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Environmental Issues in Central Asia

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Introduction

"Central Asia, encompassing the southern provinces of the former Soviet Union, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan, is rich in natural resources, most still untapped. In Kyrgyzstan and Tajikistan, large quantities of water are stored in the mountain glaciers. Kazakhstan, Turkmenistan and Uzbekistan have huge and mostly unexplored oil and gas deposits" (Envisec, 2008). Even though there are several priority natural resources which are present in large quantities in this area, their availability is not equally distributed among the population and for this reason natural resource management is a current key issue in the national and international polices of Central Asia. Moreover, despite the large quantity, a relevant part of the natural capital is strongly polluted which triggers strong impacts on the population and as a result, there are many economic and social aspects linked to this environmental issue which must also be taken into consideration.

The area is still suffering from past uses during the time of the Soviet Union. One of the main problems inherited from the past derives from the fact that the Central Asia was the nuclear testing ground for the Soviet Union since the late 1940s. This has had a significant impact on human health and the area's fragile ecosystems. Moreover, in order to supply the Soviet's need of cotton, huge areas were devoted to cotton crops and large-scale irrigation systems were built. These aspects strongly contributed to the degradation of the Aral and Caspian Sea. From a social point of view, "the consequences of colonial authoritarianism, forced secularization, central economic planning and the establishment of artificial borders in the region include severe ecological degradation, forced

migration of ethnic groups, and interethnic competition for land, water and other increasingly scarce resources" (Envisec, 2008).

As previously mentioned, the environmental problems of Central Asia are principally linked to the management of the resources which have been industrially exploited for many years. One of the main, current consequences of this, is the considerable environmental pollution, a result of improper mining and industrial waste disposal. These features are key points in the national prospective, but at an international level they are also crucial issues since the transboundary pollution deriving from industrial production can increase the risk of tension between states, a very sensitive matter, especially in the current circumstances.

The risk of transboundary pollution can also be increased by natural disaster: the whole Central Asia region is an important resource for uranium and the poor storage and the risk of health problems due to the use of this substance, which is naturally dangerous, is increased by the high vulnerability of the area to seismic activity, especially in Kyrgyzstan and Tajikistan.

Water resources are also subject to a similar scenario. Although Central Asia is rich in water resources, these are mainly concentrated in Kyrgyzstan and Tajikistan, this means that many states use the same resources making water management a very sensitive issue. Clear examples of this problem can be seen in the case of the Aral Sea Basin and the Amu Daria and Syr Daria rivers which have suffered due to past mismanagement and the creation of the extensive irrigation systems for soviet cotton crops.

fig. 1
Map of Central Asia

Other relevant consequences of the mismanagement of water systems are the degradation and salinization of land.

Moreover, the recent independency from the Soviet Union and the following rearrangement of both the economy, governance, and agricultural systems are still relevant factors influencing environmental issues. The government plays a significant role in the decision making process and on the definition of guidelines and country strategies, however, at the same time there are often problems concerning the lack of efficient and cooperative frameworks for the implementation of programs in addition to the lack of cooperation among parts of the government itself. Finally, it should also be highlighted that amongst the government priorities there are often social issues, such as poverty, availability of primary resources, employment and ethnicity concerns, in addition to environmental issues.

To conclude, these countries have common characteristics, but political and social geography is highly diverse and accordingly, the priority given to environmental constraints also varies. Summarizing therefore, the issues for Central Asia are: resource management (water, soil and mining), availability of resources (water, salinization of soil), agriculture (soil availability, use of pesticides and monoculture effects) and industry (pollution and waste), disaster prevention and health security (mining, water and radioactivity).

These environmental issues, their causes and implications will be studied country by country in the following chapters.

Kazakhstan

General Data

Total Surface:	2,717,300 sq km
Land:	2,669,800 sq km
Water:	47,500 sq km
Land boundaries	total 12,185 km
border countries:	China 1,533 km
	Kyrgyzstan 1,224 km
	Russia 6,846 km
	Turkmenistan 379 km
	Uzbekistan 2,203 km
Coastline:	0 km (landlocked) Kazakhstan borders the Aral Sea, now split into two bodies of water (1,070 km), and the Caspian Sea (1,894 km)

Use of land (2005)

Arable land	8.28 %
Permanent crops	0.05 %
Other	91.67 %
GDP - composition by sector:	agriculture: 5.80 %
	industry: 39.40 %
	services: 54.70 %
	(2008 est.)

fig. 2
Map of Kazakhstan

Overview

Kazakhstan is the largest country in the Central Asia region. “It shares common borders with Kyrgyzstan, the Russian Federation, Turkmenistan and Uzbekistan and is also one of the most sparsely populated regions in the world. Besides of Kazak ethnicity, there are minorities such as Russian, German, Ukrainians and Uzbeks. Fortunately, tensions among these groups have been less frequent than in neighbouring countries” (Carius et al, 2003).

Kazakhstan is a very rich country in terms of natural resources such as: minerals, oil, gas and water and its most urgent environmental concerns are water, radiation and waste. These issues also have considerable effects on the population’s health and so the environment and health are strongly linked in this country. Other environmental issues which should also be considered are: air pollution and biodiversity loss.

Despite the huge quantity of natural resources, in particular water, Kazakhstan currently depends on more than 50% of water supplies coming from neighbouring countries and, due to the global climate change, this dependency is destined to continue, or in the worst case scenario, to increase further. According to scientific forecasts during the next 15-20 years present pastures and arable lands could fall into the category of desert and semi-desert lands and water-security could be reduced by third.

However, for a deeper analysis, it must be noted that due to the size of the country and the presence of several different ecosystems, the environmental issues to be faced differ according to area.

Water

Water management is one of the main priorities reported in the National Environmental Plan for Sustainable Development, in particular, general water supply and its quality.

Although Kazakhstan borders on the Aral Sea, the water resources are not as rich as in the other countries in Central Asia and in general it can be said that the management of this resource has not been carried out with a long term prospective.

The mismanagement of irrigation projects is the cause of the decrease in the Aral Sea level of 13 m, halving it from its original

size. The change in size has modified the climate in the area and revealed 3 million hectares of land which is now subject to erosion. According to Carius (Carius. et al, 2003): "Kazakhstan is one of the immediate victims of the environmental devastation and collapse of the Sea's ecosystem, which derived from the shrinking of the Sea to almost half of its original size due to a reduction in average annual discharge from 50 –60 km2 before 1960 to only 5 km2, if at all, in the 1990s".

The reduction of the water volume in the Aral Sea was due to both mismanagement and the diversion of the Syr Darya and the Amu Darya rivers, for irrigation purposes, and in consequence has caused the following two main effects.

First of all, the layer of chemical pesticides and natural salts has become harmful regarding land salinization and there has been a consistent loss of biodiversity. Secondary effects are air pollution and several socio-economic issues, such as unemployment, health problems and migration. Moreover, "the impacts of salt and dust storms carrying particles from the previous seabed are felt hundreds of kilometres around" (Carius et al, 2003). Furthermore, it should be highlighted that chemical pesticides and natural salts have also polluted the soil and in combination with the poor infrastructures and wasteful irrigation practices this has brought about further hazardous implications for both man and the environment.

The Aral Sea status is of global interest, and therefore international funds have been allocated in order to stabilize the ecological situation, since its recuperation is not feasible.

A Program of Actions on Improvement of Ecological, Social and Economic Conditions in the Aral Sea Basin for the period of 2003-2010 has been developed and realised in Kazakistan.

In addition, all these issues were dealt with in an international meeting (Ashgabat September 17-18, 2007), where together with the two bordering countries, Kazakhstan and Turkmenistan, several international institutions, UNEPD, OESCD, NATO and ENVISEC, discussed and defined future strategies of cooperation. It emerged during this meeting that the dependency on the sea resources is still very high and that currently there are no realistic or viable alternatives available.

Moreover, it became clear that the awareness on the relevance of these issues is often low and the problem is not always perceived objectively since there is not a clear linkage between pollution and its effects. In order to implement the outcomes of the meeting and to promote cooperation to solve these criticalities the National Caspian Action Plan was established. The plan evidenced several priorities and pressed the regions to include these priorities in their policies and strategies.

Water is a crucial issue not only in the Aral Sea case, but also with regards to the water supply for agriculture, industry and drinking water standards.

The Syr Darya case must also be mentioned in connection with agriculture and as the river is a vital resource both for Kazakhstan

and Uzbekistan it has been grounds for many discussions and tensions in the past. Syr Darya is one of the two main rivers that originally flowed into the Aral Sea and which were both diverted for irrigation purposes. This modification made the layer of chemical pesticides and natural salts harmful since the level of water decreased significantly.

Other important aspects linked to water are basin management, water supply and distribution units. In fact, the most polluted waters are the basic waterways of Kazakhstan (the basins of rivers Irtysh, Ili, Nura, Syr-Darya), due to the mining, metallurgical and chemical industries.

Water resource management is a critical issue not only from a natural and economic point of view, but also from a social point of view. "Ethnic tensions have also been fuelled by the problem of water allocations around the Arnasay reservoir, though the last remaining border issues in this area between Uzbekistan and Kazakhstan were settled in September 2002" (Carius et al, 2003).

Radioactivity and related issues

Within the environmental concerns in this country the radioactivity level must also be considered. "Natural radioactivity is two to three times higher than the global average" (Carius et al, 2003).

As the site of the former Soviet Union's nuclear testing programs, vast areas of the country have been exposed to high levels of nuclear radiation, determining significant radioactive pollution. During the Soviet period, 14 large military testing polygons were used within Kazakhstan territory. Moreover, the nation also has 30 uranium mines, which may contribute to the problem of uncontrolled release of radioactivity.

Even if this issue is principally connected with the past, the impacts of the military testing sites on the environment still remain acute.

Kazakhstan must face not only the "modern" pollution (i.e. due to modern industrial activities, improper waste treatment and management) but also the so called "historical" pollution coming from radioactive and toxic chemical sites, test ranges, waste disposal associated with former defence industries and previous activities from oil firms during the Soviet Era.

Besides these issues, during the Soviet Period the Kazakhstan territory was also used for setting up biological laboratories. These installations are still causing environmental problems due to the substances used and for the demolition of the laboratories itself. "The Aral Sea's Vozrozhdeniye Island history as biological and chemical test site adds a further risk to human health". (Carius. et al, 2003). Furthermore, "the seriousness of this issue in the Semipalatinsk region was recognized by the UN (Resolution 52/169 M) in 1997, stating that "radiological, health, socio-economic, psychological and environmental problems" in this area would need the attention of the international community" (Carius. et al, 2003).

As Kazakhstan's economy is mainly based on geological extractions, special attention must also be placed on the geological reserves. Even though this resource has already been strongly exploited, new research shows that it would be possible to increase the oil production capacity in Kazakhstan by up to 150 million tonnes per year and more. However, the possible impacts of more extractions on the environment have not yet been assessed and in particular, the maximum permissible level of oil output in the Caspian shelf without creating further damage to the marine ecosystem.

These issues are being dealt with within the framework of the State Programme for Kazakh Caspian Sea offshore development.

Waste

Besides water management and radiation, another crucial problem to be faced by Kazakhstan is waste. There is a huge amount of industrial waste which is not being properly managed thus, causing significant impacts not only due to the quantity but also because some of it is hazardous waste coming from heavy metals used in industrial processes. This leads to the contamination of both surface and groundwater causing further considerable consequences.

Air Pollution

On the list of key environmental issues in Kazakhstan air pollution is another significant problem. Acid rain damages the environment within the country and also affects neighbouring countries. In 1992 Kazakhstan ranked 14th in the world with the highest level of industrial carbon dioxide emissions (297.9 million metric tons, and a per capita level of 17.48 metric tons). In 1996, the total emissions had dropped to 173.8 million metric tons.

Kazakhstan is taking active measures to deal with this problem, and in 2000 - 2002 it managed to stabilize harmful emissions in the atmosphere to a level of 3.4-3.5 thousand tons, despite the considerably increased level of production.

Wildlife

Kazakhstan's wildlife is in danger of extinction due to the overall level of pollution. "According to current estimates, some areas of the nation will not be able to sustain any form of wildlife by the year 2015. In the areas where pollution is the most severe, 11 species of mammals and 19 species of birds and insects are already extinct. As of 2001, 15 mammal species, 15 bird species, 5 types of freshwater fish, and 36 species of plant are listed as threatened. Threatened species include the argali, Aral salmon, great bustard, snow leopard, and tiger. The Mongolian wild horse has recently become extinct in the wild" (http://www.kazakhstan.at/).

Health impacts

Finally, it should be highlighted that all these environmental issues have important consequences on Kazak heath. In fact, there was a recent increase in cases of malignant tumours, in particular, breast cancer among women, widespread allergic diseases, disturbing levels of anaemia, with more cases emerging in the rural areas.

Energy

Energy is the leading economic sector in Kazakhstan. “Kazakhstan is estimated to have between 30 and 40 billion barrels of crude oil reserves, about half those of Russia and 11 per cent of those of Saudi Arabia and eleventh in the world, between Nigeria and the U.S” (International Crisis Group, 2007) Almost all of its oil fields are in the west, near or offshore in the Caspian Sea. The major exception is the Karachaganak field in the north west, near the Russian border.

Major oil and gas fields and their recoverable oil reserves are from the Tengiz field which was discovered in Atyrau province in 1979 and is often ranked as the world’s sixth-largest reserve with 7 billion barrels (1.1 km^3); the Karachaganak field, also discovered in 1979, with 8 billion barrels (1.3 km^3) and 1,350 km^3 of natural gas and the Kashagan field with 7 to 9 billion barrels (1.1 to 1.4 km^3), discovered in the northern Caspian Sea in 2000, and is considered the largest oil field outside of the Middle East.

The Kurmangazy field in the Caspian Sea and on the maritime border with Russia, was first drilled in 2006, although unsuccessfully. Companies currently revaluating the field have stated that the geological structures are more complex than previously thought and so it does not seem to be destined as a new extraction site.

Furthermore, every year about 10 million metric tons of Kazak crude oil are used in three refineries within the territory. Kazakhstan holds about 4 billion tons of proven recoverable oil reserves and 2,000 cubic kilometres of gas. “Industry analysts believe that planned expansion of oil production, coupled with the development of new fields, will enable the country to produce as much as 3 million barrels (477,000 m^3) per day by 2015, lifting Kazakhstan into the ranks of the world’s top 10 oil-producing nations.

Given crude oil production in 2006 was 54 million metric tons, net crude oil exports would be about 41 million metric tons (about 820,000 bbl/d). Outside OPEC, only Russia, Norway and Mexico export more” (International Crisis Group, 2007).

About 84 per cent of Kazakh oil exports on the market pass through Russia, “although with the advent of the independently owned Caspian Pipeline Consortium (CPC) pipeline in 2001, the majority no longer transit the Russian state-owned Transneft system. The CPC pipeline carries about 24.5 million metric tons per year from Tengiz through Atyrau to the Russian Black Sea port of Novorossiisk. Given expected increases in Kazakh production, volume through the Transneft system (mostly to Samara) will increase from the

current eighteen million tons; Karachaganak began sending oil this way in July 2006" (International Crisis Group, 2007).

With regards to gas, Kazakhstan is ranked eleventh in the world and about 25 per cent of its reserves are in the Karachaganak's field. Only after 2004 did Kazakhstan stop being a net importer, since the lack of foreign investment started to gradually decrease production. This low growth is also due to a lack of transport infrastructure.

National strategies on environment

The ecological policy is currently under intense development. Lots of new documentation on environmental protection and new conceptual programs have been developed.

The Kazakhstan president is pushing for a new vision of legislation and economy which is attentive to environmental protection and its measures. Strict ecological requirements have been introduced in all legal acts and economic sectors.

Kazakhstan has taken a long-term approach to environmental policy development in its Strategic Plan Up To 2030 'The Environment and Natural Resources'. Initially, the Kazakhstan government adopted the Strategic plan of Kazakhstan development until 2010, whilst the Program of Activity of the Government of Kazakhstan for 2003-2006 was accepted within the framework of the Strategy. The main objective of these programs is to improve living standards in all regions of the country on the basis of socio-political stability, sustainable socio-economic development, strengthening economic and environmental safety, reducing system risks and developing international cooperation.

In addition to this long term approach, more immediate environmental issues are addressed in various sectoral programmes (e.g. the Strategic Water Resource Plan, National Action Plan for Addressing Environmental Risks in Central Asia Combating Desertification or Forest Programme, all by the Ministry of Agriculture) as well as the National Environmental Action Plan for Sustainable Development (NEAP/SD). The NEAP/SD is mainly responsible for the preparation of the National Environmental Plan and its monitoring, and has started working on the National Agenda. Other relevant measures which should also be mentioned are that environmental impact evaluation is obligatory at the time of drafting any program which is aimed to develop industry and agriculture. It is also obligatory for schemes on industrial allocation capacities, construction of urban areas and other large-scale programs.

In this sense, the size of ecological payouts according to the actual levels of inflicted damage has been increased, and all accumulated funds are to be forwarded to environmental recovery

"Beginning from 2003 Kazakhstan is going to introduce obligatory ecological insurance and ecological audit of environmentally harmful types of activities" (http://www.kazakhstan.at/).

The relevant laws are still under development, although in

1999, a Programme of Ecological Education was also approved.

Kazakhstan has ratified the three Rio conventions (United Nations Framework Convention on Climate Change, Convention on Biological Diversity, Convention on Combating Desertification) and has signed the Kyoto Protocol. It has accession status to the Montreal Protocol on Ozone Depleting Substances, the UN ECE Convention on Long- Range Transboundary Air Pollution, is Party to the UN ECE Convention on the Transboundary Effects of Industrial Accidents and has ratified the UN ECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes, as well as the Aarhus Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters.

With the aim of implementing the decisions made during the World Summits on sustainable development held in Rio de Janeiro and Johannesburg, the Kazak government has also decided to create a National Commission on Sustainable Development and carry out a Sustainable Development Program in order to create necessary financial institutions, which will accumulate grants, donors and other non-budgetary contributions.

In 2005, Kazakhstan joined the Environment for Europe Program and still places special attention on European Union standards, this is done with the aim of improving the Kazak environmental protection legislation but also in order to stimulate cooperation programs and foreign trade among European and Kazak partners.

“First of all, Kazakhstan plans to lift the status of ecological requirements up to the level of laws. They should go in a package as an appendix to legal acts as practiced in the developed countries of the world. The implementation of international quality standards ISO-9000 and the environment protection ISO-14000 has started. Kazakhstan in simplifying the procedures of obtaining necessary permits, simultaneously toughening the ecological requirements, harmonizing them with the requirements adopted in the European countries.” (http://www.kazakhstan.at/).

Finally, with regards to international cooperation, it is important to remember the Ecological strategy of Eastern European Countries, Caucasus and Central Asia. Kazakhstan should strengthen regional cooperation within Central Asia, since all regions depend on the same resources, in particular water, but more specifically, the Aral Sea.

Some relevant government programs:

- Strategy of Kazakhstan development till 2030
- Decree “On further measures on implementation of the Strategy of Kazakhstan development till 2030”
- Program of activity of the Government of Kazakhstan for 2003-2006
- Action plan on implementation of the Program of activity of the Government of Kazakhstan for 2002-2004
- Concept of the government youth policy
- On military doctrine of the Republic of Kazakhstan
- On Education government program
- On government program on insurance sector development
- Government program on struggle against corruption
- Government program on languages functioning and development
- Government program on developing physical culture and sport
- Government program on formation and development of national information infrastructure
- Government program of the Republic of Kazakhstan on agriculture and food for 2003-2005
- Government program on socio-economic development of Astana
- Government program on support to small business development and support
- Government program on development of road-transport structure
- Government program on development of house-building in Kazakhstan for 2005-2007
- Strategy on industry and innovation of the Republic of Kazakhstan for 2003-2015
- Government program on Cultural Heritage for 2004-2006

Kyrgyzstan

General Data

Total Surface:	198,500 sq km
Land:	191,300 sq km
Water:	7,200 sq km
Land boundaries	total: 3,051 km
border countries:	China 858 km
	Kyrgyzstan 1,224 km
	Tajikistan 870 km
	Turkmenistan 379 km
	Uzbekistan 1,099 km
Coastline:	0 km (landlocked)
	Turkmenistan borders the Caspian Sea (1,768 km)

Use of land (2005)

Arable land	6.55 %
Permanent crops	0.28 %
Other	93.17 %
GDP - composition by sector:	agriculture: 33.6 %
	industry: 18.9 %
	services: 47.5 %
	(2007 est.)

Overview

Kyrgyzstan is a land-locked country with limited resources and most of its territory is mountainous. Currently the glaciers are the most important fresh water stock and also the country's main resource. Environmental issues in Kyrgyzstan are mainly irrigation systems and the large scale gold-uranium mining. Deforestation should also be mentioned and is briefly discussed below.

Water

Although water is a key resource and its good management is a vital issue, this is not considered such by the Kyrgyzstan government and a national strategy has not yet been implemented. Moreover, "not only Kyrgyzstan depends on water resources for agriculture, industry and hydropower generation. The downstream countries Uzbekistan, Kazakhstan and important parts of Tajikistan are reliant on the same sources" (Carius. et al, 2003). The principal environmental concern is that many people obtain their water directly from contaminated streams and wells. In addition, there is a significant increase in soil salinity deriving from faulty irrigation practices.

Radioactivity

As in Kazakhstan, uranium mining, heavy metals and mercury, and the storage of past mining waste deposits have also become key environmental problems in Kyrgyzstan. The uranium used in the Russian nuclear power plants came from Kyrgyzstan and there are at least 50 abandoned mineral sites.

In 1998 nearly 2 tons of uranium was accidently spilled into the Barskoön River and onwards to the Issyk-Kul water (the second largest alpine lake after Titicaca). After this incident the National Environmental Action Plan (NEAP) for Kyrgyzstan was adopted.

The radioactive waste management, transboundary water cooperation and the reversing of land degradation are issues included in the cooperation projects of CSCE in Tajikistan.

Deforestation

Due to the poor conditions in the mountains, forest resources are often used as fuel. It should therefore, be noted that "deforestation increased annually between 1990 and 2000 by 2.6 percent. Forest decline is leading to constraints of water supply and food availability, which is posing significant threats to human security on the southern and northern slopes of the Ferghana Valley" (Carius et al, 2003).

National strategies on environment

The Kyrgyzstan's Comprehensive Development Framework Strategy 2001 to 2010 (CDF) aims at "achieving political and social well-being, economic prosperity of Kyrgyz people in terms of prevalence of principles of freedom, human dignity and equal opportunities".

fig. 3
Map of Kyrgyzstan

The framework underlines the priority for the country's development both from an economic and social point of view, together with the ways in which to reach these goals, such as: effective and transparent public administration; equitable society ensuring protection and human development; sustainable economic growth.

It should also be stated that the management of natural resources and environmental policy in Kyrgyzstan is widely spread across several ministries and agencies. "Major tasks of environmental state agencies, such as the state forestry service responsible for natural resources and nature conservation, are treated separately from important issue areas such as air pollution, industrial pollution, and land and water resources, which belong to the Ministry for Emergencies" (Enivisec 2007). Even though economic incentives for environmental protection exist, they serve mainly fiscal purposes and do not encourage sustainable use of resources. "Environmental impacts on public health are rarely assessed and monitored by the Ministry for Emergencies and Ministry for Public Health. Both lack technical capacity and sufficient institutional mechanisms for coordination" (Enivisec 2007). A lack of implementation and integration of the existing policies is evident and several current measures are purely agreements without concrete development. Furthermore, the implementation of institutional arrangements and mechanisms for integrated environmental assessments are missing. The Comprehensive Development Framework Strategy aims at filling these gaps.

Another important aspect of the Kyrgyzstan's environmental policy is that the country has ratified the United Nations Framework Convention on Climate Change and has accession status to many international agreements such as: the Convention on Biological Diversity, the Convention on Combating Desertification as well as the Montreal Protocol on Ozone Depleting Substances, the UN ECE Convention on Long-Range Transboundary Air Pollution and the Aarhus Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters.

The government of the Kyrgyz Republic is also addressing a transboundary environmental project in Gorno-Badakhshan.

Moreover, the Swiss government is currently supporting a water management project in the Ferghana Valley concentrating on water allocation and utilization among the neighbouring countries. Biodiversity conservation across borders is also being promoted, through the West Tien Shan Interstate Biodiversity Project (funded through TACIS) and operates in Sary-Chelek and Besh Aral (Kyrgyz Republic), Aksu Djabagaly (Kazakhstan), and Chatkal (Uzbekistan).

Finally, there is also a recent initiative on water cooperation on the Chu and Talas rivers.

Even though transboundary environmental cooperation is officially promoted, practical implementation of projects still requires assistance.

Some relevant government programs:

- The Comprehensive Development Framework of Kyrgyz Republic until 2010 doc
- National Poverty Reduction Strategy
- "Human Rights" National Program
- "Araket" National Program on Poverty Reduction
- "Ardager" National program
- National program on State Support to disabled people
- National Program on Arrangement and Conducting the International Year of Mountains in Kyrgyz Republic
- "Jashtyk" National Youth Development Program until 2010
- "Labor Market and Population Employment in Kyrgyz Republic for 1998-2000 and for the period until 2005 (Emgek)" National Program
- "Manas" National Program on Healthcare Reforms in Kyrgyz Republic (1996-2006)
- "Strong Heart to Every Kyrgyzstany by 2010" National Program
- "Tuberculosis-II" National program of Kyrgyzstan for the period 2001-2005
- "Informational and Communicational Technologies for development of Kyrgyz Republic" National Strategy
- "New Generation" State Program on Fulfilling Children's Rights
- State Program on Improving Election System in the Kyrgyz Republic for 2001-2005
- "Earth" State Program until 2005

- State Program on Strengthening the Struggle Against Corruption, Contraband and Economic Crimes in Kyrgyz republic for 2001-2003
- Government program on house-building in Kyrgyzstan till 2010
- "Intellect" State Program on Development of Intellectual Property System in Kyrgyz Republic until 2000-2010
- State Program on Reform of Higher Medical and Pharmaceutical Education in Kyrgyz Republic (2000-2004)
- State Program on Comprehensive Socio-economic Development of Osh city for 2001-2010
- Government program on resistance to religious extremism for 2004-2005
- Government program on introduction of cashless settlement system for 2003-2005
- Government program on science reforming for the period 2003-2005
- Program on Coal Industry Development in Kyrgyz Republic until 2005
- Program on Social and Economic Development of Issyk-Kul Region for 1999-2009
- Program on achieving health for everyone in XXI century
- Program on Poultry Farming Development in Kyrgyz Republic for 2000-2005
- Program on development of material and technical base of judicial system in Kyrgyzstan for 2000-2005
- Program on beekeeping in Kyrgyzstan for 1998-2005
- Program on Sustainable Development of Industry in Kyrgyzstan for 1999-2005
- Program of measures towards tourism development in Kyrgyz Republic until 2010
- Program on developing official language of Kyrgyz Republic for 2000-2010
- "Access to Education (Jetkinchek)" Program
- Program of State Guarantees on Providing medical care to Kyrgyzstan citizens for 2003
- Program on Socio-economic Development of Batken region for 2000-2005

Tajikistan

General Data

Total Surface:	143,100 sq km
Land:	142,700 sq km
Water:	400 sq km
Land boundaries	total: 3,051 km
border countries:	Afghanistan 1,206 km
	China 414 km
	Kyrgyzstan 870 km
	Uzbekistan 1,161 km
Coastline:	0 km (landlocked)

Use of land (2005)

Arable land	6.52 %
Permanent crops	0.89 %
Other	92.59 %
GDP - composition by sector:	agriculture: 23.00 %
	industry: 29.40 %
	services: 47.60 %
	(2008 est.)

fig. 4
Map of Tajikistan

Overview

Tajikistan is mainly mountainous (93%) and its territory is prone to strong seismic activities.
After its independence in 1991, the country fell into a civil war lasting from 1992 to 1997.

The main environmental constraints in this country dealt with below are impacts of natural disasters, land degradation (and salinization), and the limited availability of clean drinkable water. The degradation of the land is mainly due to the pressure of agriculture and industry which are concentrated in the western part of the country. These activities, in addition to poor irrigation practices, are causing the salinization of vast surface areas.

Water

"Tajikistan is characterized by ongoing degradation of land resources and limited availability of clean water, a slowly stabilizing economy, enormous social problems and insufficient state capacity relying on external assistance" (Carius et al, 2003).

Although "in Tajikistan there are not problem of water resources, [...] the country has a high susceptibility to natural disasters due to a very high dependency on hydropower and agricultural production" (Carius et al, 2003). The country also faces a more complex issue regarding water quality, since in general the quality of the water is high but the drinking water standards are not always met. This is due to poor sewage treatment and informal garbage dumps which continue to pollute the water. Other causes behind the low quality are: land salinization, use of pesticides and mining discharges. These issues also have secondary effects, such as a significant increase in health problems and high morbidity rates.

It should be noted that hydropower and agricultural production are affected by droughts, which are quite frequent in this country, therefore, as the population is more concentrated in the most vulnerable areas, the impacts of drought are even stronger on the people and their livelihoods.

Deforestation, desertification and the deterioration of wild life has become a critical issue since the end of the civil war. Con-

cluding the overview on the environmental issues in Tajikistan, waste from the mining of uranium should also be included as another important concern.

Energy

The energy sector is mainly based on hydroelectric production, given that 90% derives from this energy source. “There is a greater hydroelectric power capacity in Tajikistan than any other country in Central Asia. Tajikistan has the potential to produce more than 300 billion kilowatt hours electricity per year, but currently produces only 16.5 billion kilowatt hours. The majority of Tajikistan’s hydroelectric energy is produced by the hydroelectric stations on the Vakhsh River, with a total capacity of about 3,800 megawatts (MWe), producing 14 billion kilowatt hours annually. The largest of these is the Nurek hydroelectric facility, which is rated at 3,000 MWe.” http://www.globalsecurity.org/military/world/centralasia/tajik-energy.htm.

A major portion of this hydroelectric capacity is used in the production of aluminium, which consumes 40% of the country’s total electric power, however, the construction of several other plants are planned at Roghun, Shurob, Kaphtarguzar and Sangtuda.

In Tajikistan oil, gas and coal are not produced, however, since 2001 the first small oil refinery at Konibodom has been opened. The refinery has a capacity of 400 b/d, and produces gasoline, diesel fuel, kerosene, and fuel oil. Of course this production amount is not enough for the country’s needs and so there is a strong amount of importation (around 43 billion cubic feet of natural gas per year) mostly from Uzbekistan, which provides 70% of Tajikistan’s oil product imports. There are fairly good oil reserves in the country, around 12 million barrels of oil, most of which are located in the northern part of the country in the Leninobod Soghd Region.

Regarding natural gas, Tajikistan has 200 billion cubic feet (Bcf) of natural gas reserves, comprising several fields (i.e. Khoja Sartez field, in the southern Khatlon Region the Qizil Tumshuq deposit in the Kolkhozobod District of the southern Khatlon Region). Tajikistan is trying to increase its own production by carrying out exploratory drilling in the Khatlon region, although up to now the country has mainly imported it gas supplies. In fact, Tajikistan imports 95% of its consumption, but has continual problems paying for the gas it imports. There is an intergovernmental agreement with Uzbekistan for a fixed annual quantity, but the Tajikistan imports are often higher. Moreover, only 18% of the gas consumed in 2001 was paid for by users, so Tajikistan has had to cut off non-paying customers and negotiate for more gas with its suppliers. There are two lines of electrical networks that connect the country with the Uzbekistan for the transportation of electricity, one in the south and the other one in the north and it seems that there are plans to connect the two parts.

In general “the electric power is the responsibility of the State-

owned joint stock company Barqi Tojik, which entirely controls production, transportation and distribution of electricity in Tajikistan. Oil and gas production, and development of oil and gas deposits are the responsibility of the State Committee for Oil and Gas. Distribution of natural and liquefied gas in Tajikistan is carried out by the national gas company TajikGas, while import and distribution of oil products are carried out by the State Company Tajiknefteproduct. The coal-mining sector is controlled by the State Committee for Industry" http://www.globalsecurity.org/military/world/centralasia/tajik-energy.htm.

National strategies on environment

"According to Article 36 of the Constitution of the Republic of Tajikistan 'the state guarantees the right of citizens to a favourable environment'. As a basic environmental policy measure, the Law on Nature Protection was adopted in 1994 accompanied by the State Ecological Programme (1996) and the State Programme on Environmental Education (1997)" (Enisec, 2007). The Poverty Reduction Strategy is another important national strategy dealing with socio-economic issues. The basic components of the strategy are the following: increasing the level of social protection, economic integration into the international community, attracting direct foreign investment in order to ensure rapid development of economic sectors, especially transport infrastructure, and electric power industry.

Regarding the division of responsibilities "the Ministry of Nature Protection is in charge of environmental management and is assisted by 11 offices providing administrative and technical support. In addition, other ministries such as the Ministry of Emergency Situations and Civil Defence, the Ministry of Agriculture and the Ministry of Water Resources play an important role in environmental policy-making.

However, due to a lack of coordination for environmental protection among these ministries, the implementation of policies is not yet effective" (Envisec, 2007).

It should also be noted that the effectiveness and the integration of the policies are still low due to the decreasing number of staff working on these issues and the limited available funds, particularly during the civil war. "Several bilateral agreements indicate that the connection between environmental stress and conflict is taken seriously by Tajikistan. The agreements between Uzbekistan and Tajikistan on issues of pollution from the Tajik Aluminium Plant in Tursunzade and Uzbek Bekabad's metallurgic and cement plants as well as the joint statement made by the Governments of Tajikistan and Kyrgyzstan on the water conflict in Isfara district show that the foreign policy dimension of Environmental pollution is tackled more effectively than the root causes themselves" (Envisec, 2007). Tajikistan has ratified the United Nations Framework Convention on Climate Change and has accession status to the Convention on Biological Diversity, the Convention on Combating Desertification as well as the Montreal Protocol on Ozone Depleting Substances and the Aarhus Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters.

Some relevant government programs:

- Poverty Reduction Strategy
- Interim Poverty Reduction Strategy
- Program on Agriculture Development till 2005
- Program for Attraction of Foreign Investments to the Republic of Tajikistan
- Three-year Privatization Strategy Program (2005-2008)

Turkmenistan

General Data

Total Surface:	488,100 sq km
Land:	488,100 sq km
Water:	-
Land boundaries	total: 3,736 km
border countries:	Afghanistan 744 km
	Iran 992 km
	Kazakhstan 379 km
	Uzbekistan 1,621 km
Coastline:	0 km (landlocked)

Use of land (2005)

Arable land	4.51 %
Permanent crops	0.14 %
Other	95.35 %
GDP - composition by sector:	agriculture: 11.5 %
	industry: 40.8 %
	services: 47.7 %
	(2007 est.)

fig. 5
Map of Turkmenistan

Overview

"Turkmenistan possesses large reserves of natural gas and substantial deposits of oil. The country is characterized by aridity, incorporating the Kara-Kum desert, one of the largest sand deserts in the world and limited water availability" (Carius et al, 2003).

The principal environmental concerns in Turkmenistan are the soil and groundwater contamination of by agricultural chemicals and pesticides. Moreover, water bodies are polluted by agricultural (mainly monoculture of cotton and uncontrolled discharge of agricultural drainage water) and industrial activities. Finally, although public services are often free (such as: electricity, gas and water), they are not always available for the entire population.

Agriculture

Problems regarding agriculture are associated to the fact that "cotton is at the heart of a system of political and social control that has remained unchanged since independence. Turkmenistan is the tenth largest cotton producer and 50 percent of its irrigated land serves cotton production. The agricultural sector is almost completely dependent on water from the Amu Darya and its tributary rivers Murgab and Tedgen" (Carius et al, 2003).

Water

The realisation of the irrigation channel from the Aral Sea in order to provide water to the south of the country has caused severe problems to the environment, given that the lake has completely disappeared in Turkmenistan. The diversions for irrigation purposes have also been critical in the Amu Darya River, halting its flow and thus the replenishing of the Aral Sea. The reduction of the quantity of the water made the pollution issue more critical, increasing the concentration of salt and harmful substances.

Soil

The country also needs to face up to the loss of soil and water due to salinization and poor irrigation methods and, in consequence, desertification. Of course there are also many social and health problems linked with all these aspects.

Biodiversity

Amongst the environmental concerns faced by this country the depletion of biodiversity must be considered. This is occurring in direct connection with human-induced desertification of oases and mountain landscapes.

Air

This can be considered a positive aspect, since the overall air quality in Turkmenistan is definitely good, this can be put down to industry being somewhat undeveloped. Ashgabat is the exception in this case and is almost always covered by a skin of smog.

Energy

The main exportation product in Turmenistan is gas. Turkmenistan's oil is both on and offshore and the oil reserves are high, about 600 million barrels of proven reserves. There has been some foreign investment in the oil sector, although volumes produced are small. Turkmenneft produces about two thirds of the oil, mainly offshore.

With reference to natural gases, the reserves are estimated, in a conservative way and very similar to the Kazak figures.

"Since the 1980s, most gas production has been from fields in the Amu Darya river basin, including Dauletabad, one of the world's largest. Other very big fields are Shatlyk and Yashlar in the Murgab depression of this basin" (International Crisis Group, 2007).

It was reported that in a cabinet meeting on the 24th of March 2007, Berdimuhammedov presented a plan for major new investment to raise gas production by 20 per cent. The size of this investment was not specified but, if substantial and accompanied by other reforms, it would represent a major shift in Turkmenistan's energy policy.

Finally, "the hydrocarbon sector is dominant in Turkmenistan and the others sectors are not relevant in the country economy and are quite stagnant. Agriculture, one of the largest sources of jobs, has steadily declined, with harvests of the main crops – cotton and wheat – consistently failing to meet government quotas" (International Crisis Group, 2007).

National strategies on environment

The main objective of the National Programme is to transform Turkmenistan into an actively developing country with a high international level of socio-economic development indicators and to ensure high living standards. The National Programme determines the following priority tasks: achieving the level of developed countries; preserving economic independence and security due to high economic growth rate; introduction of advanced technologies and increased labour productivity; steady increase of gross output per capita; and high investment activity and increased construction of industrial plans. In Turkmenistan, public partici-

pation is guaranteed by the Environmental Protection Act which contains several legal provisions for public associations, access to the legislative process, filing environmental complaints, access to information and public participation in decision making. Turkmenistan is a signatory to the Aarhus Convention and the OSCE has facilitated a workshop with several local environmental NGOs on its implementation (Envisec, 2008).

The Ministry for Natural Resource Use and Environment Protection is mainly in charge of the management of natural resources. Although there are economic incentives for environmental protection these are not properly implemented since the sustainable use of resources is not supported by financial incentives. For this same reason policy integration is also not encouraged and therefore, useful and substantial data are not usually available in order to foster environmental policies.

Nevertheless, Turkmenistan has ratified the United Nations Framework Convention on Climate Change, the Kyoto Protocol and the Convention on Combating Desertification. It has accession status to the Convention on Biological Diversity, the Montreal Protocol on Ozone Depleting Substances and the Aarhus Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters.

Even though there are several national policies, transboundary cooperation efforts are still not active, moreover, “financial and technical capacities to effectively implement these conventions through domestic programmes and projects are absent. Here, the government basically relies on external funding from various donor agencies” (Envisec, 2008).

Some projects, however, have been developed in order to reach the obligations of the environmental global ratified conventions, one example is the GTZ (German Technical Cooperation). This is a funded pilot project on participatory resource management which aims to introduce sustainable land use practices and foster inter-communal learning in agricultural practices.

Some relevant government programs:

- Strategy for Social and Economic Development or the Period 2000 –2010
- National Environmental Programme (1998)
- National Environmental Action Plan (1998)

Uzbekistan

General Data

Total Surface:	447,400 sq km
Land:	425,400 sq km
Water:	22,000 sq km
Land boundaries	total: 6,221 km
border countries:	Afghanistan 137 km
	Kazakhstan 2,203 km
	Kyrgyzstan 1,099 km
	Tajikistan 1,161 km
	Turkmenistan 1,621 km
Coastline:	0 km (landlocked)
	Uzbekistan includes the southern portion of the Aral Sea with a 420 km shoreline

Use of land (2005)

Arable land	10.51 %
Permanent crops	0.76 %
Other	88.73 %
GDP - composition by sector:	agriculture: 29.4 %
	industry: 33.1 %
	services: 37.5 %
	(2007 est.)

fig. 6
Map of Uzbekistan

Overview

Uzbekistan has varied resources: natural gas, oil, gold and silver, and has the largest population in Central Asia. However, "With the Aral Sea and Ferghana Valley, Uzbekistan is directly confronted with two major hot spots in Central Asia, posing significant threats to human development and regional stability. Environmental stress triggers social and economic decline and vice versa, resulting in political and social tensions or even open violent conflict, as in the Ferghana Valley" (Carius et al, 2003). The main environmental issues, as described below, concern water management and agriculture. Both the availability and quality of water are crucial issues in Uzbekistan and have often been the cause of tensions between neighbouring countries.

Water

Water management and its primary criticality is the shrinking of the Aral Sea and the consequent increase in concentrations of chemical pesticides and natural salts. Since the 1960s, when the misuse of the Aral Sea water began, it has shrunk to less than 50% of its former area and decreased in volume threefold. Due to the virtually insoluble Aral Sea problem, high salinity and contamination of the soil with heavy elements are especially widespread in Karakalpakstan – the region of Uzbekistan adjacent to the Aral Sea. "The bulk of the nation's water resources is used for farming, which accounts for nearly 94% of the water usage and contributes to high soil salinity. Moreover, there has been a high loss of biodiversity and of the fish resource and the environmental changes impact directly on the population. The loss of fish has virtually destroyed the previously important fishing sector in the region, leaving 60,000 people unemployed" (Carius et al, 2003). Water pollution is also significant due to industrial waste and the heavy use of fertilizers and pesticides (including DDT).

Agriculture

The risks of desertification, pollution and soil salinization are increasing. These aspects are influenced by agriculture and prolonged drought, in addition the cotton monoculture in Uzbekistan

and Turkmenistan creates water-sharing difficulties for the Amu Darya river states.

The agricultural industry appears to be the main contributor to levels of pollution not only in water, but also in the country's atmosphere. These issues are causing significant health problems to the population.

Waste

There is also a large risk of soil contamination from buried nuclear processing and agricultural chemicals, including DDT. The main cities produce an average of 45.8 million tons of solid waste per year.

Energy

Most of the electricity comes from thermal farms, mainly by coal fossil fuel, whilst only 15% is provided by hydroelectrical power plants. The International Crisis Group states "Uzbekistan is a net oil importer, with production from its estimated 600 million barrels of reserves expected to continue to decline slowly. The fields are mostly near exhaustion; hence the decline in production since the late 1990s, after an initial spurt in the post-Soviet period made the country temporarily self-sufficient" (International Crisis Group, 2007).

Uzbekistan ranks seventeenth in worldwide gas reserves. Most gas fields are in Bukhara and Qashqadaryo provinces, and the Ustyurt plateau, in the Autonomous Republic of Qaraqalpaqistan in the west. However, the real quantity of these resources is not clear and the problems faced by the gas sectors are management, transport and the distribution system.

National strategies on environment

The Uzbekistan government has adopted and implemented a number of important national strategies, Presidential decrees and other legislative acts assuming strong, gradual changes in all areas of socio-economic development.

The National Environmental Action Plan and the National Action Plan for Environmental Protection are the main tools focusing on environmental issues. Unfortunately, these plans highlight the lack of legislative and institutional measures, and defined financing for environmental protection. Special attention is centred on speeding up the development dynamics due to changes in institutional and sectoral structures of the national economy, administrative reforms, decentralization of public and economic administration, capacity building, implementation of reasonable measures aimed at gradual comprehensive modernization of the society.

"Environmental concerns are addressed by the State Committee for Nature Protection, with a total staff of 1864. It reports directly to parliament, which ensures its genuine independence and signifies the high priority accorded to environmental protection in Uzbekistan" (Envisec, 2008).

Even though Uzbekistan recognises the importance of fostering cooperation with neighbours regarding key issues such as water management, tensions are still limiting concrete and effective initiatives.

At the same time, Uzbekistan is involved in many regional organizations and projects, such as the International Fund for Saving the Aral Sea, the Interstate Coordination Water Commission, the Regional Environmental Centre, the Aral Sea Basin Capacity Development Project (1998 –2001), the Regional Project on the West Tain-Shan Biodiversity Saving (2001 –2003) and the Regional Environment Action Plan Development.

At international level, Uzbekistan has ratified the United Nations Framework Convention on Climate Change, the Kyoto Protocol and the Convention on Combating Desertification. It has accession status to the Convention on Biological Diversity and the Montreal Protocol on Ozone Depleting Substances.

Some relevant government programs:

- National Program on development of school education for the period 2004-2009
- Government Program “Mother and Child”
- Government Program “Healthy Generation”
- Comprehensive Program of Organizational Measures on Implementation of the Agreement on Partnership and Cooperation between the Republic of Uzbekistan and European Communities, and their member-states for the period 2004-2008
- Government Program “Makhallya Year”
- Program of Environment Monitoring in Republic of Uzbekistan for the period 2003-2005
- Program on Developing and Equipping Emergency Service for the period of 2003-2005
- Target Program of measures on implementation of priority directions for improving medical culture in the family, strengthening maternal health, healthy generation birth and education
- Program on Development of Coal-Mining Industry for 2002-2010
- Government Program “The year of protection of the interests of elder generation”
- Government Program on training and raising the level of skills for pedagogic and engineering-pedagogic cadres of secondary, specialized and professional education system for the period till 2010
- National Program on quitting use of ozone- breaking substances
- Government Program on Support to the Retired, Disabled and Lonesome Elderly People in Republic of Uzbekistan for 2000-2005

- Action Program on Preservation of the Environment for the period 2000-2005
- Program on Intensification of Reforms in Agricultural Sector for the period 1998-2000
- Government Program on Development of Export Potential of the Republic of Uzbekistan
- Government Cadre Program
- National Program on Raising Lawful Culture in Society
- Government Program on Support of Small Business and Private Entrepreneurship Development in the Republic of Uzbekistan
- National Program of Reconstruction and Development of Telecommunication Network of the Republic of Uzbekistan for the period till 2010
- Government Program on Transition of the Republic of Uzbekistan to the International Practice of Accounting System and Statistics
- Investment Program of the Republic of Uzbekistan for 2004
- Investment Program of the Republic of Uzbekistan for 2003

Conclusions

The following crucial issues have been summarized by Carius, in his publication entitled Addressing Environmental Risks in Central Asia (2003).

In Kazakhstan mismanagement and poor technology are the main causes of environmental issues such as: toxic waste (often radioactive), water pollution and industrial pollution.

Radiation levels due to nuclear tests held in the past and the vast geological uranium deposits and uranium mining waste cause significant problems for both the environment and for health.

Secondly, water quality and supply are also major environmental concerns and have been identified as priority areas by the National Environmental Action Plan.

Kyrgyzstan needs to face more social issues such as poverty and security, these aspects are also the causes behind environmental degradation. The lack of governance, ethnic tensions and poverty are strong pressures on the already fragile ecosystems (often mountainous).

It would seem however, that the Kyrgyz government is the only one in Central Asia to explicitly underline the linkage between environmental stress, poverty and security risks in its policies.

Limited clean water resources and the ongoing land degradation are the two main concerns of Tajikistan. Even though the country is not experiencing problems regarding water resources in general, the poor conditions of the water infrastructure, the high dependency on hydropower and agricultural production are the causes of its environmental emergencies. Moreover, the country has several social issues to solve and is highly susceptible to natural disaster (high seismic activity).

In Turkmenistan the main environmental issues are low water availability and pollution levels in water bodies, both of which are primarily due to agricultural and industrial activities. “Nonetheless, the comparatively prospering economy contrasts with extremely limited political rights and civil liberties, a lack of transparency and practically no participatory elements in policy-making” (Carius et al, 2003).

The large monoculture of cotton cultivation and the extensive use of pesticides are the main causes of environmental problems in Uzbekistan such as, soil erosion, contamination, and widespread salinity. Tensions between Uzbekistan and its downstream neighbouring states should also be mentioned, which are primary due to the allocation of crucial water supplies and the Aral Sea issue.

In conclusion, by looking at the environmental issues according to their nature and not geographically it can be said that “key environmental issues threatening human development and security in the region are the growing water demand mainly for irrigation (Kyrgyzstan, Uzbekistan, Tajikistan and Turkmenistan), high levels of water pollution (Tajikistan, Turkmenistan and Uzbekistan), soil erosion and degradation (Kazakhstan, Turkmenistan and Uzbekistan) and air pollution by industrial activities (Kazakhstan and Tajikistan). Differences among countries are considerable but smaller than the differentials between central and peripheral areas within countries” (Carius *et al*, 2003).

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