

The Hindu Kush Himalaya Assessment

Mountains, Climate Change, Sustainability and People

HIMAP 1st Assessment Process >350 people and growing: 200 authors (31% women; 81% from the region), 125 external reviewers, 22 Review Editors

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Even 1.5 Degrees is Too Hot

and amplified by Elevation Dependent Warming

> Source: HIMAP climate change chapter and Kraaijenbrink et al. 2017, *Nature*

Temperature increased more in high altitude regions Plateau of Tibet



Source: Liu, X; Chen, B (2000) 'Climate Warming in the Tibetan Plateau During Recent Decades' International Journal of Climatology 20: 1729–1742





Temperature increase, °C

Even 1.5 Degrees is Too Hot

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HKH will warm more compared to global mean and warm more rapidly at higher elevations

- 2.1 ± 0.1 °C (PI) in a 1.5 degree world

— 2.5 ± 1.5°C relative to 1976-2005 (RCP 4.5)

- $5.5 \pm 1.5^{\circ}$ C by 2100 at current emission levels





In a 1.5° C world, glaciers in the HKH will lose 36% volume by 2100

A 2° C global warming scenario implies a regional warming of around 2.7° C and a 49% loss of ice volume Snow covered areas and snow volumes will decrease and snowline elevations will rise;

Snow melt induced run-off peak will be stronger and occur earlier in the year

End of century glacier mass loss





Contribution to total flow by (a) glacial melt, (b) snowmelt, and (c) rainfall-runoff for major streams during the reference period of 1998–2007. Line thickness indicates the average discharge during the reference period. Source: Lutz et al. (2014)

Not running out of water, but...

Greater impact for those living closer to glaciers

Climate change is expected to drive consistent increases in total runoff of the Indus, Ganges and Brahmaputra

Indus: increased glacier melt, then declines after midcentury Ganges/Brahmaputra: increased runoff due mainly to precipitation

Changing precipitation and flow patterns – more floods and droughts; high uncertainty

Climate change also likely to affect groundwater, especially springs in the mid-hills of the HKH, but limited evidence.





Disaster risk is increasing

Floods, droughts, landslides, glacial lake outburst floods

One-third of disasters are floods, many crossing national borders





Flood magnitude may double



Average river flow will increase by EoC in upper river basins: 50% in upper Indus 30%–40% in upper Ganges 25%–50% in upper Brahmaputra

Intensities of 'once in 50 years' flood events will increase: 40%–110% in upstream areas 115%–150% in downstream areas

ICIMOD

Air Pollution and Black Carbon - Air pollutants originating in and near the HKH amplify climate change

- Raises temperatures
- Accelerates glacier and snow melt
- Affects the circulation of monsoons and distribution of rainfall over Asia

ICIMOD

- Negatively impacts health
- Reduces crop yield



Mountains of Central Asia

Mountains of Southwest China

Indo-Burma

Biodiversity

Between 1998 and 2008, **an average of 35 new** species were discovered each year in the Eastern Himalaya alone, but

Himalaya

70 to 80% original habitat in the biodiversity hotspots of the HKH already lost (relative to 1500)

60-85% of rural population in HKH directly or indirectly depend on biodiversity for subsistence





33% in mountains compared to 25% national average Poverty

Blanket approaches to countrylevel poverty not sufficient

Acute shortage of mountain specific poverty data

Poverty has a distinct gender dimension





% of population having access to electricity & clean fuel for cooking in 2014 (*Source: IEA & World Bank, 2017*)



Access to electricity Access to clean fuels & technologies for cooking

Energy Poverty 500 GW hydro potential

80% population lacks access to clean energy for cooking

Energy development policy in the HKH too strongly focused on supply and growth—and not yet on sustainability, despite the region's huge potential for renewables.



Food (In)Security

30% of HKH	50% of people
population	face some
suffers from	form of
food insecurity	malnutrition

Agriculture and food production highly susceptible to climate change

Traditional food systems are replaced by rice and wheat

Low returns from agriculture – non-agri forms of livelihood means abandonment of land





High Out-Migration

Labor migration contributes significantly to poverty reduction in HKH region Migration can be seen as a way to promote resilience to climate change, but investment in agriculture or climate adaptation is rarely the first priority of migrant households in mountainous area





Poverty (income and energy), food insecurity, and migration affect women, children and marginalised communities more severely than others, but polices and responses in HKH countries overlook these multiple forms of exclusions.

We know enough to take action, but better data and knowledge and better communication will mean better action



HKH Futures

3 directions for environmental, social and economic futures in HKH:

run downhill, business as usual, advance toward prosperity

3 factors that pose the greatest threats to prosperity in the region:

Disasters, climate change, poor governance

2 paths to achieve prosperity in 2080:

large-scale investment with regional cooperation, and

bottom-up investment with local and national cooperation

Both paths critically presuppose cooperation and coordination and are not mutually exclusive.





Three priorities for action

Cooperate at all levels across the HKH region for sustainable and mutual benefits.

Recognize and prioritize the uniqueness of the HKH mountain people.



Concerted action is urgently needed to keep global level climate change to 1.5 degrees by 2100.

Call for Action HKH Science-Policy Forum 13-14 Nov 2018 Kathmandu

MOD



