

AWARENESS RAISING SEMINAR

16-17 April 2019

**Climate change in the region,
including Mongolia**

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CLIMATE CHANGE 2014: IMPACTS, ADAPTATION, AND VULNERABILITY



The IPCC Special Report on Managing the Risks
of Extreme Events and Disasters to Advance
Climate Change Adaptation





WIDESPREAD
OBSERVED IMPACTS

A CHANGING WORLD

Asia

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The land and territories of 51 countries/regions in Asia. Maps contained in this report are only for the purpose of geographic information reference.



Figure 24-1 | The land and territories of 51 countries/regions in Asia. Maps contained in this report are only for the purpose of geographic information reference.

Observations of past events

Source: IPCC, 2013



INTERGOVERNMENTAL PANEL ON climate change

Climate Phenomenon	Asia	North Asia
Temperature	<p>It is <i>very likely</i> that mean annual temperature has increased over the past century over most of the Asia region; However, there are areas of the interior and at high latitudes where the monitoring coverage is insufficient for the assessment of trends</p> <p>It is <i>likely</i> that the number of cold days and nights have decreased and the number of warm days and nights have increased over most of Asia.</p>	<p>Large warming trends ($>2^{\circ}\text{C}$ per 50 years) in the second half of the 20th century were observed in the northern Asian sector .</p>
Precipitation	<p>Precipitation trends including extremes are very variable, with both increasing and decreasing trends observed in different parts and seasons of Asia .</p>	<p>In northern Asia, the observations indicate some increasing trends of heavy precipitation events .</p>

Observations of past events and its impacts

Source: IPCC, 2013

Climate Phenomenon	Asia	North Asia
Monsoon	<p>Distinct northeast-southwest dipole mode of variability, with one pole located in northern China and southeastern Mongolia , and the other in southwestern China and Mongolia. There is a seesaw pattern with regard to summer moisture distribution over China and Mongolia (CM), with more (less) moisture in northeastern CM and less (more) moisture in its southwestern part when the summer Asian monsoon is strong (weak).</p>	<p>Mongolian rainfall has been influenced by the East Asian monsoon . Generally when there is strong rainfall in the south, it is weak in the north, and vice versa.</p> <p>-A study covering the 1600-1991 dominant summer moisture pattern over China and Mongolia reveals significant changes in the large-scale Asian monsoon over the past four centuries, which coincide with dramatic episodes in Chinese history, two of which were the fall of the Ming Dynasty (AD 1644) and the catastrophic famine during China's Great Leap Forward (1958 – 1961). .</p>

Observations of past events

Source: IPCC, 2013



INTERGOVERNMENTAL PANEL ON climate change

Climate Phenomenon	Asia	North Asia
Permafrost	Permafrost degradation, including reduced area and increased active layer thickness, has been reported from parts of Siberia, Central Asia, and the Tibetan Plateau .	In Mongolia, mean annual permafrost temperature at 10 to 15 m depth increased over the past 10 to 40 years in the Hovsgol, Hangai, and Hentei Mountain regions .

Observations of past events

Climate Phenomenon	Asia	North Asia
Cold Waves/cold-air outbreaks	Eurasian extreme cold events observed	Anomalously cold winters in the Eurasian steppes, notably 1999-2001 and 2009-2010 (Nandintsetseg et al, 2018;
Drought	There is <i>medium confidence</i> that more megadroughts occurred in monsoon Asia and wetter conditions prevailed in arid Central Asia monsoon region during the Little Ice Age (1450–1850) compared to the Medieval Climate Anomaly (950–1250).	Droughts events following cold winters (Sternberg, et al, 2011; Rao et al, 2015; Nandintsetseg and Shimoda, 2013; Liu, et al, 2018))
Floods	Past floods larger than recorded since the 20th century occurred during the past five centuries in eastern Asia (<i>high confidence</i>). There is <i>medium confidence</i> that in the Near East and India, modern large floods are comparable or surpass historical floods in magnitude and/or frequency.	No specific observations (published in peer reviewed literature)

Observed impacts of changes in climate

Source: IPCC, 2013



INTERGOVERNMENTAL PANEL ON climate change

	Asia	North Asia
Freshwater resources	<p>The impact of changes in climate, particularly, precipitation on water resources varies cross Asia .</p> <p>Apart from water availability, there is <i>medium confidence</i> that climate change also leads to degradation of water quality in most regions of Asia , although this is also heavily influenced by human activities .</p>	<p>There is no evidence that suggests significant changes of groundwater in the Kherlen River Basin in Mongolia over the past half century .</p>
Terrestrial	<p>Terrestrial systems in many parts of Asia have responded to recent climate change with shifts in the phenologies, growth rates, and the distributions of plant species</p>	<p>Mongolian taiga forests have responded heterogeneously to recent climate changes, but declines in larch growth and regeneration are more widespread than increases .</p>

A changing climate leads to changes in extreme weather and climate



IPCC, 2012

Increasing exposure of people and assets has been the major cause of changes in disaster losses



Extreme winter conditions on the Mongolian steppe caused extensive die-offs of sheep, goats, cattle, and camels, animals that traditional herding communities rely on for their survival. Figure above show goats lining the hillside outside the home of nomadic herders Ikhavva, Enkhjargal, Bolo-Erdene, and Ariunbold which could be at risk. (National Geographic Magazine, 2018)

What are the projections of future climate in Asia in the 21st century?

RCPs	Change in temperatures	Change in Precipitation
RCP2.6 (best-case scenario)	Changes in mean annual temperature are less than 2°C above the late-20th-century baseline in both the mid- and late-21st century, with the exception of changes between 2°C and 3°C over the highest latitudes.	Precipitation increases are <i>likely</i> at high latitudes by the mid-21st century, while it is <i>likely</i> that changes at low latitudes will not substantially be greater than natural variability.
RCP8.5 (worst-case scenario)	Changes in mean annual temperature are greater than 6°C over high latitudes in the late-21 st century	Precipitation increases are <i>very likely</i> at higher latitudes by the mid-21st century, and over eastern and southern areas by the late-21st century.

Projections and projected future impacts

Source: IPCC, 2013



INTERGOVERNMENTAL PANEL ON climate change

Impact of warming	Asia	North Asia
Permafrost	<p>In the Northern Hemisphere, a 20 to 90% decrease in permafrost area and a 50 to 300 cm increase in active layer thickness driven by surface warming is projected for 2100 by different models and scenarios .</p> <p>Permafrost melting in response to warming is expected to impact ecosystems across large areas .</p>	<p>It is <i>likely</i> that permafrost degradation in North Asia will spread from the southern and low-altitude margins, advancing northward and upward, but rates of change vary greatly between model projections .</p> <p>Because aridity is projected to increase in the northern Mongolian forest belt during the 21st century , larch cover will likely be reduced (</p>

Projected Future Impacts:

Source: IPCC, 2013



INTERGOVERNMENTAL PANEL ON climate change

Climate Phenomenon	Asia	North Asia
Freshwater resources	<p>Projected impacts of climate change on future water availability in Asia differ substantially among river basins and seasons .</p> <p>Water scarcity is expected to be a major challenge for most of the region as a result of increased water demand and lack of good management .</p> <p>Integrated water management strategies could help adapt to climate change, including developing water-saving technologies, increasing water productivity, and water reuse .</p>	<p>There is <i>low confidence</i> in future precipitation projections at a sub-regional scale , and thus in future freshwater availability in most parts of Asia.</p>

Projected Future Impacts

Source: IPCC, 2013



INTERGOVERNMENTAL PANEL ON climate change

Systems	Asia	North Asia
Terrestrial systems	Together with permafrost degradation, and the projected changes in climate during the 21st century will increase the already observed impacts .	In North Asia, rising temperatures are expected to lead to large changes in the distribution of potential natural ecosystems . It is likely that the boreal forest will expand northward and eastward, and that tundra will decrease, with varying magnitudes of this change. The future direction and rate of change of steppe vegetation are unclear because of uncertain precipitation trends

Projected future impacts:

Source: IPCC, 2013



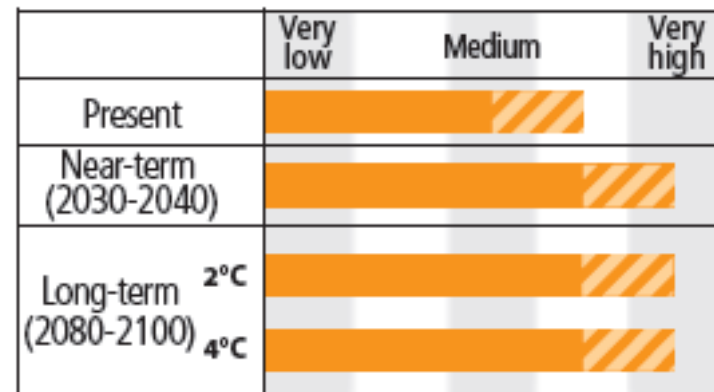
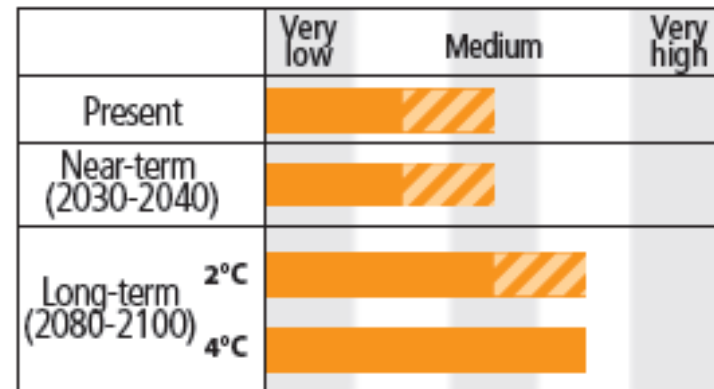
INTERGOVERNMENTAL PANEL ON climate change

Systems	Asia	North Asia
Livelihoods and poverty	The poverty impacts of climate change will be heterogeneous among countries and social groups. Floods, droughts, and changes in seasonal rainfall patterns are expected to negatively impact crop yields, food security, and livelihoods in vulnerable areas .	In North Asia, climate-driven changes in tundra and forest-tundra biomes may influence indigenous peoples who depend on nomadic tundra pastoralism, fishing and hunting .

Key Risks in Asia

Increased risk of crop failure and lower crop production could lead to food insecurity in Asia (medium confidence)

Water shortage in arid areas of Asia (medium confidence)



KEY CONCLUSIONS: IPCC-WG2

Chapter 24, Asia

- ❑ Water scarcity is expected to be a major challenge for most of the region due to increased water demand and lack of good management (*medium confidence*)
- ❑ There is *low confidence* in future precipitation projections at a sub-regional scale and thus in future freshwater availability in most parts of Asia.
- ❑ Integrated water management strategies could help adapt to climate change, including developing water saving technologies, increasing water productivity, and water reuse.

Adaptation is already occurring

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- Combining Traditional and Scientific Knowledge
 - Adapting Communications Infrastructure
 - Coastal & Water Management
 - Environmental Protection & Land Planning
 - Disaster Risk Management
 - Municipal-Level Actions
 - Adapting Energy & Public Infrastructure
 - Development Planning
 - Early Warning Systems
 - Mangrove Reforestation
 - Water Resources Management
 - Disaster Risk Management
 - Basic Public Health
 - Livelihood Diversification
 - Ecosystem-Based Adaptation
 - Water Resources Management
 - Resilient Crop Varieties
 - Planning for Sea-Level Rise
 - Planning for Reduced Water Availability
 - International Cooperation
 - Marine Spatial Planning

Research and data gaps

- Studies of observed climate changes and their impacts are still inadequate for many areas, particularly in North, Central, and West Asia .
- Improved projections for precipitation, and thus water supply, are most urgently needed.
- Understanding of climate change impacts on ecosystems and biodiversity in Asia is currently limited by the poor quality and low accessibility of biodiversity information.
- Understanding the complexity of boreal forest dynamics will require enhanced monitoring of biodiversity and species ranges, improved modeling, and greater knowledge of species biology.