NCOC
NORTH CASPIAN
OPERATING COMPANY

Sustainability Report 2015

CONTENTS

1. NCOC'S COMMITMENT TO SUSTAINABLE DEVELOPMENT – A MESSAGE FROM THE MANAGING DIRECTOR

This is the first *sustainability report* to the public from the NCOC, the operator of the North Caspian project.

The concept of sustainability – that we must develop the offshore oil and gas resources of Kazakhstan to meet the needs of the present generation without compromising the ability of future generations to meet their own needs – has been integral to our approach from the very beginning of our project in 1997. It is reflected in our fundamental commitment to balance short- and long-term interests and integrate environmental and social considerations into our decision-making. In fulfilling its social and environmental responsibilities, NCOC aims to bring long-term benefits for the Republic of Kazakhstan, its citizens, and NCOC's shareholders.

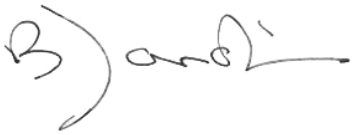
The Operators for the North Caspian project in years past have reported to the public regularly about our sustainability activities. With the reorganization into a single project Operator NCOC (N.V.) in 2015, the time is right to issue a formal annual report in compliance with maturing global best practice.[1] This is a "continuous improvement step" in our overall commitment to sustainability. We join an increasing number of companies reporting performance in this way, and we hope it leads to a better understanding of the contribution our industry makes to global progress toward the United Nations' 2030 Sustainable Development Goals.

It is the right time to launch this report for yet another reason. Later this year, we anticipate stable production to begin from the Kashagan Phase 1 project, the initial phase of the North Caspian oil and gas project. In years to come, we intend this report to be a regular feature of our responsibility to communicate transparently and openly to the local community and the people of Kazakhstan about our performance in developing their offshore resources.

I look forward to continuing the dialog with you, our stakeholders, regarding this report and our performance in general.

NCOC Managing Director

Bruno Jardin



1 This report complies with the recently-updated "Oil and Gas Industry Guidance on Voluntary Sustainability Reporting" (3rd edition, 2015), developed jointly by IPIECA (the global oil and gas industry association for social and environmental issues), IOGP (the International Association of Oil and Gas Producers) and API (the American Petroleum Institute).

2. ABOUT THE NORTH CASPIAN PROJECT

2.1 Our Vision for Creating Value for Stakeholders

For Kazakhstan

NCOC is committed to developing a world-class, pioneering offshore project to develop oil and gas resources in the Caspian that is protective of the environment, whilst growing the economy of Kazakhstan and advancing local communities.

Globally

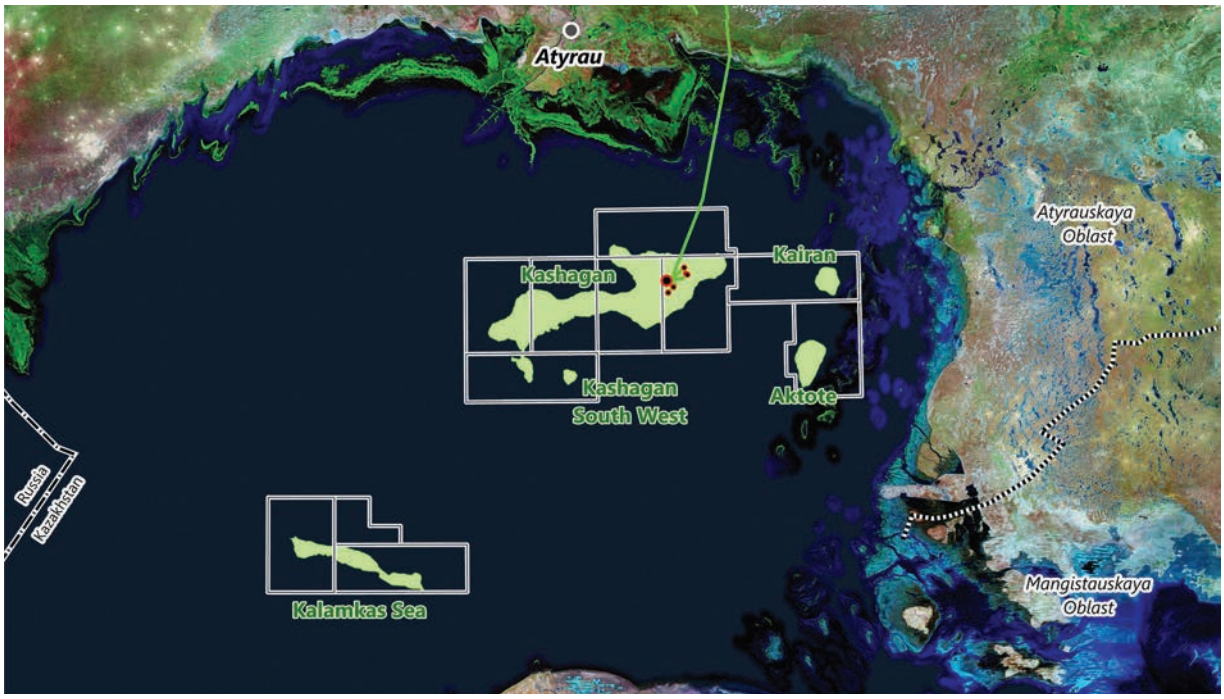
The world's population continues to grow, and with it comes increased demand for energy to address basic needs, and ensure better standards of living. While supply from new types of energy is increasing, the International Energy Agency (IEA) also forecasts that oil and gas will continue to play a major role in satisfying growing demand for decades to come, and notes the Caspian region has the potential to make a significant contribution to ensuring world energy security by increasing the diversity of supply. NCOC aims to realize that potential for Kazakhstan.

2.2 Project Description

The North Caspian project is the first major offshore oil and gas development in Kazakhstan. It covers five fields: Kashagan, Kalamkas Sea, Kairan, Aktote, and Kashagan South West.

The giant Kashagan field ranks as one of the largest oil discoveries of the past four decades, with approximately 9-13 billion barrels (1-2 billion tonnes) of recoverable oil. The Kashagan reservoir lays 80 km offshore the city of Atyrau in 3-4 meters of water, and more than 4 km deep (4,200 meters).

Given its scale and technical complexity, the North Caspian project will be developed in phases, beginning with Kashagan Phase 1. (Future phases of development are currently at a planning stage.) The combined safety, engineering and logistics challenges in a harsh offshore environment make Kashagan one of the largest and most complex industrial projects currently being developed anywhere in the world.



NCSPSA contract area

Pipeline Replacement

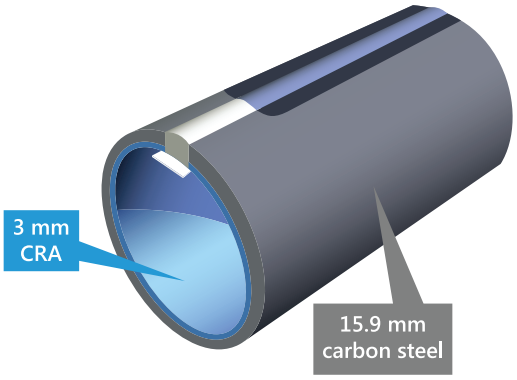
Materials experts indicated the cause of the problem in 2013 was sulfide stress cracking due to unexpected formation of hard spots in the steel.

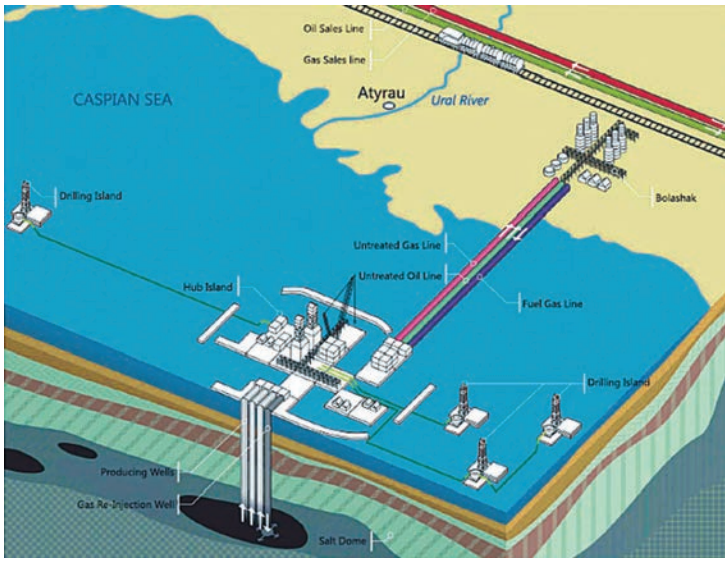
The original design and steel specifications were in full compliance with requirements of international standards and best practices in international oil and gas field development for the H_2S content and presence of water expected at Kashagan. In addition, laboratory analysis of the pipe steel, including simulation of its reaction to sour gas, had concluded that it was appropriate for Kashagan.

As a conservative choice with high safety margin, a material was selected for the replacement pipeline that is known to effectively address the risk of hard spots formed on contact with sour oil and gas. It is a two-layer composite steel, consisting of:

- a cladding layer, which will be in contact with the sour oil and gas, made of a corrosion-resistant alloy (CRA), and
- a backing layer, made of specially formulated carbon steel to provide the strength and toughness required to maintain mechanical integrity.

New welding, manufacturing and inspection protocols were also implemented, and subjected to quality certifications.





Kashagan EP development concept

The fluid to be produced from Kashagan is a mix of hydrocarbons: light, gaseous components such as methane, ethane, carbon dioxide, and hydrogen sulfide, and heavier petroleum components. Kashagan as a reservoir is characterized by high pressure (almost 800 bar), and a high concentration of hydrogen sulfide (H_2S), making the gas "sour." A positive feature is that gases at that pressure, when re-injected, can actually enhance oil recovery. So the light, gaseous components will be separated from the heavier oil offshore on D Island and most of it re-injected under high pressure back into the reservoir, into the same rock formation from which it was produced. The remainder of the gas will be sent to the Bolashak onshore processing facility where hydrogen sulfide is removed. The processed, or 'sweetened', gas will be used for onshore and offshore power generation and some will be marketed as Sales Gas.

For more detailed description of project challanges, see www.ncoc.kz

2015 Activities

On 30 June 2013, in the presence of RoK President Nursultan Nazarbayev and UK Prime Minister David Cameron, the North Caspian project and its shareholders marked the end of the construction of Phase 1 of the project and the start of commissioning and testing. Due to cracking in the pipelines found in September 2013, RoK authorities and shareholders agreed that the project's pipelines (two 28-inch pipelines approximately 95 km long) should be fully replaced for safety assurance (see inset on previous page).

Pipeline replacement commenced in spring 2015, with a target to complete in the second half of 2016.

In addition to pipeline replacement, maintenance and preparation work at the Bolashak onshore processing facility and D Island proceeded in 2015 in anticipation of resumed production, and topsides work and drilling activities are ongoing on the islands adjacent to D Island.

2.3 NCOC Governance and Management Systems

"History in Milestones" on NCOC's website

The North Caspian project is developed under the North Caspian Sea Production Sharing Agreement, signed by the Republic of Kazakhstan and an international consortium of major oil and gas companies in 1997.

Today, that consortium includes seven of the world's largest and most experienced energy companies: KazMunayGas, Eni, ExxonMobil, Shell, Total, CNPC and INPEX. Each shareholder is independently responsible for transporting and marketing its own share of production, and for reporting and sharing that production with the government according to the NCSPSA.

The project is managed by an Operator, acting on behalf of the shareholders. Prior to 2015, the North Caspian project was operated under a "venture" model, in which the Operator delegated certain development and production activities to four "agent" companies. In late 2014 the shareholders agreed to further integrate and consolidate management with the creation of a new, unified Operator: the North Caspian Operating Company N.V. (NCOC)[2]. In addition to efficiency, the transition will better position the project for asset transfers, and for future phase developments within the NCSPSA area. The top executive officer of NCOC is the Managing Director.

To ensure company systems and processes meet the highest international standards, NCOC holds the following certifications:

- OHSAS 18001 (Occupational Health & Safety Management Systems)
- ISO 14001 (Environmental Management Systems)
- ISO 9001 (Quality Management Systems)

The external verification for these awards requires NCOC to regularly demonstrate not only compliance, but also continuous improvement in its management systems.

2 Here and elsewhere in this document the abbreviation NCOC refers only to North Caspian Operating Company N.V. The term Operator may refer to NCOC, or to any of the previous Operating Companies under the NCSPSA, as appropriate in context.

3. NCOC PERFORMANCE DATA

Products	2015
Oil production (tonnes)	**0**
Sales Gas Produced (standard cubic meters)	**0**
• *Sales Gas produced (in oil equivalent tonnes)*	**0**
Sulfur production (sold), (tonnes)	**0**
Health and Safety	
Occupational injury and illness	
• Total Recordable Incident Rate (TRIR), per million man-hours	0.79
* *NCOC Employees*	*0.50*
* *Contractors*	*0.88*
• Lost Time Incident Rate (LTIR), per million man-hours	0.30
* *NCOC Employees*	*0.34*
* *Contractors*	*0.26*
• Fatalities	0
• Fatal Accident Rate, per million man-hours	0
• Fatal Incident Rate, per million man-hours	0
Number of Process Safety Tier 1 Events (per API RP 754)	0
Number of Process Safety Tier 2 Events (per API RP 754)	0
Environment	
Greenhouse Gas Emissions	
• Direct (Scope 1), thousand CO_2-equivalent tonnes [3]	465.0
* *Carbon dioxide (CO_2), thousand tonnes*	*461.5*
* *Methane (CH_4), thousand CO_2-equivalent tonnes*	*1.0*
* *Nitrous oxide (N_2O), thousand CO_2-equivalent tonnes*	*2.5*
• Indirect (Scope 2, imported energy), CO_2-equivalent tonnes [4]	10.1
• GHG intensity, CO_2-equivalent tonnes per 100 equivalent tonnes of oil produced	NA
Energy Use	
• Total, million gigajoules (GJ) [5]	2.30

3 The Global Warming Potential multipliers used to calculate CO_2 equivalence are 21 for CH_4 and 310 for N_2O, using 100-year time horizons, based on RoK Ministry of Environmental Protection Order № 280-e(p) of 5 Nov 2010 "Об утверждении отдельных методик по расчету выбросов парниковых газов." Emissions are calculated at the facility level based on approved methodologies and requirements established by the RoK Environmental Code and applicable regulations, and consistent with the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

4 Calculated from indirect electricity consumption using a demand-side emission factor of 0.995 tCO_2-eq/MWh for Kazakhstan grid (combined margin) in 2015, per "Методика расчёта коэффициента выбросов для электроэнергетических систем," Kazakh Scientific Research Institute of Ecology and Climate of RoK Ministry of Environment (2012), based on the EBRD methodology in the Appendix (Lahmeyer International, 2012), available from the KazEnergy GHG standards website.

5 1 megawatt-hour (MWh) = 3.6 gigajoules (GJ)

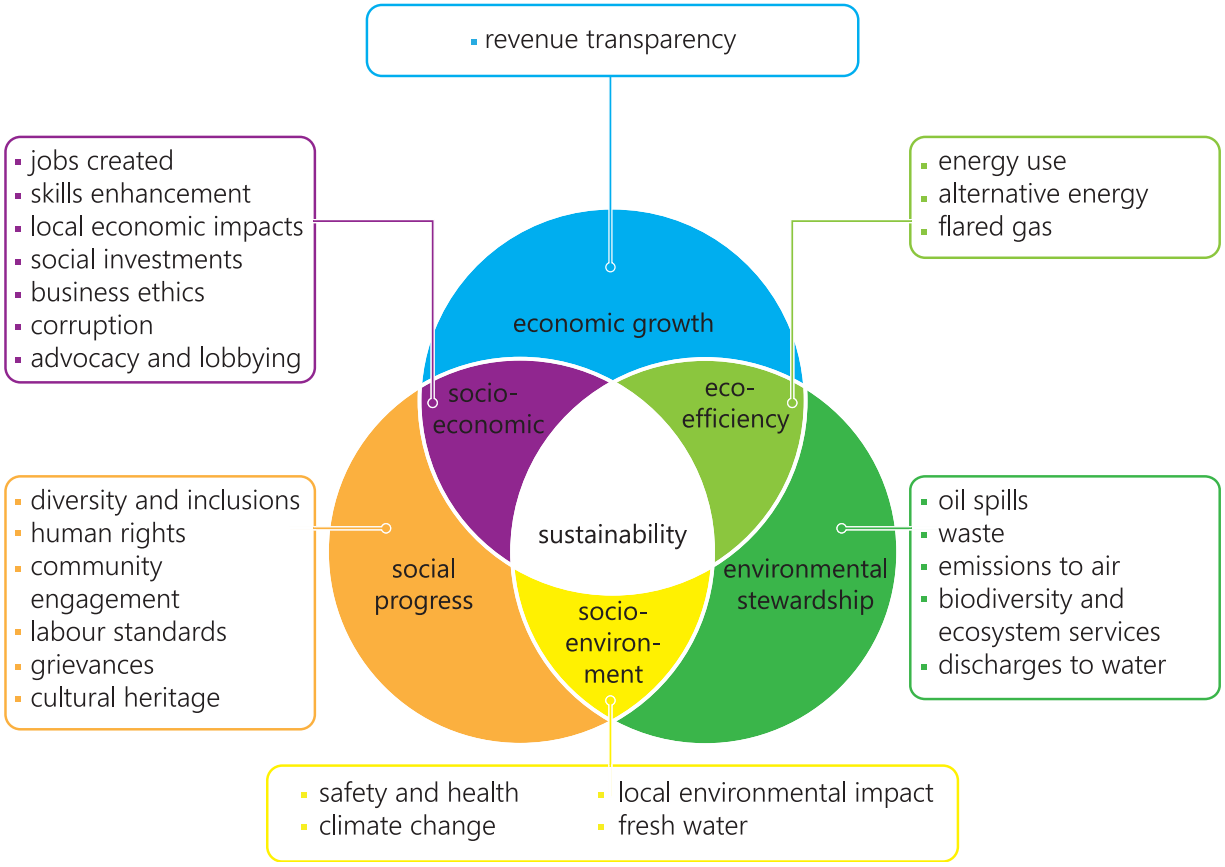
• Energy intensity, million GJ per million equivalent tonnes of oil produced	NA
• Total energy exported (imported) by NCOC, million GJ	(0.37)
Hydrocarbon Flaring, standard[6] million cubic meters	6.3
Fresh water	
• Total volume withdrawn, thousand cubic meters	384
• Total generated from seawater, thousand cubic meters	106
• Total volume consumed, thousand cubic meters	444
• Freshwater intensity, tonnes of water consumed per equivalent tonne of oil produced	NA
Controlled Hydrocarbon Discharge to Surface Water, metric tons	<0.1
Air emissions	
• Volatile organic compounds (VOCs) emitted, metric tons	395
• Sulphur dioxide (SO_x) emitted, metric tons	131
• Nitrogen oxides (NO_x) emitted, metric tons	943
Spills to the environment	
• Number of spills >1 bbl reaching environment	0
• Volume of hydrocarbons (oil) spilled, metric tons	0
Waste	
• Total quantity of waste disposed, metric tons	22,523
* *Of which classified as hazardous by local regulation, metric tons*	*19,882*
Socio-Economic	
Nationalization of NCOC Workforce	
• Percentage of national employees in management	62
• Percentage of national employees in technical and engineering positions	86
• Percentage of national employees in worker and support positions	99
Composition of NCOC Workforce, percent women employees	33
Cumulative number of Kazakhstan citizens receiving NCOC-sponsored training, thousands	15
Cumulative Bonuses Paid to RoK (millions U.S. dollars)	1,085
Cumulative direct contribution to social infrastructure and community donations, in Atyrau and Mangystau Oblasts, million U.S. dollars	500
Cumulative payments to local suppliers for goods, works and services[7], billion U.S. dollars	12.6

6 Standard cubic meter at 20°C and pressure 1 atm. The format for reporting amounts flared is established in RoK Government Decree № 1104 of 16 October 2014.

7 Local goods, works and services are defined per the Unified Methodology on local content calculations, defined in the RoK Law "On Subsurface and Subsurface Use." See Link to Subsoil Act definitions of local content used by NCOC.

4. REPORT STRUCTURE

Narrative reports on NCOC performance are divided into six different aspects of sustainability, as shown graphically below. This manifests our concept of sustainability as the integration of economic, social and environmental concerns. Each of the aspects has narrative descriptions, putting results in context with explanation, and occasionally providing a case study to illustrate progress toward goals. The topics covered are determined by "common" reporting requirements of the IPIECA guidelines (3rd ed., 2015) and our analysis of issue materiality. See page 42 (Reporting Process) for more detail.



5. SOCIO-ENVIRONMENT

5.1 Health and Safety

NCOC's General Business Policy on Health, Safety, Security & Environment

Health and safety is a core value at NCOC.

It is a guiding principle that every worker has the right to return home to family and friends uninjured, fit and healthy.

Policies, plans and programs

Lead2Safety

"Lead2Safety." Facilities, equipment, systems and standards alone do not guarantee sustained safe operations. Our long-term strategy for developing, shaping and improving NCOC's culture of safety – the leadership and behaviors that say "this is how we do business around here" – is called "Lead2Safety." The Lead2Safety strategy provides an umbrella to our activities to maintain and improve health and safety culture in NCOC and among our contractors. Some of these activities are described below.

Golden Rules. Twelve Health and Safety "Golden Rules" apply to anyone working for NCOC, either employee or contractor. Regular communication about Golden Rules sends a message that NCOC cares about our people, and is working hard to increase awareness, establish requirements, and instill safe practices to manage safety risks on NCOC sites. Awareness, acceptance and compliance with the Golden Rules are a condition of employment.

Along with the *obligation* to follow the Golden Rules, every employee also has the *right* to stop any activity they deem to be unsafe. Underpinning this authority is the belief that no task is so important, or so urgent, that is has to be carried out in an unsafe manner.

Root Cause analysis. All work-related incidents are thoroughly investigated and the root causes identified and shared throughout the project to prevent re-occurrence of similar incidents.

Traditionally, health and safety performance has been measured in terms of "lagging indicators" (i.e. accident and incident frequency rates). While these are important, they tend to be reactive and create record-keeping activity that in itself adds little to safety. NCOC is on the forefront of companies proactively working with "leading indicators" as well:

"SAFE-R," Shaping an Accident Free Environment – Reporting. Any worker can report "interventions" – actions that were taken following positive or negative observations about safety – using a special card reporting system. This helps reinforce that safety is everyone's concern, not just specialists, and helps train in identifying and correcting unsafe behaviors or conditions before they lead to accidents.)

"GRuVIS" Golden Rule Visible Implementation System. Contractors and others receive special recognition for safety efforts that go beyond minimum expectations in implementing the Golden Rules. This program specifically focuses on Management engagement with site visits to assess health and safety controls and barriers in place, communication about safety and health related issues with the workforce, and insights into the level of health and safety culture at a specific worksite.

"Tool Box Talks." A suitable and sufficient risk analysis is conducted to ensure that every potential hazard is considered, and the results communicated to all involved personnel before the start of any task.

Certification and Verification. To ensure company systems and procedures meet the highest international standards, NCOC is certified to OHSAS 18001 (Occupational Health & Safety Management Systems). The external verification requires NCOC to regularly demonstrate not only compliance, but also continuous improvement in its management systems.

Workforce Health. The HSSE General Business Policy calls on NCOC to promote a healthy lifestyle among our workforce, and to protect our people from workplace health risks. This is carried out through various activity streams. A Health Risk Assessment (HRA) is completed by Industrial Hygienists to identify the significant workplace health hazards (physical, chemical biological, psychosocial, etc.), and to establish measures to mitigate or control these hazards, such as food safety and catering specifications, winter preparedness and hot weather campaigns, or personal protective equipment like masks and gloves. NCOC has a seamless Medical Emergency Response strategy to cover the management of medical emergencies not only in the field, but also in collaboration with the local Oblast Hospital to sustainably raise medical standards for the whole community. NCOC works with medical insurers to provide a robust Fitness to work/medical surveillance/ sickness absence management processes for its staff which also includes reporting of occupational illnesses. Smoking, alcohol and drug abuse are not only hazardous to the health of the individual, they increase the risk of safety incidents that can affect other personnel. Thus our approach is to reduce smoking risks, and to strictly prohibit the use of alcohol or drugs (or any other substance likely to alter performance) in the workplace. We also encourage personnel to get involved in sports activities.

Incident Learnings in 2015. In 2015, 4 incidents occurred that could or have resulted in major consequences to the employees. All these incidents have been investigated following the company process on incident investigation and reporting, where root causes have been established. Resulting corrective actions, to prevent re-occurrence have been developed together with the lessons learned shared across the company.

Three incidents were referring to employees entering or conducting work in a hazardous situation. Intervention of colleagues resulted in stopping the activity immediately and vacating

Check of the office air conditioning system

"Tool box talks" on D Island

the hazardous area to a safer zone. The hazards were not being recognised appropriately by the involved workers. Lessons learned include the value of a thorough risk assessment prior to start of any work, and this was shared within the organisation.

One incident involved a vessel colliding with a barge during transfer at night time, with injuries. Visibility was limited, although other means to identify surrounding vessels / barges were available. Improvements to navigation of the different vessels and barges in the surroundings have been implemented and limitations on night transfer have been established.

5.2 Process Safety and Asset Integrity

Tier 1 and Tier 2 process safety events are defined in industry standard API RP 754. This would include loss of primary containment for any material, including non-toxic and non-flammable (e.g., steam, compressed air) if the event results in certain safety consequences or impacts to employees, contractors or residents. In this section, NCOC reports on the number of such events, providing context and narrative to broadly describe the nature, consequences and interpretation of the data.

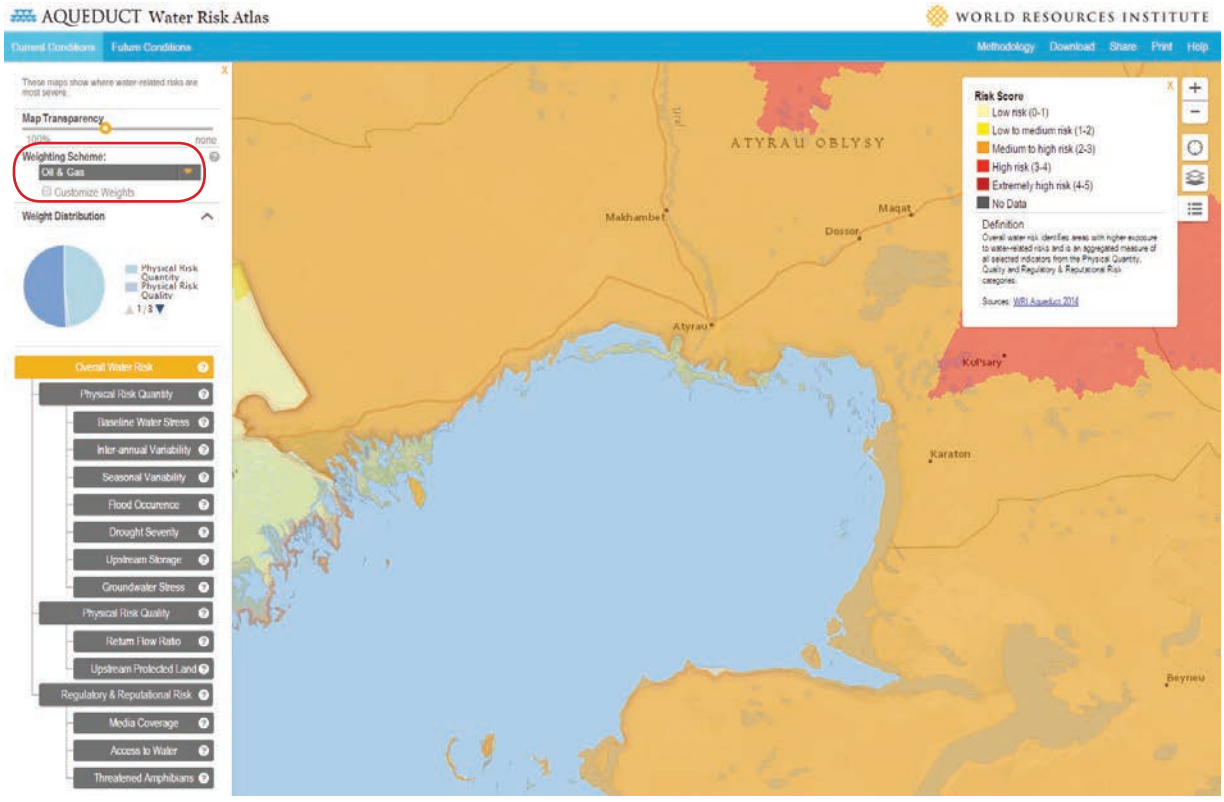
In **2015**, NCOC reported **0** Tier 1 and **0** Tier 2 process safety events.

5.3 Fresh Water

NCOC is committed to maximize conservation of fresh water.

Water Risk. NCOC onshore operations are located in an area identified by the WRI Aqueduct Water Risk Atlas (2014) as medium to high risk exposure for oil and gas operations.

Performance. The total volume of fresh water consumed in NCOC operations in **2015** was **444** thousand cubic meters. The total volume of fresh water withdrawn in **2015** was **384** thousand cubic meters. Most of this withdrawal was sourced from the Volga river via the Astrakhan-Mangyshlak pipeline, and used at the Bolashak onshore processing plant for producing steam for processes and construction camps for household use. Offshore facilities



Screenshot of the WRI Aqueduct Water Risk Atlas

Samal Camp

Green Shelter Belt near Samal Camp

also need fresh water: **106** thousand cubic meters was produced from desalination units offshore. This replaced fresh water that would otherwise be sourced from a local watershed or aquifer.

NCOC plans in future to report its water intensity (fresh water consumption normalized per unit of production) as a guide to its performance in conserving fresh water.

Policies, plans and programs. We use treated, recycled water from household use at the camp and utilities area for plant irrigation and dust suppression purposes, which helps reduce our withdrawal of fresh water for these purposes.

NCOC has proposed installation of additional treatment facilities at the Bolashak plant that will enable increased recycling of process water. In the first stage, reuse of boiler blowdown water could reduce overall consumption by 30%. In a later stage, reuse of water from the flash tower could reduce our withdrawals of water from the Astrakhan-Mangyshlak pipeline by as much as 70%.

5.4 Greenhouse Gas Emissions

NCOC is committed to reduce its GHG emissions to the lowest level compatible with operational constraints and safety. We believe the most effective way to achieve that is a combination of high operational reliability, and continual improvement in the efficiency of our energy usage.

Total direct Greenhouse Gas (GHG) emissions from NCOC operations in **2015** totaled **465.0** thousand metric tons CO_2-equivalent, including **461.5** thousand tonnes of carbon dioxide (CO_2), **1.0** thousand CO_2-equivalent tonnes of methane (CH_4), and **2.5** thousand CO_2-equivalent tonnes of nitrous oxide (N_2O). This total includes mobile and stationary sources.

NCOC production facilities are self-sufficient in electricity, heat and steam. Indirect emissions arise from purchased power for support facilities such as Bautino base and Atyrau Training Center. Total indirect GHG emissions from NCOC operations in **2015** totaled **10.1** thousand metric tons CO_2-equivalent, almost all of it carbon dioxide.

NCOC plans in future to report its GHG intensity (GHG emissions normalized per unit of production) as a guide to its performance in reducing GHGs.

There are various approaches to estimating Other Indirect ("Scope 3") emissions. NCOC will report volumes of produced oil and gas to enable stakeholders to estimate these emissions from the NCOC value chain using their preferred methodology.

6. ENVIRONMENTAL STEWARDSHIP

6.1 Policies and Programs

NCOC has a policy of zero discharge into the Caspian Sea; see Waste.

NCOC has a "No Routine Flaring" policy; see Flaring.

Policies. NCOC is committed to developing a world-class project that is designed and operated in a manner protective of the unique, sensitive environment of the North Caspian Sea. We conduct our operations responsibly and in full compliance with the laws of the Republic of Kazakhstan, and in line with accepted international regulations, standards, and best practices.

Our approach is one of risk management. Conceptually, that means identifying and understanding the risks of any action and its potential impacts; taking steps to minimize that risk or mitigate its impacts down to acceptable levels; and continually re-checking the risks and improving the measures to address them.

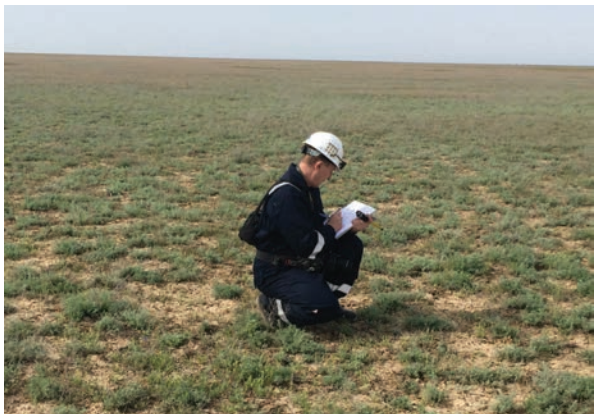
Environmental Impact Assessments. When we make decisions about production processes and facility modifications, the impact they will have on the environment is one of our first priorities. NCOC has developed and regularly updates Environmental Impact Assessments (EIAs) over each aspect of its operations, including the offshore and onshore facilities, trunklines, and onshore export pipelines, in compliance with Kazakhstan law. EIAs identify and characterize the eco-systems where activities are to be carried out, and propose optimum solutions to minimize environmental impacts. The studies developed for the North Caspian project engaged Kazakhstan environmental expert consultants, and have been presented to the local communities for public comment.

NCOC's General Business Policy on Health, Safety, Security & Environment

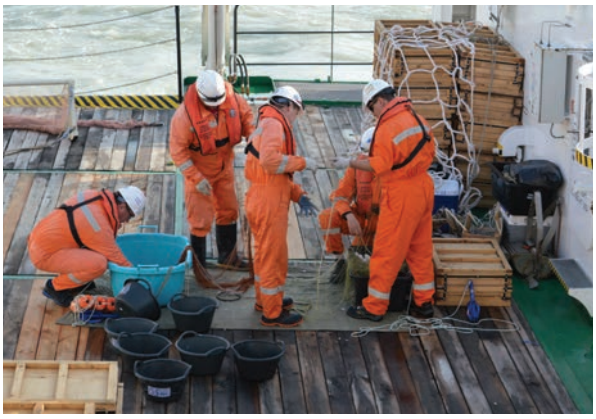
Baseline Studies and Monitoring. An essential technique of environmental protection is to understand initial conditions prior to project activity (the "baseline"), and then to monitor these conditions on an on-going basis as the project progresses to completion. NCOC has conducted hundreds such studies in all areas of our activity, with involvement of external experts and institutions. Specific studies are mentioned in appropriate sections below.

"Environmental Monitoring of the North-East Caspian Sea (2015)"

NCOC shares the conclusions of its environmental monitoring in many forms: peer-reviewed academic publications, reports, public hearings, EIAs, presentations at public and industry forums, the NCOC website, and media articles. For example, on Caspian Day in August 2015, NCOC presented and distributed a book entitled "Environmental Monitoring of the North-East Caspian Sea during Development of Oil Fields" on



Environmental monitoring onshore



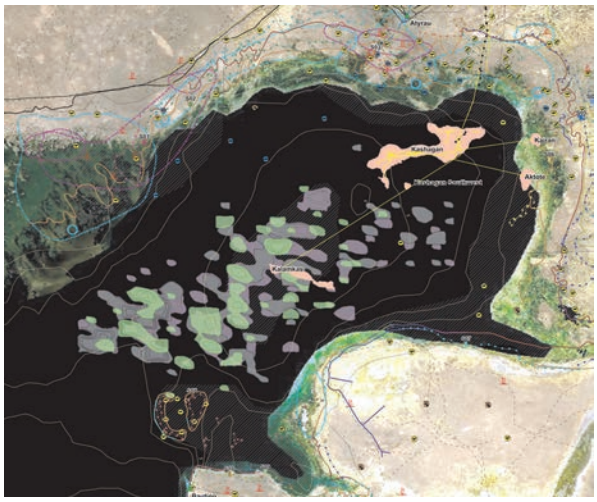
Environmental monitoring offshore

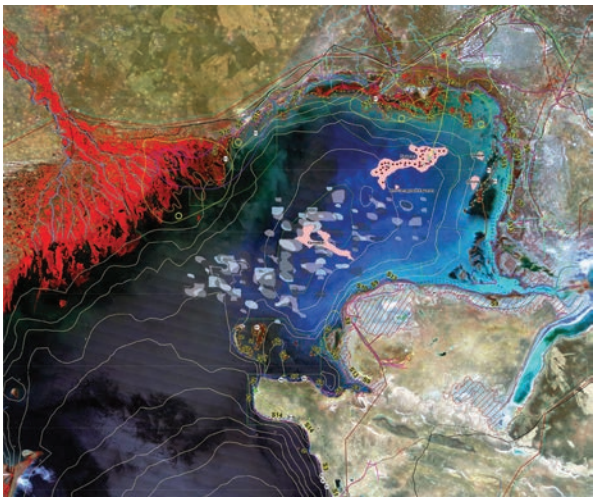
Caspian Day, August 2015. The book summarized results of environmental monitoring carried out from 1993-2006.

NCOC provides the environmental monitoring data it collects directly to the government agencies responsible for environmental protection, per terms of the North Caspian PSA. These agencies ensure that the public is appropriately informed. For example, the Department of Ecological Monitoring of RGP Kazgidromet (RoK Ministry of Energy) publishes monthly, quarterly and annual reports on the state of the environment that include an appendix of analyzed data from NCOC industrial air quality monitoring stations at Bolashak and surrounding areas.

Kazgidromet 2015 Report (Russian)

Environmental Sensitivity Mapping. The project has developed environmental sensitivity maps of the Kazakhstan sector of the North Caspian Sea, which define the most environmentally important areas around our operations. These interactive GIS (Geographic Information System) maps of landscapes, ecosystems, protected areas and habitats collate the data from many years of continuous environmental monitoring, most of it conducted for the first time especially for this project. In combination with oil spill trajectory models, sensitivity maps help set priorities in response planning in order to preserve important habitat and minimize impact on the environment. The maps also may be used to address future development scenarios, for example, for analysis of long- and medium-term sea level fluctuations, development of social infrastructure along the sea coast and growth of urbanized areas, flooding events, and changes in areas covered with reed beds in Environmental Impact Assessments for new phases of the project. The maps are regularly updated in collaboration with the National Institute of Geography and with the scientific support of Kazakhstan research centers.





Visuals produced as part of Environmental Sensitivity Mapping

Case Study: Coastal Zone Management

In addition to its use in promoting effective coastal zone management for its own operations, NCOC has shared its sensitivity mapping in the form of an Integrated Coastal Zone Management Master Plan for the Kazakhstan Sector of the Caspian Sea. The Master Plan, which accumulates 16 years of research and data gathering, is based on the best international coastal management practices and can be used to guide biodiversity protection activities. These efforts have already been praised by the United Nations Environment Program, who noted that: "the amount of data and information collected over time as well as the way in which this information has been analyzed, organized and presented in the plan, is impressive."

Environmental Protection Plans. NCOC's environmental protection activities are guided by an Environmental Protection Plan that is approved annually by the RoK government. The type of projects included in the annual EPP include: environmental surveys and monitoring of air, water, soil, and biodiversity; solid and liquid waste management; oil spill response; seismic surveys; tree planting; and training and quality assurance. These activities are carried out with the cooperation and oversight of government agencies at various levels with responsibility for environmental protection. The EPP for the upcoming year has been presented for public hearing and comment to the local community, in accordance with Kazakhstan law.

2016 Environmental Protection Plan

6.2 Biodiversity and Ecosystem Services

2011 NCOC Biodiversity brochure

The Caspian Sea, largest inland body of water in the world, has been at times in the past connected with the global oceans. Its isolation in recent millennia has led to an ecosystem with a high percentage of rare and endemic species found nowhere else. Kazakhstan's "Red Book" (list of rare and endangered species) has 194 entries associated with the Caspian region. Protection and preservation of this area's unique biodiversity is a top sustainability objective.

Protected Nature Areas

1974. The North Caspian Sea and Ural delta first declared protected areas.

1993. The North Caspian project is allowed to proceed with exploration and production of hydrocarbons in this area by the government, provided that operations are conducted in compliance with special ecological requirements developed by a group of Kazakhstan scientists and specialists. These special requirements established new protected areas along the North Caspian coast in the most sensitive and significant ecosystems and habitats. They also established certain seasonal restrictions to allow for migration, feeding and breeding patterns of commercial fish species, birds, and seals.

2007. Some 111,500 hectares of wetlands in the Ural River delta were incorporated into the Ak Zhaik State Nature Reserve. It is designated a Wetland of International Importance under the UN Ramsar Convention in April 2009.

2012. As a result of a public-private initiative with NCOC shareholder Eni, the Ak Zhaik State Nature Reserve is designated a UNESCO Man & Biosphere Reserve.

Policy, plans and programs. Over 100 marine and terrestrial environmental and wildlife surveys have been conducted by ship, air and on land to better understand species distribution, population dynamics and priority conservation actions.

Since the start of operations, the Operator has played a leading role in biodiversity action plans and ecosystem management by promoting the integrity of the Caspian ecosystem and supporting the integration of the Ural River Delta and adjacent wetlands into a protected area. See sidebar.

Since project activities started in 1993, specific Biodiversity Action Plans and Wildlife Protection Strategies have been designed, tailored and implemented at all stages of engineering and construction in both onshore and offshore environments. Some programs are described in more detail below for key indicator species.

Caspian Seal. The population of the Caspian Seal has been declining over the previous century, due to various natural and anthropogenic/technical (i.e. man-made) threats. These threats include diseases, reproductive difficulties, changes in the food chain, and changes in ice formations as well as fishing, hunting, accidents in nets, and ship strikes.

As with marine mammal populations elsewhere, dead animals have been found from time to time on beaches and shorelines in large numbers. The last such occurrence for the Caspian seal was more than

What have seal surveys told us?

The surveys have shown that the birth rate and location of breeding sites vary greatly from year to year, mostly due to changes in ice conditions and sea level, with no obvious trend over the study period.

See NCOC Biodiversity brochure and CISS studies for more detailed data on seal population, distribution of pups, recorded seal encounters, etc.

Observer reports indicate that icebreakers rarely if ever strike seals. To put this in perspective, CISS studies estimate that fishing by-catch and poaching result in the death of 1,000s to 10,000s of seals each year, while licensed hunters harvest an additional 10s to 1,000s of seals.

Some conclusions are restricted by lack of survey access to Russian sector of the Caspian. However, whilst this may limit the scope of scientific surveys, it does not hamper our ability to monitor seals in Kazakhstan waters and mitigate impacts from our shipping. In case of need, NCOC has potential access to satellite data, and is in touch with Russian researchers to compare and contrast results.

Published Research on the Caspian Seal

See page 44 for more detailed reference information on recent studies, including several sponsored by NCOC.

Caspian Seal Mitigation Measures

- An avoidance strategy is issued to all vessel captains in the pre-season, and seal avoidance workshops are conducted with ship crews.
- Trained seal observers onboard the icebreakers use binoculars or (at night and in fog) thermal imaging cameras to spot the animals and record their observations.
- If the seals are deemed at risk, spotters assist captains to avoid them and advise measures to minimize disturbance as they pass by.
- Pushing a barge in front of the lead icebreaker is avoided.
- The observer teams relay information on ice conditions and seal congregations back to an ice convoy planner located at the shore base in Bautino to improve voyage planning.

a decade ago. The reason was not been conclusively found, but research to date indicates disease as a primary cause.

In 2008 the IUCN changed the status of the Caspian Seal from 'vulnerable' to 'endangered' and placed it on the Red List of Threatened Species.

The North Caspian project has taken the initiative to launch and fund early scientific studies that have made lasting contributions to our knowledge of the Caspian seal, and to designing strategies for its protection.

Since 2005, we have engaged independent international and national seal experts to conduct winter aerial population surveys, and to provide onboard monitors for icebreakers operating near seal habitats.

From 2005-2014 the Operator engaged the Caspian International Seal Survey (CISS), based at the University of Leeds (UK). CISS was central to development of the Caspian Environmental Program (CaspEco) Seal Conservation Action Plan, which was accepted by all Caspian governments, and has guided proposals for a network of seal protected areas. CISS regularly provides reports on the Caspian seal to IUCN (International Union for the Conservation of Nature). As a result of the seal research and monitoring activities sponsored by the Operator, participating scientists in CISS have published a number of peer-reviewed research articles in international scientific journals.

In line with our long-term planning on nationalization, these activities are now conducted by Kazakhstan consultants, with oversight by scientific institutes in Kazakhstan and Russia, and involving specialists with experience in the seal surveys conducted over the past decade.

Winter population surveys have used fixed-wing aircraft and helicopters to survey seal concentrations in the North Caspian, conducting reconnaissance across the icebreaker corridor area from late January throughout the breeding season.

Traces of winter navigation between the artificial islands

NCOC icebreakers employ mitigation measures based on scientific recommendations and global best practice in protection of marine mammals.

Fish. All species of Caspian Sea sturgeon are now classified as 'endangered' by the IUCN. However, it is believed that overfishing and illegal fishing, as well as damming of rivers, has had more impact on sturgeon populations than other industrial activities.

In addition to studies and voluntary financial contributions in previous years for a variety of upgrade projects, NCOC will make a sizable contribution to fish hatcheries on the Ural River as part of its compensation obligations to add over 600 thousand sturgeon fingerlings to the population in coming years.

North Caspian Marine Study (2008)

In 2008 a group of authoritative Kazakh research centers and state agencies, led by the Ministry of Education and Science, produced a Marine Study for the North Caspian project that analyzed more than a decade of scientific studies and marine expeditions in this part of the Caspian Sea (1994-2006). The study concludes that impacts to the marine environment from operations, including the construction of artificial islands, have been negligible or transitory.

Specialists suggested the project's artificial islands, being located some 70 km off the Ural River delta, are not large enough to substantially affect the migration patterns of fish – a conclusion that is consistent with the data from full-scale ichthyologic surveys.

Monitoring results also demonstrated that short-term impacts of seismic surveys have had no observable impact on fish species composition or abundance. These surveys, covering 100,000 km^2, were the largest 2D marine geophysical surveys in the world up to that time.

Saiga

Grey heron

Saiga. Jointly with the Kazakhstan Biodiversity Association and other NGOs, NCOC is continuing a program, launched in 2014, to tag and monitor a small population of *saiga* (dwarf antelope).

Birds. The coastal wetlands attract a variety of waterfowl and shore birds, including some listed in the Red Book of Kazakhstan, and the Caspian Sea itself is a major migration route for waterfowl flying from Asia to Siberia.

NCOC conducts waterfowl and shore bird surveys every season – to monitor their over-wintering, summer nesting, and fall-spring migrations.

A number of measures are in place to avoid impacts on birds:

- High-voltage power lines in project locations now use a specially-insulated cable and are fitted with suspension-type insulators and plastic "umbrellas" to help protect birds from electrocution.
- Monitoring of nesting colonies is done from helicopter to avoid unnecessarily disturbing the birds with human presence.
- Bright lighting that could disorient birds is avoided on drilling islands and at Bolashak plant during migration periods, at night, and during periods of high winds and low visibility.
- Artificial islands at Aktote and Kairan are fenced with perimeter wire to prevent fledglings from jumping into the water.

6.3 Discharges to Water

NCOC discharges treated wastewater from industrial processes and domestic sewage into lined evaporation ponds, with no further discharge into surface waters.

The total quantity of hydrocarbons discharged with treated sewage and process water into evaporation ponds in **2015** was **less than 0.1** tonnes.

NCOC uses lined evaporation ponds as the safest available method for managing treated process water, in absence of geological formations suitable for subsurface injection. Wastewater from industrial processes at the Bolashak plant arises mainly from:

- H_2S conversion into elementary sulfur. This water may contain sulfur and other residual components. It is treated in a sour gas stripping column to remove (by up to 400 times) most of the volatile components (e.g. H_2S, mercaptans).
- Produced water, i.e., water that has been separated from produced oil. This water may contain residual hydrocarbons. It is treated with demulsifiers, hydrocyclone separation, flotation and skimmers that reduce oil content by ~40 times.

Air Quality Monitoring Station in town

Evaporation ponds at the Koshanai Waste Management Facility

In 2015, NCOC obtained all Maximum Permissible Discharge permits for the evaporation ponds, as per RoK environmental requirements.

6.4 Non-GHG Air Emissions

In **2015**, air emissions from all NCOC operations totaled:

395 metric tons of volatile organic compounds (VOCs)

131 metric tons of oxides of sulfur (SO_x), and

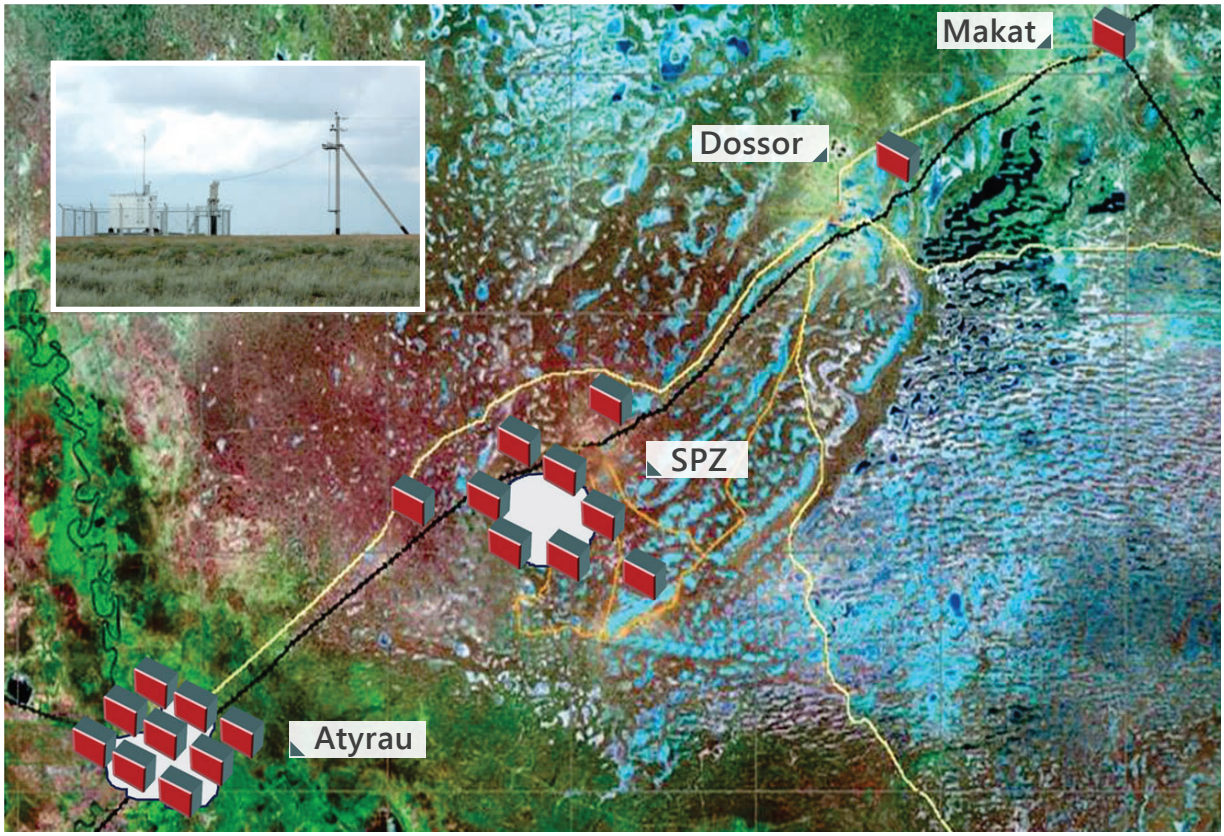
943 metric tons of oxides of nitrogen (NO_x excluding N_2O).

The most recent Environmental Impact Assessment for the project (2013), which received a favorable conclusion from the government's environmental expertise review, shows that air emissions should remain within permitted concentrations beyond the perimeter of the 7-km setback area around the Bolashak plant, regardless of wind and weather assumptions.

2013 Kazakh National Medical University study on Bolashak plant air emissions (Russian)

Similarly, a 2013 screening study by the Kazakh National Medical University concluded that emissions from Bolashak plant do not pose a health risk to nearby residents, nor those further away in Atyrau city, as the risk of negative effects is significantly lower than established minimums.

Bolashak onshore plant



AQMS location chart

Monitoring. Twenty state-of-the-art air quality monitoring stations in Atyrau oblast measure the atmospheric levels of various compounds and collect weather data.

Four stations, operating 24/7, are located on the perimeter of the setback area (sanitary protection zone) for the Bolashak plant; 7 more are located in surrounding areas, including Dossor and Makat; and nine are in Atyrau city proper.

The government meteorological agency (Kazgidromet) monitors this air quality data and informs the public of necessary actions if indicators reach certain thresholds.

Kazgidromet publishes monthly summaries of NCOC's monitored air quality data (for CO, SO_2, H_2S, NO and NO_2) on its website.

In 2015, NCOC successfully completed a test of a water/air quality monitoring station offshore D Island, working 24/7 in experimental mode. The results are being analyzed and next steps are under consideration.

6.5 Oil Spills to the Environment

Performance

In **2015**, there were **0** hydrocarbon spills greater than 1 barrel reaching the environment from NCOC operations (total volume: **0** barrels of oil-equivalent hydrocarbons).

2010 Oil Spill Response brochure

Approach

NCOC places first priority on prevention of oil spills. Secondly, no matter how confident we are of their prevention, NCOC remains always prepared to respond quickly and fully to incidents were they to occur.

NCOC Oil Spill Capability

- NCOC's dedicated Oil Spill Response group has 30 fully-trained, full-time personnel, 48 maintenance contractor personnel, and 28 marine crewmembers.
- The project's marine support base at Bautino has 10,000 m^2 of external lay-down area and 3,000 m^2 of warehouse space for equipment, 11 km of boom, absorbent material, skimmers, boats and containers.
- The North Caspian Oil Spill Response Base at Damba (operated for NCOC under contract to KMG Systems and Services) has over 10,000 m^2 of external lay-down area and 6,000 m^2 of warehouse space.
- NCOC has a fleet of 14 owned and contracted shallow draft vessels and 6 oil recovery barges at Damba. Together with floating and collapsible tanks, this provides over 500 m^3 of immediate oil storage capacity.
- NCOC's oil spill response equipment includes 30 km of oil spill booms, a skimming capacity of 2,700 tonnes per hour, and a pumping/flushing capacity of 3,600 tonnes per hour, which allows responders to remove oil from water and ice.

Prevention

By far the best defense against oil spills is to prevent them from occurring in the first place.

Oil spills are prevented by identifying spill risks at all project phases, from design, to construction and operation, and ensuring that the highest safety standards are continuously applied to mitigate those risks.

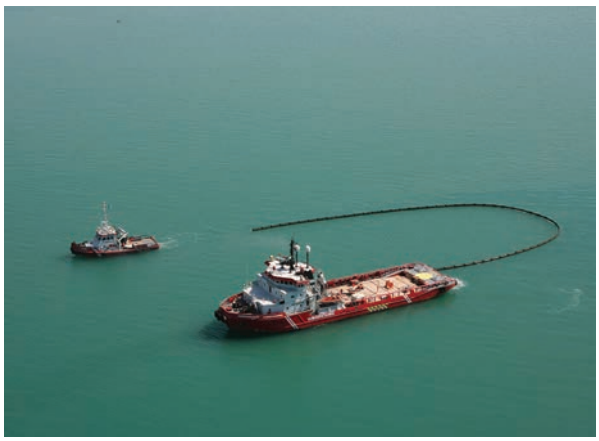
Spill risk is also managed by addressing the human factor. Clear procedures and work practices are established, and monitoring and maintenance rules enforced through frequent training.

NCOC continuously reassesses spill risks at all locations.

- Potential risks are continuously identified, and mitigation measures put in place to lower the risk to ALARP (As Low As Reasonably Possible).
- Trained oil spill response personnel make regular site assessments reviewing the risk and ensuring the correct preventive actions are in place.

Early-warning and protective containment measures can also be designed into facilities.

- For example, impermeable geotextile membranes and runoff collection systems are installed on the artificial islands offshore, to prevent any hydrocarbons from reaching the Caspian Sea and seabed.
- Onshore, tank farms are isolated and sufficient bunds built up around them to contain worst-case accidental releases.
- Pipelines from D Island to the Bolashak plant are fitted with sensors that can detect fluctuations in flow parameters, and are continuously monitored by a software-based Leak Detection System. Pipelines are also regularly monitored by helicopter patrol for both security and integrity assurance purposes.



Deployment of booms by dedicated OSR personnel during regular exercises

Tiered Response

NCOC follows the internationally recognized concept of tiered response to oil spills. The tiered response approach used is compliant with RoK legislation and National Oil Spill Prevention and Response Plan.

Tier I: A small spill that can be cleaned up by the company's personnel using materials and substances available at the site on offshore facilities.

Tier II: A moderate spill that can be cleaned up using resources available at the site on offshore facilities and additional materials, substances and personnel from local shore services.

Tier III: Large-scale spills where the response requires materials, substances and personnel from additional oil spill response companies, including international support.

Spill risk is assessed based on scenarios, categorized in terms of likelihood of occurrence and potential impact, with consideration of factors such as proximity of operations to sensitive environments.

The project has appropriate oil spill capabilities at each tier level designed to handle the identified risks. Equipment for responding to Tier I and II oil spills are available at each location and are continually reviewed in line with project development. In the unlikely event of a Tier III spill, NCOC has contracts in place with oil spill response contractor OSRL (based in Southhampton, England) to mobilize additional resources, including specialists and equipment. In the event of a spill of any reported size, OSRL would be put on standby immediately. If additional resources are required, OSRL could deliver these by air to Aktau, nominally within 24 to 36 hours. If needed, we also have access to international resources of our co-venture partners. International personnel and equipment capabilities are tested as part of NCOC's annual exercise schedules.

Technology

We employ a wide range of innovative technologies, such as remote aerial observation with the use of GPS-GIS handheld units and other remote sensing methods to monitor, map and detect oil spills as well as define oil film thickness in both open water and ice conditions.

Computer-generated models of oil spill trajectories help responders understand where an oil spill might spread, depending on weather and sea conditions, and are a fundamental part of oil spill response planning.

In combination with environmental sensitivity mapping (see pg. 16), this helps set priorities in response planning in order to preserve important habitat and minimize impact on the environment.

NCOC is conducting research on spill response techniques and tools with potential application to the North Caspian.

- NCOC has conducted joint research with the Kazakhstan Institute of Oil and Gas on use of dispersants.
- NCOC is currently conducting research on the operational capabilities and related conditions for use of in-situ burning.
- NCOC is participating in joint work to support RoK Authorities in formalizing the related procedures and regulatory framework needed to use these oil spill response methods in case of incident.

Response

NCOC maintains a comprehensive Oil Spill Response Plan that is regularly drilled, including joint exercises with responsible government agencies. The Oil Spill Response plan has detailed sections for incidents along the pipeline, with environmental sensitivities identified and specific response guidelines established for each pipeline.

NCOC retains a dedicated Oil Spill Response organization with facilities, equipment and trained personnel located at all offshore facilities and both in Atyrau and Bautino. The oil spill response equipment is owned or under contract to NCOC, and is specifically procured for operating in the unique environment of the North Caspian Sea.

The North Caspian project has already made a sizable contribution to improving oil spill response capabilities in the Caspian Sea.

Oil spill response base in Damba

OSRL personnel during a Tier III spill exercise

We are now working with the other industry organizations and responsible Authorities on additional measures, such as the Oil Spill Response Association for the Caspian Sea. This initiative aims to share response capabilities and information with other potential offshore development projects.

The NCOC Oil Spill Response group has participated in dozens of exercises each year, including annual Tier III (major oil spill) exercises with the Atyrau and Mangystau Regional Departments of Emergency Situations since 2010, and national exercises.

Oil Spill Response in Ice

NCOC has Oil Spill Response Guidelines in place covering oil spill response measures to be used in icy conditions of the Caspian Sea. Incorporating best known practices developed through global arctic research and real-world applications, the Guidelines employ three main tactics:

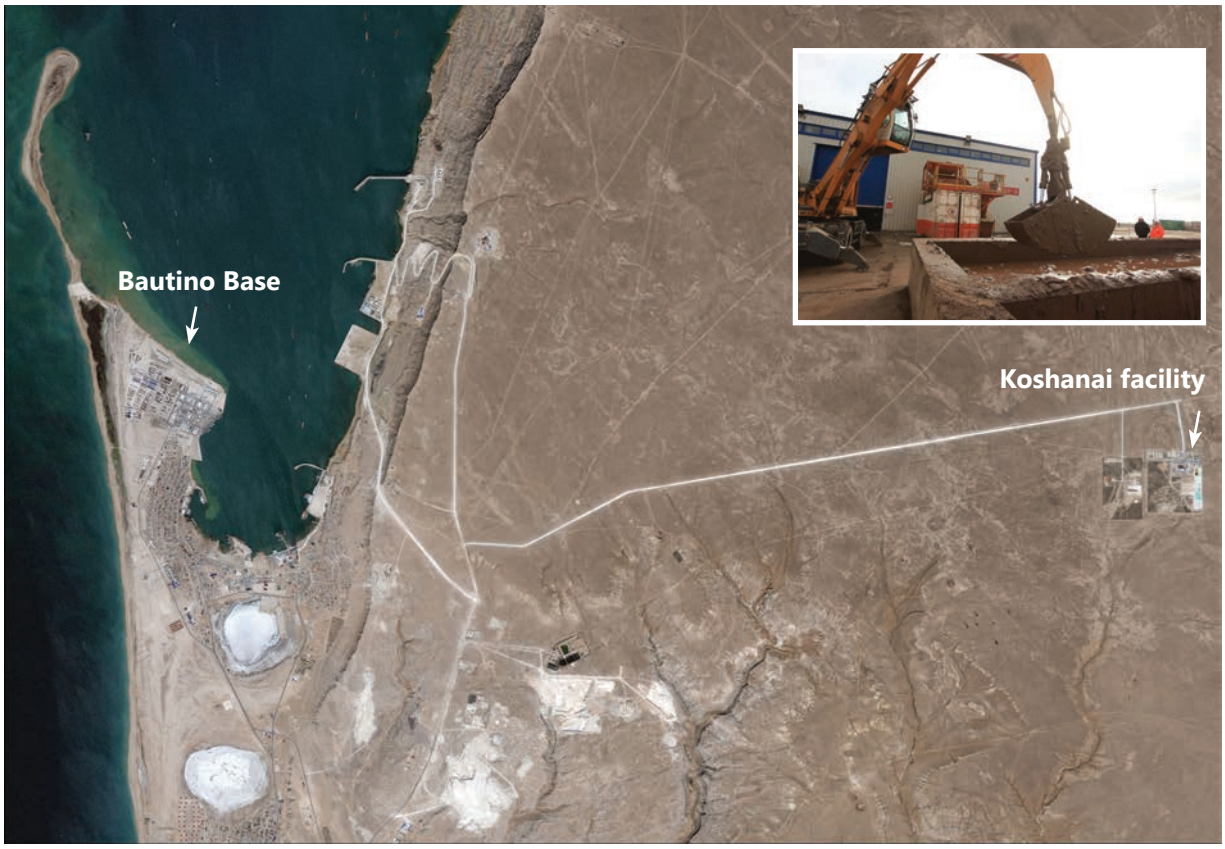
- First: Containment within natural breaks in the ice within the impacted area, followed by mechanical recovery. Where water depth is sufficient, ice breakers may be used to create breaks in the ice to collect and recover oil.
- Second: In-situ burning of oil trapped in "ice breaks" or on top of floating ice, under appropriate and safely controlled conditions, and only upon direction by government authorities.
- Third: Identify area where ice has trapped the spilled oil to the sea floor, and as the ice melts and the oil again becomes mobile, to track its movement and recover it using spill response equipment.

NCOC is a member of the Joint Industry Project "Oil in Ice" of the International Association of Oil & Gas Producers (OGP), which coordinates leading-edge initiatives to further improve techniques for containment, recovery, in-situ burning, remote sensing, tracking/monitoring, and use of dispersants in responding to oil spills in ice conditions. Learnings from these initiatives are reviewed and incorporated in NCOC response planning as we continually improve our capabilities.

6.6 Waste

Total quantity of waste classified as hazardous by the RoK and disposed from NCOC operations in **2015** was **19,882 tonnes.** This number includes wastes classified as green under Basel Convention rules, such as office equipment, wood and food waste, spent air filters, etc.

Total quantity of waste classified as non-hazardous by the RoK and disposed from NCOC operations in **2015** was **2,641 tonnes.**



Satellite image of the Bautino Base and Koshanai Waste Management Facility

"Castoro 12" pipe laying barge

A special pipe laying technique has been used in 2015 which allowed trenching, pipe laying and backfilling at the same time. This technique minimizes impact on the local environment in the area of pipeline installation, allowing it to recover within a range of a few weeks.

In line with **our "Zero Discharge" policy in the Caspian**, all waste materials from offshore facilities are brought to shore for treatment and recycling or disposal, including cuttings (mixed soil, rock and lubricant fluids brought to the surface as a by-product of drilling). Approximately 19 percent of total NCOC waste consists of drill cuttings and sludge that are thermally treated and disposed. The remainder of solid waste is disposed by a specialized and licensed company, selected by competitive tender, with demonstrated capability to process and dispose of the project's solid waste in line with our sustainability requirements.

6.7 Onshore and Offshore Surveys

NCOC implements comprehensive environmental monitoring programs to collect offshore data and analyze the chemical composition of seawater and bottom sediments, and to study fish, benthos and plankton populations. Since 1993 the project has conducted 38 offshore monitoring surveys in about 900 locations. Data collected during the surveys covers water quality (salinity, nutrients, metals), bottom sediments quality (metals, total hydrocarbons), and biological data (micro-organisms, phytoplankton, zooplankton).

Offshore surveys performed between 2003 and 2010 showed that seawater quality at monitoring locations

Zooplankton sampling offshore

Soil sampling onshore

Soil sampling and botanical survey onshore

Distribution of fish from trawl catch

was relatively consistent. Scientists did note a very low pesticide presence, which was attributed to inflow from the Volga and Ural rivers, around which significant agricultural activities occur. The quality of bottom sediment in all areas in the North Caspian is positive, ranging from designation 'fair' to 'excellent.'

NCOC conducts onshore monitoring surveys to analyze soil and groundwater quality in Atyrau and Mangystau regions. Since 2001, the project has conducted over thirty onshore monitoring surveys in Atyrau and Mangystau regions. The Caspian onshore area has a long history of oil production, so the scope of onshore surveys takes into account historic activities and data as well as current activities of nearby oil and gas developments. The soil surveys since 2005 show a general improvement in terms of heavy metals and organics. Groundwater surveys from 2005 to 2010 show the groundwater quality to be poor, mostly due to the salinity of the water.

6.8 Decommissioning and Remediation

Decommissioning is governed by the North Caspian Sea PSA, including detailed planning and funding at the appropriate time. It is not foreseen that any units or facilities will be decommissioned for abandonment during the production period of the current PSA. Decommissioning is planned and executed in the same manner as any other engineering project, with each program needing an environmental impact assessment to determine the preferred option to apply to a particular facility.

Sulfur Management

Processing sour gas and managing sulfur safely and effectively is of crucial importance to the Project. A Sulfur Management Plan has been agreed with the appropriate government agencies.

The Plan envisages the re-injection of up to 80% of the sulfur via the sour gas re-injection systems. The remaining 20% will remain as elemental sulfur, generated as a by-product at the Bolashak onshore process facility.

An average of around 1.1 million tonnes per year of elemental sulfur will be produced during the life of the project (3,800 tonnes of sulfur per day).

As it is a commodity with market value and growing demand, the Project intends to sell all produced sulfur. A dedicated NCOC sulfur management team has been working to identify international market opportunities.

The Bolashak plant has a temporary storage area that uses an innovative technology to protect the sulfur from the elements as it awaits delivery to buyers.

In this process, the sulfur is melted and poured into individual wooden forms. Once filled, the top of the wooden form is sealed with a polymer film. This prevents the sulfur from coming in contact with wind or water.

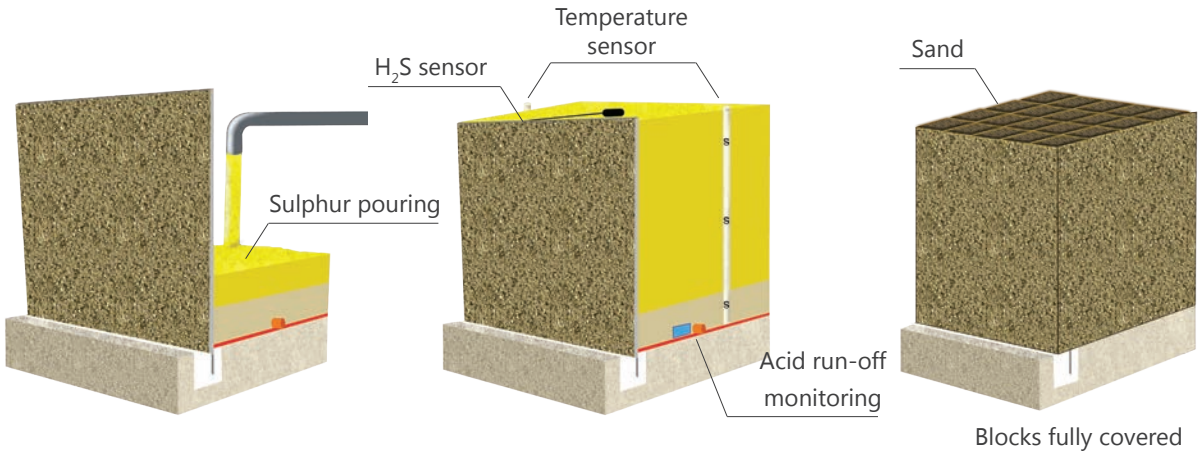
The sulfur produced at the Bolashak plant will be stored in covered conditions, isolated from the environment. Liquid sulfur will be poured into sealed containers that are monitored by sensors.

When the time comes to transport to market, the blocks are again melted and formed into pellets, rather than crushed, to reduce dust production.

The sulfur storage area at Bolashak plant will provide closed temporary storage for up to 4 million tons of sulfur.

NCOC is exploring economic development options for future Phases that, in combination with reinjection, would reduce by up to 90% the volumes of additional associated sour gas to be processed. This could almost completely eliminate production of additional sulfur as a by-product from these future Phases.

Sulphur storage technique



Case Study: Alternative Energy

Mukhtar Koshkarbayev, NCOC Greenhouse Gas and Energy Efficiency Engineer, submitted a prize-winning entry to the international student competition "Sustain the Future" in London in September 2015. Koshkarbayev's winning design integrates solar, wind, and waste-to-energy power generation into a sustainable hybrid system at a municipal solid waste facility in Atyrau, resulting in net GHG reduction. "My main intention was to present a project which is technically feasible, reliable and robust as well as mutually beneficial for both Atyrau citizens and investors," said Koshkarbayev. The competition was sponsored by "Astana-EXPO-2017" and the Kazakhstan Embassy to the UK.

Flare stack on D Island

7. ECO-EFFICIENCY

7.1 Energy

NCOC production facilities are self-sufficient in electricity, heat and steam. Indirect emissions arise from purchased power for support facilities such as Bautino base and Atyrau Training Center. Energy use in NCOC operations in **2015** totaled **645 GW-h or 2.32** million gigajoules (GJ), of which **10.2 GW-h or 0.37** million GJ was imported (purchased).

NCOC plans in future to report its energy use intensity (energy use normalized per unit of production) as a guide to its performance in energy conservation.

NCOC plans to conduct an energy audit of its facilities once stable production is established.

Though NCOC's energy needs for production facilities will be fully met using a small portion of the gas processed, we continue to look for niche applications (e.g., remote, off-grid locations or support facilities) in which alternative or renewable energy sources make sense both economically and technically.

7.2 Flaring

NCOC has a "No Routine Flaring" policy.

The Kashagan Phase 1 project was designed from the beginning to avoid routine flaring, i.e., burning of excess natural gas when an oil and gas project has no other economic way to dispose of it "routinely," in the course of producing oil. All of the gas produced in Kashagan Phase 1 will be re-injected or sold, once steady-state production is reached. Flaring is however needed in the course of operations as the safest and most effective way to deal with gas that for temporary technical reasons could not be processed, such as commissioning operations, small amounts of valve leakage into flare collectors, or one-time discharges to flare due to operational upsets. The volumes of gas flared in such cases is calculated and reported.

The quantity of (non-sour) hydrocarbon gas flared from NCOC operations in **2015** totaled **6.3 million Sm^3 (standard cubic meters).**

8. ECONOMIC BENEFITS TO KAZAKHSTAN

Kashagan Phase 1 will have a production life of decades and its shareholders are expected to contribute billions of dollars in direct revenue to the Republic of Kazakhstan in terms of taxes and share of production.

Kazakhstan has received a cumulative total of **US $1,085** million in bonus payments under the NCSPSA since the start of the North Caspian project.

As Kazakhstan's largest direct foreign investment project, the North Caspian project has a powerful multiplier effect on the economy, creating employment opportunities for Kazakh people and opportunities for local companies. At the peak of construction in 2010, the Kashagan Phase 1 project employed more than 42,000 workers, including contractors, making it one of the largest employers in the country. NCOC remains a major employer in Atyrau and Mangystau Oblasts today.

In 2015, overall payments to local suppliers for goods, works and services have totaled more than US $12.6 billion since 2004.

Mangystau and Atyrau oblasts also benefit from social and infrastructure related projects funded by NCOC. These have totaled more than a half-billion US dollars since the start of the Kashagan Phase 1 project.

These and other economic and social benefits will be described in more detail in the following section.

9. SOCIO-ECONOMIC

To date, the Kashagan project has directly contributed over half a billion US dollars for the benefit of local communities.

9.1 Social Infrastructure Projects

Under the North Caspian Sea PSA, NCOC allocates a budget each year for the development of social infrastructure projects. In **2015**, this budget amounted to **US $50 million**. The funds, for construction of schools, kindergartens, hospitals, sport facilities, as well as utilities such as roads, electric power water supply lines, and other infrastructure designed to benefit the community, are split equally between Atyrau and Mangystau oblasts, where North Caspian project activities are centered.

Between 1998 and **2015**, more than **160** social infrastructure projects were completed.

In **2015**, the cumulative value of social infrastructure projects since 1998 has reached **US $500 mln**.

2012 "Good Neighbor" brochure

2014 NCOC Local Content brochure

Social infrastructure projects are generally proposed by the Oblast Akimats (governments). Proposals are analyzed by NCOC and the PSA Authority to ensure they comply with PSA requirements and the Operator's sustainable development strategy, and are developed into projects in close collaboration with the Oblast Akimats. Once approved, the social and infrastructure projects pass through the stages of design and engineering; contract tender; execution; and handover.

Atyrau Oblast Children Hospital

Boarding house of the Small Academy of Arts in Atyrau

Sport complex in Tauchik village of Mangystau oblast

9.2 Sponsorship and Donations Program

Through its Sponsorship and Donations grant program, NCOC responds directly to the needs and requests of local communities. US $1.5 million is split equally each year between Atyrau and Mangystau oblasts for community sponsorships and donations. The Sponsorships and Donation grant program focuses on five main areas of support for local communities: healthcare, education, sports, culture and charity.

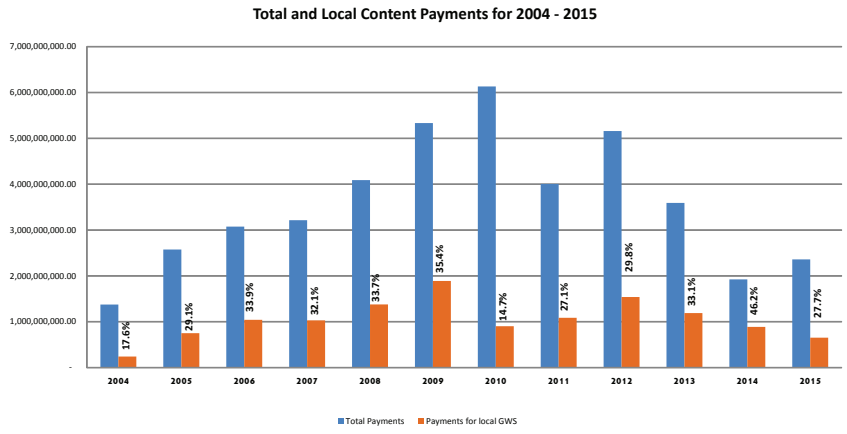
To be aligned with NCOC's sustainable development strategic goals, projects must contain elements of self-involvement and demonstrate sustainability for local communities. They should not support political or religious organizations, create conditions for unfair market competition, or undermine the ecological sustainability of local communities and/or natural ecosystems. The initiative for projects generally comes from the local communities, but may also be initiated by NCOC.

In **2015**, **64** projects were undertaken (34 in Atyrau Oblast, 30 in Mangystau oblast).

In addition, US $300 thousand has been budgeted each year since 2006 for a summer camp for 200 underprivileged and orphan children of Atyrau and Mangystau Oblasts. The project pays for camp costs, travel assistance and the cost of air tickets.

9.3 Commitment to Local Content

NCOC is committed to developing a world-class project that maximizes the use of local goods, works and services, whilst developing the skills of local people and the capacity of local companies.



In 1993, an offshore oil and gas service industry was practically non-existent here. Almost none of the needed infrastructure, equipment, vessels and drilling rigs needed for a large-scale offshore project like Kashagan could be found locally.

Substantial investments over time into local suppliers, workforce, and infrastructure have resulted in the establishment and growth of entirely new industry in Kazakhstan. At the peak of construction in 2010, the Kashagan Phase 1 project employed more than 42,000 workers, including contractors, making it one of the largest employers in the country. By 2015, overall payments to local suppliers for goods, works and services have totaled more than US $12.6 billion since 2004[8]. In 2013 alone the North Caspian project spent US $1.1 billion for local goods and services, equivalent to 30% of total expenditures, and more than 28,000 of the 37,000 tonnes of pipe rack installed on D Island were manufactured by Kazakh companies. These and other facts speak to the depth of NCOC's commitment to use of local content.

8 Local goods, works and services are defined per Unified Methodology on local content calculations outlined in the RoK Law "On Subsurface and Subsurface Use." See Link to Subsoil Act definitions of local content used by NCOC.

NCOC Local Content Policy

9.4 Local Content: NCOC Policy and Programs

NCOC gives preference to local suppliers provided they meet quality, safety standards and offer materials and services competitive in price, quality and availability to those provided by international suppliers.

Local content strategies are implemented at the earliest possible stage to allow for capacity development of local companies. During engineering and design stages of the project, opportunities for local suppliers were maximized by including, whenever possible, standards and specifications used locally (e.g., GOST standards). An analysis of the future needs of the project is also carried out with an eye to leveraging local content development opportunities, and consolidated in the project's long-term procurement outlook.

Furthermore, NCOC has developed a systematic approach – a long-term Local Content Development Program – to help identify the business opportunities for local companies, and to develop their ability to meet NCOC's prequalification criteria in supplying them.

NCOC's approach to local content development comprises three main areas: growing local industry capability; job skills training and knowledge transfer; and enhancing local infrastructure.

2015 Progress Update: Aktau Declaration

On September 25 2012, NCOC, and three other oil and gas operators (KazMunayGas, TCO and KPO) signed the "Aktau Declaration" on joint actions for promoting development of a local oilfield service industry in Kazakhstan.

Link to description of 2012 Aktau Declaration

The signatory companies agreed to work together to analyze future purchase plans and identify products or commodities that might have market demand sufficient to support localized manufacture in Kazakhstan.

On 7 November 2014, a "Roadmap for Development of a National Petroleum Service Industry" was approved by resolution of the RoK Prime Minister. It included an instruction to Ministry of Energy to launch a new web-based vendor database (called "Alash") in which Kazakhstan companies will register for free. In 2015, NCOC and the other companies have been working to harmonize their individual databases with the Alash system, making it a "single point of contact" for local vendors to advertise services and raise their visibility with all the major industry players at once.

Commodities identified as priorities for development of local manufacturing capability include lubricants, electrical equipment such as power cables and transformers, valves, flanges and fittings, and fabricated metal structures such as tanks. Services include maintenance, well support services, and waste management.

Alash will provide a unique forum for exchanging industry news, informing about new standards and regulations, joint venture and financing opportunities, and other helpful services.

The Alash website is expected to go online in 2016.

9.5 Growing Local Industry Capability

Development of local vendors is a priority. The objective is to help local companies improve their technical and managerial capabilities so that they qualify as potential suppliers to the project, and longer-term could bid on other opportunities in national and international markets.

Worker on D Island

2014 NCOC Local Content brochure

NCOC Contractor Success Stories (downloadable video)

NCOC Procurement Process

NCOC Supplier Qualification

About three thousand Kazakhstan companies are registered in the NCOC Vendor Qualification Database.

More than a thousand local companies have participated in workshops and forums organized by NCOC, ranging from general awareness seminars to introduce the project and its contracting requirements, to more specialized seminars on tender writing and pre-qualification processes.

From 2006 to **2015**, the Operator assisted over **180** local companies to obtain international standards certifications for their management, goods and services, thus significantly increasing their competitiveness for contracts with NCOC. The Operator has also provided assistance and financial support to local companies to obtain international certifications for their goods and services from the American Society of Mechanical Engineers (ASME) and American Petroleum Institute (API).

From 2006 to **2015**, NCOC conducted **more than 200** technical qualification audits and site visits of local companies, assessing their ability to meet demanding specifications and international codes and standards for goods and services put out for bid by the North Caspian project.

From 2006 to **2015** the Operator provided **more than 2,000** employees of local companies with specialized professional training in the most in-demand craft skills, such as pipefitters, industrial carpenters, crew leaders/foremen, etc. This training allows local companies to improve their skill base and meet requirements imposed by international standards, codes and heavy industry norms in common use today.

As a result of purposeful activities by the Operator, nearly **70** joint ventures were formed and contracted to provide goods and services to the project in Kashagan Phase 1. Formation of joint ventures, joining Kazakhstan capacity and skills with Western experience and financing, is way to efficiently increase local content.

9.6 Job Skills Training and Knowledge Transfer

As a means to achieve its own medium- and long-term nationalization goals, the Operator has developed a special, targeted program for identifying and recruiting Kazakhstan citizens, and providing them with training for advancement in a long-term career with NCOC (see inset on next page). More than a thousand Kazakhstan citizens have been recruited or trained by the Operator since the program began in 2002.

Atyrau Training Center

Trainees with an instructor

Types of Training Programs Provided by NCOC

- Language courses, from beginner to advanced.
- Continuing Education: sponsored pursuit of a degree or other professional improvement for employees, with a commitment to continue a career at NCOC for at least 3 years after completion of study.
- Internship: a summer unpaid-work opportunity for Kazakhstan undergraduates, performing substantive project-related work under guidance of an NCOC mentor, allowing them to learn more about NCOC – and NCOC to learn more about them as potential employees.
- Young Professionals Training: mentored development and career planning for new-hire college graduates at NCOC.
- Leadership Development: training core behaviors expected of future leaders in NCOC, including skills as mentors of others.

NCOC provides certain types of training as a PSA requirement:

- A competitive university scholarship program for non-employee nationals majoring in petroleum-related subjects (2,118 scholarships since 1998).
- Courses to introduce RoK regulators to certain aspects of oil and gas operations that will help them perform their official duties, such as logistics planning, economic analysis, petroleum accounting, contract administration, etc.
- New technology transfer, e.g., provision and purchasing of technical literature, professional publications, scientific instruments, materials and other equipment requested by RoK.

The Atyrau Training Center, a purpose-built facility that is home to NCOC's training programs, has 11 classrooms, electrical, instrumental, and mechanical workshops, a library, auditorium, and a chemical laboratory for environmental monitoring and analysis of drilling mud.

Since 1998 nearly **15,000** Kazakhstan citizens have received training, either from NCOC or as employees of local companies being helped by NCOC.

Over two decades, the Operator has spent in total about **US $250 million** on job skills and professional training to build local capacity for the North Caspian project.

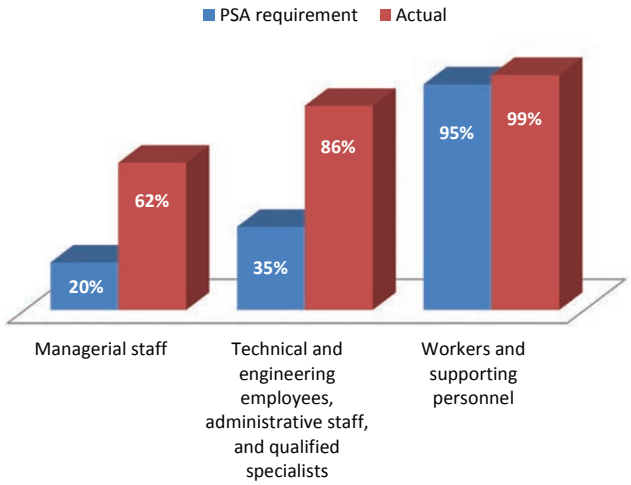
9.7 Nationalization

Article XXVII of the NCSPSA specifies the overall targets in terms of manning levels of Kazakhstan citizens employed in carrying out Petroleum Operations. In **2015**, the Kashagan Phase 1 project has already significantly exceeded these targets:

62% of managerial staff (vs. 20% PSA requirement);

86% of technical and engineering employees, administrative staff, and qualified specialists (vs. 35% PSA requirement);

99% of workers and supporting personnel (vs. 95% PSA requirement).



At the end of 2015, **88%** of the **more than 16,000** people working on the North Caspian project are Kazakhstan citizens, and **86%** of the **3,000** employees of operating company NCOC are Kazakhstan citizens.

9.8 Business Ethics

NCOC General Business Principles

NCOC Code of Conduct

Honesty, integrity and fairness in all aspects of our business is a fundamental principle, and we require the same of all those with whom we do business.

Awareness. NCOC's General Business Principles apply to all our business affairs and describe the behavior expected of every staff member of NCOC, including direct-hire Kazakhstan citizens, secondees, and contract staff. Further, all NCOC staff are required to adhere to a Code of Conduct, which instructs them on how to apply the General Business Principles in line with our core values. It provides practical instructions on how to comply with laws and regulations and how to relate to customers, communities and colleagues. Staff communications and monitoring programs are designed and implemented to assure compliance.

Suppliers. Contractors and suppliers are contractually obligated to comply with our General Business Principles and Code of Conduct in all aspects of their work with us. All those seeking to do business with NCOC undergo third-party "due diligence" background checks before contracts are signed. After further risk screening, some companies may be asked to institute mandatory training or special contractual conditions to ensure that their business practices align fully with our expectations.

Suspected Violations. No one at NCOC may instruct staff to take actions that violate the law or contradict our Principles. If an employee observes such an action or instruction, he or she may refer the situation in confidence to a supervisor and/or the NCOC Ethics & Compliance officer for further investigation and possible action.

NCOC staff, vendors, suppliers, contractors or anyone else can raise concerns or report possible non-compliance with our values and principles – even anonymously – to the NCOC Ethics & Compliance officer. Details are kept confidential. The Ethics & Compliance officer looks into allegations, and if confirmed the company's management takes actions appropriate to the circumstances. NCOC does not tolerate retaliation of any kind against those who report an issue concerning our General Business Principles, the Code of Conduct or Anti-Bribery & Corruption Manual, or compliance with applicable law.

9.9 Preventing Corruption

NCOC's General Business Principles are clear: the offer, payment, soliciting or acceptance of bribes in any form, direct or indirect, is unacceptable.

Anti-corruption sessions with NCOC management and personnel conducted by Ethics and Compliance team

Policies. NCOC's internal Anti-Bribery & Corruption Manual contains policies and procedures to ensure that any interaction with government officials is directly related to a stated business purpose or regulatory requirement, and that it is in strict compliance with the laws of Kazakhstan and consistent with any international statutes that may apply[9].

NCOC requires that its staff avoid conflicts of interest between their private activities and their part in the conduct of NCOC business.

NCOC reflects all business transactions in our accounts in an accurate and timely manner, in accordance with established procedures and agreements.

Contractors and suppliers are obligated by their contracts with NCOC to adhere to our General Business Principles in all aspects of their work with us.

As above, concerns or suspected non-compliance may be reported in confidence to the NCOC Ethics & Compliance officer.

9.10 Engagement in Public Policy

In our General Business Principles, NCOC has pledged to contribute in an ethical and constructive way to enhancing the laws and regulations of Kazakhstan on health, safety, security and environmental protection. NCOC is an active member of KazEnergy, a not-for-profit association of companies in minerals development industries in Kazakhstan. NCOC is also a member of the Oil and Gas Committee of the "Atameken" National Chamber of Entrepreneurs. We often engage in discussions of priority public policy issues affecting our industry in the framework of these organizations.

NCOC does not make political contributions of any kind.

9 The US Foreign Corrupt Practices Act (FCPA) and the UK Anti-Bribery Act are two foreign laws that could apply to companies or citizens of those countries, even if their activities take place in Kazakhstan.

10. SOCIAL PROGRESS

10.1 Engagement with the Local Community

NCOC is proud to call Atyrau its home. Almost three thousand NCOC employees, and thousands more contractors and suppliers who work for the North Caspian project, are residents of communities in Atyrau and Mangystau Oblasts.

NCOC is headquartered in Atyrau, Kazakhstan, close to the North Caspian project's resources and its facilities in Atyrau and Mangystau Oblasts. We aim to be an employer of choice and a respected member of these communities. We care about the communities where we operate because we are a part of them. We want to proactively address any concerns raised about our operations, recognizing that public respect and confidence are earned through performance, open communications and community involvement.

These aspirations are embodied in our General Business Principles, which require us to respect local cultures and communities, to provide them economic opportunities, and to participate in economic, social and educational development by supporting local initiatives. Furthermore, we have pledged to report our performance by providing relevant information to legitimately interested parties, subject only to overriding considerations of business confidentiality, and to listen and respond to stakeholders honestly and responsibly. Voluntary sustainability reporting plays an important part in this.

NCOC encourages employees to take active part in the betterment of their communities, through tree-plantings, clean-up days, and other volunteer activities. NCOC and its employees take part in holidays and other events important in the life of the community, such as Nauryz (Kazakh New Year) and Victory Day. The company annually organizes community engagement events with the participation of children from low-income families and disabled children. We provide grants for community initiatives through our Sponsorship and Donations program; see above.

We engage on a regular basis throughout the year with the public to share information or discuss their concerns and questions about the North Caspian project, in meetings ranging from small gatherings to large public hearings. Link to information about recent public hearings, organized by Zhaik-Caspian Aarhus Center.

Anyone in the community can raise concerns or report possible non-compliance with our values and principles – even anonymously – to the NCOC Ethics and Compliance officer.

NCOC staff and their families participating in Country-wide Tree Planting event

Road, Fire Safety Campaign for School No16, Atyrau

NCOC has a broad-ranging communications program to reach out to stakeholders on topics of interest. We actively work with local media outlets and regularly update the NCOC website (here). To help local businesses learn about economic opportunities associated with the North Caspian project we reach out in a variety of ways, from general awareness seminars about the project and participation in industry conferences, to highly targeted vendor audits and specialized training sessions. See the section on Local Content for more information.

10.2 NCOC Workforce; Labor Rights

NCOC aims to be an employer of choice in Kazakhstan.

NCOC goes well beyond legal requirements in providing compensation and benefits that are competitive and worthy of the skilled and motivated workforce we seek to attract. Examples include a generous maternity allowance for six months of paid leave, and a loan program to help employees buy a home.

Diversity and Inclusion

NCOC does not tolerate unlawful discrimination in employment. Our Code of Conduct for employees specifies that employment decisions are based only on relevant qualifications, merit, performance and other job-related factors.

NCOC does not tolerate any form of harassment, nor any action, conduct or behavior which is humiliating, intimidating or hostile. Managers have a responsibility to protect their staff from harassment, and to create a climate where individuals who have concerns about harassment in their work area may discuss the issues in confidence.

NCOC is committed to providing an open working environment in which respect for each other is fundamental, continuous improvement is a shared goal, and the concerns of individuals are taken seriously and dealt with positively, without prejudice to them or their career.

In 2015, 33% of NCOC's workforce are women.

New in 2015: NCOC Women's Network

In NCOC's Women's Network, women are learning and gaining support from each other through regular networking, mentoring, and the sharing of ideas and experiences. The Network facilitates personal growth and professional advancement of all women at NCOC; provides opportunities to meet role models for professional women; and enables discussion of healthy work-life balance, personal achievement and professional effectiveness, inclusive behavior, and constructive relationships.

NCOC Women Network kick-off meeting with then managing director Stephane DeMahieu, November 2015

Winners of Kids Drawing Contest arranged by NCOC Women's Network

Company Culture and Communication

NCOC, now the single operator for the North Caspian project, is a consolidation of previously separate organizations that were working on different facets of the project. NCOC has launched an initiative to build a culture with a new "one team" approach, expressing "Trust in our People and Pride in our Company."

In 2015, NCOC introduced a program called "Our Company's Core Values," with its own intranet web page. The program focuses on a Value each quarter with special activities, such as a contest for best short video on "Providing a Productive Work Environment." "Culture Ambassadors" in each NCOC directorate engage employees to help embed these values and associated behaviors into day-to-day work habits.

Company Values poster

Workforce Grievances

NCOC has clear policies and procedures for dealing with workforce grievances, which apply equally to its contractors and sub-contractors. Grievance procedures serve to bring employee problems to management's attention and ensure open, proper and timely review and resolution before frustrations can evolve into conflict. Employees may express their grievances freely and openly without fear of dismissal and intimidation. NCOC must accept, register, and review any written grievance submitted by an employee. Employees have the right to appeal any decision. If not resolved within NCOC, the grievance may be referred to appropriate RoK officials. By law, neither NCOC nor its contractors may compel employees to join or not join a legal labor action, and must reserve for the employee any prior job position and benefits.

NCOC has policies and procedures in place for monitoring timeliness of salary payment, living conditions and canteen facilities provided by our contractors and sub-contractors.

10.3 Human Rights

NCOC has been working for many years to promote respect for human rights within our organization, as well as with suppliers and contractors. We place a priority on promoting human rights in our project, not only because we believe it is the right and responsible thing to do, but also because doing so promotes a stable and productive business environment. Our approach to human rights consists of several core elements, including:

- Compliance with applicable laws and regulations;
- Regular dialogue and engagement with our stakeholders;
- Contributing, directly or indirectly, to the general well-being of the communities within which we work;
- Adherence to our General Business Principles, the Code of Conduct, and the Anti-Bribery & Corruption Manual, which address related issues.

Suppliers are also contractually obligated to comply with our General Business Principles and Code of Conduct in all aspects of their work with us.

Security

NCOC has programs and measures in place to provide security and safeguards as appropriate to protect its people, operations, facilities, business information, and other assets. NCOC sites have implemented security programs based on a proven, structured risk assessment methodology. NCOC complies with relevant laws and regulations affecting security in areas where we operate, and we support a coordinated and cooperative approach to infrastructure security with the competent local and national security agencies.

NCOC requires its security contractors to abide by the Voluntary Principles on Security and Human Rights.

11. REPORTING PROCESS

11.1 Principles

NCOC reports sustainability performance in a full and transparent manner to its stakeholders in compliance with its General Business Principles, and subject to relevant terms of the North Caspian Sea PSA.

This report is guided by global best practice; foundational is the 3rd edition (2015) of "Oil and Gas Industry Guidance on Voluntary Sustainability Reporting" ("the 2015 Guidance"). Our intent is that, through strict adherence to its indicators and processes, this report will be relevant, transparent, consistent/systematic, complete, and accurate in the sense defined by the 2015 Guidance.

The data is fully consistent with reports on environmental and socio-economic performance of the North Caspian project made to NCOC shareholders, and to the Republic of Kazakhstan in its oversight and regulatory capacities.

11.2 Materiality

Identification. The 2015 Guidance, in particular its "common" reporting requirements, has formed a basis for what is included in this report. The North Caspian project has maintained a robust system of stakeholder engagements and issues monitoring, extending back more than a decade. The database of these issues, and the response materials used at various times in public consultations and media inquiries, has been used extensively to identify potential material issues specific to this project. Thus, for example, narrative and data reporting on sulfur production is deemed of interest to our stakeholders and included in this report, though not specifically covered under the 2015 Guidance.

Prioritization. The frequency with which stakeholders raise certain issues and the volume of response material in our databases, media coverage, and considerations of timeliness (i.e., pertinent to a 2015 report), are criteria which have all influenced the prioritization of issues and inclusion herein. The structure of the report has been evolved from the 2015 Guidance's illustration of the interconnecting social, economic and environmental dimensions of sustainable development, reproduced as a figure in this report on page 10.

11.3 Data Protocols

For more than a decade, the Operator has had robust management and other systems in place for collecting and analyzing environmental, safety, production and financial activity, and reporting it to the shareholders of the North Caspian project, as well as to the PSA Authority and RoK government agencies at various levels for oversight and regulatory compliance submissions. This report uses the same data sources and reports provided to them. If there is a difference (e.g., in units or definitions) between reporting requirements of the 2015 Guidance and those of Republic of Kazakhstan, we are governed by the latter and attach a footnote.

11.4 Assurance

For more than a decade, NCOC's data gathering and reporting systems have been subjected to a variety of audits and "cold eyes" reviews by shareholders, and inspections or reviews by the relevant governmental regulatory agencies.

Reported inventory of direct GHG emissions for 2015 were verified in compliance with RoK legislation by EnEco Solutions (Uralsk, Kazakhstan).

NCOC holds the following certifications:

- OHSAS 18001 (Occupational Health & Safety Management Systems)
- ISO 14001 (Environmental Management Systems)
- ISO 9001 (Quality Management Systems)

The external verification for these awards requires NCOC to regularly demonstrate not only compliance, but also continuous improvement in its management systems.

11.5 Table of Correspondence to IPIECA Indicators

Reporting overview	IPIECA Indicator	Page
The North Caspian Project	SE13	5
Health and Safety	HS1, HS2, HS3	11
Process Safety and Asset Integrity	HS5	13
Fresh Water	E6	13
Greenhouse Gas Emissions	E1	14
Biodiversity and Ecosystem Services	E5	17
Discharges to Water	E7	20
Non-GHG Air Emissions	E8	21
Oil Spills to the Environment	E9	22
Waste	E10	25
Decommissioning and Remediation	E11	27
Energy	E2, E3	29
Flaring	E4	29
Social Infrastructure Projects	SE4	31
Sponsorship and Donations Program	SE4	32
Local Content: NCOC Policy and Programs	SE5	33
Growing Local Industry Capability	SE7	33
Job Skills Training and Knowledge Transfer	SE17	34
Nationalization	SE6	35
Business Ethics	SE9, SE11, SE12	36
Preventing Corruption	SE11, SE12	36
Engagement in Public Policy	SE14	37
Engagement with the Local Community	SE1	38
NCOC Workforce; Labor Rights	SE15, SE16, SE18	39
Human Rights	SE8, SE9, SE10	41

Recent publications on the Caspian Seal, including studies sponsored by NCOC:

- Proceedings of 7th International Conference of the Marine Mammal Council, Suzdal, Russia (2012). http://www.2mn.org/downloads/bookshelf/mmh7_vol1.pdf

  Wilson S., Dolgova E., Trukhanova I., Goodman S., "Breeding behaviour and pup development in the Caspian seal"

  Goodman S., Dmitrieva L., Baimukanov M., Bignert A., Jüssi I., Jüssi M., Kasimbekov Ye., Verevkin M., Vysotsky V., Wilson S., Härkönen T., "Population status of Caspian seals (Pusa caspica): threats, priorities and barriers to conservation"

  Kydyrmanov A., Karamendin K., Kassymbekov E., Baimukanov M., Kasimbekov Ye., Dmitrieva L., Jüssi I., Verevkin M., Goodman S., "Analysis of quantitative indicators of thyroid hormones in Caspian seals (Phoca caspica)"

  Dmitrieva L., Jüssi I., Baimukanov M., Kasimbekov Ye., Verevkin M., Wilson S., Goodman S.J., "Autumn-winter migration, habitat use and diving behaviour of Caspian seals (Pusa caspica) revealed by satellite telemetry"

- Dmitrieva L, Kondakov AA, Oleynikov E, Kydyrmanov A, Karamendin K, Kasimbekov Y, et al. (2013) "Assessment of Caspian Seal By-Catch in an Illegal Fishery Using an Interview-Based Approach." PLoS ONE 8(6): e67074. doi:10.1371/journal.pone.0067074. http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0067074
- Wilson SC, Eybatov TM, Amano M, Jepson PD, Goodman SJ (2014) "The Role of Canine Distemper Virus and Persistent Organic Pollutants in Mortality Patterns of Caspian Seals (Pusa caspica)." PLoS ONE 9(7): e99265. doi:10.1371/journal.pone.0099265. http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0099265
- Wilson, SC., Trukhanova, I, Crawford, I, Dolgova, E, Dmitrieva, L & Goodman, SJ, University of Leeds, UK, "Assessment & mitigation of impacts from icebreaking vessels on ice-breeding pinnipeds in the Holarctic." http://www.sealresearch.org/attachments/article/581/icebreaker%20ppt%20mmh8-final.pdf