Environment and Security

Transforming risks into cooperation

The case of the
Eastern Caspian Region

The **United Nations Environment Programme (UNEP)**, as the world's leading intergovernmental environmental organisation, is the authoritative source of knowledge on the current state of, and trends shaping the global environment. The mission of UNEP is to provide leadership and encourage partnership in caring for the environment by inspiring, informing, and enabling nations and peoples to improve their quality of life without compromising that of future generations.

The **United Nations Development Programme (UNDP)** is the UN's Global Development Network, advocating for change and connecting countries to knowledge, experience and resources to help people build a better life. It operates in 166 countries, working with them on responses to global and national development challenges. As they develop local capacity, the countries draw on the UNDP people and its wide range of partners. The UNDP network links and co-ordinates global and national efforts to achieve the Millennium Development Goals.

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The **Regional Environmental Centre for Central and Eastern Europe (REC)** is a non-partisan, non-advocacy, not-for-profit international organisation with a mission to assist in solving environmental problems in Central and Eastern Europe. The centre fulfils this mission by promoting cooperation among non-governmental organisations, governments, businesses and other environmental stakeholders, and by supporting the free exchange of information and public participation in environmental decision-making.

The **North Atlantic Treaty Organisation (NATO)** embodies the transatlantic link that binds Europe and North America in a unique defence and security alliance. In response to recent changes in the overall security environment, NATO took on new fundamental tasks. These include addressing both instability caused by regional and ethnic conflicts within Europe and threats emanating from beyond the Euro-Atlantic area. NATO's "Science for Peace and Security" programme brings scientists together to work jointly on new issues and to contribute to security, stability and solidarity among nations.

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Contents

Hinterkaspien

The geographical focus of this report used to be a classical hinterland. For a long period in history the area was even called Transcaspia, in other words the land behind the Caspian Sea. Also from the perspective of the now independent former Soviet Republics Kazakhstan and Turkmenistan the strip of land bordering the Caspian Sea is a distant province remote from the capitals.

But things are changing. The geopolitical centre of gravity has shifted east and with the rapid development of China's economy, another pole has emerged, rendering the terms 'trans', 'hinter' or 'behind' invalid for this region. And with the rapid developments linked to oil and gas exploration in Kazakhstan and Turkmenistan, the sleepy provinces along the coast are waking up. Aktau, for instance, has become a boomtown by international standards.

Now this assessment puts the region centre stage, where it belongs. What are the impacts of these tremendous dynamics on the environment, and, going one step further, can environmental issues, such as pollution on land and sea, desertification, species extinction be a threat to security? What are the potential impacts of climate change? Would these threats be confined to the region or would they affect much larger areas? Or does the environment build bridges, does it connect?

This set of relatively simple questions serves as the guiding principle for how the environment and security initiative works. Both Kazakhstan and Turkmenistan joined the ENVSEC club early on and asked for assistance in addressing common issues of environment and security, outlining possible solutions, and communicating the findings in a way that can be understood by a larger public both in and outside the region and its constituencies.

This publication is the result of more than three years of intensive work done by Kazakhstan, Turkmenistan and international organisations: first diplomatic, then more hands-on environmental assessments including field work and consultations, writing texts and making maps and graphics. Considering the perceived sensitivity of some of the topics the report was dealing with, further diplomatic efforts have deployed to ensure that countries agreed about the key outcomes of the document. After all, there is no more hinterland, in the traditional sense, east of the Caspian Sea.

Introduction and executive summary

In the past, the notion of security was primarily conceived in terms of neutralizing military threats to the territorial integrity and political independence of a state. However, in recent decades, it has been considerably broadened through incorporation of non-conventional threats and factors promoting tension and conflicts.

This report considers the role and impact of environmental factors in securing human safety and sustained development of the eastern Caspian Sea region, including the parts of Kazakhstan and Turkmenistan opening onto the Caspian Sea. Furthermore, the analysis presented here introduces a security perspective as it seeks to identify those environmental, socio-economic and political issues that are profoundly affecting the livelihoods of the populations and could lead to social tensions and instability.

The environment and security approach aims not only at comprehending and resolving local and regional environmental problems but also at reducing the potential for tensions and improving cooperation and stability. This also concerns actions targeted at specific issues in the so-called "environmental hotspots", identified and prioritized through public consultations, joint assessments, and information from authoritative international and national sources.

The report is a product of a comprehensive process that started with a study of the existing literature and information available on the Caspian region. In particular, analytical work done by the Caspian Environmental Programme (CEP) and the eastern Caspian countries from 1998 to 2007 has been extensively used throughout the Environment and Security Initiative (ENVSEC) assessment. The CEP is an umbrella programme of the five littoral states and group of international donor organisations, and is financed by the Global Environment Facility (GEF), the World Bank (WB), the European Union (EU) through its TACIS programme, the United Nations Environment Programme (UNEP), and United Nations Development Programme (UNDP). Through its ten thematic centres operated from 1998 to 2002[1] the CEP has extensive monitoring and research capacities able to carry out an in-depth analysis of Caspian environmental issues. The Programme's main research output is the 2002 Trans-diagnostic Analysis (TDA), and its 2007 Revisit. For these reasons the present ENVSEC report

The Environment and Security Initiative (ENVSEC)

The Environment and Security Initiative (ENVSEC) was launched in May 2003 simultaneously at the 5th Environment for Europe ministerial conference in Kyiv and the OSCE Forum in Prague, by three international organisations with different while complementary agendas and missions: the UN Environment Programme (UNEP), the UN Development Programme (UNDP) and the Organisation for Security and Co-operation in Europe (OSCE). In 2007 the Initiative has been joined by the UN Economic Commission for Europe (UNECE), the Regional Environmental Centre for Central and Eastern Europe (REC), and the Public Diplomacy Division of the North-Atlantic Treaty Organisation (NATO) as an associated partner.

From the outset ENVSEC has seen its primary goal as helping countries to identify, understand and where possible mitigate risks to stability and security that may stem from environmental problems and challenges. Likewise it aims to promote more sustainable solutions to security challenges by addressing their environmental aspects. The Initiative seeks to contribute to solving existing or emerging political disputes by improving dialogue and promoting cooperation on environmental issues throughout the pan-European region. Assessments in South-Eastern Europe and the Southern Caucasus have so far led to a broader, deeper and more concrete understanding of how environmental and security concerns and policies intervene and affect each other. ENVSEC analyses and maps are known and used at schools and universities, in public debates as well as in governmental planning. Assessments are accompanied by projects on the ground ranging from awareness-raising and in-depth field investigations of specific issues to helping countries strengthen their institutions, improve policies and find solutions to concrete problems in the environment and security domain.

has been able to draw on research and analysis produced within the framework of the CEP. Production of the ENVSEC Eastern Caspian report also included independent assessment missions on the east coast of the Caspian Sea region in 2006. During these field assessments to the Turkmen and Kazakh provinces on the Caspian, local authorities, local experts and NGOs were consulted. The field missions were followed by national-level consultations in Ashgabat in September 2007. This event brought together international and national experts on the issues raised by the report. At the same time, these consultations were instrumental in developing recommendations and proposals for follow-up actions.

Both CEP and ENVSEC look at environmental issues, however the main strength of the ENVSEC initiative is to combine environmental analysis with a security perspective, trying to understand how these two dimensions are related.

In a context where fossil fuels are of paramount importance for the global economy, energy policy is a key area in which stakes for both the environment and security are very high. The issue of stable energy supply becomes a matter of national security and the centre of geopolitical interests. The *drive towards energy security and away from extreme energy dependence* can have both positive and negative local and global environmental

effects depending on which resources, solutions and technologies are prioritized.

States that are well endowed with oil and gas resources, such as Kazakhstan and Turkmenistan, are confronted with the challenges of managing them. These include, for example, the risk of over-emphasising the development of the energy extraction sector and the consequent weakening of the manufacturing and agricultural sector of an economy, with the development of high economic inefficiencies. Such a situation can increase socio-economic inequalities, and widen the gap between underprivileged communities and those that have benefited from the revenue generated by the energy sector. Rural-urban inequality is a typical instance of this trend.

The quality and availability of freshwater in the arid eastern Caspian region is a key factor for rural development and public health. While urban centres located on the seacoast can afford expensive desalinization plants and/or the delivery of water via regional pipelines, access to reliable freshwater sources for the hinterland remains difficult and the vulnerability of these regions could increase with rising problems of environmental pollution and degradation.

State institutions play a key role in coping with such challenges since their *capacities for managing the wealth generated by the extraction of resources* have had an impact on the country's economic and political stability. In the eastern Caspian region the booming energy sector can lead to core changes in the socio-economic conditions of the whole area. This situation presents both opportunities and risks since rapid development of energy resources can imperil the region's delicate environmental balance.

The increased specialization of the region in the production of fossil fuels combined with the degradation of marine biological resources, freshwater and agricultural land are sources of concern. Rapid industrial development without due consideration for environmental security, especially in the shore and sea zones, can lead to environmental degradation and loss of livelihoods. The rapid negative changes associated with the latter could erode the region's resilience and increase vulnerability to societal tensions. Population growth combined with unequal access to natural resources could further contribute to discriminating against and marginalizing specific social groups. Overuse of resources will have long-term consequences that will affect the region long after the oil and gas resources have been used up.

The security anxiety that was fuelled by the Cold War (1945-1991) also had important environmental ramifications. By far the largest environmental impact of this period was caused by the construction and operation of military-industrial complexes and arms testing sites. In the context of our report this is particularly apparent in Kazakhstan, where the Soviet nuclear industry in the formerly "secret" town of Shevchenko (now Aktau) flourished until the 1990s creating a large uranium-tailing dump and an onshore nuclear station. The vast Kazakh steppes favoured the creation of large-scale military testing ranges stretching for hundred of kilometres, now polluted with rocket fuel components and radioactivity, making it difficult or impossible to use agricultural land.

Finally the fluctuating sea level and, in a medium to long-term perspective, the issue of climate change represent a major challenge

Understanding the relationships between the environment and security

Links between *environment* and *security* are the subject of heated debate in the academic community. This report is based on the assumption that multiple stress factors may cause insecurity, whereas other factors may promote security for individuals and groups of people:

Security-promoting vs. Insecurity-promoting mechanisms

Systems	Security-promoting mechanisms	Insecurity-promoting mechanisms
Economic	Wealth and welfare Wealth policies	Poverty Inequity
Political	Law Legitimate force	Corruption Unlawful use of force
Cultural	Social identity Justice	Discrimination Injustice
Demographic	Low birth rate Urbanization	High birth rate Rapid population flows
Ecological	Life support Natural resources and raw materials Stable climate	Scarcity Degradation Lack of access Disputed right of resource use Extreme natural events and climate changes Disease and epidemics

Adapted from Dabelko et al., 2000 and Maltais et al., (2003)

Although still very broad in its scope, the table above underlines the need to look at the problems and issues that lower the resilience of groups and societies, in other words their capacities to absorb shocks, and make them more vulnerable to tensions and threats, including the threat of violent conflict.

For this reason, the analysis needs to assess the complexity of the relationship between different security or insecurity-promoting factors, not only at a local and national level, but also in a world of rising connectivity and progress, both in the regional and global dimensions. In general, one can say that resource scarcity and degradation, access to critical resources on which people may depend, competition to extract and control valuable commodities and outbreaks of diseases are significant non-military threats to security and prosperity of nations and individuals.

In more vulnerable areas, such as arid plains, mountain areas with highland-lowland inter-

actions, and transnational river basins, instability related to environmental degradation can contribute to conflict development (Baechler, 1999).

When discussing the importance of environmental and demographic factors in modern conflict, academic research points out that *the loss of livelihoods* is, to a greater extent than poverty, the common denominator for many recent internal conflicts.

Livelihood definition
A livelihood comprises the capabilities, assets (stores, resources, claims, and access) and activities required for a means of living.
(Chambers and Conway, 1992)

Ohlsson (2005) argues that "while poverty may be a near-endemic condition in certain societies, loss of livelihoods marks a rapid transition from a previous stable condition of relative welfare into a condition of poverty or destitution". *It is the rapid process of change resulting in a sudden fall into poverty that creates the potential for livelihood conflicts*. Losses of livelihoods have many causes in the contemporary world, most of them being related to job scarcity, population increase, and degradation of key environmental resources.

Scarcity can arise either when the quality and quantity of resources decreases (*supply-induced scarcity*), population grows (*demand-induced scarcity*) and/or resource access becomes more unequal (*structural scarcity*) (Homer-Dixon, 1999). The UN Secretary-General, Ban Ki-Moon, corroborated the scarcity hypothesis during the recent Security Council debate on the impact of climate change, saying that "when resources are scarce – whether energy, water or arable land – our fragile ecosystems become strained, as do the coping mechanisms of groups and individuals. This can lead to a breakdown of established codes of conduct, and even outright conflict"[2].

Changes in the natural environment affect human societies and their survival capacities. Recent reports underline the fact that changes in climatic conditions "will overstretch many societies' adaptive capacities within the coming decades. This could result in destabilization and violence, jeopardizing national and international security" (WBGU, 2007:1). Such changes could exacerbate existing environmental crises such as drought, water scarcity and soil degradation, and intensify existing problems. Weak and fragile states are more exposed to the risks induced by climate change as their capacity to adapt may be rapidly overstrained and lead to increased instability (WBGU, 2007).

Another approach in research has been to consider that dependence on natural resources, as measured by the percentage of GDP stemming from primary commodity exports, increases the risk of conflict (Collier et al., 2003). Recent analysis (Kahl, 2006) shows the importance of going beyond the abundance versus scarcity dichotomy. This is particularly true in the case of abundant energy resources, in high demand in national and global markets. Hence in an increasingly interdependent world, abundance and scarcity of resources need to be put into their context to understand how they become factors of security or insecurity.

and a considerable threat for vulnerable societies such as coastal communities and ecosystems. The Caspian Sea coast is highly vulnerable to rapid and destructive fluctuations in sea level. The latter, together with other natural hazards, including storm surges, earthquakes and regional epidemics, presents a serious risk to human security and loss of livelihoods for the whole Caspian Sea region.

A number of these ecological problems were inherited from the past, whereas new challenges are arising from the region's economic development since independence. As the economic life of the region is closely linked to the development of energy resources, it is an open question whether adequate measures are being taken to ensure environmental safety and sustainable development of the eastern Caspian. Answering such a question is a complex task. On the one hand, many positive initiatives have been implemented. For example, the natural canal between the Caspian Sea and the Kara Bogaz Gol has been reopened, allowing the bay to fill once more with water, which has in turn significantly improved its bio-diversity. National authorities consider the Caspian Sea region as an important and vulnerable area since all five Caspian states signed the Framework Convention for the Protection of the Caspian Sea Marine Environment (the Convention was signed in Tehran in 2003 and came into force in 2006). The Caspian Environmental Programme (CEP) was instrumental in launching this Convention, facilitating the Transboundary Diagnostic Analysis (TDA) of the Caspian Sea in 2002 and its update in 2007, establishing expert working groups and regional thematic centres. Several international projects and national actions have been catalyzed and implemented since then[3]. Signatory states have also developed National Caspian Action Plans, which aim to implement nationally the Framework Convention. These initiatives show that generally, Caspian Sea states have been able to develop a positive dialogue on how to deal with environmental issues in the region.

Local environmental authorities have been entrusted with decision-making power over environmental performance in the Caspian area, a measure accompanied by improved financial resources allowing them to mitigate some of the environmental problems. National environmental legislation and regulations were improved and, for example, Kazakhstan approved in 2007 a new Ecological Code[4] including a critically new approach to the issues of environment protection, including *inter alia* special status for the Caspian Sea, and a zero-emissions policy for the land and sea.

Several national and international oil companies have introduced ISO 14000 standards addressing various aspects of environmental management and better technologies for environmentally safer oil exploration and production. Energy companies and littoral states have embarked on remediation activities on polluted land and oil-storage pits. Globally significant biodiversity regions such as the Khazar reserve and the Ural river delta have received valuable support. Mass media and public organisations have helped draw attention to the issues of oil industry development and made ecological information more transparent for the public. Related activities include media tours around the Caspian, public Environmental Impact Assessment (EIA) hearings and ecological expertise, and regular coverage of environmental issues in the local and national newspapers.

On the other hand, a number of existing and emerging environment and security problems are still unsolved and appropriate action is needed at both local and national level in cooperation with neighbouring countries, as recommended in the concluding chapter of this report.

The Caspian region

Map produced by UNEP/GRID-Arendal, August 2008

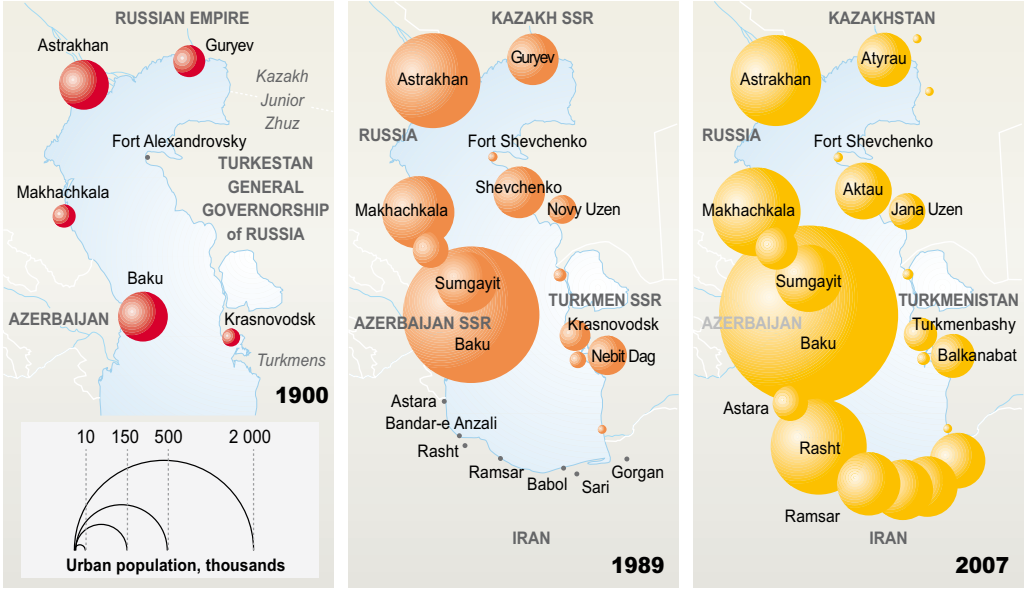
The Caspian region

Overview

Located at the crossroads between Europe and Asia, the Caucasus and Central Asia, Russia and Iran, the Caspian Sea is the world's largest body of inland water covering 371 000 sq km, slightly larger than Germany. It is landlocked and drains inward. For this reason the inflow of its rivers largely determine the level of the Caspian Sea. With no outlet the Caspian Sea is the repository of all that is transported by and discharged into its waters by the rivers, including pollution. Human life and the rural economy in these rugged conditions depend on the ecosystem's resilience and stability. Globally significant biological species of sturgeon, Caspian seals, pink flamingo, and about 400 endemic species live in the sea. Sturgeons look very much as they did 100 million years ago, in the age of dinosaurs. Migration routes of rare species, such as *saigak* antelope, wolves and foxes pass along the semi-desert coastal zones of the Caspian Sea. The north Caspian shelf, Ural river delta, Mangystau peninsula – which boasts impressively diverse and unique geological sites – and the Turkmenbashy gulf are amongst the most important biodiversity areas. They also hold the greatest potential for local eco-tourism.

The coastal regions located to the northeast and east of the Caspian in Kazakhstan and Turkmenistan display many similarities: a dry climate[5] and a mostly desert landscape with very low population density. The majority of the population currently lives in urban settlements along the coast. There are marked differences between coastal and *hinterland* regions, the latter usually depending on cattle farming whereas the coastal regions feature well-developed industries.

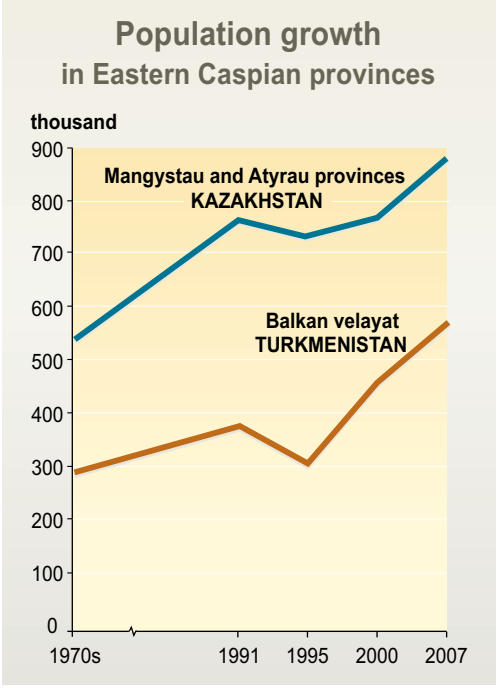
Urbanisation on the Caspian shores



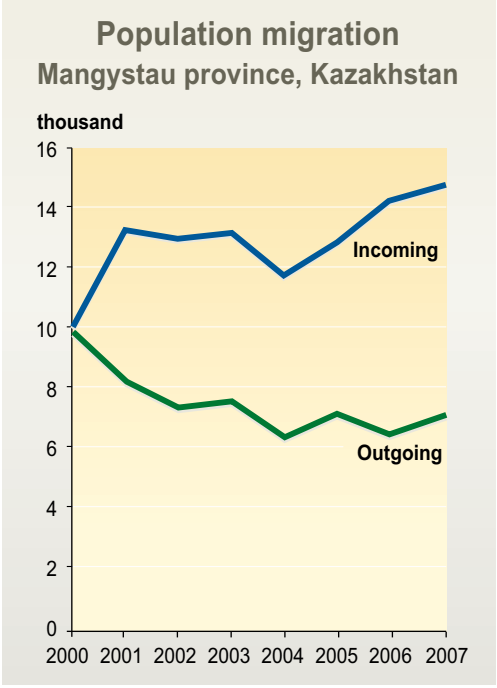
Data for Persia (Iran) for 1900 and 1990 is missing

Sources: USSR Population Census 1989; Wikipedia; National population statistics

Map produced by UNEP/GRID-Arendal, August 2008



Sources: National statistical data of Kazakhtsan and Turkmenistan; BSE

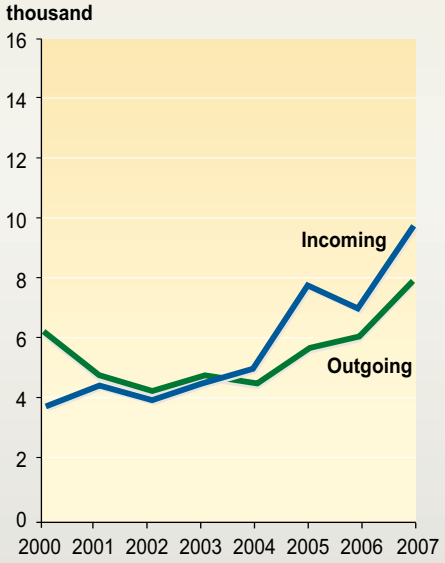


Source: National statistical data of Kazakhtsan (www.stat.kz)

Kazakhstan's provinces of Atyrau to the northeast and Mangystau to the east of the Caspian make up 10% of the country's territory and about 5% of its population[6]. With 2–4 inhabitants per sq km, population density is low. However in the past 30 years the region's population has increased by about 35%[7]. The provincial capitals of Aktau and Atyrau accommodate nearly half the total population in each province. Kazakhs constitute the ethnic majority (80–90%) in both cases. Russians, Tatars and other nationalities, including foreign labourers and labour migrants, make up the rest (Agency of the Republic of Kazakhstan on Statistics).

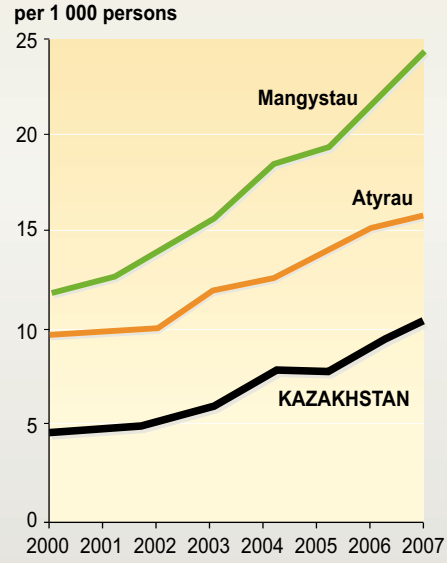
The Balkan province of Turkmenistan occupies 138 500 sq km stretching 1 200 km along

Population migration
Atyrau province, Kazakhstan



Source: National statistical data of Kazakhtsan (www.stat.kz)

Natural population growth
in Kazakhstan's selected provinces



Source: National statistical data of Kazakhtsan (www.stat.kz)

the east coast of the Caspian. The population of the province exceeds half-a-million[8] (8.5% of the country's total), with the majority (about 80%) living in the urban centres (especially Turkmenbashy, formerly Krasnovodsk, and Balkanabat, formerly Nebit Dag). Despite having the lowest population density in the country, the population has increased by a factor of 1.8 since 1976 (Great Soviet Encyclopedia, Berkeliev 2006, CEP 2006 a), compensating even the emigration of the 1990s. The population of the region is young with a median age of 27.5 (UNICEF 2004). Turkmens constitute the ethnic majority. In keeping with the urban profile of the province, the fertility rate is low. On the other hand the province has rather high mortality rates, possibly related to its industrial profile (UNICEF 2004).

The Caspian region

Recent transitions

The Caspian region has been inhabited since prehistoric times, the sea providing an accessible source of food for coastal communities. The sea has also represented an important waterway for trade, sea routes being more efficient than the long overland routes. The Caspian Sea has hence represented an important north-south and east-west communication platform, allowing the exchange of goods and the movement of people.

In the days of the USSR the Caspian region underwent considerable social and economic change. Compulsory free, universal education and the provision of universal health care were among the Soviet Union's major social achievements. But the development of large-scale agriculture and the meat industry was accompanied by a radical change in the traditional way of life of the nomadic populations of Kazakhstan and Turkmenistan, pushed into adopting a sedentary life style.

In the Soviet Union's centrally planned economy, Azerbaijan was an important centre for industrial oil production, while Kazakhstan developed its mining and processing industry. Oil production expanded although most of its output went to the military–industrial complex, well established in the Kazakh SSR, with the nuclear test sites at Semipalatinsk and Kapustin Yar, and the Baikonur space centre (Akiner, 2004: 8).

Turkmenistan experienced similar developments. Nomadic populations were forced into sedentary settlements and the republic became one of the USSR's most important cotton-producing centres. Industrialization included the development of the oil-gas and chemical industry in the Caspian region. Turkmen gas in 1990 represented almost 11% of total Soviet gas production (Djalili and Kellner, 2003: 186).

The process of change has continued or even accelerated over the last 15 years. In 1991 the newly formed eastern Caspian states of Kazakhstan and Turkmenistan found themselves, along with the central Asian and southern Caucasus republics, separated from the USSR. At first they faced many challenges: finding their place in the international community as sovereign nations, establishing political systems, securing their borders, and establishing their own position in the global market without any support from the centrally-managed redistributive mechanism of the Soviet economy.

Many activities and jobs that previously enjoyed central promotion and support, such as the uranium-production complex in Aktau, and the mineral extraction plants in Garabogaz and Khazar, shrank significantly or disappeared. The previous system of supplying the coastal cities with food and other goods was reduced to a trickle.

The break-up of the Soviet Union introduced four new actors to the region: Azerbaijan, the Russian Federation, Kazakhstan and Turkmenistan. With Iran they all now border on the Caspian Sea. The legal status of borders on the Caspian Sea and its shelf resources have been under negotiation ever since, accompanied by a build-up in military forces in the region.

Over the last 25 years the Caspian has attracted increased global attention. The presence of significant oil and gas deposits and the lack of thorough geological exploration before 1991 fuelled hopes of unproven reserves capable of rivalling the Persian Gulf, according to the most optimistic estimates[9]. In a period of growing demand, and worldwide decline in oil and gas reserves and correspondingly high prices for hydrocarbon derivatives, these hopes have done much to encourage interest in the region, focusing in particular on the size of its hydrocarbon reserves, its geopolitical influence and the route taken by export pipelines.

The transition from a planned to a market economy has built largely on the extraction and export of hydrocarbon resources, a situation that is now changing the national importance of coastal areas, the structure of national economies and the livelihoods of people living in the region. The development of the oil and gas sector is also a challenge for the distribution of wealth and benefits generated by this sector, and strengthens the dependence of the local economy and job market on the energy sector.

The most vulnerable local communities, in addition to the crisis in the system as a whole, faced severe environmental problems: the rise in the Caspian Sea level between 1978 and 1996 flooded pasture and other land and destroyed infrastructure. Flooding also contributed to the salinization of the areas affected. Overfishing, pollution and the invasion of external species contributed to a significant drop in fishery output, while damage to water supply networks and interruption of service (in some cases regional networks crossing borders) led to lower drinking water availability and quality. Coastal provinces in the eastern Caspian became increasingly dependent on the sea for their water supply by desalination.

Such challenges and in many instances hardships caused an overall reduction in the quality of life, especially in rural areas, prompting outward migration from such areas. The declining biological resources of the sea combined with pollution, often inherited from the past, and recent environmental changes, made it increasingly difficult for the local population to live in a healthy environment, produce food, and generate sufficient income outside of the energy sector.

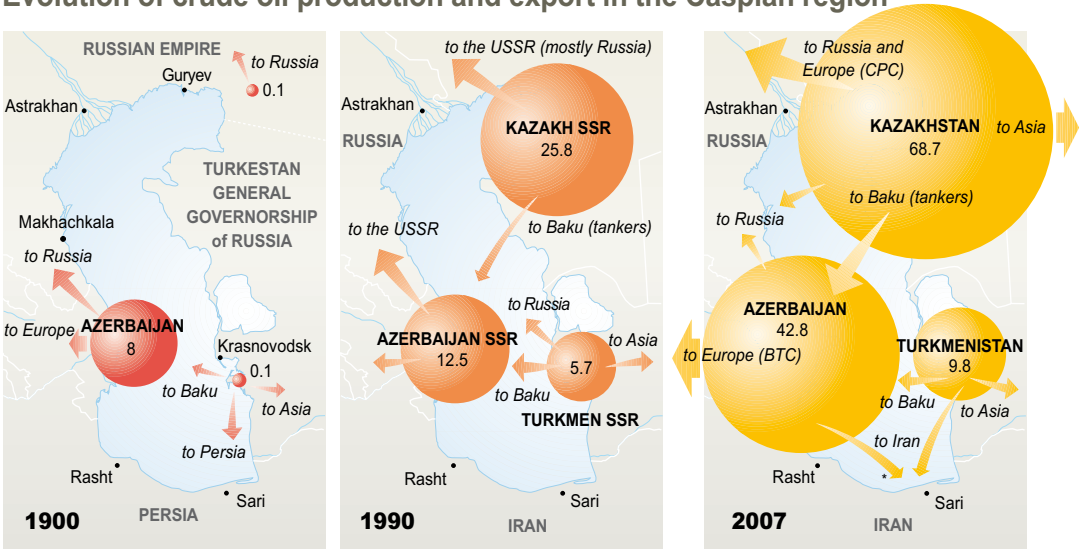
The Caspian region

Striving for energy security

The development of energy resources is not a new phenomenon in the Caspian region. Oil (in the form of naphta) has been extracted and used for centuries in the Apsheron peninsula (situated in today's Azerbaijan). From the mid-19th century, oil extraction in the Caspian (especially in the Baku oilfields) became an industrial operation[10]. Western and Russian interests allowed the Baku oilfield to expand and by 1897 it accounted for almost half of global oil production (Djalili and Keller, 2003; Akiner, 2004)[11]. Fierce competition over transport routes emerged: north by sea to Astrakhan, west overland to Batumi (and then via tanker to international markets), or south by pipeline to the Persian Gulf. The latter plan prompted fierce opposition from the British, who saw it as a challenge to their strategic interests, so the pipeline was not built. The competition over oil transport routes in the 19th century bears important similarities with the "pipeline politics" of the late 20th century, after the disintegration of the USSR.

Oil transformed the city of Baku, which by 1908 had a population of 248 300 (Akiner, 2004). By the end of the 19th century Baku had become one of the largest industrial centres of the Russian empire. The first important oil field in Kazakhstan was discovered in 1911, east of Guriev (now Atyrau)

Evolution of crude oil production and export in the Caspian region



Oil production figures are in million tonnes

Sources: BP Statistical Review 2008 (data 1990 and 2007); compilation of data on historical oil production

Map produced by UNEP/GRID-Arendal, August 2008

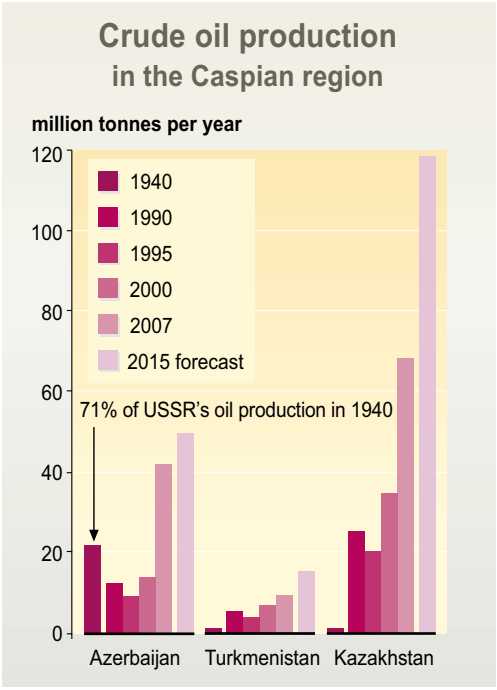
* oil export from Azerbaijan via Iran since August 2008

(Akiner, 2004). The same period saw attempts to extract oil on the Caspian coast of Turkmenistan on the Cheleken peninsula and at Krasnovodsk (now Turkmenbashy).

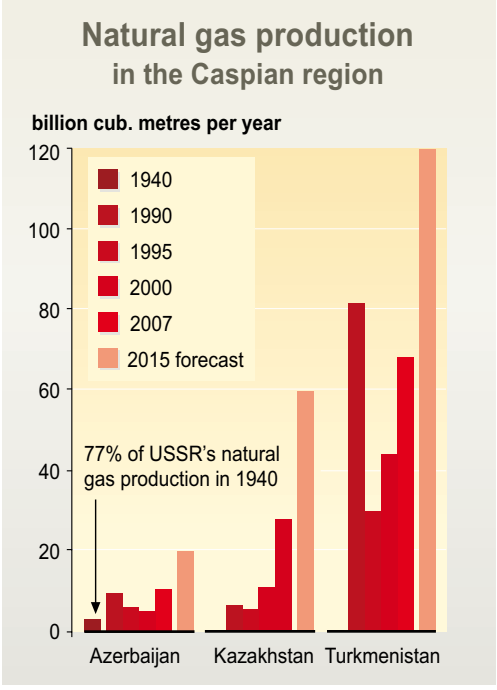
In 1991 Caspian oil production represented only 3% of total output in the USSR (Djalili and Kellner, 2003: 186). In global terms the importance of other regions such as the Middle East overshadowed the Caspian as an oil producing region for a long time. However, in the last decade, the situation has changed.

Current oil estimates for the five states range from 17 to 49 billion barrels (bbl) of proven reserves (Ladaa, 2005; EIA, 2007; BP 2008). Globally the region's reserves represent between 3 to 5% of world reserves. As for natural gas, proven reserves in the Caspian region are estimated at 5.9 trillion cubic metres, comparable to Saudi Arabia with possible reserves estimated at 7.2 trillion cubic metres (BP 2008). At the end of 2007 Kazakhstan's proven oil reserves were estimated at 39.8 bbl (3.2% of world's reserves) and Turkmenistan's at 0.6 bbl (BP 2008).

The frenzy surrounding the region's oil and gas reserves that characterized much of the 1990s, is somewhat tempered by an analysis of production figures. In 2006 regional oil production reached roughly 2.3 million barrels a day, comparable to Brazil, South America's second largest oil producer. By 2010 the EIA expects the countries of the Caspian region to produce



Sources: BP Statistical Review 2008 (data for 1990-2007); BSE; EIA



Sources: BP Statistical Review 2008 (data for 1990-2007); BSE; EIA

Natural gas supply
from the Caspian region

Eastern Caspian states
Other states bordering the Caspian region
Other states (transit and gas importing countires)
Export routes via Russia
Major gas producing areas
Other export routes
Planned

Map produced by UNEP/GRID-Arendal, August 2008

Crude oil supply
from the Caspian region

Eastern Caspian states
Other states bordering the Caspian region
Other states (transit and oil importing countires)
Export routes via Russia
Major oil producing areas
Other export routes
Planned

* due to explosion at BTC pipeline section in Turkey in August 2008 and military operations in Georgia, Azerbaijan initiated oil export to Iran (Neka) by tankers

Map produced by UNEP/GRID-Arendal, August 2008

between 2.9 and 3.8 million barrels a day, which would exceed annual production by South America's largest oil producer, Venezuela (EIA, 2007) although expectations may be tempered by the fact that Kashagan, one of the biggest Kazakh oil fields will not come online before 2013. As for gas, regional production reached approximately 138 billion cu m (bcm) in 2004 and 163 bcm in 2007, exceeding the combined production of South America, Central America, and Mexico (BP 2008).

The large energy reserves of Kazakhstan and Turkmenistan have attracted the interest of international energy companies and states alike. The combination of high oil prices, geographical position – at the crossroads of Europe and Asia, two energy importing regions – diversification of demand in Europe and USA, fast growing fuel consumption in India and China and political instability in the Middle East, ensure that the Caspian region will continue to attract considerable international attention in coming years.

The New Great Game

The competition for the control of access to the hydrocarbon reserves and their transportation routes to the international markets has been called the "New Great Game".

Pipelines create an end-to-end supply line integrating the economies of consumer and producer (as well as transit countries), hence pipeline routing is not only a question of economic calculus and cost-benefits ratios. In a world heavily dependent on fossil fuels and in a region at the crossroads between Europe and Asia, pipeline routing depends on geopolitical interests.

The first generation of pipelines was built during the Soviet era and consisted, among others, of the Central Asia-Centre and the Bukhara–Ural pipeline networks. However these networks had only limited capacity and in the course of time the infrastructure became inefficient and degraded. The Central Asia–Centre gas pipeline will undergo major modernization work to boost capacity to 50 billion cubic metres (bcm)[12]. According to a recent agreement between the Russian, Kazakh and Turkmen governments, the Central Asia–Centre gas pipeline will be complemented by a new project, the Pre-Caspian gas pipeline. The new pipeline will skirt the east coast of the Caspian Sea carrying 20 bcm a year of Turkmen and Kazakh gas along the Caspian shores north to Russia's Saratov oblast[13].

Construction of the second generation of pipelines started in the mid-1990s and includes the small Turkmenistan–Iran (Kurt Kui) gas pipeline, the significantly larger Caspian Pipeline Consortium (CPC) from the Kazakh field of Tengiz to the Russian Black Sea port of Novorossiysk where crude oil is transported further by tanker to markets, and the Baku-Tbilisi-Cheyan (BTC) pipeline[14]. In late 2005 Kazakhstan agreed to supply up to 600 000 barrels a day of crude oil to the BTC pipeline. The oil would be delivered from Kuryk, near the oil port of Aktau, and would then be shipped via tanker across the Caspian to the port of Sangachal, the starting point of the BTC. This decision was complemented by the signature in Astana, on January 24 2007, of a Memorandum of Understanding to create a trans-Caspian oil transport system[15]. In early May 2008 the Kazakh and Russian energy authorities reached an agreement to more than double the throughput capacity of the CPC pipeline by 2012. The CPC pipeline currently has an annual throughput capacity of 32 million tonnes; this is expected to rise to 67 million tonnes[16].

Tanker system capacity is projected at 25 million tonnes a year in the first stage and 38 million tonnes in the second stage, primarily serving the transportation of oil from Tengiz and Kashagan with adjacent oilfields. Such significant quantities of oil being transported by tankers is of great concern due to the risk of accidents and spills at sea or oil product leakages in the seaports. Fortunately there have not so far been any large oil spills along the eastern shore of the Caspian. A tonne of oil was spilled in 2006 during loading of an Azerbaijan tanker in the port of Aktau (Ministry of Environment Protection of the Republic of Kazakhstan 2007, Akhmetov 2006). A larger oil spill polluting 12 sq km of the sea outside Baku occurred as the result of the Mercury-2 tanker accident involving 18 fuel tanks.

The third generation of pipelines is still at the planning stage and mainly includes gas pipelines that either run north to Russia and Europe, west to Turkey and Europe (through, for example, the Nabucco project or the Turkey-Greece-Italy (TGI) pipeline[17]), or south via Iran, or east to China via Turkmenistan, Uzbekistan and Kazakhstan. The 7000 km long Trans-Asia Gas Pipeline from Turkmenistan to China, for example, with capacity more than 40 bcm per year, should become operational after 2010. Moreover, designing a Trans-Caspian gas pipeline along the seabed from Turkmenistan to Azerbaijan and thence to Europe has become a realistic venture. A feasibility study for the project is already under preparation. Another project is 3 000 km oil pipeline linking Caspian oil fields of Kazakhstan to China, which will become operational after 2010.

Finally, energy demand in India and Pakistan is growing rapidly and both countries seek to improve their access to Central Asian energy reserves. In April 2008 the projected Trans-Afghan gas pipeline that aims to connect the Davletabad gas field in Turkmenistan (estimated gas reserves 4.5 trillion cu m) to Pakistan and India via Afghanistan reached a new phase when the four countries signed the agreement for the construction of the 1 700 km gas pipeline. Construction should start in 2010 at a cost of US$8 billion. The pipeline would have a projected capacity of 30 bcm of gas per year.

Oil and gas infrastructure in the Caspian region

Oil and gas fields
Potential oil and gas fields
Oil and gas pipelines
Tanker delivery and proposed oil and gas pipelines
Terminals (ports)

Map produced by UNEP/GRID-Arendal, August 2008

The Caspian region

An area of geopolitical importance

The transportation of energy not only creates various forms of interdependence between producers and consumers but also involves numerous actors and stakeholders. This situation increases the complexity of planning and building pipeline systems.

For energy-thirsty consumers such as Europe, the United States, India and China diversifying the suppliers of energy contributes to reducing vulnerability created by dependence on a specific energy source (oil), from an insecurity–ridden supplier (the Middle East). Diversifying energy suppliers increases energy security. In this context the gas and oil resources of the Caspian are of great interest to China and India, whose economic growth relies on increasing demand for energy. At present the European Union imports half of its energy products. The estimates published by the European Commission in 2006, for the G8 meeting in St. Petersburg – suggest that the EU's dependence on energy imports will further increase, reaching 70% of its total energy consumption by 2030 (94% of oil and 84% of natural gas). The role of gas will increase considerably, hence the importance of securing the flow of energy[18].

Russia is both a producer and a transit country. Russia is the world's largest exporter of natural gas, the second largest oil producer and exporter, and the third largest energy consumer. It also controls various pipeline routes to Europe and Asia. This positions Russia as a strategic energy supplier and "energy axis" between Europe and Asia, which also allows Russia to assert its influence politically. The problem of energy security is also a priority for the Shanghai Cooperation Organisation (SCO), in which Russia and China play significant roles.

Iran, itself a producer of fossil energy, seems mostly interested in better connecting Caspian oil to the facilities in the Persian Gulf. The country has developed cooperation with Russia and, more importantly, embarked on development of its military arsenal and especially its missile capabilities and a controversial nuclear programme. This situation is a source of international tensions and regional insecurity.

For transit states such as Georgia, but also Turkey and Ukraine, pipelines are financial lifelines, with states being paid rent and duty for use of their territory and for damage caused by building and operating the pipelines. So, increasing the number of pipelines crossing a given country not only means increasing revenue for the state but also establishing that country as a "hub" or "pivot" in the political economy of energy transportation[19].

The US oil industry has been present in the Caspian since the 19th century, but only since the disintegration of the Soviet Union has the US developed closer links with the region.

The presence of energy resources and the geographical position between global actors such as Europe, Russia and China ensure that the Caspian region retains its full geopolitical significance for the US. As for other economies, US dependence on oil increasingly supplied by countries in the Middle East, Africa and other non-Western areas means that the American economy is becoming increasingly exposed to supply disruptions in overseas production areas. Diversifying energy suppliers increases energy security. As they strive to control the most promising sites in terms of new oil, US interests are competing with other indus-

trialized regions and especially China. The conflicts in the Middle East and Afghanistan have amplified the region's overall insecurity, increasing the risk of critical infrastructure becoming a target for terrorist attacks.

Furthermore other oil rich areas are increasingly prone to instability, making it imperative to protect – including by military means – investments in the energy sector and ensure the constant flow of energy to the markets.

A sea or a lake? Beyond hydrology: the uncertain status of the Caspian Sea

The main question is whether the Caspian should be considered a sea or a lake. The answer to this question has considerable implications for use of the resources of both the Caspian's surface waters and its seabed. If the Caspian counts as a sea then the United Nations Law of the Sea – the Montego Bay Convention of 1982 – would be the applicable body of law. In this case, each littoral state would be allotted a strip of coastal waters of a few tens of kilometres, or in other words 12 nautical miles of territorial waters as well as an exclusive economic zone where states have sovereign rights over surface water and seabed alike.

From 1921 to 1991, the Caspian was considered a lake, and its waters were consequently divided by extensions of the land borderlines by consensus of the bordering states, Iran and the USSR. The status of the Caspian was then regulated by bilateral international treaties and national legislation. The resources of the sea were considered to be the joint, exclusive property of the two littoral states (Djalili and Kellner, 2003; Granmayeh, 2004). With the break-up of the Soviet Union, the situation changed completely. There were now five states (instead of two) each with an interest in the Caspian and its resources[21]. To date the five countries are still negotiating a regional convention on the legal status of the Caspian but an overarching agreement has yet to be reached on the division of the Caspian waters and – indirectly - its natural and mineral resources.

Clarifying the legal status of the Caspian Sea is one of the key issues for regulating access to its natural resources. Clear and agreed regulations increase the predictability of the situation, while at the same time decreasing the political risks related to possible confrontation over access to these resources. This in turn makes the Caspian region more attractive to global, regional and national investors.

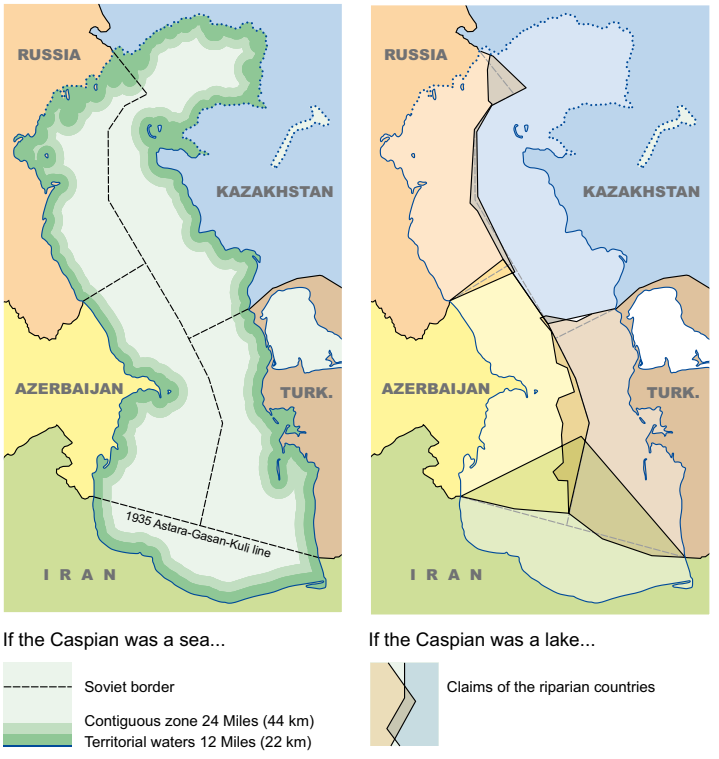
The fact that the legal status of the Caspian Sea is still an open question underlines this reality and the weight of political and economical interests in finding a common solution. At the same time, states have been able to find cooperative solutions not only on a bilateral or trilateral basis but also in a multilateral framework.

By ratifying the Framework Convention on the Protection of the Marine Environment of the Caspian Sea (Tehran Convention) that entered into force in 2006, the signatories – all five bordering states – signalled that they were willing to search for common strategies to protect the Caspian environment. These include the prevention of pollution, the development of preventive measures, and access to and exchange of information. Progress in negotiating and implementing the Convention's protocols is "mixed" and further cooperation is urgently required to achieve efficient control of human activities affecting the Caspian's marine environment. In this context environmental issues have become the basis for planning and implementing common measures, allowing the concerned states to improve stability and security in the region.

The ratification of the Tehran Convention and the work done within the framework

In keeping with concerns mentioned above, in April 2005 the American Department of Defence announced a major restructuring of the US military presence overseas which foresees closing some military facilities in Europe and East Asia and redeploying forces in other regions including South East Asia, Africa or the Caspian Region (Klare, 2006)[20]. Since the late 1990s the US has increased military cooperation with (training and arms

The uncertain status of the Caspian Sea



If the Caspian was a sea...

Soviet border

Contiguous zone 24 Miles (44 km)

Territorial waters 12 Miles (22 km)

If the Caspian was a lake...

Claims of the riparian countries

Source: Vital Caspian Graphics 2005

Map produced by UNEP/GRID-Arendal, August 2008

of the Caspian Environmental Program are certainly positive examples of the ability of the Caspian states to operate in multilateral policy frameworks to develop alternative sources of regulation and decision-making. In the meeting held in Tehran on 16 October 2007, the Presidents of the five Caspian states (MFA RF 2007) not only underlined the importance of developing legal documents regulating that status of the Caspian Sea but also highlighted their concerns over the state of the environment in the Caspian as well as the importance of enhancing environmental cooperation and coordination of national policies in order to improve the protection and use of biological resources. At the same time, the combination of geopolitical and national interests with the profound changes occurring in the region is such that the model based on competition will continue to influence events in the region.

supplies) Georgia, Azerbaijan and Kazakhstan in order to strengthen the capacity of local forces to protect oil–related infrastructure (Klare, 2004). The new US doctrine foresees the establishment of US military facilities in the Caspian region (so-called Forward Operating Locations) (Klare, 2006) – possibly in Azerbaijan or Kazakhstan.

Deploying military forces in such a region modifies the balance of power between actors. The August 2008 military actions in Georgia, which is strategically positioned on the oil routes from the Caspian Sea to the Black and Mediterranean seas, coupled with alleged terrorist attacks on the BTC pipeline in north-east Turkey over the same period, underline the high vulnerability of the energy infrastructure to conflicts and instability[22].

The military presence has increased in the Caspian region over the last ten years, with coastal states increasing military spending and modernizing military infrastructure (Katlik, 2004)[23]. At present there are large disparities in military strength between the five Caspian states. The Caspian being a maritime region, the naval component is particularly important. Russia and Iran are the leading naval forces in the region, while Kazakhstan[24] and Turkmenistan are investing in increasing their military forces in the region and upgrading capacity.

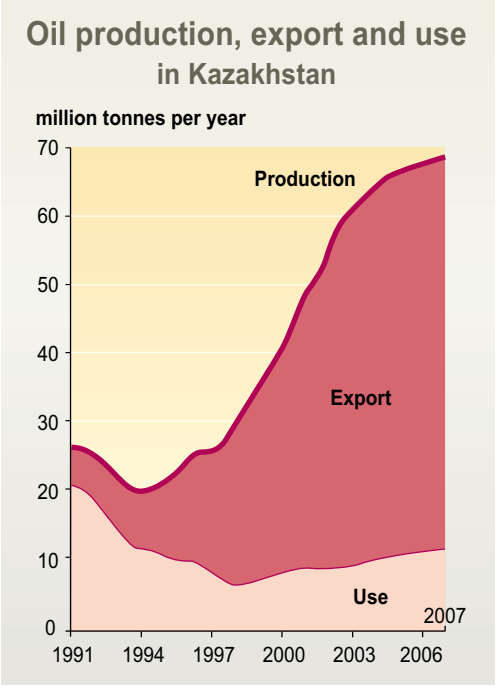
The 2001 Iran-Azerbaijan confrontation[25] is an illustration of the security risks related to the unresolved legal status of the Caspian Sea. However, since then there have been no other inter-state military confrontations although states have been strengthening their naval forces and border troops in the region. Certainly all the actors are well aware of the negative political and economic impact of military conflict in the region where even a limited confrontation between two or more coastal states would be enough to slow or halt offshore exploration and put investors to flight. Further significant investment in the energy sector will only occur if there is political stability and security in the region.

Changing livelihoods in the eastern Caspian region

Changing livelihoods in the eastern Caspian region

Natural capital, energy resources, and wealth distribution

The World Bank estimates that oil and gas-related financial flows in Kazakhstan could reach up to US$7 billion a year in two decades (World Bank, 2005). Turkmenistan has also benefited from high world prices for oil (reaching US$136 a barrel in June 2008), boosting its foreign currency reserves and cutting external debt. Turkmenistan also gained from the improvement in the terms of payment[26] for its natural gas exports to Russia and Ukraine, two key commercial partners for the country. Furthermore, the long-term agreements with Russia and China for natural gas exports will guarantee the influx of foreign exchange into Turkmenistan for the next three decades.



Source: BP Statistical Review 2008

Though oil-related revenue helps reduce cash constraints for the state budget, there are several risks associated with rising oil revenue.

The Kazakh government is aware of these challenges and a large share of oil revenue is allocated to the National Oil Fund of the Republic of Kazakhstan. The National Fund was established in 2001 with the main objectives of reducing the impact of volatile world prices and smoothing the distribution of oil-wealth over generations. The fund's capital comes from a share of government income from the oil sector, royalties, bonuses and revenues from Production Sharing Agreement (PSA). The fund is invested in foreign equities. By the end of 2007 the fund had accumulated over US$21 billion[27]. At the same time the oil and state-owned sectors of the economy still attract the largest investments in Kazakhstan, while agriculture, tourism and other sectors of the economy show signs of disinvestment[28]. Oil remains the main driving force and a strong factor in the vulnerability of the economy.

In Kazakhstan, as in most oil exporting countries, oil is produced in only a few regions of the country: five out of fourteen oblasts, with 21 oil-producing districts out of a total of 158 districts (not including cities). The Atyrau and Mangystau provinces play an important role in the country's economy: in 2006–7 two-thirds of Kazakhstan's crude oil[29] and a third of natural gas[30] were produced in the Caspian region. Their combined output accounted for 16.5% of Kazakhstan's Gross Domestic Product in 2006 (Agency of the Republic of Kazakhstan on statistics). Industry, mainly the oil and gas sector, contributes 70–90% of Gross Regional Product followed by transport[31] and services.

The "Dutch Disease"

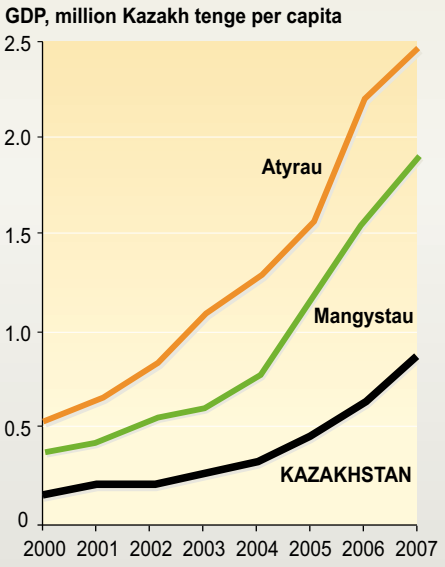
From an economic perspective, the World Bank considers that oil-rich countries are confronted with problems related to volatility issues, quality of government spending, inflexibility of government policies in an uncertain environment, and boom-bust economic cycles (World Bank, 2005: 9). However one of the key problems for oil producing countries is the "Dutch Disease", a situation that develops when the economy is overheated by an increase in oil-related revenue and the associated fiscal, monetary, and credit growth. This can lead to excessive appreciation of the local currency, exerting negative pressure on sectors such as farming and manufacturing.

Resources may also give rise to grievances if state institutions, responsible for managing them fairly, engage in private accumulation and even criminal dealings. The weakness and failure of political systems is a key factor in environmentally–related instability and violent conflict (Kahl, 2006). This problem is aggravated by the fact that governments often rely on natural resources rather than taxation for their sustained development and prosperity.

States dependent on natural resources often feel little need to respond to the demands of their citizens and consequently tend to use revenue generated by the extraction of natural resources to secure their own powerbase and the support of political allies (Karl, 2000). In this case links between the centres of political and economic power are very close. This situation has been qualified as the "resource curse" (Ross, 1999)[32]. An important factor worth considering is that the potential of natural resources to cause conflict varies according to their characteristics and distance from the political centre (Le Billon, 2001). Valuable minerals, for example, are much more likely to produce resource curses than agriculture because governments typically own such resources or otherwise control the bulk of their revenue streams (Karl, 1997; Ross, 1999, 2001). Likewise "honey pots" drive conflicts when valuable natural resources are concentrated in specific areas or otherwise easily seized and controlled; therefore, concentrated resources such as valuable minerals are more likely to produce conflict than diffuse resources such as cropland or freshwater. In this context it should be remembered that up to 80–90% of Kazakhstan and Turkmenistan's proven oil reserves are concentrated in the Caspian region.

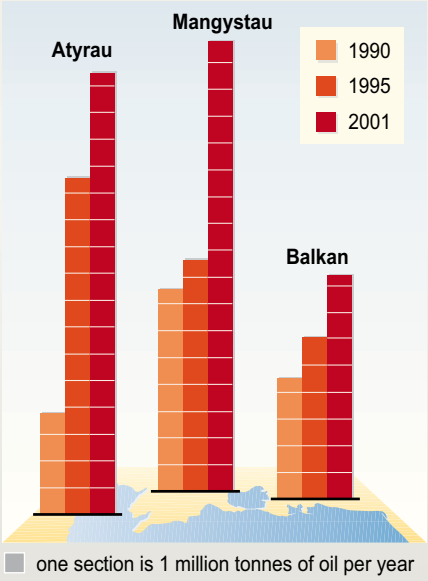
Societies and countries are not powerless when confronted with tension, instability and conflict. They have the capacity to deal with such problems. How resources are managed and revenue stemming from such resources redistributed influences the overall stability of a country. Institutions, particularly political bodies, can work to defuse conflict. Examples from countries such as Norway or the United Kingdom show that "Dutch Disease" or the "resource curse" are not an inevitable outcome for economies well endowed with natural resources. In a well-managed economy the extraction of mineral resources can have a strong, positive impact on the local economy even in peripheral regions that may face strong centrifugal forces from the national core region (Auty, 2006). Policies fostering broad-base, long-term human capital investments not only enhance the population's opportunities to find employment (and improve workforce productivity too) but also mitigate potential deterioration in income distribution that oil inflows may create. The main challenge for states is how best to manage wealth generated by the extraction of natural resources. Successful countries are the ones that invest heavily and well in broad-based human capital – not just in a narrow elite (World Bank, 2005).

Economic performance in Kazakhstan's selected provinces



Source: National statistical data of Kazakhtsan (www.stat.kz)

Crude oil production in Eastern Caspian provinces

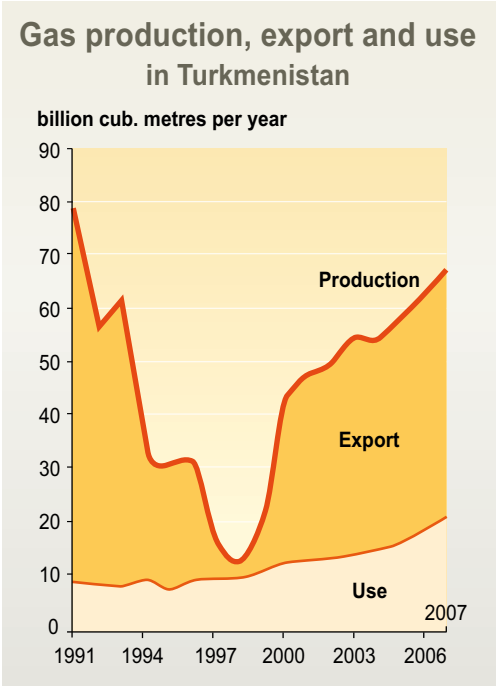


Source: National statistical reports of Kazakhstan and Turkmenistan

Since independence, the coastal provinces of Kazakhstan have enjoyed a boom in the energy sector with massive investment in local industry and infrastructure. The investments have mainly been made by major Western energy firms, which expanded their presence in the region in the early 1990s. Between 1993 and 1999 Kazakhstan attracted US$9.29 billion in Foreign Direct Investment (FDI), about 53% of which went to the oil and gas industry (Brill Olcott, 2002). FDI has continued to increase from US$1.8 billion in 1999 to US$4 billion in 2004. An estimated 80 to 90% of total FDI goes to the oil and natural gas sector.

Because of the booming oil and gas sector, GRP in Mangystau and Atyrau provinces has increased since 1991 respectively by a factor of two and four (Agency of the Republic of Kazakhstan on statistics, Ministry of Natural Resources and Environment Protection of the Republic of Kazakhstan 2001). The industrial sector employs 25–30% of the economically active population in each province.

Turkmenistan is facing similar challenges. Initially revenue from energy and cotton exports accumulated in the Foreign Exchange Reserve fund (FERF), an off-budget fund controlled by President Niyazov until his death. Spending from FERF is discretionary and is used to support major government infrastructure projects, some of which have been criticised for not being genuine de-



Source: BP Statistical Review 2008

velopment priorities. According to the Ministry of Foreign Affairs of Turkmenistan, in order to achieve more efficient use of state funds, the new President signed a decree on 4 February 2008 ordering the closure of the FERF. Although this measure may contribute to more transparent and efficient use of the state's financial resources, the country will still have to deal with the challenges represented by its dependency on revenue generated by the extraction of natural resources.

Turkmenistan's Balkan province displays similar trends to its Kazakh neighbours, Mangystau and Atyrau. The province has a marked industrial profile, the main drivers of the regional economy being fuel and energy, chemicals (almost 50% of GRP), construction (26%), transportation and communication (10%)[33]. Since 2000 the province's industrial output has doubled, largely due to the energy sector. The transportation sector is growing steadily. The port of Turkmenbashy is the largest terminal in Turkmenistan and an important stretch of the international corridor linking Europe to Central Asia via the Caucasus. The province contributes roughly 18–23% of the country's GDP but accounts for the largest share of added value in the production sector (33.7%). The Balkan province produces 95% of the country's oil and about 15% of its natural gas. It has consequently attracted almost 40% of FDI, at a national level, primarily directed towards the development of the fuel-and-energy industry.

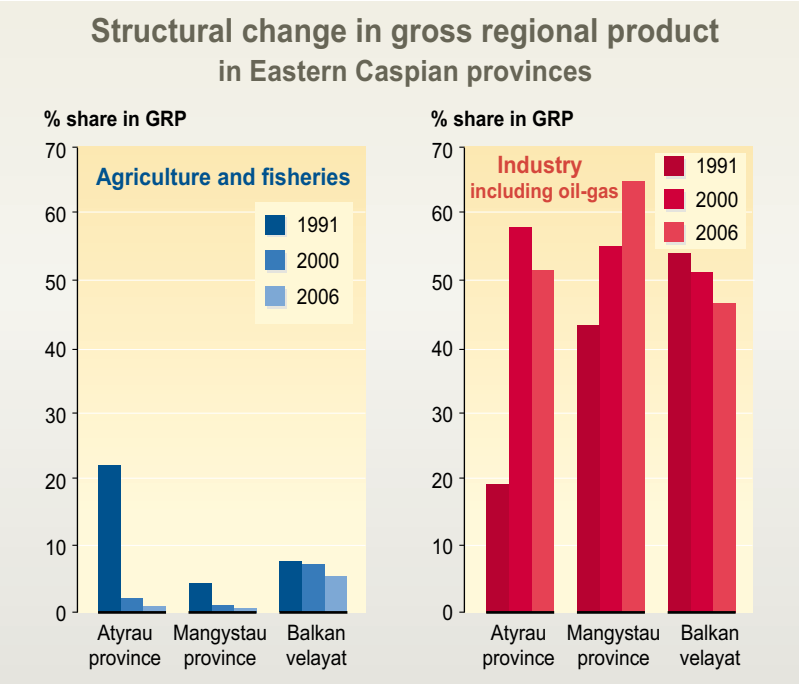
Changing livelihoods in the eastern Caspian region

New opportunities or a gloomy outlook?

The disintegration of the USSR in 1991 led to a systemic crisis in all the countries of Central Asia. In the Caspian region these changes affected all sectors of society and all provinces. Many activities and jobs that previously enjoyed central promotion and support, such as the uranium-mining complex in Aktau or the minerals extraction plant in Garabogaz, lost their importance. Former collective farms and fisheries in the Caspian region suffered various fates. Some were modernized, adapting in the main to the conditions of a market economy. Others underwent serious transitional shocks, leading to a general decrease in the importance of farming in the region.

In the eastern Caspian, development of the energy sector has changed the economic and social structure of the whole region. As we have seen above, all coastal provinces – particularly in Kazakhstan – enjoyed a boom in the energy sector and massive investment in local industry and infrastructure.

But alongside the booming energy sector, the share of agriculture in GRP in Atyrau and Mangystau provinces has steadily dropped. Experts report that a significant reduction in agricultural output, coupled with a threefold fall in farm-gate prices, led to a fivefold drop in agricultural added value. This cut living standards and increased poverty in rural areas (Chulanova, 2007: 17). Fifteen years ago the agricultural sector of the Atyrau province contributed 22% of GRP whereas it now accounts for less than 3%[34]. Cereal cultiva-



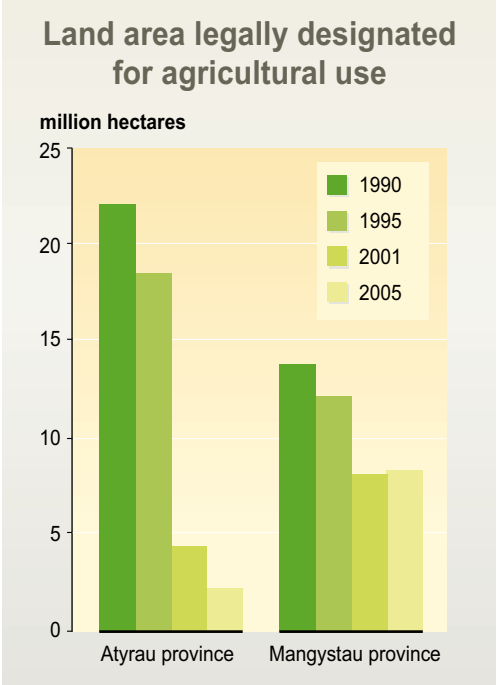
Source: National statistical data of Kazakhstan and Turkmenistan

tion decreased tenfold and cattle and meat production dropped substantially, though in 2000–7 the trend was once more upward. In Mangystau province, where the role of agriculture was much less important than in Atyrau, the contribution of the agricultural sector to GRP – essentially cattle breeding – dropped from 4% to less than 1%[35].

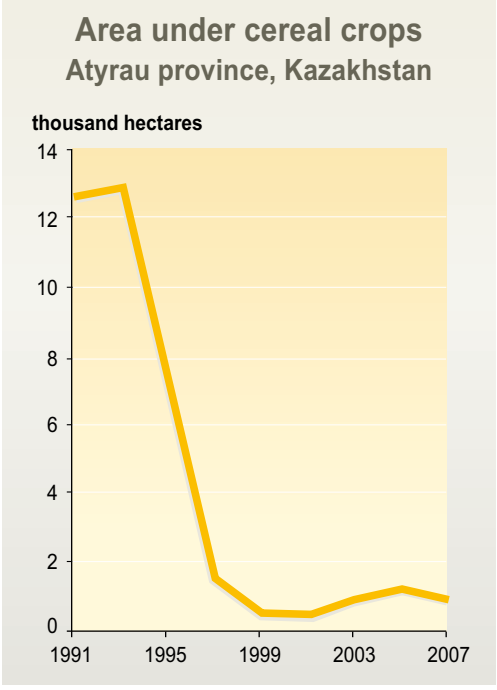
The amount of land under cultivation in Atyrau province fell from 80 000 ha in 1990 to around 2 000 ha in 2005–7, and in Mangystau from 1 500 ha to 50 ha (Agency of the Republic of Kazakhstan on statistics). The number of sheep and goats decreased two to threefold. Many areas of cropland and pasture especially in Atyrau were flooded due to a rise in the sea level. Other areas were significantly degraded by overgrazing or industrial development. As a result of these factors and changes in land use priorities, the area legally designated for agricultural use has substantially declined.

Over the same period fishery output from the Caspian Sea and the Volga-Ural deltas decreased by a factor of two to three. Fish catches in Atyrau fell from more than 20 000 tonnes in the early 1990s to 15 000 tonnes in the 2000s. In Mangystau catches plummeted from 9 000 tonnes to 500 tonnes (Agency of the Republic of Kazakhstan on statistics). Sturgeon catches dropped dramatically, by a factor of more than 20, despite increasing efforts to farm the fish. Illegal poaching of sturgeon and black caviar, the cash commodities for many rural coastal communities, has aggravated the productivity losses of the Caspian's biological resources (Akhmetov 2006; CEP 2002). The world food crisis may amplify the potentially fragile situation in the eastern Caspian region with declining agricultural and fish production or may be also an opportunity for reversing the local trends.

The trends described so far underline the regional economy's increasing dependence on the energy sector and the impact of hu-



Sources: National statistical data of Kazakhtsan (www.stat.kz)
Kazakhstan's Food and Agricultural Programme 2003-2005



Source: National statistical data of Kazakhtsan (www.stat.kz)

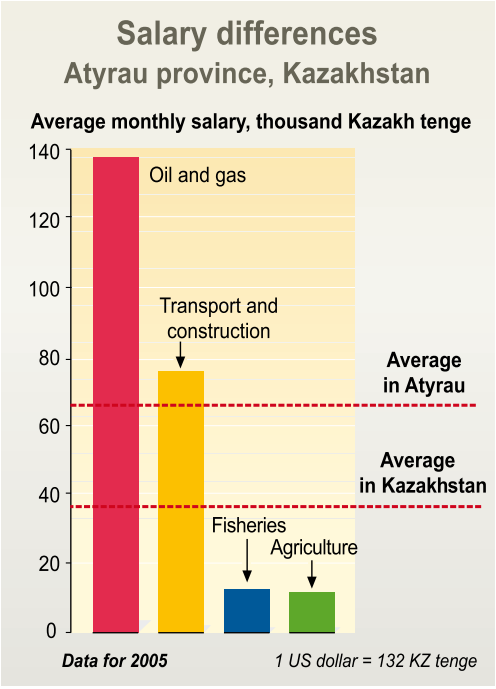
man pressures and environmental change on economic sectors and livelihoods that depend on the ecosystem. There are however several sides to the picture.

One clearly identified trend relates to the increasing differences between urban centres on the coast and areas in the rural hinterland. Urban centres, especially the Kazakh provincial capitals Atyrau and Aktau, have become strategic nodes for services to the energy sector (financial services, transportation, housing, etc.), attracting population from rural areas, other parts of the country and other states. The energy sector needs a qualified workforce, often drawn from abroad by the high wages paid in the region. The presence of large numbers of foreign workers may cause social tension[36].

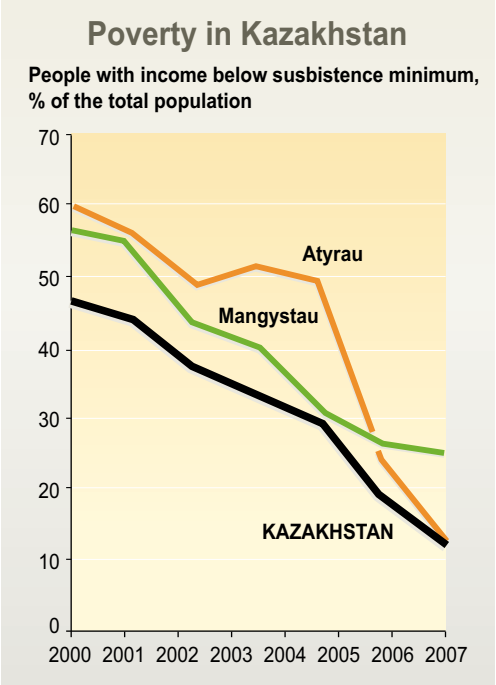
More than half the region's population is currently living in urban centres on the coast near the oilfields and other mineral deposits. This concentration of population also increases demand for resources such as energy, water and food.

Massive investment in urban centres and infrastructure is widening the gap between rural and urban areas. Despite the fact that rural communities may also benefit from an range of social investments financed by the energy companies – such as the construction of schools and gas mains, road repairs, etc. – many rural communities remain marginalized and impoverished.

At the same time the rapid development of urban centres often lacks consistent planning, leading to major differences within the centres themselves between areas served by recent municipal infrastructure, and those that lack such services or depend on decaying infrastructure.



Source: National statistical data of Kazakhtsan (www.stat.kz)



Source: National statistical data of Kazakhtsan (www.stat.kz)

Another factor relevant to the impact of the energy sector's development in Kazakhstan is the overall increase in per capita income in Atyrau and Mangystau (twice as high as the average for Kazakhstan). Average wages rose to the top of the scale in Kazakhstan (Agency of the Republic of Kazakhstan). On the other hand the rise in salaries can hide the persistence of substantial wage differences – sometime exceeding a factor of 18[37] – between the oil-and-gas sector and other sectors, especially farming. The Gini Coefficient is an indicator measuring inequalities in income distribution. For Atyrau and Mangystau in 2002 it showed values 0.43 and 0.36 respectively, compared to Kazakhstan's average 0.33 (Pomfret 2006; World Bank 2004).

Although in 2006–7 inequality and poverty levels decreased all over Kazakhstan compared with 2001–2, they nevertheless remained high in Atyrau and Mangystau despite these provinces' high levels of per capita GRP. Between 2001 and 2006 the percentage of the population living below the subsistence minimum in Mangystau fell from 60% to 26%, and in Atyrau from 56% to 24%[38] (Agency of the Republic of Kazakhstan on statistics).

The widening gap between urban and rural areas is also apparent in income and poverty levels. Although poverty rates in Mangistau and Atyrau provinces are generally among the highest nationwide, there is cause for even greater concern regarding rural poverty. In Atyrau it has come close to 44% at certain times, while in Mangystau it culminated at 85% of the rural population (the highest level in the country) compared with a national average of 35% for the rural population[39]. Despite the importance of oil production in Mangystau, almost 40% of its total population is poor, which is higher than a poverty

headcount in Kazakhstan's Jambyl province, which has the lowest regional product per capita (Pomfret 2006; ILO 2004). At the same time, in Mangystau in 2003, three out of five people were poor in rural areas, compared with only one in five in urban areas (Chulanova, 2007: 18). The differences in income distribution between urban and rural areas have significantly increased since independence[40] although the underprivileged can obtain some social assistance and partly compensate the differences in revenues.

A recent survey of the coastal regions of Kazakhstan (CEP 2004 c; CEP 2004 d; CEP 2006 b; UNDP 2007) showed that the rural population's main problems were unemployment and low salaries, lack of entertainment and more generally opportunities for children and young people, and environmental impacting on the quality of life in these regions. The sharp decline in the importance of agriculture and fishing, which face a gloomy future, are key factors underpinning the deterioration of the economic situation in rural areas.

Turkmenistan's Balkan province displays similar trends to its Kazakh neighbours. While the energy sector is growing in importance, agriculture accounts for about 7% of GRP. The province's arid pastures are an important feeding ground for about 15% of country's sheep and goats and for one third of its camel stock (Turkmenmilliihasabat; CEP 2006 a). Fisheries have generally declined in importance since the 1980–90s, yet they remain an important source of income for fishing communities and state enterprises, with an annual catch totalling 15–20 000 tonnes of fish in the Caspian (Berkeliev 2006).

The Balkan province shows signs of developing into an increasingly specialized economy dependent on the fuel-and-energy sector. Employment options in other sectors are limited, a situation worsened by the fact that many industries on which various small towns such as Garabogaz or Khazar depended have gone into decline due to low profitability. Furthermore the low incomes from traditional activities such as grazing or fisheries, combined with a rise in living standards, make these sectors less attractive and may even lead to the gradual destruction of the way of life in Turkmenistan's fishing and pastoral communities. There are also recent plans to boost coastal tourism development on the Caspian Sea[41], particularly in the Turkmen sector. Recently the President of Turkmenistan, Mr. Berdymuhamedov, pointed out that the "Caspian seashore is a unique, ecological zone well-known by its favourable climate and the richest potential that opens wide perspectives to convert it to the true recreational pearl"[42]. According to recent studies (CEP 2007), the north-eastern and eastern shores of the Caspian Sea have low levels of pollution, except for hydrocarbons which sometimes exceed permissible concentrations in industrial areas and sea ports. Compared with other larger parts of the Caspian Sea – of Iran, Azerbaijan or Russia – the eastern Caspian is considered less polluted. There are two main factors contributing to this: fewer rivers – the vector for most of the pollution – draining into the sea, and fewer sources of land or sea-based pollution, combined with low population density. Although there is still some uncertainty regarding the realization of these plans, in some cases such as Avaza, in Turkmenistan and Aktau-city in Kazakhstan official local tourism and general development plans have been approved.

At the same time the Turkmenistan government's policies of state support and subsidies for the public sector – mostly financed by oil and gas revenue – has largely maintained

living standards. An analysis (UNICEF 2004) of living standards in Turkmenistan in 1998-2003 revealed two main positive trends: constant growth in income in all regions; levelling of income disparities between regions[43] and household income groups. Thanks to government policies regulating the size of monetary and in-kind labour remuneration, the income of an average household increased during the relevant period. However major differences still exist between urban and rural living standards (Library of Congress - Federal Research Division 2007).

The preceding paragraphs have outlined some of the challenges associated with the management of wealth derived from extracting natural resources. Revenue from natural resources usually starts by benefiting a country at the national level. Local authorities are often unable to raise and use funds to develop infrastructure and provide services in line with a realistic local economic development scenario. Developing the energy sector may therefore lead in the long-run to unbalanced growth of the local economy, accentuating the risk that local and regional communities will have to pay a high social and environmental cost for extraction activities with little compensation. Many of the environment costs that local communities in extraction regions face are caused by the pollution related with the production and transportation of extracted resources.

Salt production in Garabogaz, Turkmenistan

The towns of Khazar (formerly Cheleken) and Garabogaz (formerly Bekdash) on Turkmenistan's Caspian shore were established in the early 20th century mainly to support extraction of minerals from surface salt deposits (sodium sulphate, bischofite, Glauber's salt) and underground iodine and bromine brines. The population of these towns consisted predominantly of workers of the enterprises and members of their families. Their mineral production was exported to the Soviet republics, while centralized supplies handled imports of food, water and goods to sustain their operations. With independence, the situation in these industrial towns became critical. Over and above the consequences of the adverse environmental impacts accumulated during the period of active mineral extraction, the region lost its centralized support.

The town of Garabogaz is a typical example of this situation. Founded in the 1930s between the Caspian Sea and the gulf of Kara Bogaz Gol, the town depended on Karabagazsulfat, an organisation specialising in the extraction of mineral salts (mostly Na_2SO_4) available in the gulf. The geographic and climatic conditions here are harsh, with almost no natural sources of freshwater, and a hot, arid climate. An industrial plant was established in 1975, but mineral extraction started in 1929 relying exclusively on human labour and natural methods. The break-up of the USSR substantially reduced the town's supply of food, water and other essential goods. Garabogaz now has a population of about 6 000 people (1 000 less than in 1991), 800 of whom work in the salt industry. Currently the sodium sulphite is mainly exported to Iran, however there are also buyers in Central Asia and other countries in the post-Soviet space. The sharp drop in wages and employment made many local inhabitants seek alternative sources of income in commercial activities and fishery. The current situation in Garabogaz is emblematic of the risks associated with excessive specialization and dependence on exporting raw materials.

Environmental degradation and security

Industrial activity, pollution, extraction of valuable raw materials and natural resources (oil, gas, uranium, but also commercial fish stocks such as sturgeon) can cause environmental degradation and in their most severe forms loss of livelihood (as with the collapse of fisheries or the flooding of cropland). The exploitation of essential natural mineral resources, available in large quantities, attracts considerable economic and political interest. But in such situations environmental protection may often be a low priority. Furthermore extreme natural events and global changes exacerbate anthropogenic activity. Subsequently climate change, natural hazards, migration of alien species and epidemics stress the ecosystem, with the risk of damaging ecological security and the living environment.

Environmental degradation and security

Environmental consequences of oil and gas development

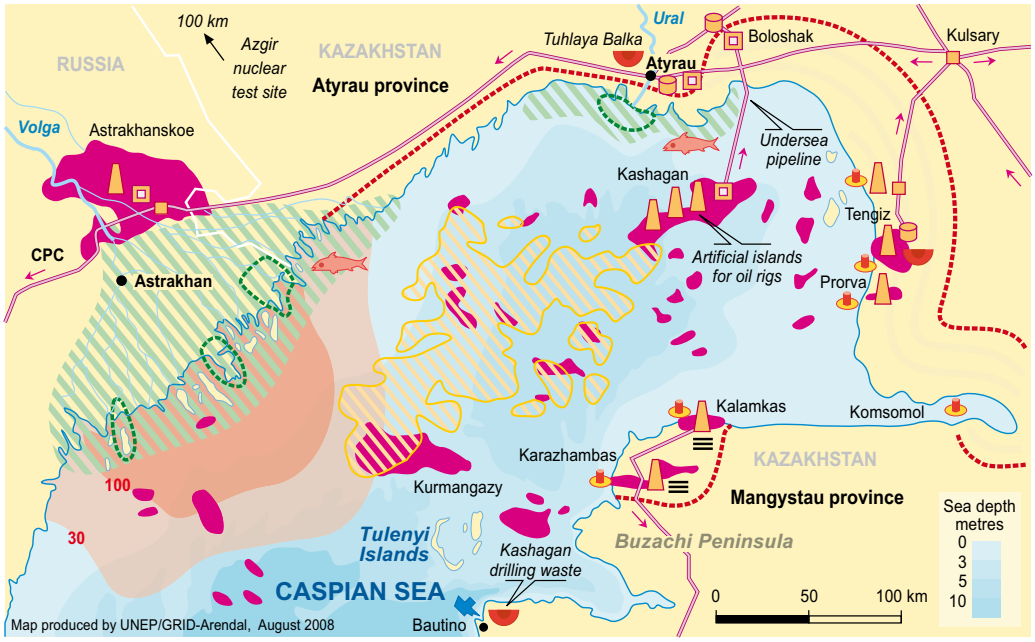
Of all the economic activities in the eastern Caspian region, oil and gas exploration and extraction are probably causing the greatest concern among the local population and authorities regarding the current and future environmental situation and potential risks. The problems related to poor environmental practice in the past, as well as several mass fish and seal die-offs in recent years, have been on the agenda of governments, experts, mass media and public organisations addressing the energy sector's present and future.

Lack of knowledge about the actual state of marine ecosystems and their vulnerability to pollution, coupled with inadequate environmental monitoring, also fuel concern and uncertainty for the future.

During the Soviet period, oil and gas development in the region was often conducted using environmentally unsound practices and outdated technologies. Many cases of pollution of sea water, air and soil in the Caspian region have been reported. An area covering as much as half a million hectares is now affected by desertification, soil compaction and pollution due to oil extraction and transportation activities (CEP 2006 b). Severe land degradation, caused by lakes of oil waste and spills, affect up to 5 000 hectares in Atyrau and Mangystau provinces (CEP 2006 b; NESSD 2006; Akhmetov 2006; Ministry of Environment Protection of the Republic of Kazakhstan 2007). Information about land pollution in Turkmenistan is limited, but according to data collected during field missions, severe land degradation may affect as much as 1 000 ha.

After independence the region saw a drop in pollution levels, partly due to declining economic activity and partly due to the introduction of better environmental practice and cleaner technology. However increasing oil prospecting and production, on land and sea, the expanding pipeline networks

Environmental issues in the northen Caspian Sea



Important biodiversity:
- Wetlands and river deltas
- Existing and planned protected areas
- Caspian seal habitats (in 2005)
- Sturgeon spawning grounds

Energy production and distribution:
- Oil and gas fields
- Major energy producing areas
- Processing plants and stations
- Oil tanks
- Oil and gas pipelines

Environmental concerns:
- Hydrocarbons pollution (mg/l)
- Abandoned and flooded oil wells
- Major waste sites
- Historical pollution due to oil spills
- Ship wrecks
- Flood risk zone

Sources: ENVSEC East Caspian assessment (field mission to Aktau, April 2006); environmental reports of Atyrau and Mangystau for 2005-2007; compilation of EIA reports

and the high expectations placed on revenue from hydrocarbon extraction have prompted renewed environmental concern.

Annually thousands of tonnes of petroleum hydrocarbons are discharged into the Caspian Sea by the Volga river alone from land-based sources (CEP 2007). Overall, rivers draining into the Caspian Sea carry more than 50% of total oil pollution. Further exploration of coastal and offshore fields may increase pollution. High concentrations of phenols and oil by-products, which may damage biodiversity, are already being observed in the northern part of the Caspian, mainly at the mouth of the Volga. The fall in fish stocks and the decline in the region's aesthetic appeal and water quality, along with other negative factors, may wreck its prospects for further development, especially in fishery and tourism.

The northern Caspian Sea, which is the main habitat for sturgeon, seal and waterfowl, once enjoyed the status of a protected area. However the situation changed in 1993 when a Kazakh government decision[44] allowed the geological exploration and development of oil deposits in the area (especially Tengiz).

Given the rich biological diversity and vulnerability of the shallow northern Caspian in the event of an accident, the environmental impact of oil pollution in this area could

Oilfields of the northern Caspian – Kashagan and Tengiz, Kazakhstan

The giant Kashagan offshore field was discovered in July 2000, 80 km south of Atyrau. It is the largest Caspian offshore field and one of the largest fields discovered anywhere in the world in the last 30 years. Named after a prominent, 19th century Kazakh poet, it covers an area 75 by 45 km. The Kashagan field was formed 350 million years ago in shallow warm sea conditions, lying below salt fields at a depth of 4–4 500 metres. The oilfield is estimated to contain reserves of about 38 billion barrels, 9 to 13 billion of which can be extracted using the gas re-injection method. Analysts hope that Kashagan will prove to be one of the world's largest offshore fields and also provide a reliable indicator of the Caspian's potential oil supply (German, 2008). Its oil is characterized by very high pressure (800 bars), temperature (125°C), hydrogen sulphide content (15–20%), and the presence of naturally occurring toxic substances (mercaptanes). This creates major logistical difficulties and could turn even a small emergency into a large environmental disaster. For example, in 2000 and 2001, minor emergencies during exploratory drilling reportedly led to the discharge of pollutants into the sea. In August 2007 the Ministry of Environmental Protection of Kazakhstan stopped exploration of the Kashagan oilfield due to alleged violations of environmental legislation. On 14 January 2008 a new Memorandum of Understanding was signed between the companies in the Kashagan consortium, increasing the share of Kazmunaigaz, Kazakhstan's national oil company from 8.3% to 16.8%[45], a situation that led some to conclude that the hold-up was partly due to delays in production, frustrating all project partners, but also due to an interest in revising the PSA agreement.

The estimated cost of developing the Kashagan field is likely to rise from US$50 to more than US$136 billion, with the start of operations now delayed from 2008 to 2013. Oil and gas production at the Kashagan field will be based on several artificial islands, being built at present. An underwater pipeline will transport hydrocarbons to the Boloshak oil and gas terminal 30 km from Atyrau. It is estimated the oilfield will operate for 30–40 years. If all goes according to plan Kashagan oil output should increase from an initial 75 000 barrels a day to 1.2 million barrels a day (more than 55 million tonnes a year) at the peak of production in 2015–2045. For the sake of comparison, in 2006, total oil production in Kazakhstan amounted to 1.43 million barrels a day, with 0.22 million barrels daily consumption (BP, 2007). Overall, in the coming decades, offshore energy production in the Kazakh sector of the Caspian Sea could jump from almost zero to more than 88 million tonnes of oil and 80 bcm of gas a year (Atyrau Oil and Gas, 2007). Bautino Base, located in the Mangystau province 265 km south of the Kashagan field, is the main maritime-support base and oil-waste recycling centre.

Tengiz, another giant oilfield (size 19 x 21 km) was discovered in 1979, however large-scale exploitation only started in 1993 due to technology problems similar to those encountered at Kashagan. The Tengiz field is expected to contain about 3 billion tonnes of oil and will be exploited over the next two decades. In 2006 oil output from the Tengiz field amounted 291 000 barrels a day. By 2008–10 the volume of oil production is slated to double. A new processing plant is planned to come online by then.

One of the main problems encountered on Tengiz is that sulphur accumulates during oil and gas extraction at the rate of more than 5 000 tonnes a day. Yet the total storage ca-

pacity currently is 9 million tonnes (Ministry of Environment Protection of the Republic of Kazakhstan 2007). This means that with lower demand for sulphur and fewer exports the heap of sulphur stored in the open air may continue to increase, prompting concerns among local authorities and in the community. The Kazakh environmental authorities have recently imposed a US$309 million fine on TengizChevroil (TCO) – the field operator and a Chevron-led venture – for breaches of environmental regulations – including stockpiling sulphur[46].

In 2006 local authorities and TCO carried out an assessment of environmental and health effects of storing sulphur in the open air at Tengiz. The Kazakh Institute of Oil and Gas admitted that increased sulphur accumulation and storage could raise environmental pressures, and risks to the public and occupational health[47]. With the introduction of stricter environmental targets, modernization of production methods and facilities gas flaring on the Tengiz field was reduced from 1 800 million cubic metres in 1999 to 420 million cubic metres in 2006 (TCO Environmental Bulletin 2006). Further cuts in this type of pollution are planned after 2008, when a new plant will start producing granulated and block sulphur using the deposits stored on the Tengiz oilfield. Finally the new ecological legislation (Environmental Code of Kazakhstan 2007), coupled with stricter enforcement, will also contribute to improving the situation in the region.

On the other hand changes at Kashagan and Tengiz indicate that the Kazakh authorities – perhaps following the Russian example on the Sakhalin-2 oilfields in Siberia – seem to be stepping up pressure on energy multinationals operating in the Caspian region.

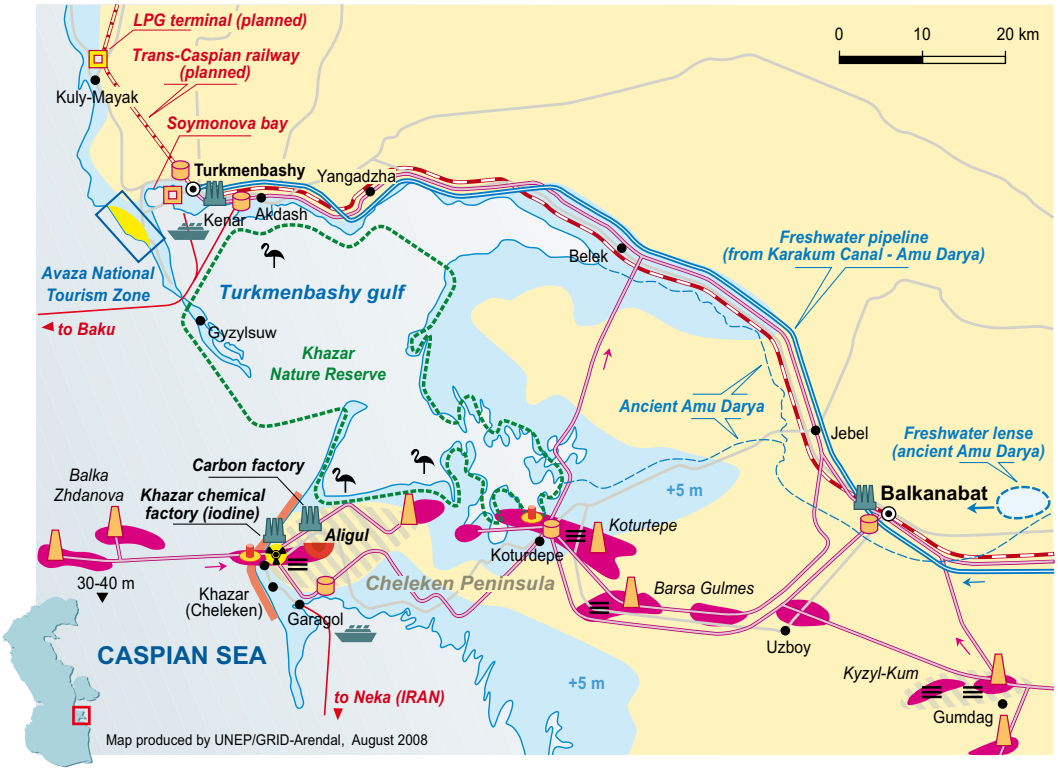
be far greater than in other parts of the sea (Ministry of Environment Protection of the Republic of Kazakhstan 2007).

Some environmental experts suggest that damage caused by oil pollution could – in the long term – exceed short-term profits generated by oil development (Nogaev 2007; Diarov 2007). Experts point out that once the region's energy resources are exhausted, it will have to cope with the results of several decades of oil and gas extraction (polluted environment, depleted biodiversity, etc.) without the financial resources to remedy the damage wrought by industry. Long-term damage and impacts could consequently far exceed current short-term benefits[48].

Several Caspian oil deposits contain naturally occurring radioactive elements. Long-term exploitation of these deposits, especially in Mangystau province, has caused the formation of 10–15 000 tonnes of low-level radioactive oil waste and scrap metal, which is being temporarily stored on-site (Ministry of Environment Protection of the Republic of Kazakhstan 2007). These radiation sources represent an additional threat to environmental security.

There is a serious risk of industrial pollution in the northern Caspian. An accident already occurred in 1985, when Tengiz well #37 shot a column of flame 150–200 metres into the air. It took more than a year to put out, burning 3.5 million tonnes of oil and half a million tonnes of hydrogen sulphide. This accident significantly impacted biodiversity and public health within a 50–100 km radius (Akhmetov 2006; Ministry of Environment Protection of the Republic of Kazakhstan 2007). In the Beyneu and Karakiyan districts industrial development has so severely damaged pasture that the population has started to move grazing cattle to neighbouring areas.

Environmental issues around the Cheleken peninsula, Turkmenistan



Important biodiversity:
- Protected areas
- Habitats of endangered species

Industrial infrastructure:
- Industries
- Tanker terminals and ports

Energy production and distribution:
- Oil and gas fields
- Major energy producing areas
- Processing plants and stations
- Oil tanks
- Oil and gas pipelines

Environmental concerns:
- Radioactive waste
- Waste sites
- Abandoned and flooded oil wells
- Historical pollution due to oil spills
- Soil degradation and scrap metal
- Flood risk zone (+5 m sea level raise)

Source: ENVSEC East Caspian assessment (field missions to Turkmenbashy-Cheleken, April 2006 and March 2008)

Similarly in Turkmenistan oil production around the Cheleken peninsula, and oil and gas transportation by tankers and pipelines have affected biodiversity and the local ecosystem. The Cheleken peninsula is also home to specialized chemical enterprises. The concentration of oil and chemical industries calls for particular attention to the environment and safety. In addition to posing a risk of increased water and air pollution these industrial activities may suffer adverse effects due to the rising sea level.

In Cheleken, Turkmenistan, offshore oil production is concentrated on dozens of sea platforms producing 350 000 tonnes of oil a year. So far, six cases of oil fountain ignition accidents and numerous seepages of an oil and water mixture have been registered, especially during exploration in the 1970s and 1980s.

Before the intense oil development around Cheleken now culminating in annual oil output of 2 million tonnes, salty hollows onshore (*takyrs*) served as natural reservoirs. They could store and supply water for some 10 000 people, as well as farm animals (camels, goats and sheep) and migratory birds. When oil production started, many

such hollows were used as waste ponds for evaporating associated water, filling up with oil residues, surface-active agents and heavy metals. These water sources are consequently no longer usable and the population must rely on mains water, tanker deliveries or supplies from desalinization plants.

The Turkmenbashy refinery and marine terminal, with annual capacity of 10 million tonnes, were significant sources of oil pollution from the 1940s to 1980s due to their primitive treatment systems and poor environmental practices. Large amounts of waste oil and polluted water were discharged into Saymonov Bay, which now contains more than 16 million cubic metres of a mixture of hydrocarbons, chlorine-organic compounds, heavy metals and phenols (Barsuk 2007). Evidence of previously severe oil pollution remains in the form of "asphalted paths" along the beaches in Turkmenbashy Gulf. Reconstruction of the refinery and improvements to oil extraction practice have reduced oil pollution of the bay and the waters of the Caspian, but it still exceeds permissible limits due to inefficient wastewater treatment and the legacy of previous pollution. The nearby area serves as a local tourist attraction due to ease of access and proximity to the city[49]. In other parts of the Caspian, also potentially attractive for tourism, oil contamination affects areas near terminals.

The growing cargo traffic in the Caspian region, especially transportation of oil by sea, is also increasing environmental risks. Accidents or discharge of contaminated ballast waters can harm the marine environment, and require constant monitoring by the authorities and interstate bodies[50].

Not only active oil extraction, but also abandoned wells represent a risk for livelihoods in the region. Experts estimate that leakage from abandoned and flooded oil wells and other seepage significantly contribute to overall oil pollution in the Caspian (CEP 2002). Fluctuating sea levels and wave surges have flooded oil wells, particularly in the flat coastal areas of Mangystau province, Kazakhstan, causing oil spills as recently as the winters of 2001 and 2003. The Kazakh authorities reacted to this threat by identifying the largest abandoned oil wells, which exceed 150 in number with more than half located in the flooded zone. However the shortage of funds hinders progress and only about 30 priority wells were secured in 2004–6. In Turkmenistan oilfields situated near the shore of the Caspian Sea have been partly flooded, for example in the northern Cheleken peninsula and at Kenar which serves as a transfer base for oil delivered to the Turkmenbashy sea port and refinery.

In large-scale onshore oil extraction, the use of outdated technologies in the past had a significant environmental impact, with a corresponding effect on livelihoods. This is particularly apparent at Uzen and Senek in Kazakhstan.

In spite of clean-up efforts at Uzen and other oil-polluted sites in Kazakhstan, with more than 180 000 tonnes of waste oil extracted and recycled in 2001–7, the extent of historical pollution is decreasing slowly. A similar situation prevails in Turkmenistan especially at Gum Dag and other locations. Oil leakages and accidents continue to pose a threat to the environment (CEP 2007e).

Lack of research makes it difficult to establish clear links between these sources of pollution and health problems. Nevertheless the deterioration in public health, and particularly the increased incidence of respiratory diseases and cancer can be partly attributed to the impacts of air pollution. In 2005 there were three times more respiratory diseases among teenagers in Atyrau province than in 2001. Health authorities also reported a threefold increase in neuropathy problems (Granovsky 2003; Akhmetov 2006).

There has been additional public concern since large petrochemical plants and a technology park started operations near Atyrau,

with fears the local air quality may deteriorate, which in turn would have a negative effect on public health[51].

An additional source of concern is the dismantling and disposal of shipwrecks in Bautino Bay, where the remains of more than 50 sunken and stranded vessels are located. Though many of the ships have already been broken up and removed, the remaining wrecks not only pose a danger to passing boats but may also contribute to sea pollution.

Realizing the necessity to protect the ecosystem of the Caspian Sea and its biodiversity while developing the oilfields in the region, the governments and local authorities of both Kazakhstan and Turkmenistan have prioritized issues related to ecology and safety. In particular Kazakhstan has banned gas flaring (natural gas combustion) and dumping of waste into the sea. In both countries environmental standards and accident-prevention rules have been brought in line with international standards. Additionally several measures designed to improve the response in the event of oil spills have been adopted, including the creation of a maritime emergency unit. National Action Plans for Oil Spillage Prevention and Response have been developed for the sea and inland waters. Finally, within the Framework Convention on the Protection of the Marine Environment of the Caspian Sea (the Tehran Convention) several protocols in priority areas have been drafted and submitted to the littoral states for review and ratification[52].

Oil extraction and water use in Uzen, Kazakhstan

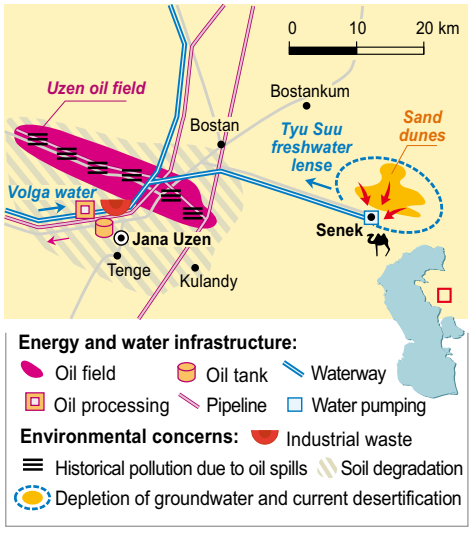
The Uzen oilfield was discovered in 1959 and development began in 1964. The oilfield is 35 km long from east to west and 8 km wide from north to south. It is the largest in size in the eastern Caspian region. In 1975 production culminated at 330 000 barrels of oil a day. Since 1990 there has been a sharp decline in overall output (down to 50–60 000 barrels a day in the mid-1990s) mostly due to obsolete technology and the degraded state of production facilities. In 2005, after the introduction of improved technology and increased water-pumping to maintain pressure, production rose to 132 000 barrels a day. In all 4 500 wells are now operating on the field. By 2006 about 300 million tonnes of oil had been extracted at Uzen since the start of operations.

Increasing oil production gave rise to severe environmental problems. An aerial survey conducted in 1989 showed that an estimated 10 000 ha of land in Uzen were polluted by oil spills; of these 3 600 ha were considered severely polluted. Spillage around the wellheads or pipeline failures had contaminated about 3 million tonnes of soil. Two large oil-waste pits originated as emergency oil retention ponds in the early 1970s. Overall almost no attention has been paid to protecting the environment from oil exploitation over the last 30 years. As a result nearly 30 000 ha of land have been damaged by mechanical compaction, spills and erosion. According to the local authorities and EBRD, the cost of improving environmental protection, mitigating damage and rehabilitating land at Uzen is estimated at US$100 million.

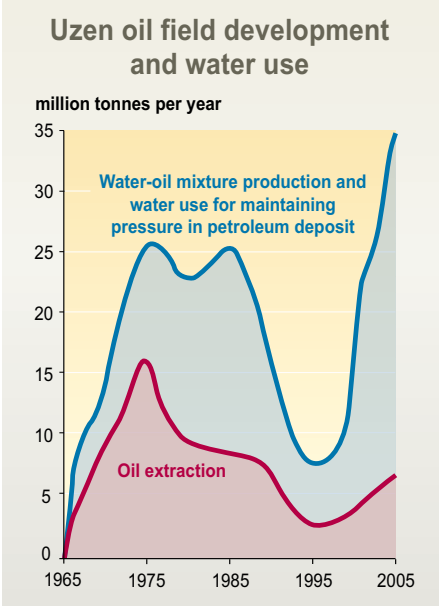
The town of Jana Uzen (70 000 people) and the oil-extracting enterprise Uzen use a lot of water. The bulk of water is supplied by a water pipeline from the Volga river and from the Caspian Sea. However a smaller part of the water is pumped from nearby natural groundwater reserves. Since 1971 intense exploitation of the Tyu Suu fresh groundwater lenses has lowered the water table, affecting vegetation and creating large sand dunes. These moved towards the village of Senek, Mangystau Province's largest farm, partly burying the north-western edge of the village. Scientists have warned that similar expansion of deserts near the Ushtagan

Local authorities have also received increased financial means that should allow them to respond more effectively to environmental degradation. For example in 2005 the local budgets of Atyrau and Mangystau received US$30 million (3.65 billion KZT) and US$7 million (0.76 billion KZT) respectively in compensation for environmental damage[53]. However, questions remain on how effectively local environmental funds are spent since only 10–20% of all the funds were allocated to environmental remediation, monitoring and/or preventive activities. In the same year environmental expenditure by industry amounted to 29.4 billion KZT and 13.1 billion KZT in Atyrau and Mangystau respectively (NESSD 2006). At the same time expenditures on project activities under the Caspian Environmental Programme amounted to almost US$30 million by 2007.

Despite the fact that these and other measures should help minimize pollution risks and remediate the consequences in the case of historical pollution, there are still areas in which international experience may be of use to states in the Caspian Sea region. These areas include the assessment and mapping of ecologically sensitive areas on the sea and in coastal zones, continuous monitoring of oil pollution, transfer of experience and best practice in the remediation of historical land-based oil pollution and development of action plans to reduce contamination of transboundary waters, such as the Ural river or Turkmenbashy gulf.



Source: ENVSEC East Caspian assessment (field mission to Aktau, April 2006)
Map produced by UNEP/GRID-Arendal, August 2008



Source: Uzenmunaygaz

and Tishukuduk villages will occur unless adequate action is taken. Kazakhstan's Institute of Geography, funded by the Mangystau local authorities, is implementing a pilot project to stabilize the sand dune at Senek (NESSD 2006; Akianova 2006; ENVSEC 2006a).

Environmental degradation and security

Legacy of the military-industrial complex

Military test ranges and nuclear sites in the northern Caspian Sea region

Nuclear power station, uranium mine and radioactive waste
Atmospheric nuclear explosions (military)
Underground nuclear explosions (peaceful and military)
Military test ranges and missile drop zones
Landing areas of rocket's detachable parts; soil pollution

Map produced by UNEP/GRID-Arendal, August 2008

Another dimension of Environment and Security analysis is the impact of military activities on a specific area. The anxiety about security fuelled by the Cold War also had significant environmental consequences for Soviet Central Asia. The construction and operation of military-industrial facilities and weapons testing sites caused the arms race's greatest environmental impact. In the region this was particularly apparent in Kazakhstan, where the vast steppes lent themselves to the creation of large-scale military testing ranges stretching for hundreds of kilometres, now often polluted with rocket fuel and radioactivity making agricultural use of the land either difficult or impossible. The Soviet nuclear industry also flourished in the region until the early 1990s, for example at the formerly "secret" town of Aktau where it created a large uranium-tailing dump and onshore nuclear station. Major military sites in Kazakhstan included the nuclear and weapon test sites of Azgir, Kapustin Yar, Taysogan, Ashuluk and Say-Utes, as well as the uranium-mining industry in Aktau.

Activities in the military ranges in the north-east Caspian region had numerous impacts on the environment, the health of the local civilian population and their livelihoods. Most of all these activities reduced scope

Military-industrial facilities in the eastern Caspian region

The Azgir range (also known as Galit) is located in the Kurmangazy district, Atyrau province, near the border with Russia. Between 1966 and 1979, 17 underground nuclear tests were carried out in salt domes at depths between 160 and 1 500 metres in ten wells with an explosive power ranging from 1 to 100 kilotonnes (Krivohatsky et al 1999; Swedish Defence Research Agency 2004; UNDP 2004 a). These so-called peaceful nuclear explosions were carried out with the stated purpose of creating underground cavities for large-scale oil and gas storage. The wells where nuclear explosives were used were usually sealed. In two tests, however, radioactive gases escaped into the atmosphere and affected personnel. In 1989–94 the radioactive defence forces from *Arzamas-16*, the specialized Russian military station, arranged a major clean-up of the territory. Kazakh scientists have monitored the nuclear test area since then, and doctors have carried out a medical examination of the local population. Estimates of the environmental and radiological impacts of the site vary depending on the source of information and range from a "normal situation" to a "situation of concern" (Office of Public Prosecutor in Atyrau 2002; CEP 2006 b; NTI 2007).

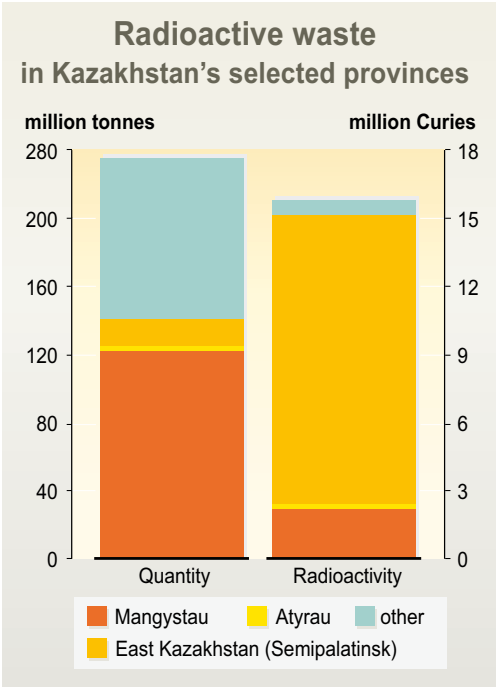
Another military range and rocket launch site, the Kapustin Yar (area within Kazakhstan is approximately 1.5 million ha), on Russia's border with Atyrau and West Kazakhstan provinces, has operated since 1947. Between 1957 and 1962, 11 nuclear explosions in the atmosphere at heights from 5 to 300 km were conducted; 24 000 guided missiles were tested and 600 RSD-10 "Pioneer" medium-range missiles destroyed in 1988–1991 under the USSR-USA disarmament agreement. The site is also being used for launching various space rockets. The total fallout of toxic substances from rocket launches and missile elimination is estimated at several thousand tonnes, while the landing area of rockets' detachable sections covers thousands of square kilometres, mostly in low-populated territories of Kazakhstan. Much as the site discussed above, assessments of environmental and radiological impacts at Kapustin Yar provide contrasting pictures. Some studies suggest that today's impacts are not significant (Berkinbaev et al 2006); others (UNDP 2004 a) indicate that there are dangerous legacies left around the site. The fact that both sites are included in the National Action Plan of the Republic of Kazakhstan on Environmental Health (2000) shows that Kazakh authorities are concerned about possible impacts on the environment and human health.

The Taysogan range, located 180 km north-east of Atyrau and covering nearly 1 million ha, is part of the Kapustin Yar military range. It was designated as a recovery area for burned out missile stages and other military exercise purposes. It is currently leased by the Russian Ministry of Defence from the government of Kazakhstan. Here again there are signs of soil, water and vegetation being affected by human activities.

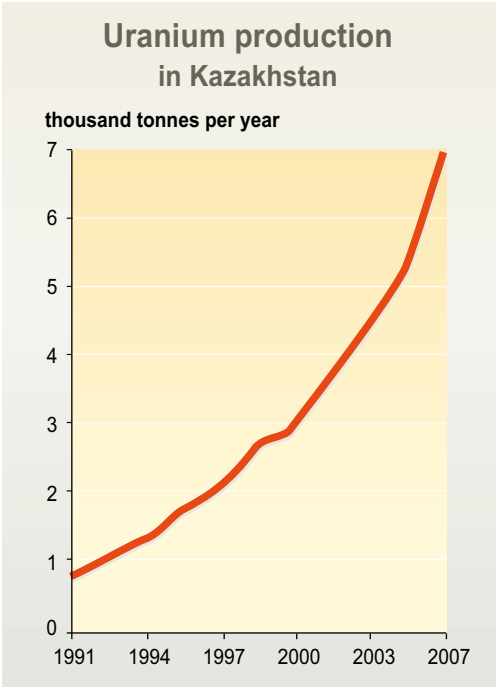
The above mentioned areas adjacent to military ranges and rocket launch sites are generally exposed to a high risk of contamination with radionuclides, heavy metals, toxic rocket propellants and scrap metal. As a consequence, large expanses of land and many surface water sources are unfit for use and more research is needed to identify and reduce the risks.

The Ashuluk, the primary surface-to-air missile training range in Russia, which has been operating since 1960 and is located near the border with Kazakhstan (under the USSR, it also included part of Kazakhstan's territory) occupies almost 300 000 ha. In all there were more than 150 manoeuvres conducted, involving various missile systems and aerial bombs (Ministry of Defence of the Russian Federation). Unfortunately data on contamination and ecological risks are not available.

Finally, the Say Utes – another nuclear test site in the Mangystau province – experienced three underground nuclear explosions between 1969 and 1970 at depths of 400–700 metres. The environmental effects of these explosions seem to be of minor concern to the local authorities. Surface radioactivity is reported to be close to normal levels and no traceable impacts on the health of local population are apparent (ENVSEC consultations in Aktau, April 2006; Mangystau's rural areas development programme 2004–2010).



Source: Kazatomprom

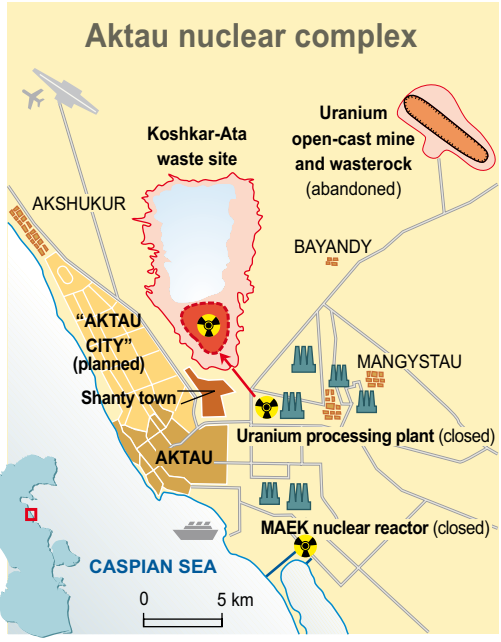


Sources: Kazatomprom; Australian Uranium Association 2007

for safe use of the land for agriculture and water for drinking and irrigation. In some of the military sites mentioned above military tests and exercises will probably continue subjecting the local environment to further stress. Lessons learned from the past should be taken into consideration to prevent more environmental damage.

Uranium production is another feature of the eastern Caspian region. At its peak in the 1980s Kazakhstan was producing more than one-third of Soviet uranium at more than 30 mining sites. The discovery of vast uranium deposits in the deserts of Western Kazakhstan led to the establishment and rapid development of uranium extraction and processing around Aktau[54], with large open-cast mining pits[55], a processing plant, the Koshkar-Ata tailing site, and the MAEK nuclear power plant. At present more than half of all the radioactive waste in Kazakhstan has accumulated around Aktau, Mangystau province.

The price of uranium dropped in the 1980–90s reflecting changes in military priorities. Meanwhile the uranium concentration in the mines gradually declined and the overall economic crisis in the post-Soviet world of the 1990s cut back output until uranium milling operations in Aktau were finally stopped in 1999. In 1997 the US and Kazakh governments agreed to undertake a joint programme to improve the safety and security of plutonium-bearing spent fuel from the BN-350 fast-breeder reactor at Aktau. By the end of 2001 all this material had been inventoried, placed under International Atomic Energy Agency (IAEA) safeguards, and packed into storage canisters. At the same time the distillation plant supplying water to Aktau was switched to oil and natural gas. At present the highly radioactive spent fuel containing



Source: ENVSEC East Caspian assessment (field mission to Aktau, April 2006)
Map produced by UNEP/GRID-Arendal, August 2008

3 000 kilos of plutonium, 10 000 kilos of highly enriched uranium (both could be used to produce weapons of mass destruction and are consequently a high priority for non-proliferation activities) and over 10 000 tonnes of other radioactive waste with a total activity of 14 466 Curie is being stored onsite. By 2010 the station's nuclear waste will have been transported for long-term storage at the Baikal-1 facility, Semipalatinsk. Operations will cost about US$300 million (NTI 2007).

On the other hand, increasing demand for energy and water in the booming eastern Caspian region of Kazakhstan coupled with the rising cost of fossil fuel-based energy generation and water desalinization are driving the search for alternative ways of meeting growing demand. To this end, a special session of the interagency governmental commission of Kazakhstan headed by the Prime Minister K. Masimov in the late 2007 gave the go-ahead to build a new nuclear power plant at Aktau, possibly using Russian-built reactors. The feasibility study is underway and should be completed in 2009. Construction should start in 2011 with the first unit commissioned in 2016 (Australian Uranium Association 2007; Kazakhstanskaya Pravda Newspaper Jan 2008[56]).

World uranium prices have increased steeply (sevenfold) since 2001. In this context, Kazakh uranium production facilities are now in demand and once more operating at full capacity. Also the empty uranium mines around Aktau are being considered as potential storage areas for radioactive waste of local and foreign origin.

One of the priority tasks should be to secure the safety of the Koshkar-Ata tailing pond. At present 51.79 million tonnes of uranium-mining waste (containing uranium-238, ra-

dium-226, thorium-230) with a total activity of 11 242 Curie, and over 50 million tonnes of other toxic waste are stored there. The pond is also used for dumping industrial and municipal waste from Aktau city and several local industrial enterprises.

In Turkmenistan, the environmental problems resulting from Soviet military activities on the Caspian Sea coast are not as obvious: several air defence and border-security facilities are positioned here, but there is not sufficient information to conclude whether their activities are affecting the local environment.

Military sites are considered a problematic legacy for the whole eastern Caspian region. Past and current activities still represent a risk factor for the region's environment and for the livelihoods of local people. To secure the environmental safety and sustainable development of the Caspian coastal zone, the problems related to military and industrial activities, including uranium extraction, processing and storage, demand attention. Risk assessment and land rehabilitation projects could be developed and implemented, and the information on risks for human health and the environment in and around those sites should be transparent for the public.

Koshkar-Ata tailing pond, Kazakhstan

Koshkar-Ata was chosen in 1960 as a convenient location to stockpile radioactive and toxic waste from the Caspian mining and hydrometallurgical industrial complex, which produced uranium concentrate and rare-earth metals. It is located in a natural depression about 5 km from Aktau and 8 km from the shore of the Caspian Sea. The Koshkar-Ata depression is one of the largest industrial tailings in the world, occupying an area of approximately 77 sq km.

The southern part of the pond, an open section covering 10 sq km[57], contains the highest concentration of contaminants (80 to 150 micro roentgens per hour [uR/h] measured on the surface at this location). Large amounts of phosphoric gypsum formed a crust on the surface preventing the escape of radon gas. However the amount of water pumped into the lake to prevent dispersal and reduce radon emission is insufficient, and as it is constantly swept by strong winds, there is a serious risk of pollutants being dispersed. Higher concentrations of heavy metals in soils have been reported in the nearby settlements of Akshukur, Bayandy, and Mangystau. The poor neighbourhoods of Aktau city, located only a kilometre from the most dangerous dry area of the tailing pond, are particularly exposed to health risks.

Groundwater monitoring around the lake suggests that the tailing does not currently constitute a significant health hazard. There seems to be no firm evidence that pollutants have reached the Caspian Sea either. However, given its location near the sea, the problem has a transboundary dimension. The situation is clearly precarious, as a rise in the level of groundwater and winds could cause more widespread dispersal of pollutants.

Local environmental authorities and the population have expressed concern about the state and future of Koshkar-Ata. Reclamation of the site is costly, and the measures taken so far, although an important first step, are only a temporary solution. In 2007, 125 million tenge (about US$1 million) were allocated from the local budget for the first phase of reclamation. The total cost of initial reclamation measures is estimated at US$8–10 million[58].

Environmental degradation and security

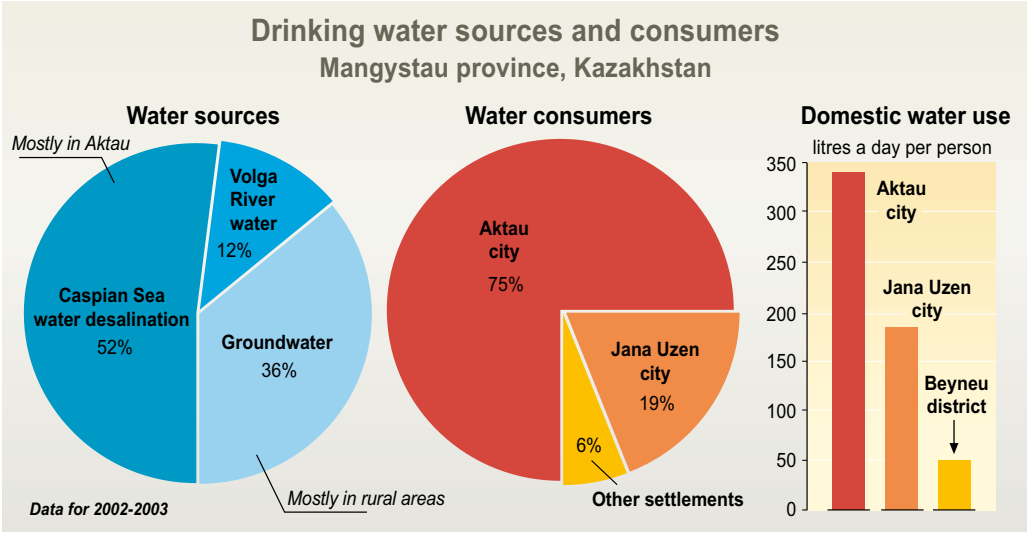
Freshwater

All provinces in the eastern Caspian region suffer from a shortage of good-quality freshwater. Water scarcity is a major hindrance for local development. Water is delivered by tankers to remote villages, as only sizable urban areas have access to tap water.

Overall in the Caspian Sea provinces of Kazakhstan tap water is available to approximately 70–75% of the population (living mostly in the towns of Atyrau, Aktau and Jana Uzen) (NESSD 2006; Mangystau province programme "Drinking water 2003–2010"). Again the main differences in access are observed between urban and rural areas. In both Caspian provinces domestic use of freshwater (for drinking and household services) amounts to 15 million cubic metres a year. In rural areas – such as Beiney, Mangystau, Tupkaragan, Karakyan districts – water use is lower than 50 litres a day per person, which is below basic health and sanitation requirements.

There are substantial differences in the sources of water supply. In Mangystau province about 50% of drinking water is provided by desalination of Caspian water (by the MAEK plant in Aktau, 100 million cu m a year, and at Fort Shevchenko), the rest being supplied by the 1 100 km long Volga–Mangyshlak water pipeline and by underground reserves.

In Atyrau province the main water supply is the Ural river, while distant rural settlements draw water from tankers or wells. The Ural river[59] is also the second largest watercourse in the whole Caspian region, after the Volga river, forming part of the geographic boundary between Europe and Asia. Phenols, heavy metals and oil products are the principal pollutants in the Ural basin. The diluting effects of Ural's spring floods decrease water pollution in the river's lower reaches in the Caspian lowland and permit self-purification of the river system.



Source: Mangystau Province's Drinking Water Programme 2003-2010

The Ural River transboundary watershed (Russia-Kazakhstan)

Map produced by UNEP/GRID-Arendal, August 2008

Water quality in the lower reaches of the river in Atyrau province is considered normal and has generally improved since the 1990s (UNECE 2006, NESSD 2006, Kazhydromet 2008 b), while further upstream the river is still receiving contaminants – mostly from industry in Russia and western Kazakhstan. The Ural delta is an important sturgeon spawning ground and a habitat for endangered bird species. Given the important role played by the Ural river in maintaining good water quality, high priority should be given

to preventing pollution and conserving wetland biodiversity. To this end the Ak Zhayk state nature reserve on the Ural delta is being established thanks to the joint efforts of the Kazakh government, local authorities, international organisations and communities (UNDP 2007).

The Kazakh government, which considers the supply and quality of water a high priority, has developed the "Drinking Water Programme 2003–10" which covers both eastern Caspian provinces. The programme has been allocated substantial financial resources, with a national budget exceeding 100 billion tenge. Thanks to implementation of this programme the share of the population with access to tap water increased by roughly 3–7% by 2006. Furthermore water filters and modern desalination facilities are being installed to improve drinking water quality.

Turkmenistan's Balkan province also suffers from water scarcity since permanent surface waters are limited to the Atrek river, the Yashan and Chilmamedkum groundwater lens and a number of shallow perennial lakes and rivers[60]. The Karakum Canal, a gigantic 1 300 km long artificial waterway which takes water from the Amu Darya river terminates in Balkan province supplying agricultural fields and settlements along its banks, including in the eastern Caspian region[61]. The use of water from the Atrek river remains a sensitive issue between Iran and Turkmenistan, because in dry years the delta receives virtually no water, which has a direct impact on the livelihoods in the lower reaches and delta due to the reduction in the volume of water available for drinking, agricultural activities and especially fisheries. (See the box devoted to the Atrek river).

Average domestic freshwater use in Balkan province is 45 million cu m a year. About 70% of population has access to tap water. In the recent past a number of settlements on the Caspian coast of Turkmenistan were supplied by water from the Volga and tankers from Baku. After independence these services stopped and alternatives had to be found: desalination and local water tanks. These solutions were quite problematic and the water supply was repeatedly interrupted due to technical failures[62].

The towns of Esenguly, Garabogaz and Turkmenbashy are supplied with water from desalination plants and receive additional water from the Balkan mountains via pipelines. Traditional methods condensing water from atmospheric moisture transported by sea winds are being used in some places. Industry uses more than 50% of all water[63], reflecting the province's industrial profile.

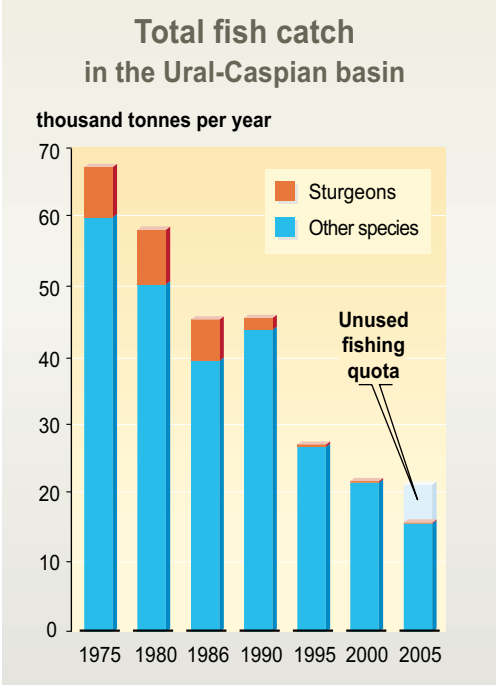
The question of the availability of water and its quality is a key issue in the eastern Caspian region. There are major differences in access between urban and rural areas, with the latter at a clear disadvantage. Inadequate access reinforces poverty in rural areas, since poor families are forced to buy water or fetch it from open sources (when available). In addition to low per capita water availability, a significant proportion of the eastern Caspian rural population drinks water that is often below quality limits. The high mineral content of drinking water often results in kidney and bladder diseases, enteric infections and viral hepatitis, and a general decline in health. Poor water treatment resulted in cholera outbreak in Aktau in 2001 when crops were irrigated with untreated wastewater.

Environmental degradation and security

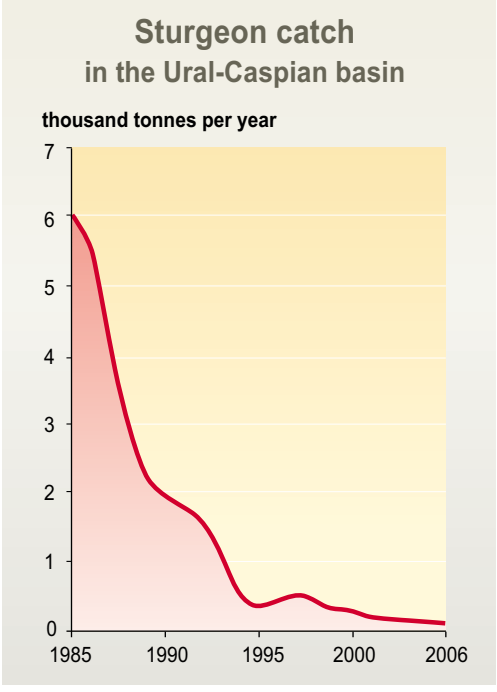
Marine resources and biodiversity

Human activities have affected the Caspian environment in several ways. First of all, the flow of river water, especially in the Volga, has been regulated by dams, changing the hydrological balance of the sea. The gulf of Kara Bogaz Gol, a large shallow lagoon covering 18 000 sq km, was separated from the sea in the 1980s in an effort to halt the falling sea level. Contrary to many people's expectations the level has risen steadily since 1978. This separation caused the gulf to dry out with the formation of a salt basin that harmed biodiversity, particularly birdlife. In 1992 the flow of water was restored and the water level in the gulf rose quickly.

Since the Caspian Sea is landlocked, contaminants such as persistent organic pollutants and heavy metals entering the water body have no way of being removed. They are consequently retained. Pollution of the sea has increased due to industrial development of the coastal region and transport of pollutants by rivers. In the late 1970s pollution with organic contaminants, including oil products and DDT, reached the biological limits of tolerance for sturgeon and their muscular tissue was exfoliated and weakened (CEP 2002; Berkeliev 2002). Tumours have been reported in common fish. Twenty mass die-offs of Caspian seals (*Phoca*



Sources: Kazakhstan State Committee on Fishery 2003; NESSD 2006



Source: Transboundary Diagnostic Analysis CEP 2007

caspica) and sturgeon in the last two decades were caused by the accumulated impacts of pollution, ecosystem change and epidemics. Although most of the pollution is brought to the sea by rivers, oil spills and shelf exploration also have a negative effect on the environment.

Eutrophication due to wash-out of agricultural fertilizers stimulates the growth of toxic algae, especially in the northern and southern Caspian Sea. As the algae die and decay, they rob the water of oxygen, creating dead zones where marine life cannot survive. Mass flowering of toxic algae (*N. spumigena, N. harveyana*) is increasingly regarded as an additional stress factor for the marine ecosystem. The first evidence was reported in 1999, and in 2004 localized fish deaths occurred (especially phytophagous grey mullet and goby) due to the algae's toxic effects. In 2006 major spots of blue-green algae were detected on the Iranian coast (CEP 2007).

Intensive fishing since the 1950s combined with unsustainable fishery practices rapidly depleted fish stocks. The catch of sturgeon, the main commercial fish of the Caspian Sea, has dropped steadily in recent decades from 16 800 tonnes in 1981, through 8 000 tonnes in 1991, to less than 1 000 tonnes in the 2000s. The official catch for the entire Caspian Sea in the two years 2003–4 was only about 100 tonnes, signalling the industry's complete collapse (CEP, 2007). Experts link this dramatic decline with the combined effects of damage to the spawning grounds in the Volga and Ural deltas, dam construction, over-fishing, increasing poaching and pollution, and increased competition for zooplankton by invasive species affecting the food available for the fish (CEP, 2007). Apart from a small annual quota it has been illegal to catch sturgeon in Turkmenistan since 1946. In Kazakhstan the catch in the Caspian-Ural river basin dropped from about 8 000 tonnes in 1980 to less than 200 tonnes in recent years (Agency of the Republic of Kazakhstan on statistics; CEP 2006 b). Illegal sturgeon fishing (poaching) in the Caspian Sea continues at a significant level, such activities having been stimulated by the economic crisis, social problems and increasingly lax controls. In 2006 almost 3 tonnes of illegal sturgeon catches, 127 kilos of black caviar and 26 tonnes of other fish were registered in the Kazakh sector of the sea. In 2007 the Kazakh authorities reported catches of 0.5 tonnes of sturgeon, 33 kilos of black caviar and 19 tonnes of other types of fish (KazInform news 2006 a; Akhmetov 2006; Ministry of Environment Protection of the Republic of Kazakhstan 2007). Poachers from other regions, mostly Dagestan and Azerbaijan, on the opposite coast of the Caspian, are also operating in the waters of the eastern Caspian.

Although the importance of fishing as a commercial activity has significantly declined, fishing remains an important factor in the survival of the coastal population of Turkmenistan and Kazakhstan. Sturgeon is the main source of cash income, while small fish are mostly used for food. Therefore, a stable, healthy environment plays a critical role for the livelihoods of coastal communities. The gradual decline of these resources could increase vulnerability to crisis, unemployment and hunger, undermining their overall situation.

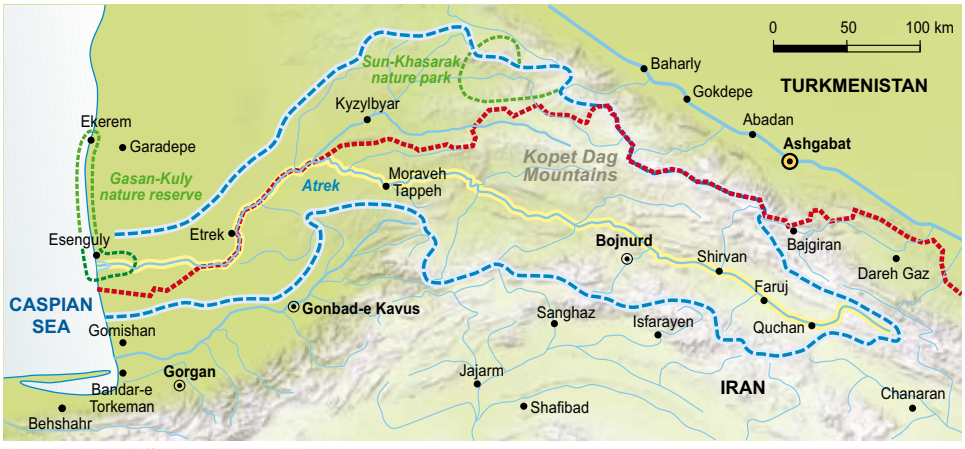
Finally, the invasion of destructive species such as *Mnemiopsis leidyi*, a bioluminescent jellyfish first observed in 1999 in the Caspian Sea, affected the food chain with dramatic consequences for anchovy kilka (*Clupeonella engrauliformis*) in 2001–3. Kilka is a main fishery product in the eastern Caspian region, especially in Turkmenistan.

Fishery in the lower reaches of the Atrek river, Turkmenistan

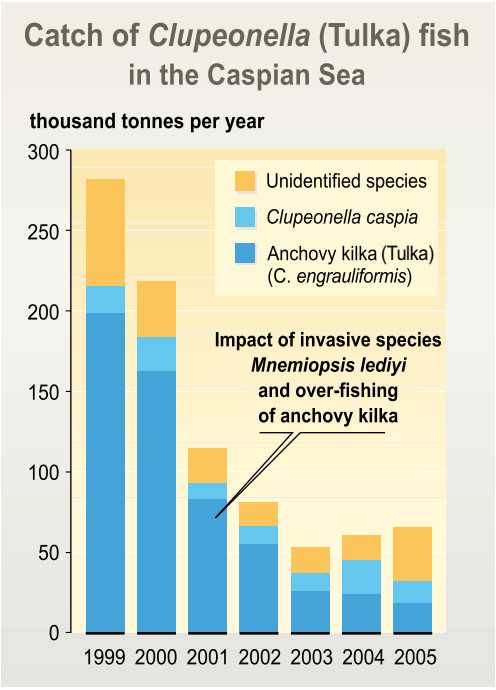
The basin of the Atrek river[64], with a total area of 27 000 sq km, is shared by Iran and Turkmenistan. The river, which is 530 km long, rises in Iran, flows for some 150 km along the border between Iran and Turkmenistan, and ends in the Caspian Sea.

Historically the southern part of the Turkmen coast was the Caspian's second fishery site by value and productivity. In the Esenguly district of Balkan province, the fish catch amounted to more than 10 000 tonnes a year in the 1930s. In the 1980s and 1990s commercial fishing gradually declined to almost nothing. Local people link it to excessive diversion of water for irrigation in Iran, affecting the flow of the Atrek river, an important spawning ground for roach (*Rutilus rutilus caspicus*) and carp (*Cyprinus carpio*). Reportedly with the development of irrigation in the Iranian section of this transboundary river, the flow dropped substantially. Furthermore Turkmen experts estimate that climatic changes could further reduce river flow by 50% in the long term (Atamuradova, 2007). In the 1960–70s the river was dry for five to seven months. Since the 1990s (in 1990, 1995–97, 1999–2000) the river has not reached the sea, virtually putting an end to fishing in the delta and coastal zone (Berkeliev 2006). In this respect local experts consider the Atrek river delta a regional environmental "hot spot" because of its essential role in the supply of fish and work for local people, coupled with the transboundary causes of degradation to the river delta. Among noteworthy positive developments, Turkmen and Iranian authorities are currently discussing new cooperation arrangements on the Atrek river. Furthermore, there are plans to establish a national park along the upper reaches of the Atrek river in Turkmenistan.

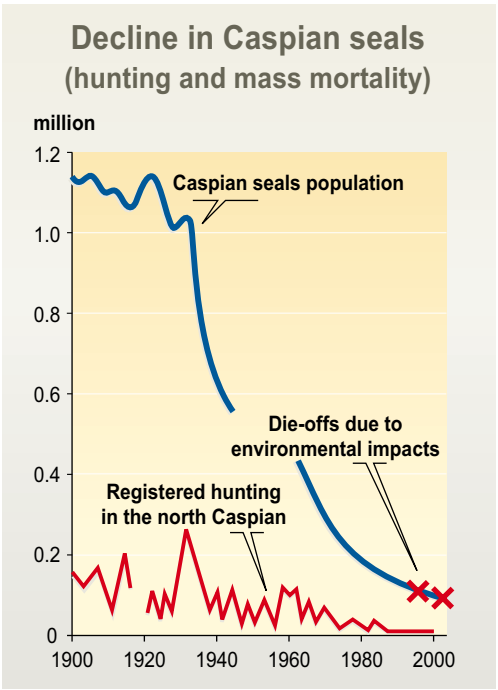
The Atrek River transboundary watershed (Turkmenistan-Iran)



Map produced by UNEP/GRID-Arendal, August 2008



Source: Transboundary Diagnostic Analysis CEP 2007



Sources: Transboundary Diagnostic Analysis CEP 2007; CISS 2007

In 2005 the density of *Mnemiopsis leidyi* in the Turkmenbashy gulf exceeded previous record levels in the Black Sea. As this jellyfish has no natural enemies, the only factors limiting its spread are water salinity and temperature. The devastating effects of *Mnemiopsis* in the Azov and Black Seas are a powerful incentive for action as the jellyfish are threatening the existence of kilka and other fish, with consequent effects on livelihoods, food sources for the local population, and for the Caspian seal and sturgeon.

All in all excessive fishing and extraction of marine products, geological exploration, well drilling, offshore oil production and transportation, invasive species and climate change are negatively affecting the livelihoods of coastal communities, the sea's ecosystem, and the overall biodiversity of the region.

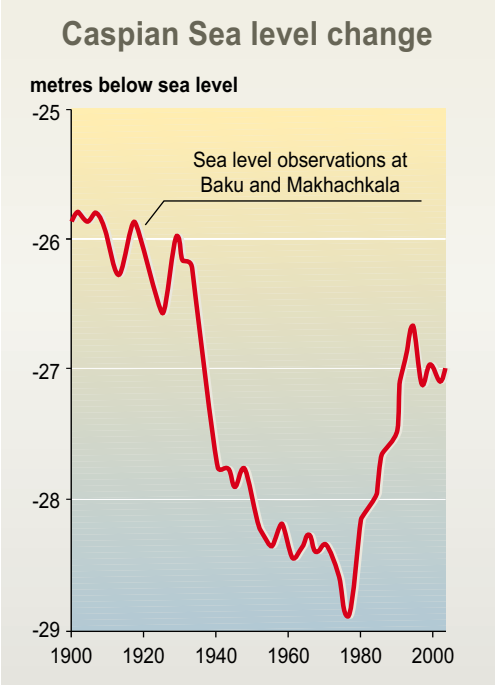
One indicator of the growing human impact on the marine environment is the dramatic drop in the number of Caspian seals from 350–400 000 animals in the 1970s to 110 000 at present, as well as frequent die-offs of seals measured in thousands (CEP 2006 b; CISS 2006). These events attract considerable attention at a local and international level. Whereas excessive poaching initially caused the reduction in the number of seals, the lead causes of extinction are now environmental pollution, lack of food, changes in the ecosystem and epidemics. Yet in many cases it is difficult to identify the precise root causes of the die-offs, and comprehensive international assessment may be required. In 2000–7 seal die-offs raised concerns, particularly in Russia, which questioned the links between the event and oil prospecting and extraction in the Kazakh Caspian shelf-coastal zone. Unfortunately the information available on Caspian bio-resources is incomplete and littoral countries, local communities and international donors would benefit from more efficient, coordinated data gathering.

Environmental degradation and security

Fluctuating sea level and natural hazards

Caspian coastal regions, where most towns, farmland, industrial activities and oilfields are situated are exposed to considerable fluctuations in sea level. Rising sea levels and storm surges flood vast areas containing oil wells and infrastructure, increase pollution and damage scarce farmland.

The level of the Caspian Sea has fallen and risen, often rapidly, many times in the past. The main factor affecting the sea level is believed to be changing climatic conditions, especially in the Volga river basin, the source of 80% of the water in the sea. Water diversion and dams play a lesser role. Despite years of research, knowledge of the factors responsible for fluctuating levels is still limited and insufficient to make reliable, long-term predictions. Researchers from Russia, Kazakhstan and Germany have suggested that the trend towards higher rainfall observed since the 1970s in the northern parts of the Caspian basin will in the long run increase water flow in the Volga and Ural rivers[65]. The likelihood of rising sea levels consequently seems realistic[66]. Although such forecasts should be regarded with some caution, a wise strategy for adaptation would be to prepare for the worst-case scenario of a 1–3 m rise in sea level. Under such a scenario, many coastal settlements could be flooded, and agricultural land would be lost, not to mention possible flooding of roads, oil wells and sites used for waste storage and other environmental hazards. All of this could be further aggravated by storm surges capable of raising water levels by an additional 2–3 m in the most extreme cases. Littoral states are aware of this danger and are taking measures to reduce the negative consequences of such events. For example, planning and implementation of coastal protection measures is already under way in the most of vulnerable areas of Kazakhstan.



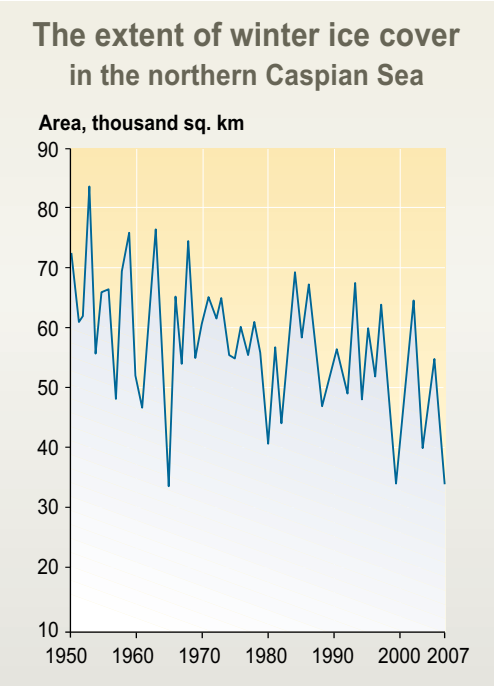
Source: Panin 2007; Kozhavnikova 2006; Abuzyrov 2003

The most recent 2.5 m rise in the Caspian Sea from 1978 till 1996, when the sea reached the highest level of –26.5 m, considerably affected Atyrau province in Kazakhstan as well as Turkmenistan's shoreline. In the past ten years, however, the level of the sea has been largely stable, even dropping 1 m then rising again, following a trend typical of seasonal fluctuation.

Industries in the Cheleken peninsula and sea level rise, Turkmenistan

Khazar (formerly Cheleken) is a town of 10 000 people (16 000 people in the past), located on the Cheleken peninsula on the Caspian shore. Iron bromide ($FeBr_2$) production started at the Cheleken plant in 1940. The start of iodine production followed in 1976. The production capacity of the plant is about 250 tonnes of iodine a year. The natural water (brine) found here contains radioactive elements. During iodine processing, using the coal absorption method, radionuclides (mostly Ra) in the brine are deposited on the surface of pipes and equipment, and in the coal used in the process itself. About 18 000 tonnes of radioactive waste have accumulated and are now deposited in an open storage area less than 200 m from the sea. Some of the plant's facilities have already been engulfed by the rising sea. The radiation dose on the plant's dump varies from 2 500 to 4 000 micro roentgens per hour [uR/h], and in the surroundings 250–750 uR/h, posing an occupational health risk for workers mainly through inhalation. Radon concentrations in the local air are 1 000 times higher than the average for Turkmenistan and close to the permissible limit values for exposure. Strong winds and dust storms may disperse the materials and contaminated carbon particles in the dump. Liquid acid effluents from the plant pose an additional environmental problem. Due to the appalling condition of the pumping and neutralization stations these effluents are discharged almost untreated. The authorities have issued a call for tenders to neutralize the site and build a radioactive waste storage unit in Aligul, a safer location 17 km away from Khazar. The NATO project implemented under the Environment and Security Initiative in Central Asia is assisting Turkmenistan in the safe handling of radioactive waste, including support to a radiochemical laboratory in Ashgabat and training in waste characterization and radio protection.

Estimates of the damage caused by the rising sea level and wave surges in Kazakhstan's Caspian region over the period from 1978 to 1996 amount to US$1 billion, mostly due to the impacts on oil wells and coastal infrastructure[67]. Atyrau province suffered the most because of its flat terrain. Over 1 million ha of coastal land, including more than half a million ha of pasture and other agricultural land, several oilfields and over 150 wells were flooded. Many commentators attribute the decline in Atyrau's agriculture to the flooding. The Tuhlaya Balka reservoir, which accumulates and evaporates Atyrau's wastewater, is just 10 km from the Caspian Sea. Storm surges cut this distance to 3–4 km, and any further rise in sea level threatens to flood this major waste site on the Caspian Sea shore. A forecasting and early warning system is now operational and should minimize possible damage and enable prompt evacuation.



Sources: Rodionov 1998; Kouraev 2008

In Turkmenistan the impacts of the rising sea level are particularly apparent in the Cheleken peninsula, where seawater has submerged roads, a fragment of the town of Khazar and some industrial infrastructure. Other towns (Garakol, Ekerem, Chekichler), oilfields (Goturdepe, Cheleken) and pipelines are under threat. In the worst-case scenario (+5 m), the Cheleken peninsula could be completely separated from the mainland. Adequate adaptation measures and coastal zone management may help to prevent many of the negative impacts of fluctuating sea level.

Finally, global warming is directly affecting the Caspian Sea environment. Satellite data and meteorological records suggest that the extent and duration of winter sea-ice, which covers approximately 70–75%[68] of the northern Caspian Sea, is declining, which is consistent with regional and global warming patterns (Kouraev, 2008). Because of milder winters with higher than normal temperatures, the extent of ice has been much smaller than usual during the last 10 years. Such a reduction of the ice affects the breeding habits and living conditions of the endangered Caspian seals and the entire ecological system (UNEP/GRID-Arendal 2006; CEP 2007; Ivkina and Stroeva 2007). Under these conditions seals must live closely packed on the little remaining ice, which in turn facilitates the spread of disease, including canine distemper virus (Kuiken 2006).

It is worth considering the impact of natural disasters as factors of increased vulnerability and loss of livelihoods. Among natural hazards present in the area, not only storm surges deserve mention but also the seismic activity and the related possibility of tsunami generation.

One of the most devastating recent earthquakes in the Caspian region was the Ashgabat M 7.2 earthquake in 1948 along the Kopet Dag mountains fault zone. Despite being relatively shallow and localized, the quake caused massive loss of life and property in the capital of Turkmenistan. According to estimates 90% of Ashgabat's buildings collapsed or were too badly dam-

aged to be restored and from 27 000 as reported to the Soviet government in Moscow in 1948, to 100 000 people lost their lives as now officially recognized by Turkmenistan, out of a total of 130 000 Ashgabat residents at the time (Nikonov, 1998). In the Cheleken area powerful earthquakes are significantly deeper, yet their magnitude could be high, with a corresponding destructive potential. Parts of the South Caspian region are seismically active and may become the area of tsunami generation, if submarine earthquakes exceed magnitude 7. Historical data contains evidence of small waves of 1 m (Dostenko et al 2002).

In the shallow northern Caspian Sea, the risk of earthquakes and tsunamis is low; but the risk of extensive flooding due to storm surges is high. Storm surges have the potential to severely damage oilfields as well as populated areas and infrastructure, especially in Atyrau province. Moreover 0.8 million ha of agricultural land are subject to the risk of storm surges. In 1989, 1990, 1991, 1993, 1996 and 2005 such wind-induced surges of seawater penetrated 15-30 km inland and affected settlements, oilfields (Prorva and Terenozek) and agricultural land.

Regional or global epidemics could also affect living conditions and livelihoods. The risk of a possible outbreak of avian influenza spread by migrating birds, millions of which visit each year the eastern Caspian Sea's lagoons and bays, should not be underestimated[69].

Climate change and natural hazards in the Caspian region

Topography

Deserts, lowlands and piedmont areas

Mountains

Climate change impacts

- Observed increase in air temperatures (0.2-0.3C/10 years)
- Decrease in annual precipitation and moisture availability; raising temperatures and climate aridity; reduced wind speed
- Increase in summer-autmn precipitation; risk of floods
- Sea-ice limit (current and future)
- Increasing stress on sensitive biodiversity; seal die-offs
- Shrinking glaciers and rapid snow melt; risk of flashfloods
- River flow increase; earlier onset of spring waters
- Decreasing water availability in the rivers (projected)

Natural hazards

- Risk of flooding due to strom surges and sea level fluctuations

Sources: Panin (2007); Atamuradova (2007); National communications from Iran, Azerbaijan, Armenia, Kazakhstan, Turkmenistan to the United Nations Framework Convention on Climate Change; Rodionov (1998); Kuraev (2008); Arpe (2005); Nezamosadat (2006); Shiklomanov (2007); IPCC (2007).

Conclusions

Conclusions

Conclusions and recommendations

This report sets out to identify the issues that affect the environment of the Caspian Sea, focussing specifically on the eastern Caspian Sea shores of Turkmenistan and Kazakhstan. Reaching beyond an exclusively environmental perspective, the report analyses the changes that are profoundly modifying the livelihoods of people living in the eastern Caspian region and could lead to social tension or even regional instability. The analysis identifies several areas that correspond to this concern. The boom in the energy sector in the last ten years has left a lasting mark on the region, changing its socio-economic conditions. In many cases these changes are a stress factor for both the environment and local communities. Furthermore, various military and industrial activities have in the past contributed to environmental degradation, or still do, which in turn has a negative impact on human security. Climate change and natural disasters are also a risk factor for the eastern Caspian region. As none of these elements can be isolated from the others, the report looks at how these risk factors interact.

The eastern Caspian region is well endowed with oil and gas resources and since the 1990s the region's energy sector has enjoyed massive growth leading to core changes in the socio-economic conditions of the whole area. Both the geographical position at the crossroads between East and West, between Russia, Central Asia, the Caucasus and Iran, and the presence of hydrocarbon reserves have focussed global interest on the Caspian over the last 20 years.

Growing demand for energy, particularly from Western (EU, USA) and Eastern markets (China, India), combined with rising energy prices and efforts by top energy importers to diversify sources have encouraged competition fuelled by commercial and political factors, making this part of the world the nub of the "New Great Game". Over the years a large number of actors and stakeholders have been involved in the complexities of planning and constructing pipeline systems in a region that has undergone significant political change since independence.

The break-up of the Soviet Union introduced four new actors to the region: Azerbaijan, the Russian Federation, Kazakhstan and Turkmenistan, which with Iran now border the Caspian Sea. Since then the legal status of borders on the Caspian Sea and its shelf resources has been under negotiation. At the same time the military presence in the region has increased, a trend that also needs further monitoring. Protecting oil and gas infrastructure is a security concern for both littoral states and major energy consumers. Clarifying the legal status of the Caspian Sea is one of the key issues in regulating access to its natural resources. Clear and agreed upon regulations increase the predictability of the situation while decreasing the political risks related to possible confrontation over access to these resources. This in turn increases the interest for global, regional and national actors to invest in the Caspian region. The fact that the legal status of the Caspian Sea is still an open question underlines this reality and the pressure of political and economical interests towards finding a common solution. At the same time, states have been able to find cooperative solutions not only on a bilateral or trilateral basis but also in a multilateral framework (ie the Tehran Convention). Past experience has shown that the Caspian States have been able to develop a positive dialogue, especially on environmental issues.

Geopolitical and energy security considerations will continue to influence the way global and regional actors perceive the eastern Caspian region in the coming decade. Political stability and security in the larger basin will be of paramount importance for further significant development of the region. To minimize real or perceived security threats, Caspian Sea states should further develop trust and confidence – building measures that ultimately lead to greater regional cooperation and integration. This in turn would enable states to respond more effectively to new challenges such as the impacts of climate change.

The transition from a planned to a market economy has been largely based on the extraction and exportation of hydrocarbon resources. This situation is changing the structure of national economies, the overall importance of coastal areas and the livelihoods of people living in the region. Although both countries have benefited from energy-sector revenue, the development of oil and gas resources also challenges the distribution of associated wealth and benefits and strengthens the dependence of the local economy and job markets on this sector. The Kazakh and Turkmen provinces on the Caspian Sea shores all show signs of economic overspecialization. Further Gross Regional Product growth depends largely on the energy sector as agriculture is declining. Fisheries, a traditional source of revenues for riverside and coastal communities, have also been in constant decline since the 1990s.

Urban centres have become strategic nodes for services to the energy sector (financial services, transportation, housing, etc.), attracting people from rural areas, other parts of the country and abroad. More than half of the region's population is currently living in coastal urban areas near the oilfields and mineral deposits, widening the gap between urban centres on the coast and the rural hinterland. The rapid development of urban centres is often unplanned, creating stark differences within the urban centres themselves, between areas served by recent municipal infrastructure, and those lacking such services or depending on decaying infrastructure.

These developments are also reflected in changes in the wage structure of the eastern Caspian region. Despite an overall rise in salaries, substantial wage differences persist between the oil-and-gas sector and other sectors, particularly agriculture and fisheries. Furthermore, with the decline of fishing and agriculture, employment opportunities are becomingly increasingly scarce in the construction industry and sectors other than energy. Such a situation further increases the differences in living conditions between urban centres and rural areas, where making a living is increasingly difficult.

Intensive fishing since 1950s and other factors such as damage to the spawning grounds in the Volga and Ural deltas, dam construction, over-fishing, and increasing poaching and pollution, have caused rapid depletion of fish stocks. Other factors have further contributed to the dramatic drop in fish stocks: invasive species have been competing with the Caspian Sea's marine fauna leading to a decrease in the availability of food. The catch of sturgeon, the Caspian Sea's main commercial fish, has steadily declined in recent decades from 16 800 tonnes in 1981, through 8 000 tonnes in 1991, to less than 200 in 2007 leading to a temporary ban on caviar exports imposed in 2001 by the Convention on International Trade in Endangered Species of Wild Fau-

na and Flora (CITES)[70]. This depletion has caused huge economic and environmental losses. Unfortunately, the measures taken by littoral states and the international community have not succeeded in curbing illegal fishing, still the only source of revenue for many impoverished communities.

Although the development of energy resources brings new opportunities to local economies and communities, it can also imperil the region's delicate environmental balance. Local communities are in the front line in their exposure to the risks and consequences of pollution. Marine pollution is caused by industrial development of the coastal region, exploration and exploitation of off-shore energy resources and by rivers transporting pollutants. The region has already witnessed cases of pollution-related mass deaths of birds, fish and seals. Marine pollution from extraction and transportation of hydrocarbons is particularly important in the shallow northern Caspian Sea, an area of rich biological diversity that is vulnerable to pollution. The Cheleken peninsula in Turkmenistan is another area that demands particular attention for the environment. Abandoned oil wells and oil spills on land are a major pollution hazard, due to the risk of flooding in the event of rising sea level and storm surges. This situation has already occurred leading to the pollution of land and sea in several areas.

Finally, in large-scale on-shore oil extraction, the use of outdated technology and short-sighted planning in the past have had significant negative environmental effects in the areas around the oilfields: soil contamination, increased radioactivity and air pollution.

Another major issue is the quality and quantity of freshwater available in the eastern Caspian region. This is certainly an obstacle to further development of this part of the basin. Poor quality water affects public health. Again there are important inequalities in the access to quality water between rural and urban areas, with the former at a clear disadvantage. With the rapid growth of urban areas, water consumption by city dwellers is expected to increase significantly. The question of access to freshwater resources will be essential for the sustainable development of the eastern Caspian's urban areas over the coming decade. Water is also used in oil production, exacerbating the problem of water availability for other purposes and contributing to the desertification of large areas of hinterland due to lower groundwater levels and soil humidity, as in Uzen-Senek, Kazakhstan. The main river systems of the eastern Caspian – the Atrek in Turkmenistan-Iran and the Ural in Kazakhstan-Russia – require further international attention and improved cooperation.

The eastern Caspian region has inherited from its Soviet past a number of military-industrial facilities and weapons testing sites, including nuclear arms – primary elements of the former military and industrial security system. Activities in the region's military ranges had numerous impacts on the environment, on public health among the civilian population and their livelihoods. Most of all these activities reduced scope for using the land safely for farming. Extraction of uranium ore has left a large stockpile of radioactive waste. Remediation of the Koshkar–Ata tailing pond and the safety of the MAEK nuclear plant should both be given priority. Plans to build a new nuclear power plant on the Caspian Sea coast as a replacement require further attention.

Human activities have taken a heavy toll on the biodiversity of the region. One indicator of the growing impact on the marine environment is the dramatic drop in the number of Caspian seals from over 1 million a century ago, to 350–400 000 in the 1970s and less than 110 000 at present. Thousands of seals have perished in mass die-offs. These events attract considerable attention at a local and international level. Initially excessive poaching caused the reduction in the seal population, but today the prime causes of extinction are thought to be environmental pollution, shortage of food, changes in the ecosystem, climate warming and epidemics.

The level of the Caspian Sea has fallen and risen, often rapidly, many times in the past. The main factor affecting the fluctuating sea level is thought to be changing climatic conditions, particularly in the Volga river basin, the source of 80% of the water in the sea. Rising sea levels and natural hazards such as storm surges affect vast areas, flooding oil wells and infrastructure, which increases pollution and damages already scarce farmland. Earthquakes are also a potential hazard for the region and its energy infrastructure, with devastating consequences for the population and the environment. Finally, other factors such as climate change will affect the region, for example by reducing sea-ice in the winter, impacting on the breeding habits and living conditions of Caspian seals and, more broadly, the ecological system as a whole.

The eastern Caspian region has experienced rapid change since independence in the early 1990s. The booming energy sector holds many opportunities but also considerable challenges and risks. The region's increasing specialization in the extraction of fossil fuels, combined with the degradation of marine biological resources, freshwater reserves and agricultural land are the main sources of concern from an environment and security perspective. Greater dependence on the energy sector also makes the region more vulnerable to any major changes in that quarter.

The Caspian Sea region must also strike a balance between the economic gains from rapid development of energy resources, and the risk of over-exploitation and environmental degradation, particularly in shore and sea zones. Depletion of vital ecosystem products would impact negatively on human development. Urban areas must deal with very fast growth and increasing dependency on the energy sector to fund such development. At the same time rural areas are facing deepening poverty and a deteriorating environment. These changes undermine the region's resilience and heighten its vulnerability to powerful social tensions.

Overuse of resources will have long-term consequences that will affect the region long after oil and gas resources have been used up. There is a concern that once its energy resources have gone, the region will have to cope with the legacy of several decades of oil and gas extraction (a polluted environment, depleted biodiversity, etc.), but without the financial resources to repair the damage.

The signature of the Tehran Convention by all the Caspian states was a major step towards enhanced protection of the Caspian basin. However the littoral states still need to develop a unified approach to sustainable management of the economic and natural resources of the Caspian region, opening the way for less dependence on the energy sector and better protection of its population's livelihoods.

Conclusions

Possible actions under the Environment and Security Initiative

Analysis of the interaction between the environment and security factors presented in this report suggests that their background and scale in the eastern Caspian region differ a great deal from the "classic" models of the Ferghana valley, southern Caucasus and the Balkans. The ecological problems and socio-economic trends that may result in grievances and conflicts are concealed by low population density and development of the region's hydrocarbon reserves. Other problems are being addressed by the Tehran Convention, and by local and national government under the Caspian Environmental Programme or other specific initiatives. Some issues, such as the transboundary management of the waters of the Atrek river (Iran-Turkmenistan) are currently beyond the scope of the ENVSEC Initiative.

Based on the present analytical report and consultations with the experts and governments of the countries concerned, the ENVSEC Initiative has defined the scope for implementation of further activities. The ENVSEC work programme for the eastern Caspian Sea region complements and extends the measures being implemented by the countries and the Caspian Environment Programme. In the matrix below we present the outlook for possible follow-up actions developed by the various national, local and international stakeholders taking part in the consultations held as part of the report's production. Recognizing the achievements of the Caspian Environmental Programme and national actors, the present report focuses on the areas that are not yet covered in the current or planned initiatives.

Priority areas	Assessment	Capacity building	Policy formulation	Risk reduction
Assessment and mapping of environmental sensitivity and risks in the northern Caspian Sea in view of energy development and climate change	■	■		■
Supporting good practices in remediation of historical pollution and promoting cleaner production technologies in the energy sector		■		■
Increasing transparency and accessibility of environmental information to the general public (including Caspian Aarhus centres)		■		
Enhancing national policies in environmental security and industrial safety in the Caspian region			■	
Confidence-building measures and demonstration interventions in managing transboundary water resources	■	■	■	
Integrated coastal zone management to protect the Caspian region ecosystems and livelihoods of people		■	■	

Actual activities will take place at the request of the host countries given enough financial resources are raised and following the mandates of the ENVSEC partners.

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Endnotes

1. The ten thematic centres stopped operating with the cessation of the TACIS.

2. Quoted from the speech given by Professor Ole Danbolt Mjøs, Chairman of the Norwegian Nobel Committee at the occasion of the 2007 Peace Prize; accessed at http://nobelprize.org/nobel_prizes/peace/laureates/2007/presentation-speech.html.

3. The next phase of implementation of the Caspian Environmental Programme in 2008-2011 will primarily focus on aquatic bioresources and fisheries, invasive species management, marine protected areas and spawning grounds, improving coastal communities livelihoods.

4. The original version of the new Kazak Ecological Code can be accessed at http://base.zakon.kz/doc/lawyer/?uid=5CC242A5-B708-4A51-B52D-1BE3EC93F26F&language=rus&doc_id=30085593&page=0.

5. The annual mean precipitation in the region is 150-200 mm of rain.

6. Atyrau province: 390 000 people for 166 000 sq km; Mangystau province: 480 000 people for 119 000 sq km.

7. Sources: Great Soviet Encyclopaedia, Agency of the Republic of Kazakhstan on statistics.

8. 569 000 people as of 1 January 2006 with an increase of 15% on 2002.

9. Khan Imran, "Central Asia: Energy pipelines or economic lifelines?" Alexander Gas & Oil Connections, 11(1), January 12 2006; Knight Robin, "Is the Caspian an oil El Dorado? "Time Magazine, International edition, 151(26):28, 29 June 1998; Bruce Nelan, "Caspian black gold", Time Magazine, International edition, 26(26), 29 June 1998.

10. In the 19th century the region was associated with the Nobel brothers, the Rothschilds, Henri Deterding of Royal Dutch, and Marcus Samuel of Shell who were involved in the start of the oil industry in the region.

11. By 1940 Baku was delivering over 70% of Soviet oil, continuing throughout World War II. As production in the onshore fields declined, offshore extraction was developed. Most of Azerbaijan's oil is now extracted offshore.

12. "Modernization of the gas pipeline Central Asia – Centre", source http://www.caspionet.kz/index.cfm?id=46296; "Caspian gas to run within Central Asia-Center corridor", 11.05.2007, source Itar-Tass (www.itar-tass.com).

13. "Russia seals Central Asian gas pipeline deal", accessed at http://www.msnbc.msn.com/id/22345096.

14. The case of the BTC pipeline is rather controversial as the US$4 billion project may not be economically viable unless Kazakh oil can be added to the Azerbaijani oil transported by the pipeline (Ebel and Menon, 2000). The controversy stems from the fact that many think the project was politically motivated, some foreign policy-makers being keen to support east-west energy transport routes that bypass the territory of Iran and Russia.

15. The Memorandum was signed by the participant companies in the Tengiz-Chevroil consortium, those in the KCO consortium, and Kazakhstan's national oil and gas company KazMunayGaz (Interfax, 24 January).

16. "Russia, Kazakhstan agree to double CPC throughput capacity". RFE/RL NEWSLINE Vol. 12, No. 87, Part I, 9 May 2008.

17. On 26 July Turkey, Italy and Greece signed an intergovernmental agreement to build a US$1.36 billion natural gas pipeline that will connect Azerbaijan's Shah Deniz gas field to Italy via Turkey and the Adriatic (Corriere Della Sera, 26 July). The Turkey-Greece-Italy (TGI) pipeline has a projected annual capacity of 11.5 billion cu m of natural gas. The pipeline should be completed in 2012. (Eurasia Daily Monitor, volume 4, issue 151 accessed at http://www.jamestown.org/edm/article.php?article_id=2372345).

18. The European Union currently imports 45% of its oil from the Middle East and 40% of its gas from Russia (30% Algeria, 25% Norway). By 2030, the EU estimates that 90% of its oil consumption will have to be covered by imports, with over 60% of EU gas imports expected to come from Russia with overall external gas dependence expected to reach 80%. Source http://ec.europa.eu/external_relations/energy/index.htm.

19. Turkey and Ukraine play such a role on the Western routes. See for example the articles published by Eurasianet: Igor Torbakov, "Turkey stands to benefit from Caspian basin energy competition", published on 17 February 2006.

20. For a detailed discussion on the issue of militarization of the Caspian Sea see Katlik M. (2004), "Militarisation of the Caspian Sea", in Akiner, (2004).

21. The positions staked out reflected the interests of the states: Azerbaijan, with many offshore oilrigs, favoured the territorial division model based on a roughly north-south median line, along with Kazakhstan and Turkmenistan. Significantly Russia changed its position in 2000 to favour territorial division, after it emerged that the promising North Kashagan oil field would be in its sector. As territorial division seemed inevitable, Iran requested that the sea be divided into 5 equal shares, a claim disproportionate to its 15 % share of the coastline and targeting hydrocarbon fields in the sectors claimed by Azerbaijan and Turkmenistan.

It is worth pointing out that the disputes over underwater areas between East Caspian states are not between Kazakhstan and Turkmenistan, where the border provides a demarcation line on which both seem to agree, but with the other neighbouring states. At present Kazakhstan seems to have settled its undersea claim (the trilateral agreement of May 2003) with Russia and Azerbaijan. The most serious disputes all pertain to oil fields located in the southern Caspian Sea and involve Azerbaijan. The Turkmen-Azeri dispute concerns Hazar (Azeri), Osman (Chirag), Altyn Asyr (Sharg), and Serdar (Kyapaz), the Iranian-Azeri dispute revolves around the Alov-Araz-Sharq (Alborz in Farsi) oil field (Haghayeghy, 2003). In this respect Turkmenistan has disagreed with the median line proposed by Azerbaijan that would give the Kyapa/Serdar field to Baku.

22. Azerbaijan made arrangements to start exporting oil to Iran, since the BTC stopped functioning for several weeks and another westward oil route via Georgia to the Black Sea was constrained by military action.

23. In parallel, foreign military aid to the Caspian countries has also increased. Not only the US has provided aid but also Russia and China.

24. On 19 September 2007 the Kazakh Defence Minister, Daniyal Akhmetov, discussed plans to bolster Kazakhstan's naval force in the Caspian Sea. The planned build-up, laid out in a new strategic planning document outlining the development of the Kazakh navy through 2015, includes the planned procurement of several large naval vessels, the modernization and expansion of the Zenit shipbuilding facility in Uralsk and the training of naval specialists. Minister Akhmetov explained that the build-up reflects the recognition that "the Caspian region is of great significance for the economy of Kazakhstan," and the "need to create a modern navy to ensure" security in the Caspian Sea (RFE/RL NEWSLINE Vol. 11, No. 175, Part I, 20 September 2007). According to media reports, the Kazakh Ministry of Defence has set March 2008 as the target time to launch the new Kazakh navy (RFE/RL Newsline Vol.12, No. 25, Part I, 6 February 2008).

25. The disputed area between Iran and Azerbaijan led in July 2001 to an armed confrontation in the Caspian, with an Iranian military vessel firing at BP geological exploration ships operating on the Alov-Araz-Sharg concession for the Azerbaijani government. Since this incident the countries have been able to downplay tension and reached bilateral or trilateral agreements allowing continuing exploration and exploitation of the resources.

26. Turkmenistan received US$130 per thousand cubic metres for the first six months of 2008, and will get US$150 per tcm for the last half of the year. Just half a decade ago Central Asian states were offered US$25 per tcm. The price for Turkmenistan's natural gas may well increase to US$300 per tcm in the coming years. (See: "Price manoeuvring begins for Uzbek and Turkmen Natural Gas Exports to Russia", Eurasianet, 21 April 2008). The question of the terms of payment for Central Asian gas is a sensitive political issue. In December 2007 Turkmenistan stopped gas supply to Iran allegedly for technical reasons but probably in a move to increase gas tariffs. Competition among energy-thirsty economies has caused an unprecedented increase in prices for oil and gas. In this situation, energy giants such as Gazprom had to renegotiate prices with producers in Central Asia. In 2009 Gazprom will be paying average market prices for Central Asian gas. A decision that may have far reaching consequences on the economic viability of other energy export projects such as Nabucco or the pipelines to China. See: "Domestic gas monopoly declares the inevitable rise in energy prices", Nezavisimaya gazeta, 2008-06-11, http://www.ng.ru/economics/2008-06-11/1_gazprom.html?mthree=1.

27. The NFRK, which had accumulated US$5 billion in late 2004 (or approximately 17 % of GDP). For details see, Kalyuzhnova and Kaser (2005) and IMF (2004:19). For 2007 data see IMF Country Report No 07/235 of July 2007 and factsheet of the National Bank of Kazakhstan (http://www.nationalbank.kz/cont/publish621708_4142.pdf).

28. In 2006 the Kazyna Sustainable Development Fund was established to provide long-term funding for infrastructure and projects in new industries in non-extractive sectors. The fund is the managing company and sole shareholder in the Kazakh Development Institutions (comprising the Development Bank, Investment Fund, National Innovation Fund, Small Business Development Fund, Marketing and Analytical Research Centre, Kazakhstani Centre for Investment Promotion, State Insurance Corporation for Export Credits and Investments). In 2007 the total authorized stock of the Development Institutions amounted to US$1.8 billion (as of 1 June 2007). (Source: http://www.inform.kz).

29. Tengiz is the largest oil production area in Atyrau, while Zhana-Ozen is an important oil and gas production area in Mangystau.

30. Kazakhstan plans to increase gas production in the Caspian Sea region from today's 29.6 billion cu m in 2007 to 114 billion cu m in 2020 (KazMunaiGaz).

31. Both provinces have large marine terminals; Mangystau is investing in modernizing its existing ports and building large new ports.

32. In certain cases, the existence of valuable natural resources can encourage political entrepreneurs to secede or seize areas as a means of controlling their revenue streams, which is sometimes called the "honey pot" effect (de Soysa, 2000).

33. Sources: UNICEF 2004; CEP 2006 a; Turkmenmilliihasabat - National statistics of Turkmenistan: data for 1991-2005.

34. Sources: Chulanova, 2007 and Ministry of Natural Resources and Environment Protection of the Republic of Kazakhstan 2001; Agency of the Republic of Kazakhstan on statistics. Online data: http://www.stat.kz/RU/Pages/default.aspx).

35. Sources: Chulanova, 2007 and Ministry of Natural Resources and Environment Protection of the Republic of Kazakhstan 2001; Agency of the Republic of Kazakhstan on statistics. (Online data: http://www.stat.kz/RU/Pages/default.aspx).

36. This is especially the case when perceived differences of treatment and salary between local and foreign workers can foster discontent and even spark clashes. Some observers consider the incidents in October 2006 at the Tengiz oilfield where clashes erupted between Kazakh and foreign oil workers (mostly Turks and Filipino) an example of this situation. See Joanna Lillis, "Oilfield Brawl Dents Kazakhstan's Image", Eurasianet article accessed on 21 November 2006. In June 2008 nearly 600 workers of the Italian ENI oil company operating in the Balkan velayat of Turkmenistan went on strike when salaries suddenly lost 50% of their value after the levelling of the official and market exchange rates for the local currency (the Manat) to the foreign currency. Sixty-two workers were arrested when troops from the Ministry of Interior intervened to end the strike. Source: http://www.dw-world.de.

37. Chulanova (2007: 15) reports also that in the Atyrau province, there is a ninefold wage gap between the oil-extracting region of Zhylyojskiy and the rural Mahambetskiy.

38. Compared to the 18% of the average poverty level in Kazakhstan in 2007; 9,608 KZ Tenge was the average per capita subsistence minimum in Kazakhstan in July 2007.

39. Data for 2002.

40. For more detailed analysis read: Kurmanova A., and Disenova M. (2007). "Kazakhstan: The wealth for the few. Problems of equitable distribution of oil resources". Economic Strategy Institute - Central Asia 2007. Available on-line: www.inesnet.kz/file.php?file_id=73&article_id=73.

41. Associated Press (AP). 22 July 2007. Energy-rich Turkmenistan wants foreign investment for Caspian Sea resort. On-line: http://www.iht.com/articles/ap/2007/07/22/asia/AS-GEN-Turkmenistan-Tourism.php.

42. Quoted from the article "On the coast of grey Hazar" http://www.tourism-sport.gov.tm/en/avaza.

43. The levelling of household income across the regions is reflected in the narrowing gap between the highest and lowest incomes – from 60% in 1998 to 17.5% in 2003 (UNICEF 2004).

44. Resolution of the Council of Ministers of the Kazakh SSR "On declaring protected zone in the northern part of the Caspian Sea", 30 April 1974 - 252 (amended by the Decision of the Cabinet of Ministers of the Republic of Kazakhstan 23 September 1993 - 936). Decision of the Cabinet of Ministers of the Republic of Kazakhstan "On the formation and development of hydrocarbon deposits in the Kazakh part of the Caspian Sea", 13 February 1993, 97.

45. Ak Zhayk Newspaper Atyrau, 15 January 2008. "Kazakhstan once again forced foreigners to share Kashagan". Available at: http://azh.kz/2008/01/15/kazakhstan-vnov-zastavil-inostrancev.html Official information is available from Kazmunaigaz (http://www.kmg.kz).

46. Ak Zhayk Newspaper Atyrau, 22 November 2007. "How to use sulphur milliards?" Available at: http://azh.kz/2007/11/22/kak-ispolzovat-sernye-milliardy.html.

47. Ak Zhayk Newspaper Atyrau, 22 November 2007. "Sulphur storage at Tengiz is unsafe". Available at: http://azh.kz/2007/11/22/sernye-karty-na-tengize-nebezopasny.html.

48. Discussions during the regional ENVSEC consultations held in Ashgabad, Turkmenistan, September 2007.

49. In April 2007 Turkmenistan's President announced plans to invest US$1 billion to build a major tourist resort on the Caspian Sea (at Avaza).

50. The declaration by the Kazakh President Nursultan Nazarbayev concerning the construction of a transport

link between the Caspian and the Black Sea reaffirms this necessity.

51. Nearly 80% of Atyrau people (1,000 respondents took part) are against the construction of Kashagan oil processing plant according to NGO Kaspi Tabigaty (Caspian Environment). http://azh.kz/2007/06/14/884_atyraucev_protiv_stroitelstva_zavodov_adzhipa_v_karabatane.html.

52. These protocols deal with: i) Regional Preparedness, Response and Cooperation in Combating Oil Pollution Incidents, ii) Environmental Impact Assessment in Transboudary Context (EIA protocol), iii) Biodiversity Conservation, and iv) Pollution from Land-Based Sources and [Activities].

53. Environmental penalties and fines in the region amounted to almost 1 billion KZT in 2005. They were paid into the republic's budget.

54. The Aktau uranium production complex is reported to have had annual capacity in excess of 1 300 tonnes of U3O8. Uranium production declined in the early 1990s, from 1 100 tonnes of U3O8 in 1990 to 370 tonnes in 1993. Mining and milling operations were suspended in February 1994.

55. As of 1994 the total uranium resources of mines around Aktau operated by the processing plant were estimated at 64 400 tonnes of uranium (NTI (2007). After 1994 uranium extraction moved to other sites in Kazakhstan with in-situ leaching.

56. Kazakhstanskaya Pravda Newspaper published on 5 January 2008. "MAEK - Kazatomprom: development prospects", available at http://www.kazpravda.kz.

57. State as of 2007.

58. Sources: Ministry of Environment Protection of the Republic of Kazakhstan 2005 b; Mehanobr 2005; UNEP/GRID-Arendal 2006; Akhmetov 2006.

59. The total length of the Ural river is 2 428 km, of which 1 082 km are in Kazakhstan (catchment area within Kazakhstan is 147 800 sq km, 64% of the total). About 72% of its total runoff forms in the Russian part of the basin, average flow is 9.8 cu km a year. In the last 30 years the Ural's flow in Atyrau varied from a low point at 2.54 cu km in 1977 to 17 cu km in 1994.

60. A network of torrents frequently appears in the foothills. An ancient riverbed of Uzboy (a former bed of the Amudarya river flowing into the Caspian Sea 300 years ago) is also located here.

61. In fact, the water from the Amu Darya reaches the Caspian Sea via the final 150-km section of the Karakum Canal and then flows down a pipeline built in 1983 to Balkanabat (formerly Nebit Dag) and Turkmenbashy.

62. Eurasianet reports that in 2006-2008 Turkmenbashi city was left without water supply for several weeks.

63. Water use in the Balkan province in 2005: 1 180 million cu m, 6% of national total.

64. Average annual flow of Atrek is estimated at 292 million cu m (8.37 cu m per sec to a maximum flow of 120 cu m per sec). The watershed area is in Iran (20,000 sq km) and Turkmenistan (7 000 sq km). Rain and snow are the main sources of the river's waters. (Ballyev and Esenov, 2005).

65. Researchers expect a 10-20% increase in the flow of water in the Volga and Ural (Shiklomanov 2007). On the other hand according to several global scenarios for the 21st century, the increased water loss of the Caspian Sea due to evaporation could exceed Volga runoff and the sea level could consequently drop by as much as 4 m by 2100 (Renssen et al, 2007).

66. During the last decade of the Soviet Union, fears of flooding due to the rapidly rising level of the Caspian Sea level, coupled with increasing awareness of the growing Aral Sea disaster, promoted the idea of developing a massive water transfer project from one sea to another. This implied the construction of a 500 km long canal elevating water by almost 100 metres between the Caspian and the Aral Sea at a cost of roughly 15 billion Soviet rubles. Ironically, at the same time Soviet water planners were also considering an opposite plan to collect irrigation drainage water from the Amu Darya and divert it into the Caspian Sea. After independence this plan was modified by Turkmenistan to divert irrigation drainage water from agricultural fields supplied by the waters of the Amu Darya to the so-called "Golden Century Lake", an artificial lake under construction 300 km east of the Caspian Sea.

67. Sources: CEP 2006 b; CEP 2002; CEP 2007.

68. Average for 1930-85.

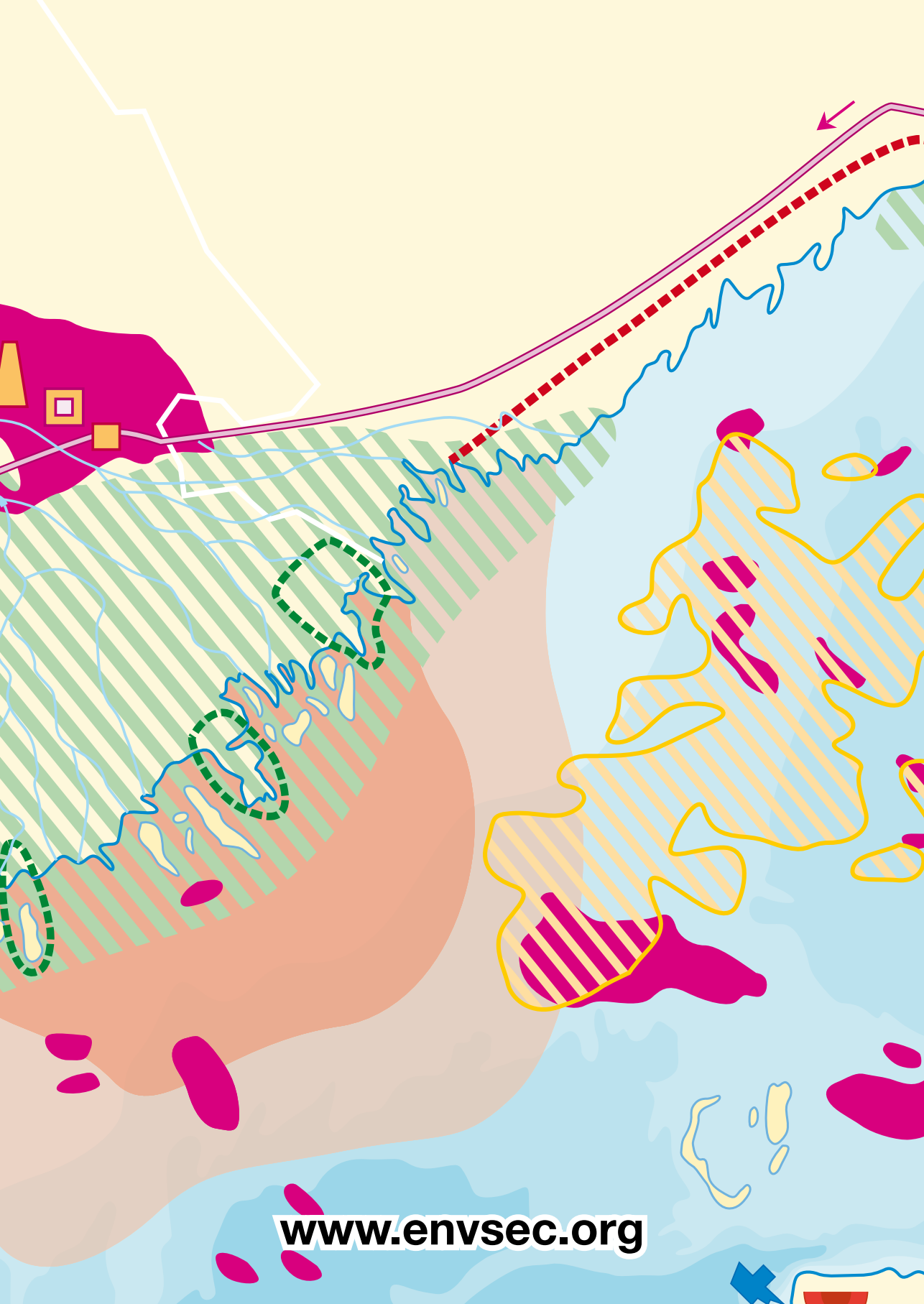
69. In 2006 the H5N1 strain of bird flu was discovered in a dead swan in Mangystau (IRIN, 23 February 2007).

70. The ban was lifted in 2002. Before 2007 the CITES Secretariat didn't publish data on the caviar quotas for the Caspian Sea's fisheries because the five concerned states did not provide sufficient information about their sturgeon catch.

Abbreviations and units

BTC	Baku-Tbilisi-Ceyhan pipeline
CEP	Caspian Environmental Programme
DDT	Dichloro-Diphenyl-Trichloroethane (pesticide)
EBRD	European Bank for Reconstruction and Development
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GRP	Gross Regional Product
OSCE	Organization for Security and Co-operation in Europe
PSA	Production Sharing Agreement
TDA	Trans-diagnostic Analysis
UNDP	UN Development Programme
UNEP	UN Environment Programme

bbl	billion barrels
bcm	billion cubic metres
ha	hectare
sq km	square kilometres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