

## Climate Change Impacts - Central Asia -

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The IPCC 4<sup>th</sup> Assessment Report state that climate change poses serious threats to Central Asia's environment, ecological and socio-economic systems, particularly because of the arid nature of the region.

The complexity of precipitation changes, vegetation-climate feedback, and direct physiological effects of CO<sub>2</sub> on vegetation present significant challenges for understanding and modelling climate change in such an arid region. However, the evidence shows that there has been a general warming trend in Central Asia on the order of 1-2 C° since the beginning of the 20<sup>th</sup> century that might have a strong potential impact on the regional temperature and precipitation regimes and also on natural ecosystems, agricultural crops and human health.

Scientific studies show that in Central Asia there is a high correlation and positive feedback loop between poverty and land degradation, aggravated by climate change. In fact, the impacts of climate change, land degradation and desertification will be felt by the poorest people living in rural areas.

Some of the projected impacts of climate change on main sectors that specifically apply to the Central Asia are listed below.

### Agriculture

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There are few projections of the impacts of climate change on agriculture and food production in this region, but it is evident that land degradation and limited water supplies constrain present agricultural productivity and threaten the food security of poor rural communities.

There have been very intensive human-induced regional climate and environmental changes in Central Asia, primarily associated with massive irrigation schemes, the desertification crisis in the Aral Sea area, and changes in the grazing pressure on desert rangelands. For example, an overall change in production of cereals between -0,8 and + 4,3 % is expected facing with a 2-4% of temperature increase. In particular, studies in Kazakhstan have suggested some negative impacts on wheat yields.

However, also positive implications are expected for crop growth in desert-marginal areas, favouring greater productivity and biomass of natural desert vegetation and soil organic matter.

Central Asian countries are experiencing major economic changes, particularly in agricultural systems and management. This transition is expected to provide opportunities to change crop types and introduce more efficient irrigation practices. For example, food production concentrated on more intensively managed lands could lead to greater reliability in food production and reduce the detrimental impacts of extreme climatic events, such as drought, on rangeland systems. Implementation of more flexible

risk-management strategies along with the use of a wider variety of domestic animals, game ranching, and multiple production systems-would provide greater food security to the region.

## Coastal Systems

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Coastal systems in the region are under threat from pollution and development, resulting in the deterioration of fish populations in some countries. Projected changes in sea level will not have significant effects on the region as a whole. Certain coastlines of the region are still predicted to be threatened by development. In particular, facing with a 50 m sea level rise 2,4 million emigrants and 1,8 billion USD/year in costs are projects in Central Asia.

Coastal zones in this region are not identified as significantly affected by sea-level changes; the major pressures on them will be related to development rather than the direct result of climate change.

Many countries in the region are big oil producers. Oil production is mostly land-based and is not as vulnerable to the impacts of climate change as offshore oil production in other regions. Transportation of oil also is less likely to be affected than some higher-latitude areas, which are projected to experience an increase in storm activity and icebergs. However, coastal oil production areas are likely to be affected by storm surges.

Fishery industries are also important and vulnerable in some countries where over fishing and marine pollution have led to a decrease in fish catches. In particular, recent evidence shows that the fishing sector in Central Asia is close to collapse and that climate change impacts will further exacerbate and accelerate this process affecting mainly poor rural people.

## Ecosystems

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The region is mostly arid and semi-arid and is dominated by grasslands, rangelands, deserts, and some woodlands. Projections suggest considerable changes in desert and semi-desert vegetation due to a combination of GHG related climate change and direct physiological CO<sub>2</sub> effects on vegetation. Grasslands, livestock, and water resources are likely to be most vulnerable to climate change in this region because they are located mostly in marginal areas.

Vegetation models project little change in most arid vegetation types under climate change projections, most land that are deserts are likely to remain deserts. The impacts may be greater in the semi-arid lands of the region than in the arid lands, especially in composition and distribution of vegetation types.

Glacial melt is projected to increase under climate change, leading to increased flows in some river systems for a few decades; this will be followed, however, by a reduction in flow as the glaciers disappear-creating larger areas of arid, interior deserts in low- and mid-lying parts of the region. The projected small increase in precipitation is unlikely to improve land conditions in the next decade, partly because soil conditions take a long time to improve and partly because human pressure on these systems may contribute to land degradation. Improved water-use efficiency by some plants under elevated carbon dioxide may lead to some improvement in plant productivity and changes in ecosystem

composition. The loss of mangroves probably has added to the problem by affecting breeding grounds.

Forests/woodlands are important resources, although they cover only a small area. Large fire situations in forest and steppe ecosystems have resulted in considerable ecological and economic damages to the region. Sometimes these wild fires have transnational impacts, for example smoke pollution and its impacts on human health and safety; loss of biodiversity; or site degradation at landscape level leading to desertification and reduced food security. The depletion of terrestrial carbon by fires burning under extreme conditions in some vegetation types is an important factor in causing disturbance in the global carbon cycle. Studies document an increasing vulnerability in the region of poor rural people living in or around forest environments.

There is an overall need to assess the vegetation and the soil carbon budget of the region and improve understanding of the special distribution of carbon sources and sinks; as well as see a better understanding of the linkages between climate change, ecosystem, and land-use changes using remote sensing, field observations and modelling experiments. Furthermore, improved management techniques can increase the carbon sequestration capacity of semi-desert rangelands and arable lands.

## **Water**

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Water stresses already are a problem in many countries of this predominantly arid region, and are unlikely to be reduced and may be aggravated by climate change since they do not have sufficient development in water infrastructure yet.

In particular, glacial melt in the mountainous areas due to temperature increase is projected to increase, leading to increased flows in the river and lake systems. On the other hand, glacier melting has supported until now proper additional water resources in rivers, but decrease of volume of glaciers cause expectation that in the next 20 years flow of Amudarya and partly some tributaries of Syrdarya and Zarafshan rivers can fail on 25-30 %, that will present big challenge to the region.

Projected precipitation increases are small, and temperatures and evaporation are projected to rise. Rapid development is threatening some water supplies through salinization and pollution, and expanding populations are increasing the demand for water. Studies state that facing with 2-4 C° temperature increase, the number of people experiencing increase in water stress in the region will increase by 0-137 million. Because the rainfall in the region is already low, severe water stresses, leading to further desertification, are expected, with rises in surface air temperature and depletion of soil moisture.

Water storage and integrated water management are key element for developing sub-regional adaptation strategies. These might include more efficient organization of water supply, treatment, and delivery systems for urban areas and, in arid Asia, increased use of groundwater. Measures to conserve or reuse water already have been implemented in some countries; such strategies may overcome some shortages, especially if they are adopted widely throughout the region. Changes in cropping practices and improved irrigation practices could reduce water use significantly in some countries.