird species and extends for about 500 m on each side of the helicopter. The helicopter route is recorded by a satellite navigation tool (GPS) based on pre-defined coordinates. The entire route is divided into flight sections, and any birds noticed in each section are counted. Large bird colonies are recorded separately. The resulting seasonal information is used to map distribution of bird accumulations.

Multiple year data from aerial observations



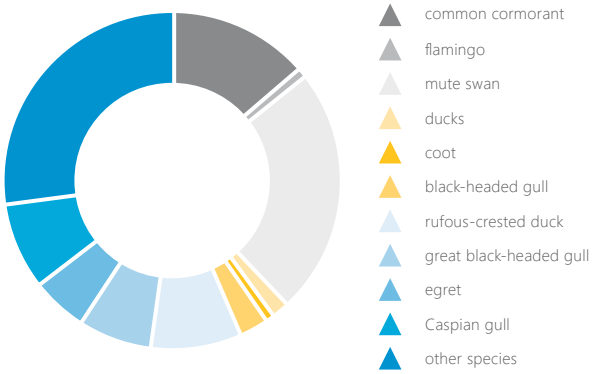
Multiple year data from the aerial visual observations (made traditionally in autumn) have shown a steady inhabitation of birds with a slight growth in their populations.



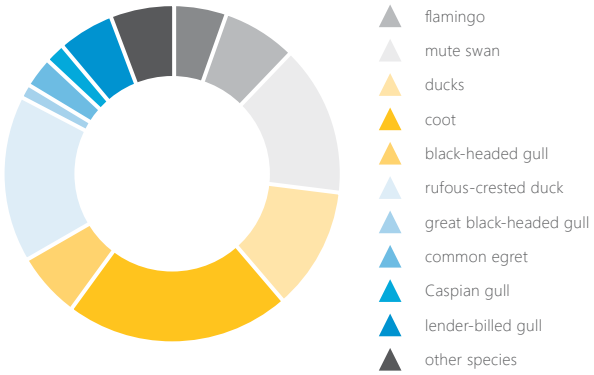
Bird species distribution

aerial flyover survey in spring of 2017

aerial flyover survey in summer of 2017



aerial flyover survey in autumn of 2017



The diagrams represent the main bird species found in the North Caspian Sea. As shown in the diagrams, the largest numbers of migrating flamingos, ducks and coots were registered in autumn and spring.

The population of mute swan, one of the keystone species in this region, is sustainably high. The number of swans recorded during autumn surveys in September of 2016 was 61,500 and 61,700 in 2017. Mute swans are encountered in the North Caspian throughout a year. These birds nest in reed beds that provide conditions favourable for raising nestlings. Swans begin to moult in mid-summer and lose their ability to fly. At these times of the year swans are most vulnerable and need safe places to moult which they find in the North Caspian coastal areas. This explains large accumulations of swans in summer and early autumn, especially in shallow waters of the Seal Islands.

Rufous-crested duck is a common species in the North Caspian Sea, since it is found here in large numbers during nesting and seasonal migration periods. In addition, 10,000 birds are observed wintering near to ice-edge zones of the Tupkaragan Bay.

Among the species listed in the Kazakhstan Red Book, the Dalmatian pelican, European pelican, flamingo,

whooper swan, little egret, pond heron, spoonbill, glossy ibis, great black-headed gull and white-band tailed eagle can be found in this region.

The largest accumulations of migrating birds are recorded on the Seal Islands and Komsomolets Bay. Mass wintering sites for birds are Seal Islands, Yeraliyevo Bay and Karakol Lake.

Artificial islands of the Kashagan field occupy a significant onshore area which is increasingly used by birds not just for stopover in transit, but also for nesting. The observations have shown that the islands are used by birds of various environmental groups (forest, semi-aquatic and open-ground birds).

Since 2006, several species of larids (common tern, sandwich tern, slender-billed gull and Caspian gull) have been observed nesting on the islands protected by ice barriers.

Caspian gulls, Caspian terns and great black-headed gulls (latter species included in the Red Book), have regularly formed colonies on DC-04 Island since 2012.

Since 2014 several couples of hooded crows have regularly nested on man-made structures; they even formed a local sedentary population.

Analyses of long-term year-round monitoring data clearly show that no significant environmental changes have been caused by the presence of Kashagan man-made facilities in the North Caspian offshore area.

This is confirmed by good health status of many commonly occurring bird species including both piscivorous and herbivorous birds, which is also an indicator of high abundance of food reserves.

3. AIR QUALITY

Air quality monitoring is an integral part of the Company's activities. NCOC performs such monitoring in the course of industrial environmental control (IEC) activities.

The primary air emission sources at the Company's facilities are the flare unit, gas turbines, boilers and diesel generators. The flare unit is a part of any oil and gas production facility and functions as a so-called "relief valve" of the plant. The flare flame is maintained at all times. If gas needs to be vented from plant process units, the flare ensures safe burning and dispersion of associated emissions. The flare unit height is designed to maximize dispersion of combustion products in the air.

Gas turbines supply power for the entire production facility. They are installed both onshore and offshore. Turbines run on natural gas obtained through processing of associated gas produced from the field. Turbines are equipped with low NO_x burners designed to reduce nitrogen oxide emissions.

Boilers produce steam, heat water and provide building space heating. Boilers run on fuel gas, but diesel fuel can also be used according to the accepted technology. Stand-by diesel generators are available for power generation.

3.1. Air Quality Monitoring System

The Company has implemented an air quality monitoring system as part of the program to stabilize and improve the Atyrau Region environmental status. The system includes 20 Air Quality Monitoring Stations (AQMS) along the boundary of the Sanitary Protection Zone surrounding the Company facilities, at the adjacent settlements and in the most functional areas of Atyrau city.

The stations operate continuously and measure concentrations of the following pollutants: hydrogen sulphide, carbon dioxide, nitrogen dioxide, nitrogen oxide, and carbon oxide. The data is transmitted to the Company's host computer for storage, analysis and processing. Simultaneously, this data is transmitted to the Atyrau Region Office of KazHydromet RSE and State Department for Natural Resources and Nature Use Regulation for the Atyrau Region.

Air quality and weather conditions monitoring in real-time mode is particularly important in emergencies, as it allows tracking of movements of polluted air masses and taking prompt and appropriate actions.

Apart from AQMS, air quality observations are conducted from time to time at onshore production facilities and offshore monitoring stations with engagement of contractors.

3.2. Under Plume Monitoring

Under plume monitoring is carried out under the flare plume to collect samples and identify the footprint of a certain industrial emission source. Under plume monitoring is performed using a dedicated contractor's vehicle equipped with air sampling instruments. The following weather parameters are estimated while taking samples: wind speed and direction, atmospheric pressure, air temperature and humidity.

3.3. Monitoring at Emission Sources

Maximum permissible emission (MPE) rates the Company is required to comply with are calculated for each emission source. Measurements of actual emissions from a source are made instrumentally involving subcontractors. Stacks at the primary sources are equipped with special sampling ports. Source emission samples are collected using a gas sampling probe and the Pitot tube to measure the following parameters: nitrogen oxides (NO, NO_2), sulphur dioxide (SO_2), carbon oxide (CO), gas flow velocity, pressure and temperature.

4. WASTE WATER TREATMENT

Production operations are carried out in the environmentally sensitive area of the Caspian Sea. The Company has adopted a Zero Discharge Policy to minimize the impact on the marine environment. Wastewater generated at offshore facilities is not discharged into the Caspian Sea, but transferred onshore by dedicated vessels for further disposal.


MOTOROLA

The following wastewater streams are generated at the Company's facilities:

- Industrial wastewater
- Storm water
- Domestic wastewater

The Company applies different methods to treat these wastewater streams.

Industrial wastewater generated as a result of industrial activity may contain oil products, hydrogen sulphide, methanol, suspended solids and other contaminants. The wastewater is pre-treated at the plant facilities. For example, low pressure steam is used to remove hydrogen sulphide from water in the Sour Water Stripper. Treated wastewater is discharged into accumulation sections of Plant Liquid Waste Disposal Area (PLWDA). The sections are equipped with impervious screens to prevent soil and ground water contamination.

Storm water from a rainfall, flushing activities or testing of fire-fighting systems is collected by open drains.

Wastewater generated at offshore facilities is collected in dedicated water tanks and transferred to onshore facilities in the Mangystau Region. Oily wastewater is treated at Bautino Base in the Aquater plant which was upgraded in 2017. To improve treatment efficiency, the Aquater plant was equipped with an additional Dissolved Air Floatation Package. Dissolved air floatation is a wastewater treatment process to remove suspended solids, oils and other contaminants using dissolved air in the form of finely dispersed air bubbles. Suspended solids combined with air bubbles rise to the surface where they are skimmed off.

The flotation technique combined with coagulants is one of the most advanced industrial wastewater treatment and post-treatment methods. Polyelectrolytes are used as coagulant aids in wastewater treatment. 2017 Industrial Environmental Control results show that the upgraded Aquater plant reached an average treatment efficiency of 83 %, namely 99.9 % for oil products and 97 % for suspended solids. Treated wastewater is then discharged into lagoons (evaporation ponds).

Domestic wastewater is treated in biological treatment plants installed at all Company's facilities (both offshore and onshore). TRIQUA treatment plants are installed on D Island and Living Quarter Barges. The secondary wastewater treatment followed by water filtration and disinfection takes place in bioreactors.

To determine wastewater treatment efficiency, samples are collected for water contamination tests performed by both in-house and certified third-party laboratories. The testing is focused on 15 basic parameters, including oil products, suspended solids, chemical oxygen demand (COD), biochemical oxygen demand (BOD) and other substances. COD is a quantifiable parameter to measure the total organic matter content of wastewater, whereas BOD is a measure of organic compounds serving as natural substrates for microorganisms.

According to 2017 industrial monitoring data, the treatment efficiency values averaged 77.9 % for D Island treatment facilities, 81.7 % for Karlygash LQB, 85.5 % for Shapagat LQB, 87.6 % for NUR LQB, and 85.8 % for Zhuldyz LQB. Treated wastewater is transferred onshore for further disposal.

Due to high efficiency of the Company's treatment facilities, treated wastewater can be reused in summer for dust control, testing of fire-fighting system and watering of non-horticultural plants.

5. WASTE MANAGEMENT

NCOC Waste Management System involves a number of activities to mitigate the environmental impact of production processes and generated wastes. The key purpose of the waste management process is to "reduce or completely eliminate waste generation by a source or process" through proper planning of the Company's activities.

5. WASTE MANAGEMENT

Waste management is carried out throughout the waste life cycle from generation to final disposal. Waste segregation (sorting) is an important step of waste management process. As hazardous and non-hazardous wastes shall not be mixed together, they are collected in separate containers or sealed drums. Food wastes and medical wastes are classified as hazardous. TeamTec dual-chamber incinerators are installed at offshore facilities (Living Quarter Barges) to dispose of such wastes. A compactor is used for the compression of paper and cardboard waste at the Company's facilities. All wastes generated at NCOC facilities are transferred to a specialized company for further processing and disposal.

Wastes generated at the Company's facilities are recycled to manufacture new products.

- Waste tires are used for recycling of the raw material obtained using deflation, shredding, crushing of tires into chips and recovery of steel wire and textile fabric. The material is then melted and mixed with other additives at a certain temperature to produce anti-slip rubber flooring and curbs
- Granulated plastic is used to manufacture products such as roof tiles and paving slabs
- Compressed paper and cardboard are recycled to produce cardboard boxes, envelopes and bags
- Waste batteries go through electrolyte recovery and neutralization process for further reuse. Waste batteries are recycled in electric thermal furnaces to produce new generation batteries
- Metal scrap is used to manufacture various types of steel rebar, fasteners and tubular products

Plastic waste containers have been installed at NCOC's offices and Samal Camp since January of 2018. As part of the agreed terms, a dedicated local company provides free-of-charge plastic waste removal and recycling services. Plastic and cellophane wastes are recycled to produce finished goods such as polymeric sand for pavers and roof tiles conforming to relevant standards.

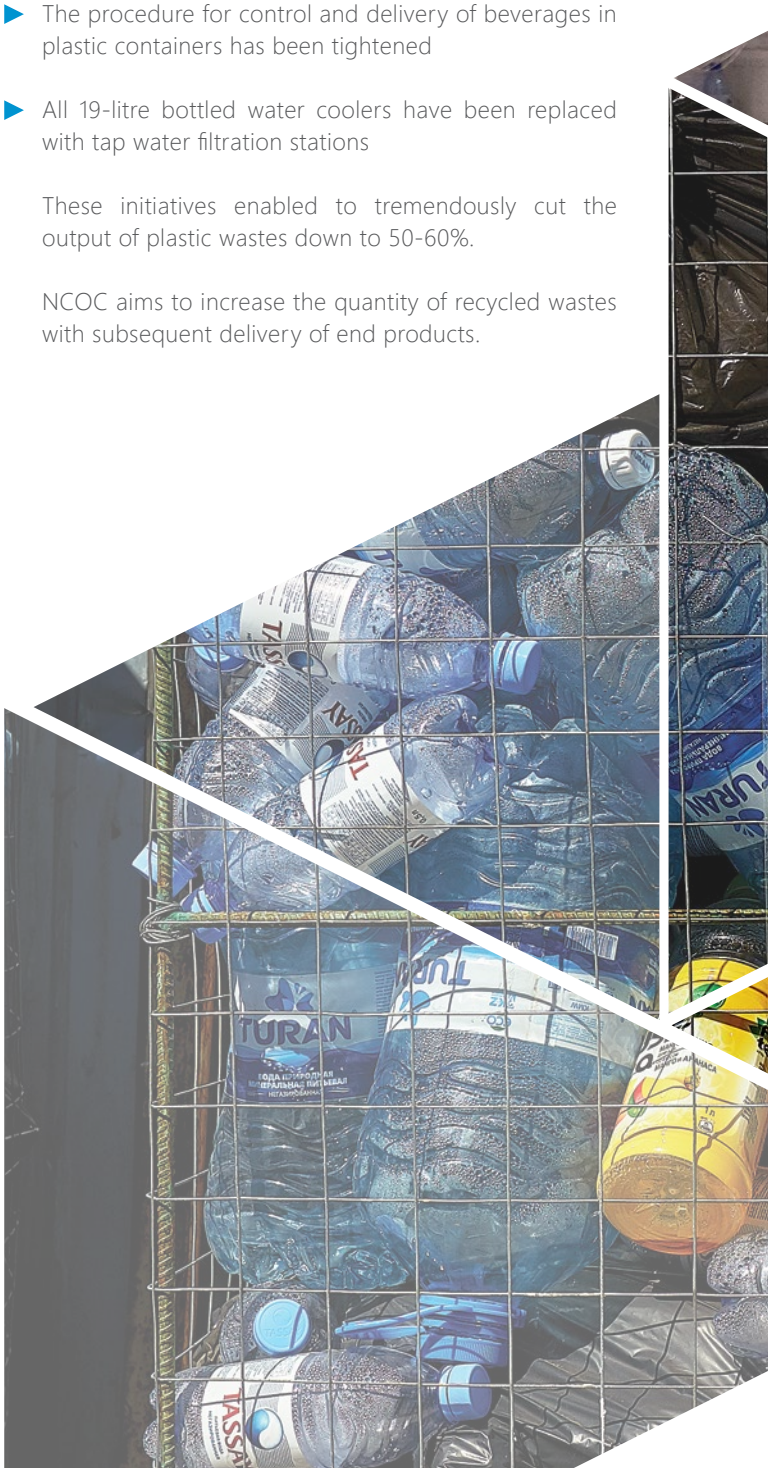
Since 1,863 kg of plastic waste and cellophane have been removed from Samal Camp, Atyrau Training Centre and the Company's offices during 'Say No to Plastic' campaign held over the course of two quarters of 2018. This waste was recycled into 550 m2 of roof tiles, 1,300 kg of polymer, and 200 m2 of paving blocks.

Over the period of 2017 to 2018 the following measures have been implemented:

- The system of distribution and limitation of drinks in plastic containers;
- 'Bring your own cup' initiative was introduced to eliminate single-use disposable containers (cups)
- The procedure for control and delivery of beverages in plastic containers has been tightened
- All 19-litre bottled water coolers have been replaced with tap water filtration stations

These initiatives enabled to tremendously cut the output of plastic wastes down to 50-60%.

NCOC aims to increase the quantity of recycled wastes with subsequent delivery of end products.




PLASTIC
PLASTIC BAGS, PLASTIC
CONTAINERS & BOTTLES
METAL
E-WASTE
PAPER
GLASS
LIGHT BULBS
ORGANIC
BATTERIES

6. ENVIRONMENTAL SUPPORT AT PRODUCTION FACILITIES

Environmental experts who constitute the Environmental Support Team work at every industrial location of the Company (Onshore, Offshore, Bautino Marine Support Base).

The main task of the Environmental Team is to liaise with Operations departments, get involved with process change management by consulting on environmental issues so as to ensure compliance with environmental laws and regulations.

This team maintains working relationships with NCOC N.V. staff members and contractors on industrial sites during toolbox talks and daily inspections (planned, based on the citation or unplanned) to verify compliance of the equipment and current operations with requirements related to environment protection and rational nature use.

Responsibilities of the team also include responding to environmental emergencies, rendering technical assistance in obtaining Environmental Emission Permits, monitoring the management of industrial wastes and effluents, supporting the monitoring activities, providing environmental information, and generation of initial environmental reports.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7. ENVIRONMENTAL INITIATIVES

For many years the Company has been implementing various environmental initiatives both inside and outside the Company's premises to promote environmental stewardship, foster environment-friendly attitudes among young people, and to contribute to landscaping and land improvement at the Company's facilities.

7.1. Pilot Tree Planting

In 2014 to 2015, the Company carried out a research with regard to land improvements along the Atyrau-Karabatan-Dossor motor road.

As an outcome of this research, the Company and Atyrau Region Akimat entered into a Memorandum of Understanding which served as a basis for pilot tree planting along the mouth of Sokolok River.

In subsequent years (2016-2018), the Company fulfilled its obligations by planting 1,500 trees on a 0,5 hectare area selected by the Akimat. A drip irrigation system was installed in advance to irrigate the planted trees with water from the Sokolok River. The area was planted with trees and shrubs adapted to the local climate: large-leaved elm, Caspian willow, oleaster and privet. The accomplished comprehensive tree care measures ensured survival ability of the trees for 98 %.

7.2. Green Shelter Belt

Green shelter belts have been created at the boundary of the Sanitary Protection Zone to prevent adverse effects of production facilities on populated areas. Green shelter belts are constructed under the project which was positively approved by the Department for Natural Resources and Nature Use Regulation for the Atyrau Region. The project plans to provide emission protection buffers made of trees and emission-absorbing surfaces composed of shrubs and sward. The project will be implemented in two phases: Phase A and Phase B.

Phase A will be implemented between Samal Camp and Onshore Processing Plant. The green shelter belt consists of 19 modules, each of them has an average length of 180 m by 6 rows. Each module has its own drip irrigation system using treated wastewater. Seedlings with closed root system are supplied by local tree nurseries: common ash, Siberian pea-tree, large-leaved elm, and Caspian willow.

High salinity of soils and ground water make it impossible to use the conventional open-ground planting method because of its detrimental effect on trees. The method of planting in a PVC-insulated trench involves backfilling a trench with imported soil in which the transplanted seedlings are grown.

3,150 trees were planted in the green shelter belt in 2017 and an additional 4,000 trees will be planted in 2018.

Following the experience of Phase A, a decision will be made to proceed with Phase B which involves further expansion of the planting area.

7.3. Clean-Up of the Ural River Banks

The Ural River has an embankment promenade popular with both adults and children. As the river banks become clean of snow in spring, they reveal the litter accumulated over the winter along the river that needs cleaning out.

It is important to show to the city residents and guests that human beings and the environment are tightly coupled together, that we should stop leaving garbage behind and dispose of it properly. We need to be friendly towards the environment if we want to have a brighter future.

Every year, the Company undertakes a Ural River clean-up campaign involving the Company's employees and their families, non-governmental organizations, local students, volunteers and residents. Hundreds of volunteers participate in such campaigns every year.

This initiative is intended to make the Ural River banks a more pleasant and safer place through raising public environmental awareness and setting eco-friendly examples.

The area for clean-up is to agreed in advance with the Atyrau Region Akimat and dedicated waste management contractor.

Apart from other environmental actions, this campaign has become a good opportunity for the employees and their families to meet their colleagues in an informal setting and to make a shared contribution to the success of this initiative, as well as to cultivate positive attitude towards waste management among the younger generation.

CONCLUSION

Finally, the Company has adopted a Zero Discharge principle which is essential to environmental safety system during implementation of the Kashagan Project. Zero Discharge means no discharge of waste water, industrial or domestic wastes into the sea. All collected and segregated wastes are transported onshore for further disposal or processing. The zero discharge policy has been strictly followed in both exploration/production drilling and commercial production of hydrcarbons.

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