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# Experience on the Applications and Disaster Risk Reduction in the Third Pole Region

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**New Delhi, India**

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# TPCF products for disaster risk reduction

## Seamless integration of multi-scale information value chains

**Decision Window**

**Operational**
Weather forecasts

**Short range 0-3 days**
**Medium range 4-10 days**

**Tactical**
Sub seasonal predictions

**2 weeks to 2 months**

**Strategic**
Seasonal Predictions

**3 to 6 months**

**Long term – Adaptation**
Climate projections

**Years to decades**

**TPCF Statements**

- **Indicative of potential hazards**
- **Geography and context**

# Evolution of Early Warnings, Anticipatory Action

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**A** — UN Bonn Conference EWC (2006)

How Early warnings are produced, reach end users and understood, includes agriculture sector

**B** — Early action, Anticipatory Action (AA)

Ensure early warnings, impact forecasts lead to early actions to protect life, livelihoods and activating AA financing

People centered

Impact forecast

Multi-hazard

Multi-sector

Inclusive

**C** — Processes and pathways

'Foundational elements' enabling environments; 'Design element' of Early Warning Early Action (EWEA) Value Chains.

Early Warnings for All

**D** — A call for action

Early warnings for All by 2027: Partnership for People-Centered Multi-hazard Early Warning System (MHEWS)

# EW4All advances but new challenges emerge

Need to raise ambitions

## Uneven progress

EW4All is advancing and accelerating, but vulnerable countries continue to suffer disproportionately..

## The Trend

Countries with less comprehensive MHEWS have a disaster-related mortality ratio that is nearly six times higher than those who lack MHEWS.

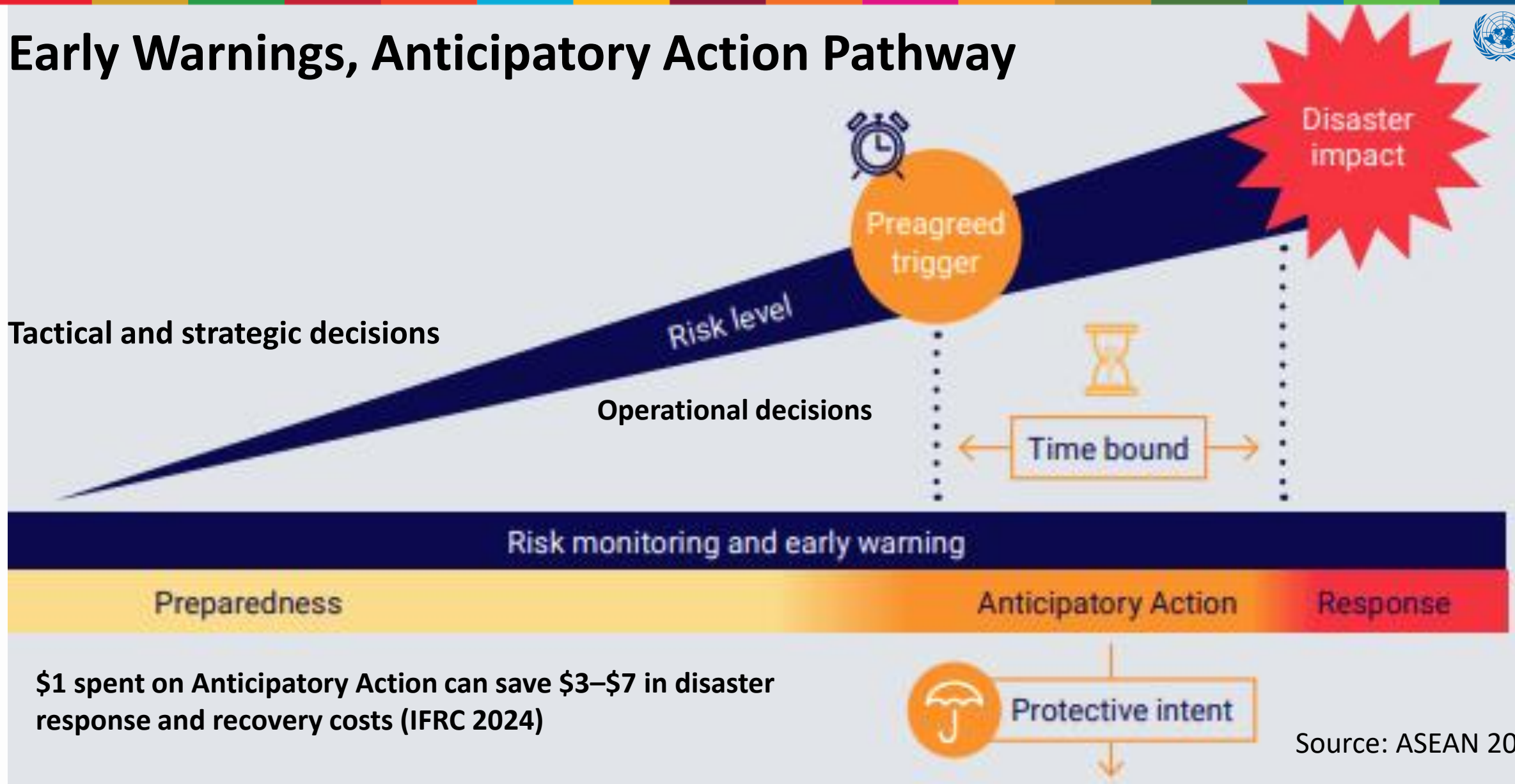

## Newer Challenges

Whilst floods and storms have traditionally been associated with the worst losses, extreme heat has emerged as a major killer

## Early Warning Early Action Gaps

"Even among countries with MHEWS, gaps exist in among the pillars: risk knowledge, forecasting and detection, warning dissemination, and early action

# Early Warnings, Anticipatory Action Pathway




**$1 spent on Anticipatory Action can save $3–$7 in disaster response and recovery costs (IFRC 2024)**

Source: ASEAN 2022

**Anticipatory action – reduced risk, enhanced preparedness, response time, cost savings, smart decision**

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# Hazards of Warming Third Pole

**01** Third Pole (TP) is warming at an alarming rate of over 0.3 ºC per decade, surpassing the global average.

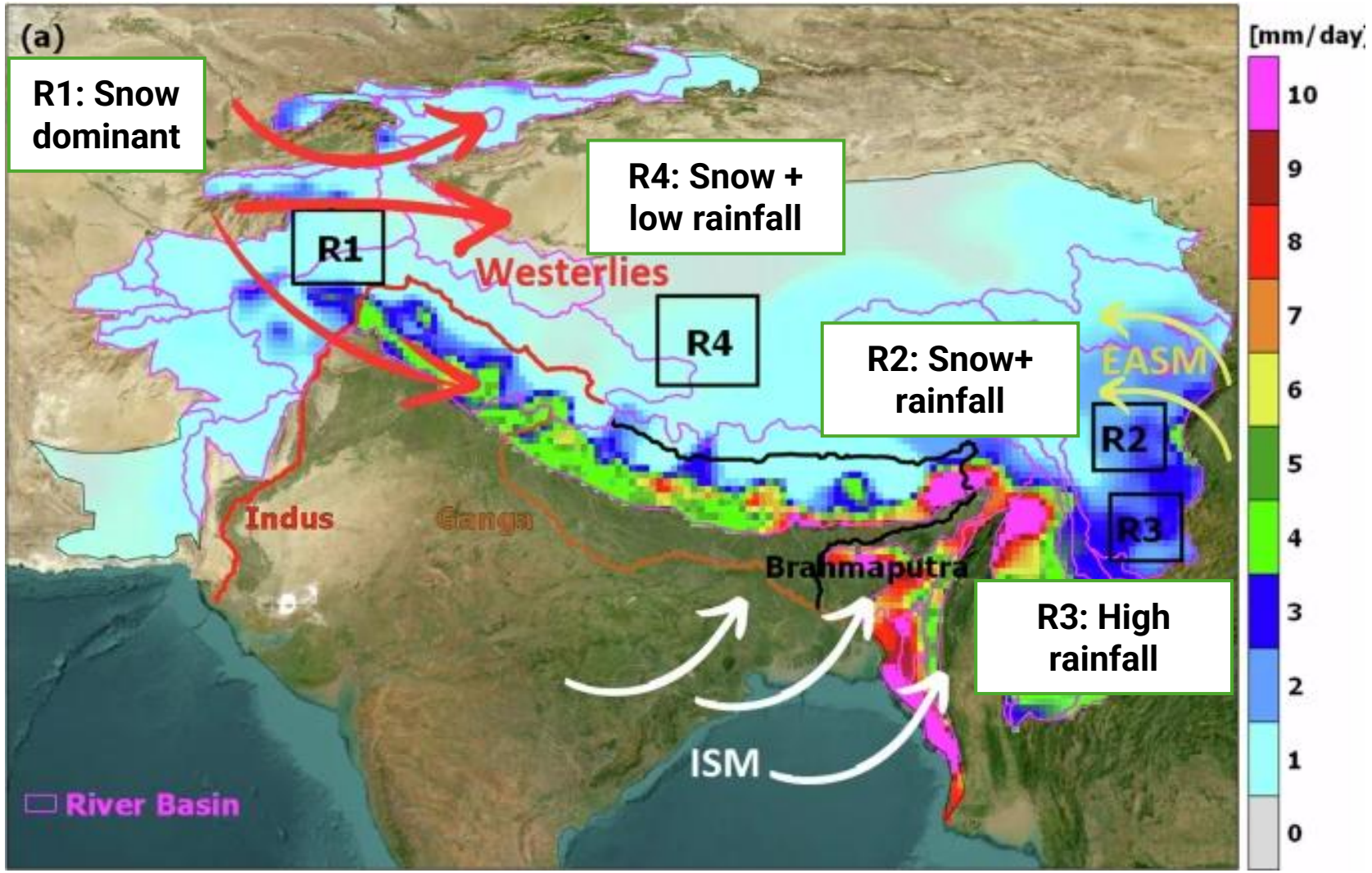
**02** Warming of TP impacts high-mountain ecosystems and downstream regions, lakes, inland water bodies and the runoff into the river basins and cause more frequent glacial disasters glacial lake outburst floods (GLOFs), glacial retreats.

**03** The risks emanating from warming are quite diverse in the different geographies of the TP, more intensive melting along the Himalayas resulting leading to multi-hazard risk hotspots.

**04** The warming  is reducing freshwater for major Asian rivers, the Yangtze, Indus, Ganges, Amu Darya and Helmand, decreasing frozen ground (permafrost) leads to frequent landslides, threat to infrastructure at high elevation.

# Third Pole:
# Understanding the teleconnections of impact drivers

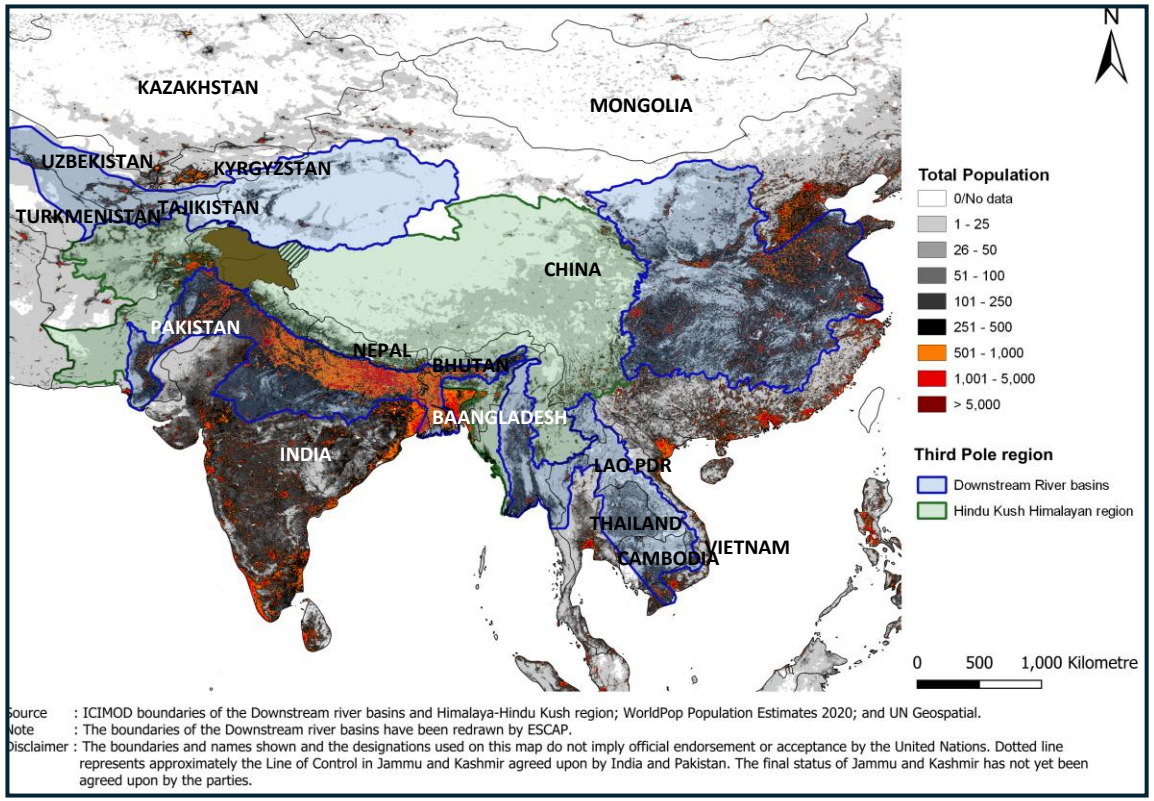
## Influence of geophysical drivers on snow melt (SM) and precipitation (P)




- Source: Jayanarayanan K et al (2024), Clim and Atmos J

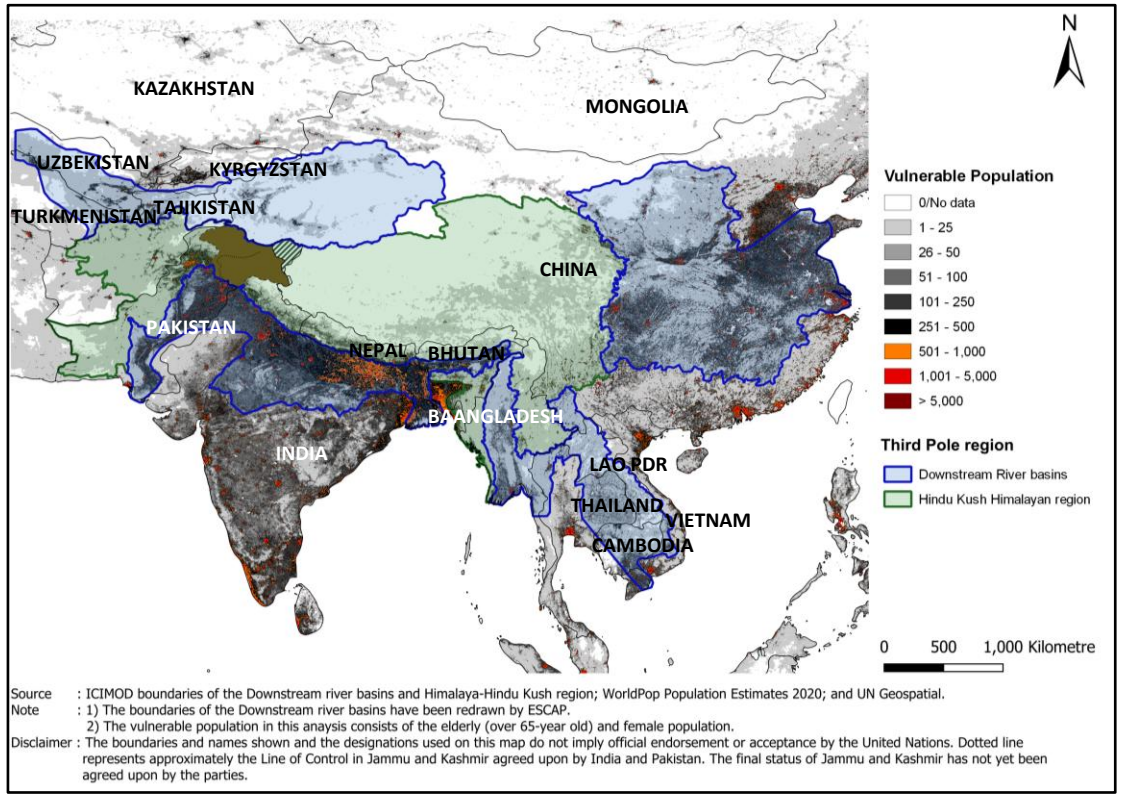
# Vulnerability and Exposure: People

## Population exposure to DRB and HKH




Source : ICIMOD boundaries of the Downstream river basins and Himalaya-Hindu Kush region; WorldPop Population Estimates 2020; and UN Geospatial.
Note : The boundaries of the Downstream river basins have been redrawn by ESCAP.
Disclaimer : The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations. Dotted line represents approximately the Line of Control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties.

## Vulnerable population exposure to DRB and HKH




Source : ICIMOD boundaries of the Downstream river basins and Himalaya-Hindu Kush region; WorldPop Population Estimates 2020; and UN Geospatial.
Note : 1) The boundaries of the Downstream river basins have been redrawn by ESCAP.
2) The vulnerable population in this anaysis consists of the elderly (over 65-year old) and female population.
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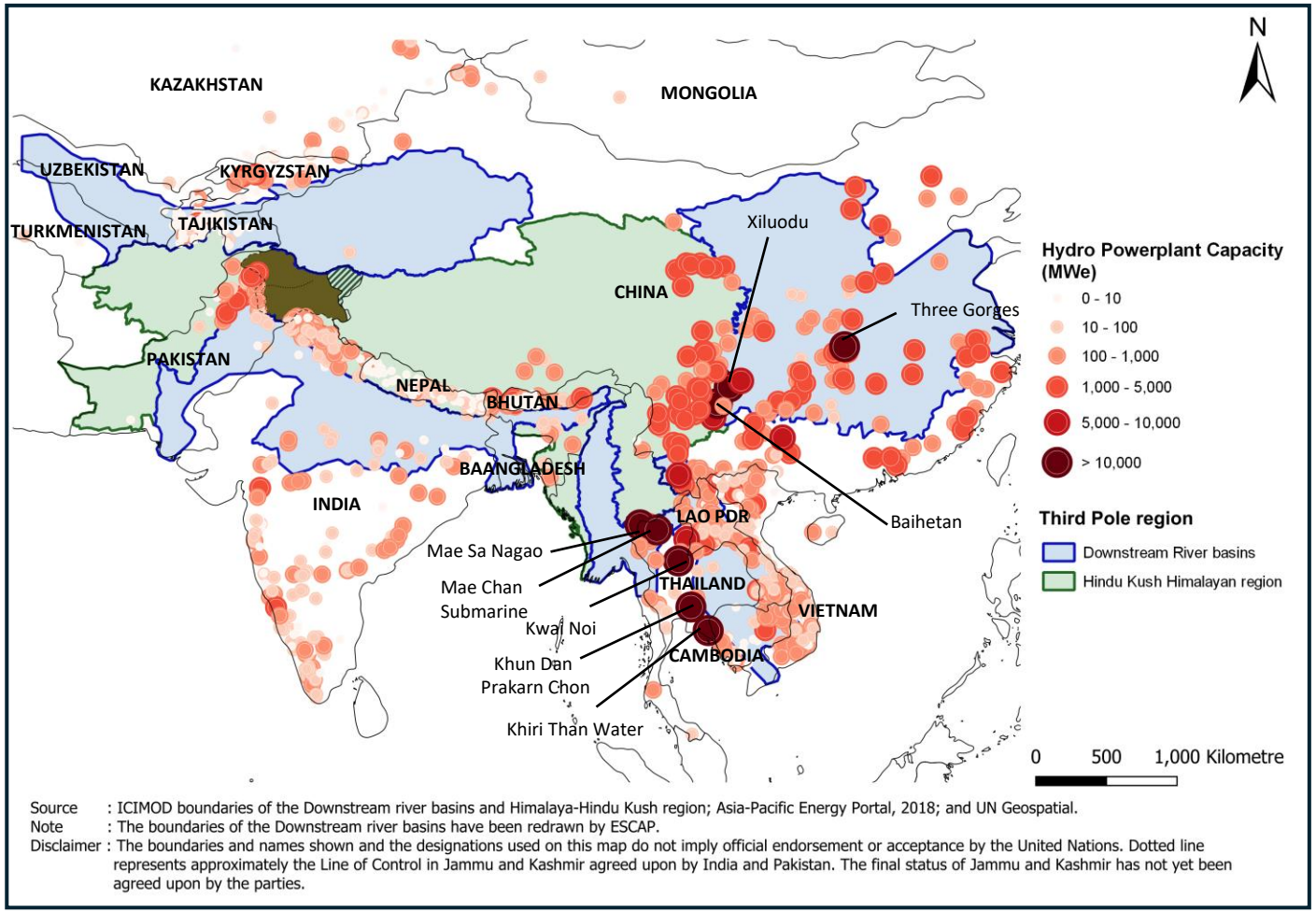
# Vulnerability and Exposure: Hydropower

**Major rivers:**

- Indus
- Brahmaputra
- Ganges
- Yellow
- Yangtze
- and 900+ hydro electronic dam of various size and capacity




**A list of mega hydro powerplants (>10,000 MWe)**

1. Mae Sa Nagao, Thailand
2. Mae Chan Submarine Power Plant, Thailand
3. Baihetan Dam, China
4. Xiluodu Dam, China
5. Three Gorges Dam Hydroelectric Power Plant, China
6. Khun Dan Prakarn Chon Dam, Thailand
7. Kwai Noi Dam, Thailand
8. Khiri Than Water Hydropower Project, Thailand

# Third Pole: Challenges of Disaster Risk Management

## Geography of Hazard, Vulnerability, Exposure and Risk leads to Cascading Impacts

### CASCADING EFFECTS ACROSS SYSTEMS

Climate impacts are not isolated: water, food, and energy systems are interdependent

Transboundary impacts are becoming more frequent and intense

### CASCADING IMPACTS

Glacial melt impacts cascade downstream, affecting:

Water supply reliability for communities and ecosystems

Hydroelectric power generation and infrastructure planning

Agricultural productivity and irrigation systems

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# Challenges of risk assessment and impact modeling in TP

**01** The TP is characterized by hazards of glaciers with their potential exposure, vulnerability and impacts zones which are thousands of kilometers aways across the different nodes.

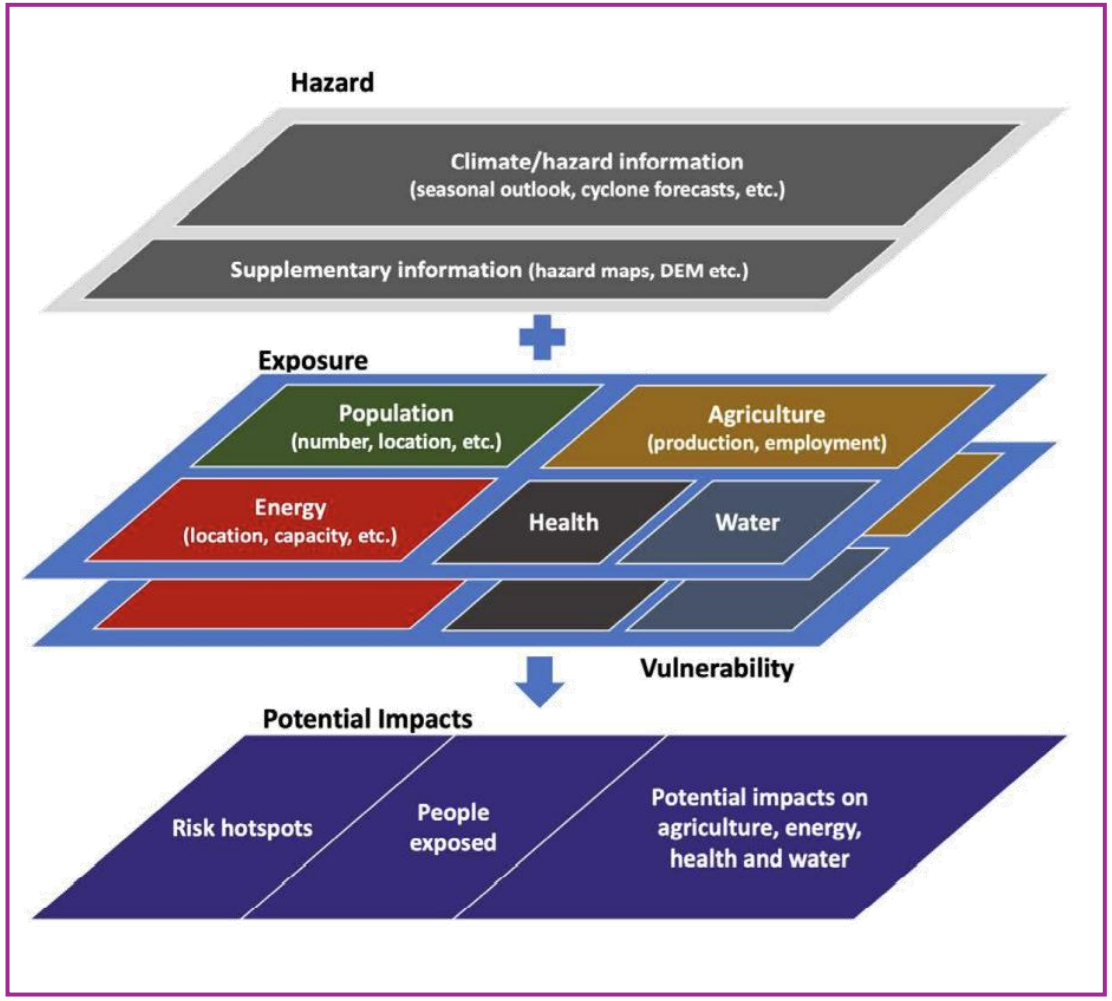
**02** The impact assessment needs to be based on understanding the teleconnections of glaciers and their potential impact zones.

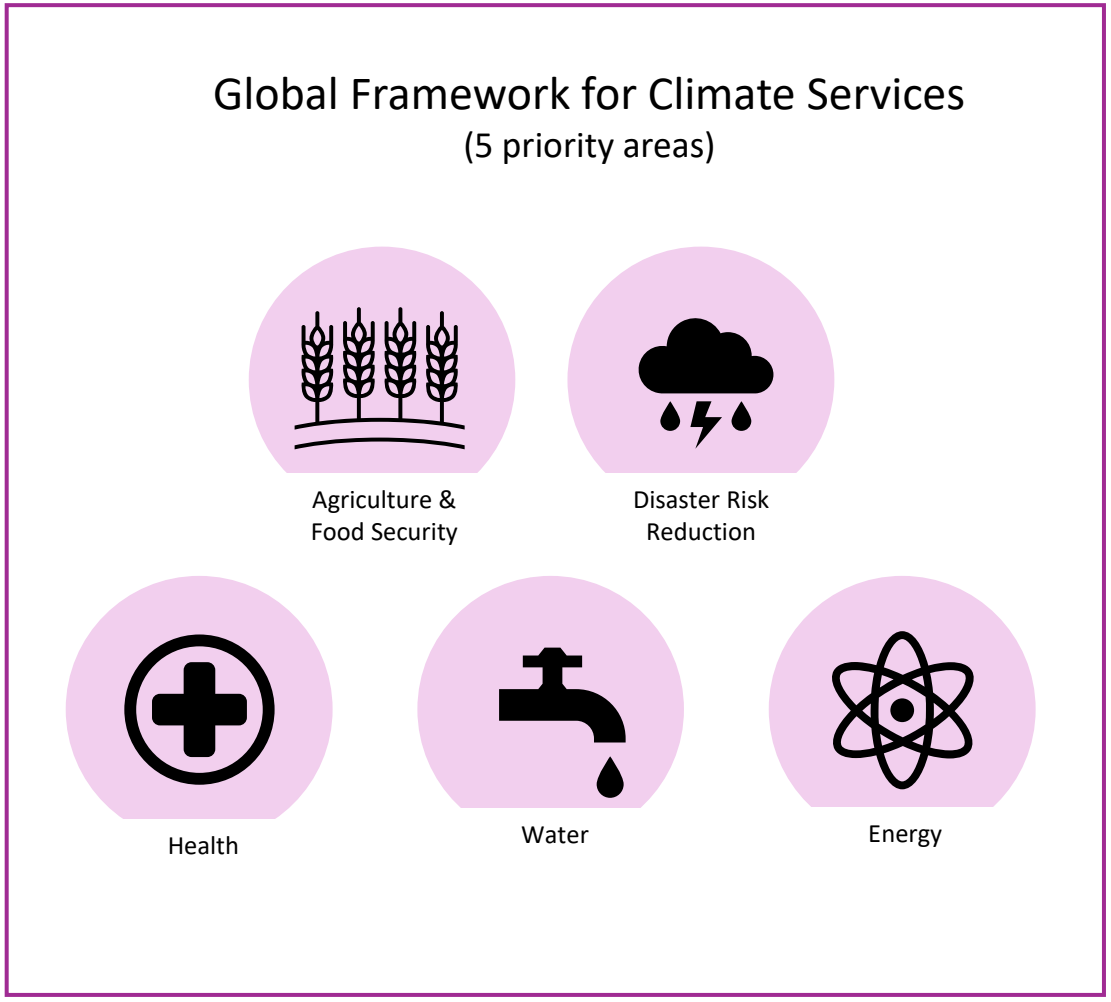
**03** The impact assessment needs to be based on understanding the teleconnections of glaciers and their potential impact zones.

**04** Automation impact-based forecasting tool can help guide risk informed decision making and fill knowledge gaps.

# Impact-based Forecasting (IBF)

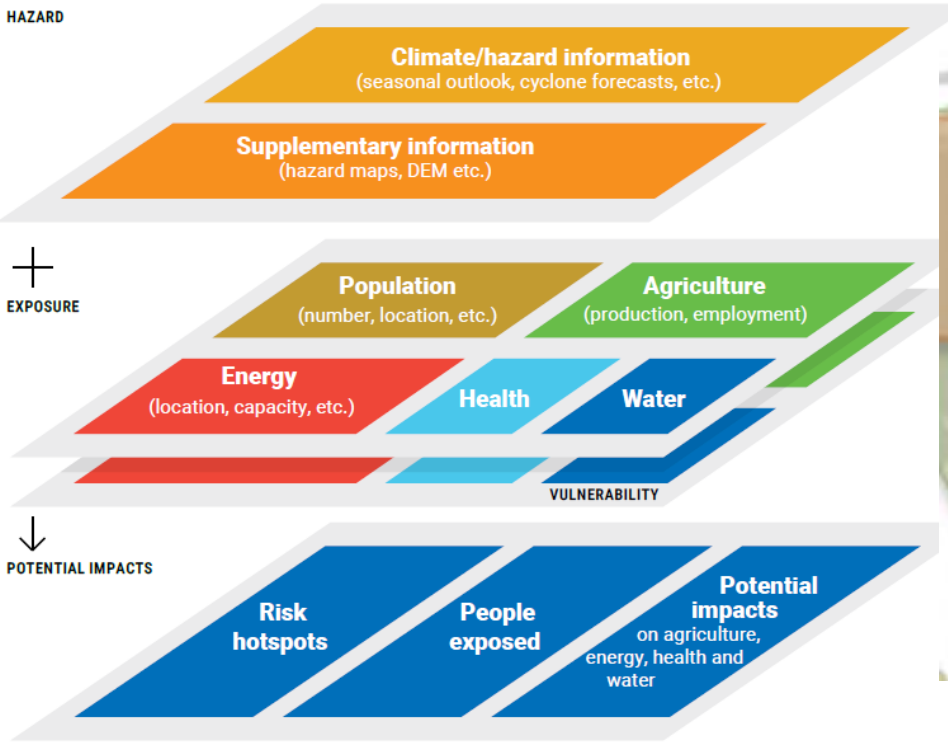
## Approach for Impact-based Forecasting

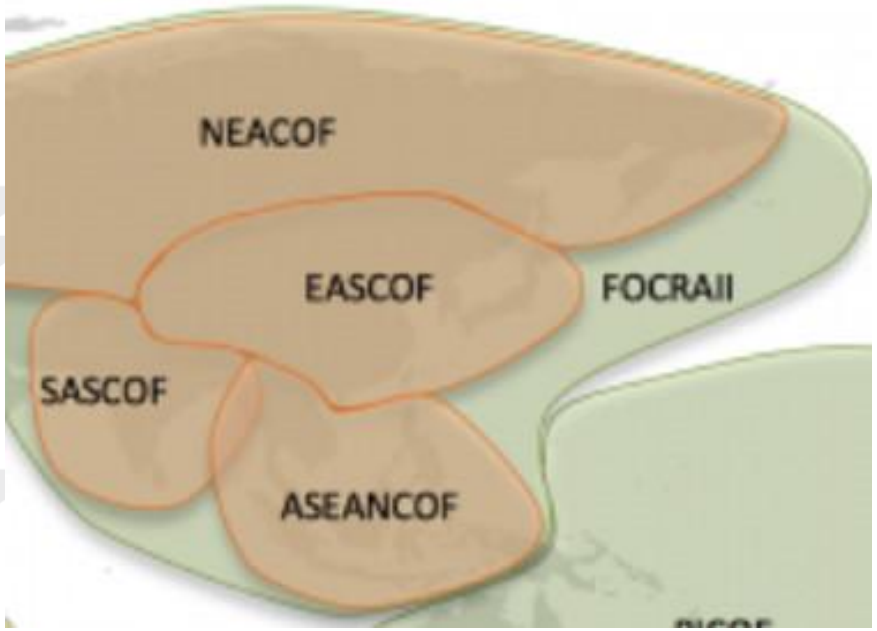


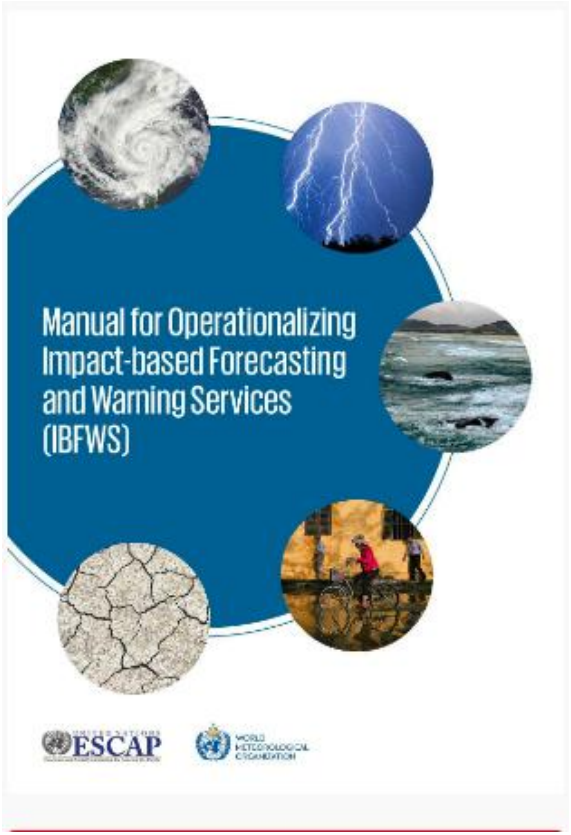




Source: ESCAP (2021) Overview of the work of secretariat and the UN system at the regional level. ESCAP/CDR/2021/INF/1
Global Framework for Climate Services: https://gfcs.wmo.int/

# Translating consensus outlook to impact forecasting



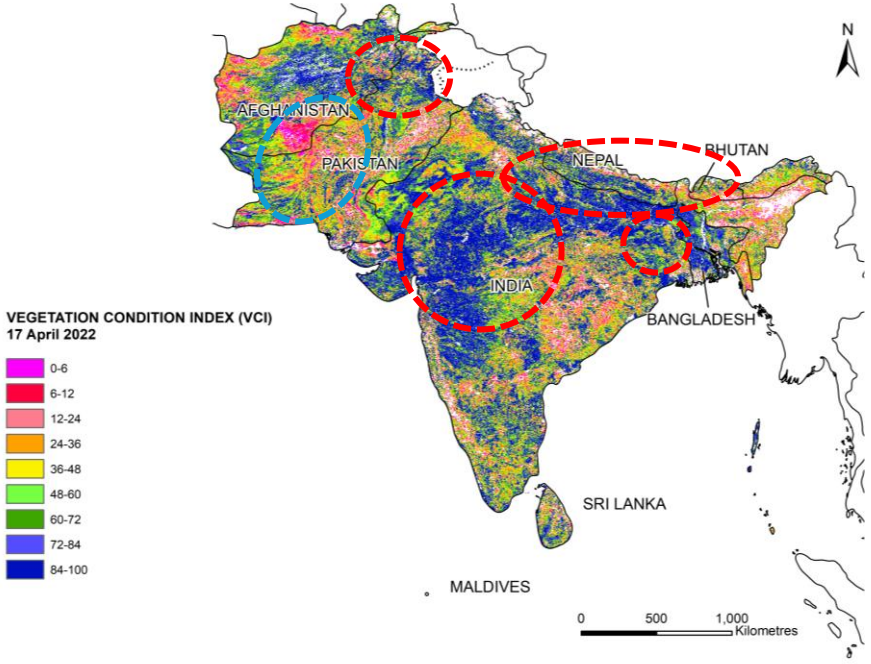




**Climate Outlook Forums – consensus seasonal outlook to impact forecasting – key sectors – DRR (people, food, water, energy and health sectors)**

# Seasonal Outlook 2022
# Areas of attention with above-normal precipitation

**Vegetation health and flood hazard map were used to find out the areas of attention for Above-normal precipitation.**

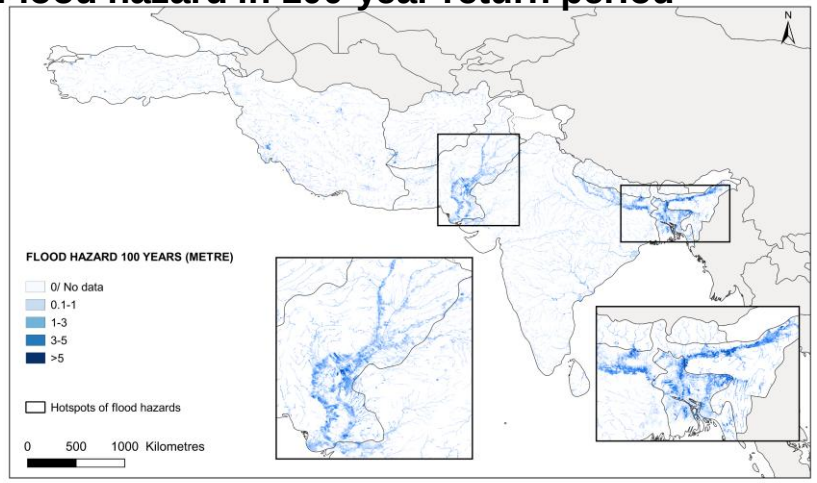
## Vegetation condition index as of 17 April 2022




Source : SASCOF Seasonal Outlook Precipitation Data for June to August 2022; UN Geospatial

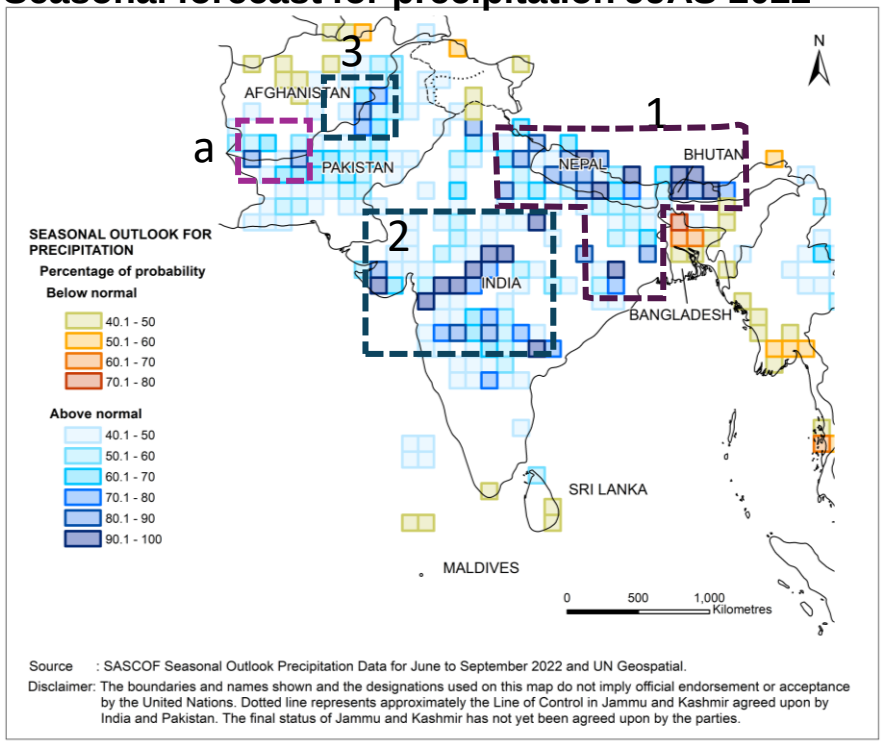
Disclaimer: The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations. Dotted line represents approximately the Line of Control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties.

## Flood hazard in 100-year return period




Sources : ESCAP, based on Global Assessment Report on Disaster Risk Reduction (GAR) Risk Atlas, 2015.
Note : Flood data consists of all categories of flood hazard height with a return period of 100 years.
Disclaimer: The boudaries and names shown and the designations used on this map does not imply official endorsement or acceptance by the United Nations. Dotted line represents approximately the Line of Control in Jammu Kashmir agreed upon by India and Pakistan.The final status of Jammu and Kashmir has not yet been agreed upon by the parties.

## Seasonal forecast for precipitation JJAS 2022




Source : SASCOF Seasonal Outlook Precipitation Data for June to September 2022 and UN Geospatial.

Disclaimer: The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations. Dotted line represents approximately the Line of Control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties.

### Areas of attention for Above-normal precipitation

**1.** Northern parts: north and east parts of India, all parts of Nepal and Bhutan. (90-100 % probability of above normal precipitation)

**2.** Central parts: central parts of India. (90-100 % probability of above normal precipitation)

**3.** North-east parts: central parts of Pakistan neighboring with Afghanistan (80-90 % probability of above normal precipitation)

### Areas with advantage - Above-normal precipitation

**a.** North-east parts: south-west parts of Pakistan neighboring with Afghanistan (80 % probability of above normal precipitation)

# Seasonal outlook for precipitation JJAS 2022

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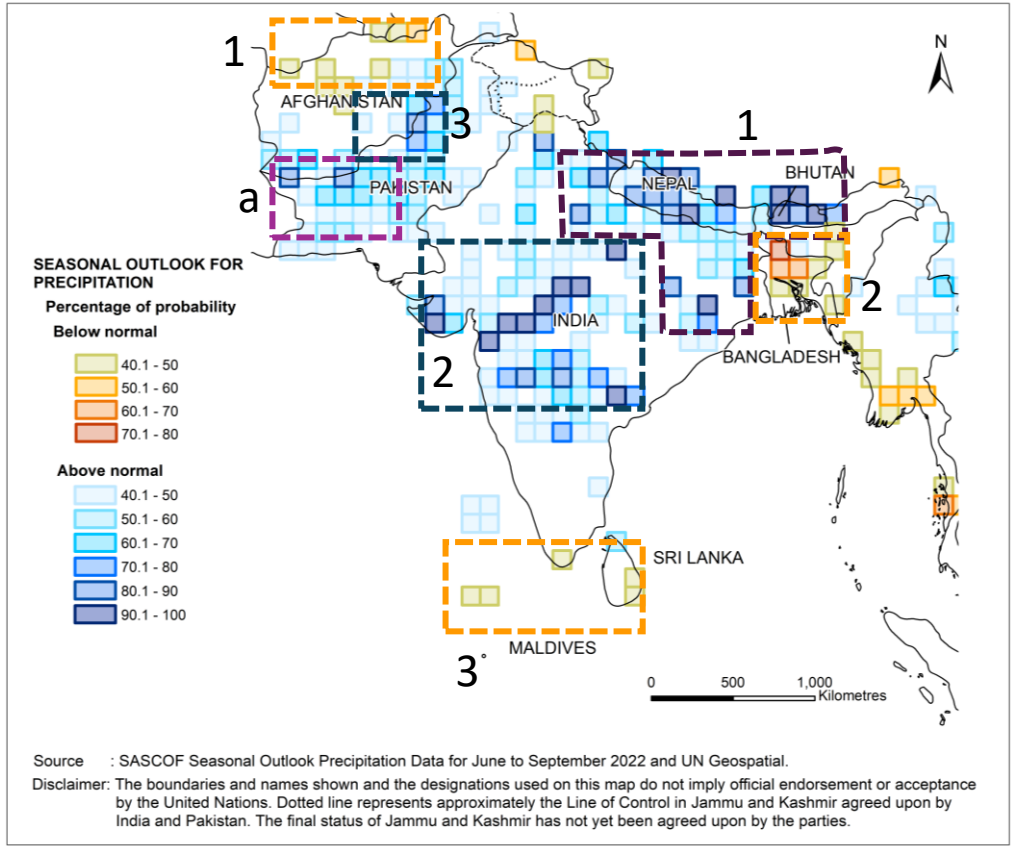


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### Areas of attention for Below-normal precipitation

**1.** North-western parts: north-west parts of Afghanistan.

**2.** North-eastern parts: Bangladesh (60-70% probability of below-normal precipitation).

**3.** South parts: Maldives, south parts of Sri Lanka, and south parts of India.

# Verification of the SASCOF OND 2023 IBF percent exposure from automation tool with the manual calculations on QGIS

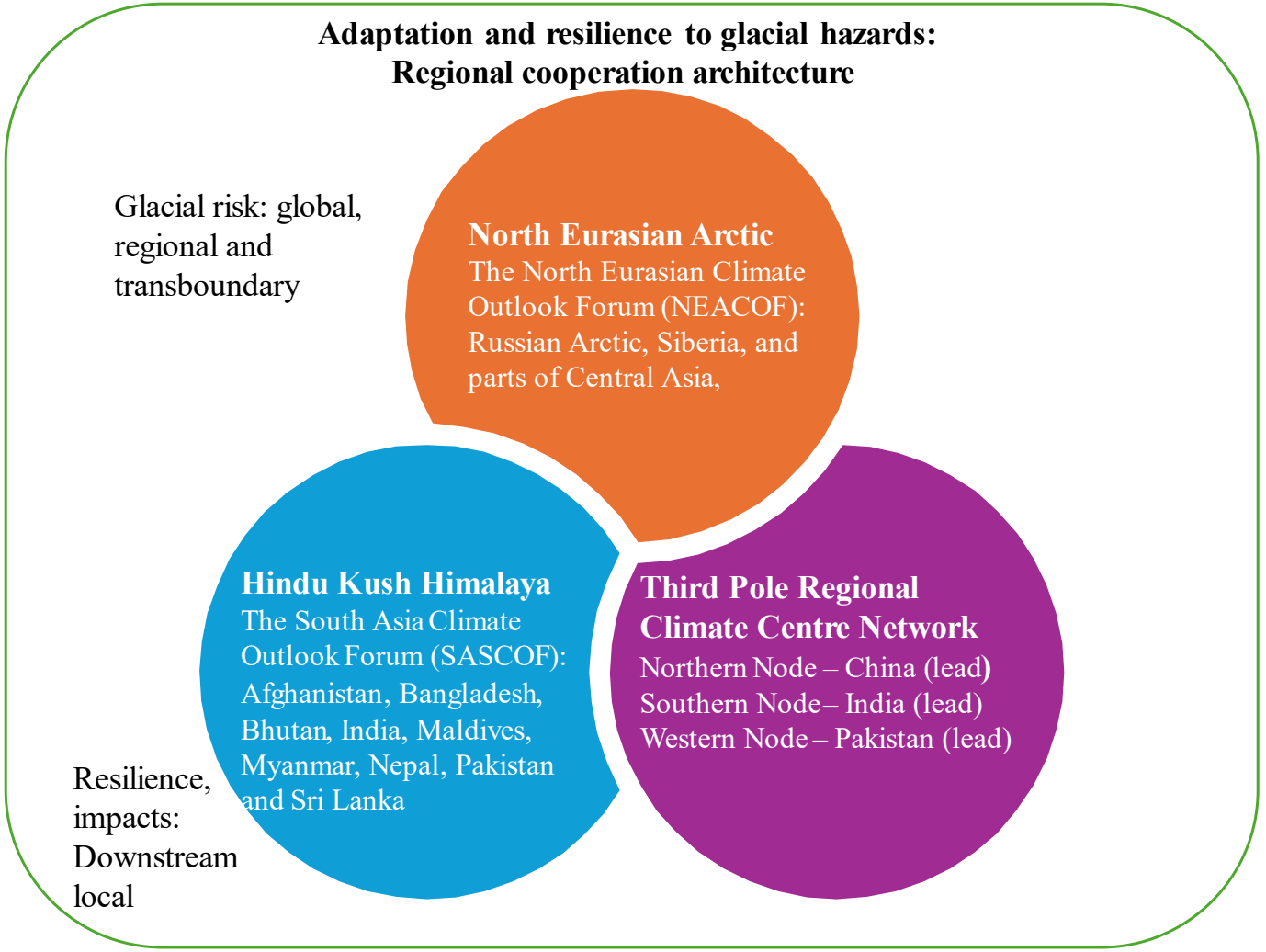
| Country | Method | BELOW-NORMAL | | | | ABOVE-NORMAL | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Exposed to 35.1% - 40% probability of below normal precipitation | Exposed to 40.1% - 50% probability of below normal precipitation | Exposed to 50.1% - 65% probability of below normal precipitation | Percent of exposure to below normal precipitation | Exposed to 35.1% - 40 % probability of above normal precipitation | Exposed to 40.1% - 50 % probability of above normal precipitation | Exposed to 50.1% - 70% of above normal precipitation | Exposed to 70.1% - 90% of above normal precipitation | Exposed to 90.1% - 100% of above normal precipitation | Percent of exposure to above normal precipitation |
| Afghanistan | Manual | 0.3% | 0.2% | 0.0% | 0.5% | 8.3% | 56.1% | 31.6% | 2.5% | 0.0% | 98.5% |
| | Script | 0.3% | 0.2% | 0.0% | 0.5% | 8.4% | 56.4% | 31.9% | 2.5% | 0.0% | 99.2% |
| | % difference | 0.1% | 0.3% | 0.3% | 0.3% | 0.1% | 0.3% | 0.3% | 0.0% | 0.0% | 0.7% |
| Bangladesh | Manual | 15.7% | 42.5% | 31.5% | 89.7% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Script | 15.9% | 43.2% | 31.7% | 90.7% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | % difference | 0.1% | 0.3% | 0.3% | 0.3% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| Bhutan | Manual | 40.3% | 24.5% | 0.3% | 65.1% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Script | 40.5% | 24.4% | 0.5% | 65.3% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | % difference | 0.1% | 0.3% | 0.3% | 0.3% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| India | Manual | 15.3% | 11.5% | 0.5% | 27.3% | 12.8% | 4.0% | 1.3% | 0.0% | 0.0% | 18.1% |
| | Script | 15.5% | 11.6% | 0.5% | 27.7% | 12.9% | 4.0% | 1.4% | 0.0% | 0.0% | 18.3% |
| | % difference | 0.1% | 0.3% | 0.3% | 0.3% | 0.1% | 0.1% | 0.0% | 0.0% | 0.0% | 0.2% |
| Maldives | Manual | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 3.4% | 0.0% | 83.9% | 87.3% |
| | Script | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 3.9% | 0.0% | 79.1% | 83.0% |
| | % difference | 0.1% | 0.3% | 0.3% | 0.3% | 0.0% | 0.0% | 0.5% | 0.0% | -4.8% | -4.3% |
| Myanmar | Manual | 1.6% | 0.0% | 0.0% | 1.7% | 19.9% | 14.8% | 14.7% | 9.4% | 1.1% | 59.9% |
| | Script | 1.6% | 0.0% | 0.0% | 1.7% | 20.1% | 14.9% | 14.8% | 9.5% | 5.2% | 60.5% |
| | % difference | 0.1% | 0.3% | 0.3% | 0.3% | 0.3% | 0.1% | 0.1% | 0.1% | 4.0% | 0.6% |
| Nepal | Manual | 5.0% | 55.1% | 0.0% | 60.1% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Script | 5.2% | 55.0% | 0.0% | 60.2% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | % difference | 0.1% | 0.3% | 0.3% | 0.3% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| Pakistan | Manual | 12.8% | 1.0% | 0.0% | 13.9% | 18.7% | 6.0% | 1.7% | 0.0% | 0.0% | 26.4% |
| | Script | 12.9% | 1.0% | 0.0% | 13.9% | 19.1% | 6.1% | 1.7% | 0.0% | 0.0% | 26.9% |
| | % difference | 0.1% | 0.3% | 0.3% | 0.3% | 0.4% | 0.1% | 0.0% | 0.0% | 0.0% | 0.5% |
| Sri Lanka | Manual | 2.7% | 0.0% | 0.0% | 2.7% | 6.2% | 39.9% | 25.2% | 0.0% | 0.0% | 71.3% |
| | Script | 2.7% | 0.0% | 0.0% | 2.7% | 6.3% | 40.0% | 25.5% | 0.0% | 0.0% | 71.8% |
| | % difference | 0.1% | 0.3% | 0.3% | 0.3% | 0.1% | 0.1% | 0.3% | 0.0% | 0.0% | 0.5% |
| TOTAL | Manual | 14.0% | 13.0% | 3.1% | 30.2% | 12.2% | 5.6% | 2.5% | 0.3% | 0.0% | 20.6% |
| | Script | 14.2% | 13.1% | 3.1% | 30.5% | 12.3% | 5.6% | 2.5% | 0.3% | 0.1% | 20.9% |
| | % difference | 0.1% | 0.3% | 0.3% | 0.3% | 0.1% | 0.1% | 0.0% | 0.0% | 0.1% | 0.2% |

- Percent difference from automation and manual calculations, for population exposure ranges from **0.1% to 0.3%** in each country for **below-normal precipitation.**
- Percent difference from automation and manual calculation in each country, for population exposure ranges from **0% to 4% and -4.8%** in each country for **above-normal precipitation.**

# TP Cooperation Architecture

**The riskscape of this vast glaciated region is captured through seasonal outlooks produced by**

- **The North Eurasian Climate Outlook Forum (NEACOF),**
- **TPRCC-N,**
- **The South Asia Climate Outlook Forum (SASCOF)**



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High-Level International Conference on Glaciers' Preservation

29-31 May 2025

Dushanbe, Tajikistan

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