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23rd South Asian Climate Outlook Forum (SASCOF-23)

Climate Services User Forum (CSUF)

Impact-Based Forecasting for the Seasonal Outlook – OND 2022

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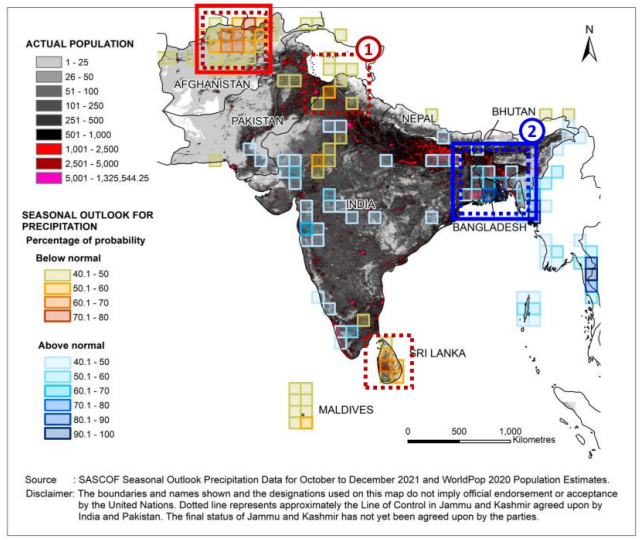
28 September 2022

In September 2021, potential drought and flood risk hotspots were identified



September 2021
Total deaths: 19
Affected: 4
Khyber Pakhtunkhwa

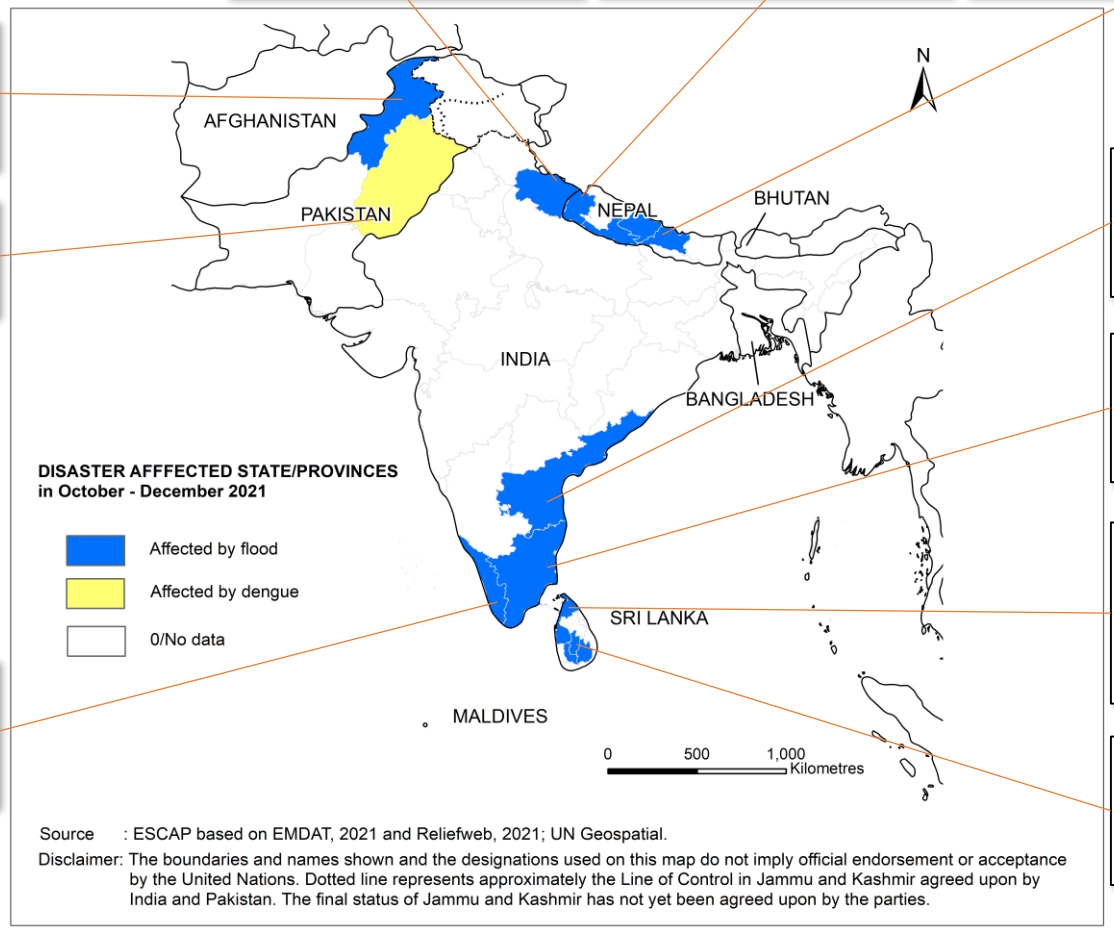
October 2021
Affected: 2728
Islamabad, Rawalpindi

October 2021
Total deaths: 39
Affected: 3950
Kerala

October 2021
Total deaths: 57
Affected: 1402
Uttarakhand

October 2021
Total deaths: 118
Affected: 10
Sudurpaschim

September 2021
Total deaths: 13
Affected: 1010
Bagmati, Gandaki, Lumbini



November 2021
Total deaths: 62
Affected: 74500
Andhra Pradesh

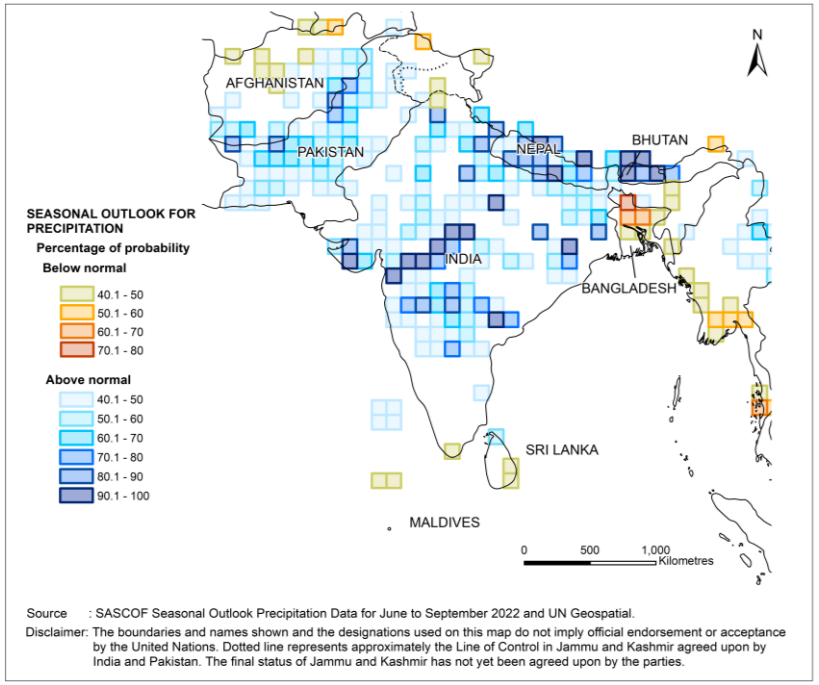
November 2021
Total deaths: 14
Affected: 11000
Tamil Nadu

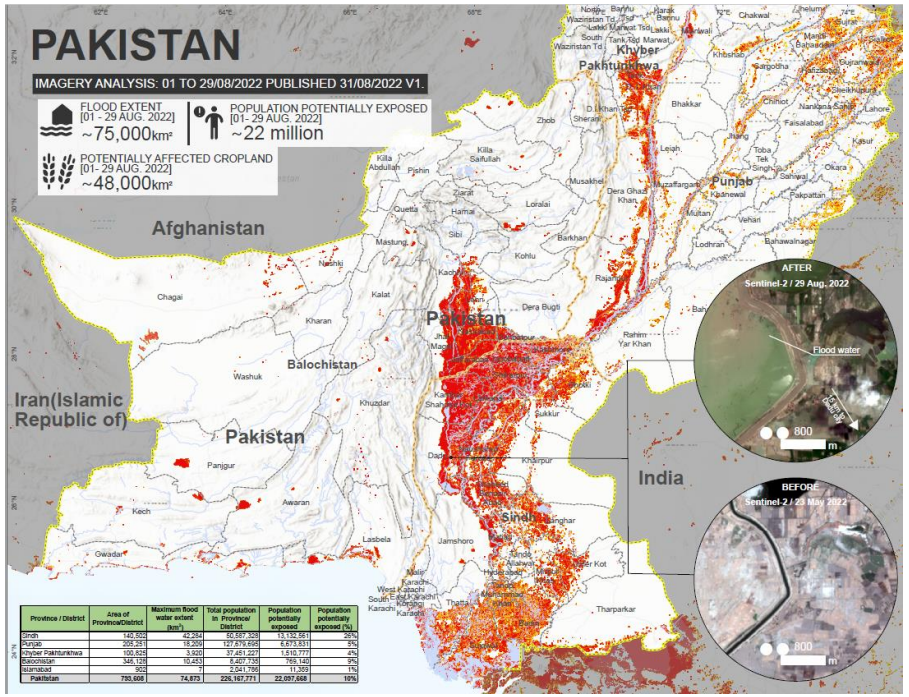
October - November 2021
Total deaths: 4
Affected: 6000
North-western, Northern, Sabaragamuwa, Uva

November 2021
Total deaths: 26
Affected: 230004
Central

States or provinces affected by disasters from October to December 2021

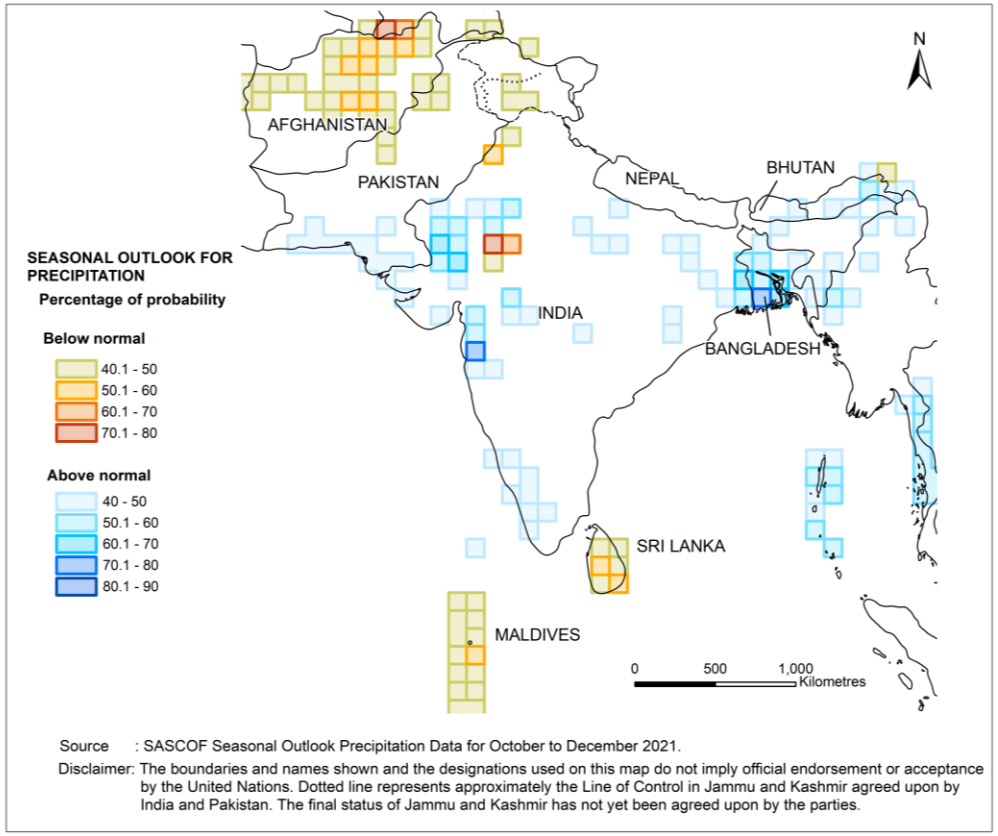
Seasonal Outlook for Precipitation, June-September 2022 (left), Satellite image of flood affected provinces in Pakistan (right)





- **Hotspots that stand out in the seasonal forecast coincide with provinces hit by floods in Pakistan:** Sindh, Punjab, Khyber Pakhtunkhwa, Balochistan, Islamabad.
- Despite certain limitations related data granularity and probabilistic nature of the analysis, it accurately identifies the hotspots of impending risks.
- Seasonal outlook for precipitation can prove to be an **effective decision-making support** for policymakers on the ground.

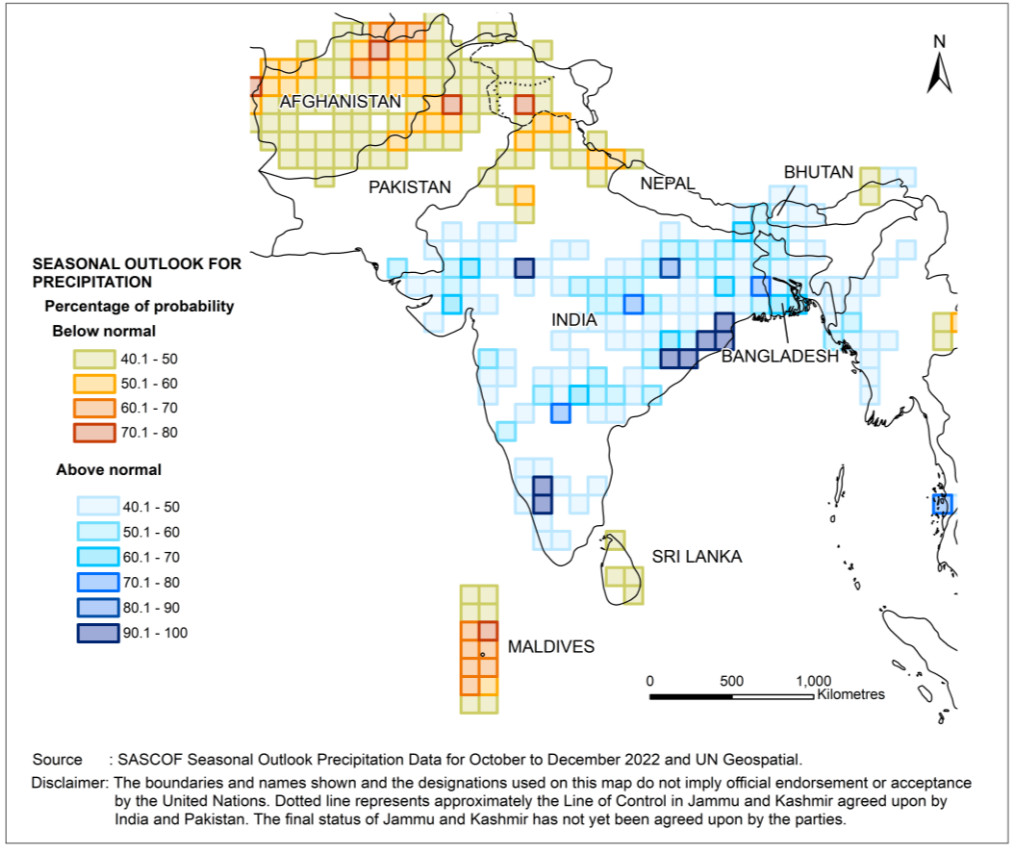
Seasonal outlook for precipitation OND 2021



Source : SASCOF Seasonal Outlook Precipitation Data for October to December 2021.

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.

Seasonal outlook for precipitation OND 2022



Source : SASCOF Seasonal Outlook Precipitation Data for October to December 2022 and UN Geospatial.

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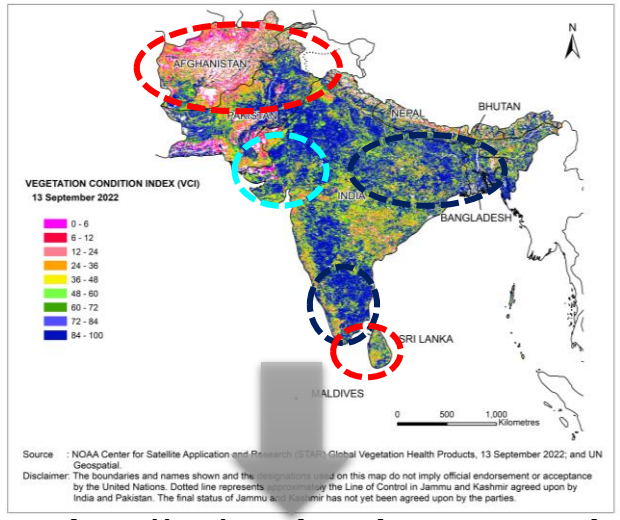
Seasonal Outlook OND 2022
Areas of attention for precipitation

Vegetation health during the most recent week, historical flood and drought hazard maps were used to find out the areas of attention for **above-normal** and **below-normal** precipitation.

Vegetation condition index as of 13 September 2022



Source : NOAA Center for Satellite Application and Research (STAR); Global Vegetation Health Products, 13 September 2022; and UN Geospatial.
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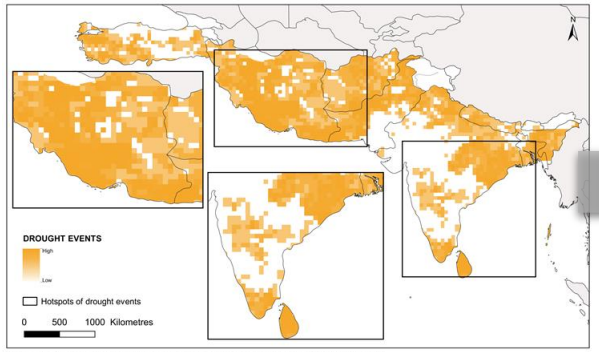
Drought events from 1980-2001



Sources : ESCAP, based on Global Assessment Report on Disaster Risk Reduction (GAR) Risk Atlas, 2015.
Note : In the map, individual drought events from 1980 to 2001 are indicated by light orange polygons. Darker colours appear where multiple polygons overlap, and therefore indicate areas with a higher frequency of previous drought events, while lighter shades indicate a lower frequency.
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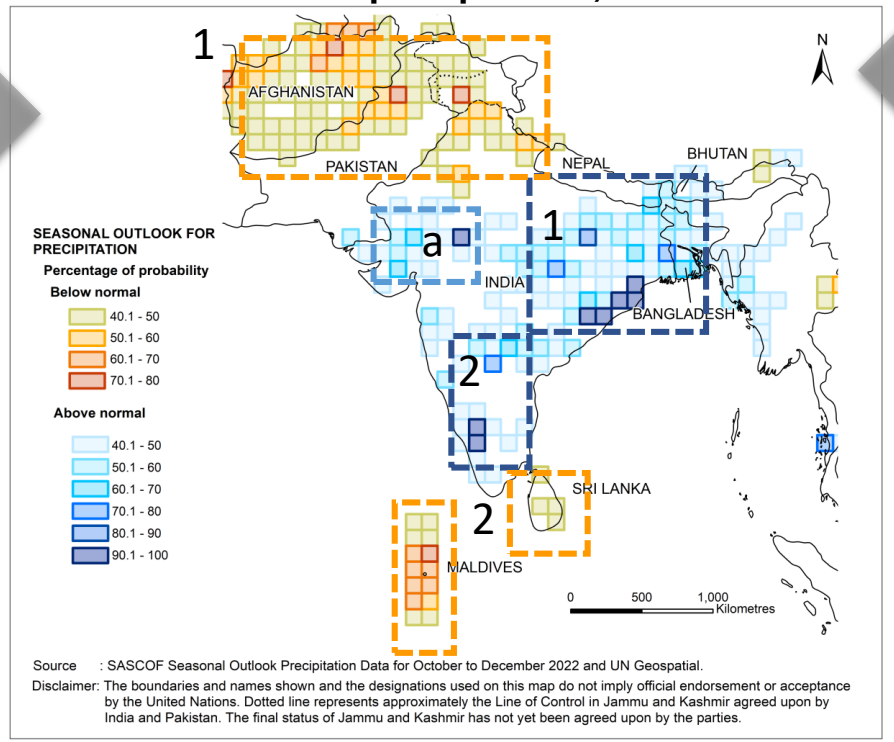
Areas for attention for above-normal and below-normal precipitation, OND 2022



Source : SASCOF Seasonal Outlook Precipitation Data for October to December 2022 and UN Geospatial.
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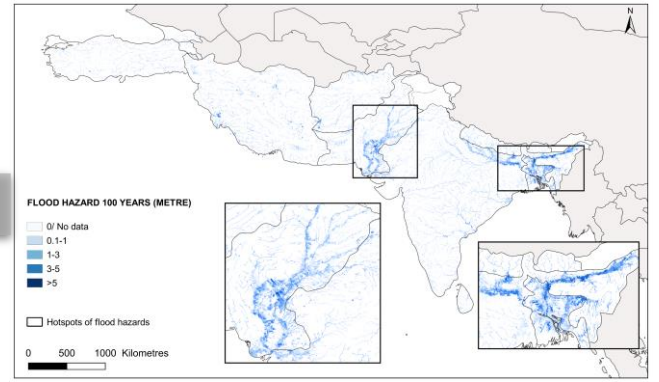
Flood hazard in 100-year return period



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.
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Areas of attention for below-normal precipitation

1. **North-west parts**
2. **South parts**

Areas of attention for above-normal precipitation

1. **Northern parts of the region**
2. **Central parts**

Areas with advantage - Above-normal precipitation

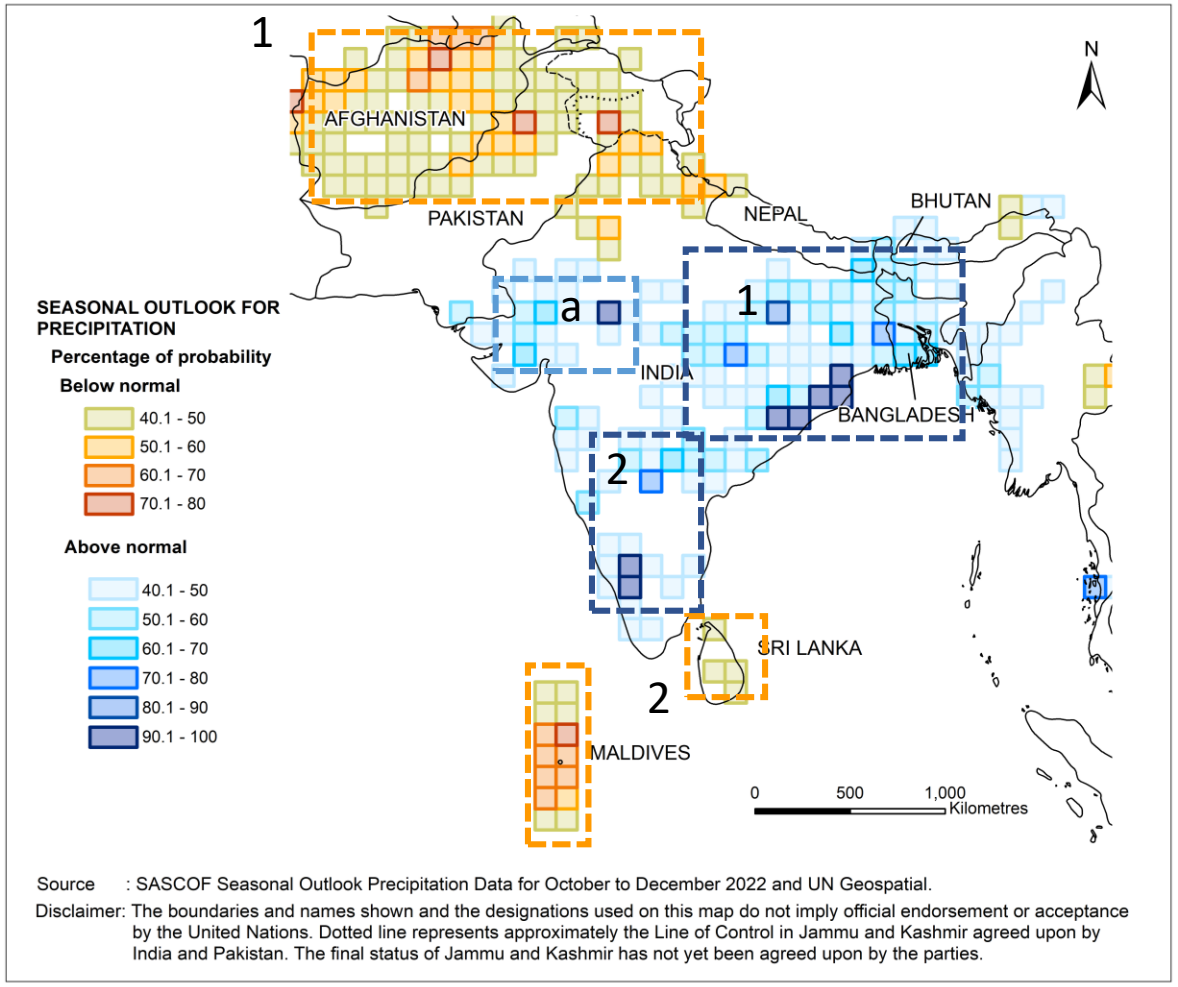
a. West parts

Seasonal outlook for precipitation OND 2022

Areas of attention for below-normal precipitation

1. North-west parts:
The entire Afghanistan (up to **77%** probability of below-normal precipitation) and north-east parts of Pakistan neighboring with Afghanistan (up to **73%** probability of below-normal precipitation), and north parts of India (up to **55%** probability)

2. South parts:
Maldives (up to **73%** probability of below-normal precipitation) and Sri Lanka (up to **48%** probability).



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Areas of attention for above-normal precipitation

1. Northern parts of the region:
Central and east parts of India (up to **100%** probability of above-normal precipitation), Bangladesh (up to **70%** probability), and Bhutan.

2. Central parts:
Central and south parts of India. (up to **100%** probability of above normal precipitation)

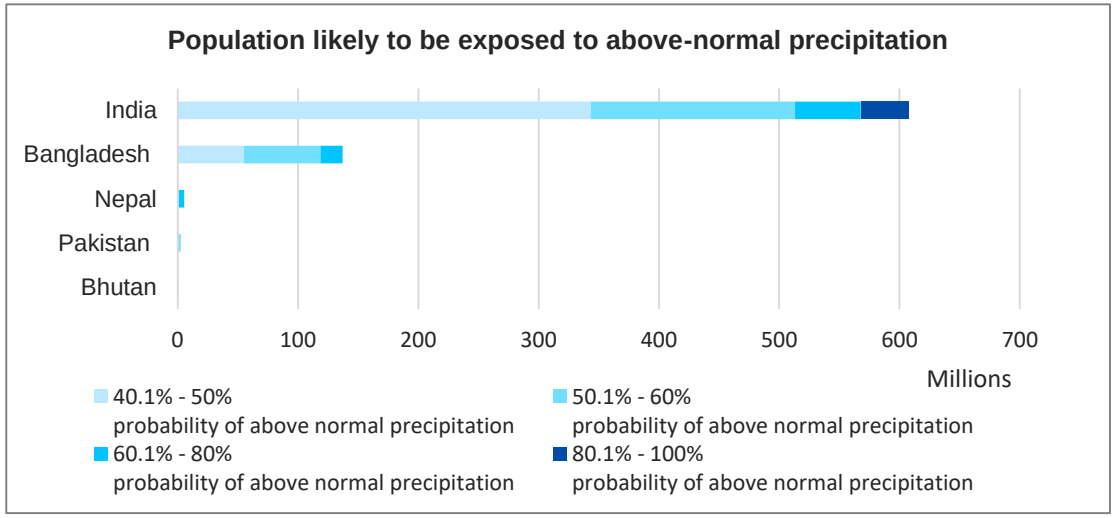
Areas with advantage - Above-normal precipitation

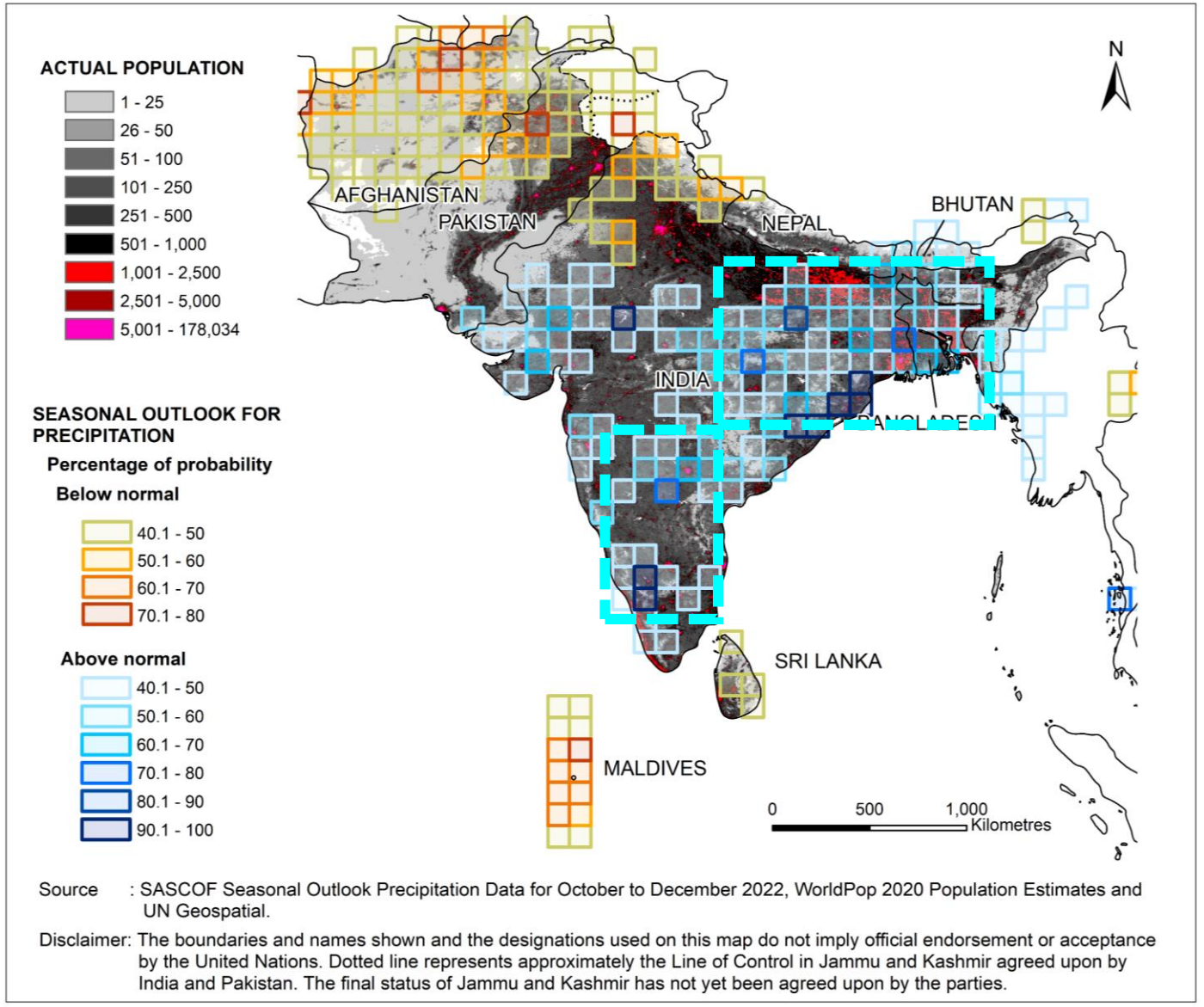
a. West parts:
west parts of India (up to **94%** probability of above normal precipitation)

Estimation of population likely to be exposed to above-normal precipitation

Country	Total population 2020 (thousands)	Percent of population exposure				
		40.1% - 50% probability of above normal precipitation	50.1% - 80% probability of above normal precipitation	60.1% - 80% probability of above normal precipitation	80.1% - 100% probability of above normal precipitation	Above normal precipitation
Afghanistan	38,928	0.0%	0.0%	0.0%	0.0%	0.0%
Bangladesh	164,689	33.5%	39.1%	11.2%	0.0%	**83.9%**
Bhutan	772	39.2%	21.6%	0.0%	0.0%	**60.8%**
India	1,380,004	25.2%	12.5%	4.0%	2.9%	**44.5%**
Maldives	541	0.0%	0.0%	0.0%	0.0%	0.0%
Nepal	29,137	1.8%	1.1%	15.6%	0.0%	**18.5%**
Pakistan	220,892	0.2%	0.9%	0.0%	0.0%	**1.1%**
Sri Lanka	21,413	0.0%	0.0%	0.0%	0.0%	0.0%
Total	**1,856,376**	**21.8%**	**12.9%**	**4.2%**	**2.2%**	**41.1%**

In total, **41.1%** of South Asia population are likely to be exposed to **more than 40%** probability of above-normal precipitation.





Source : SASCOF Seasonal Outlook Precipitation Data for October to December 2022, WorldPop 2020 Population Estimates and UN Geospatial.

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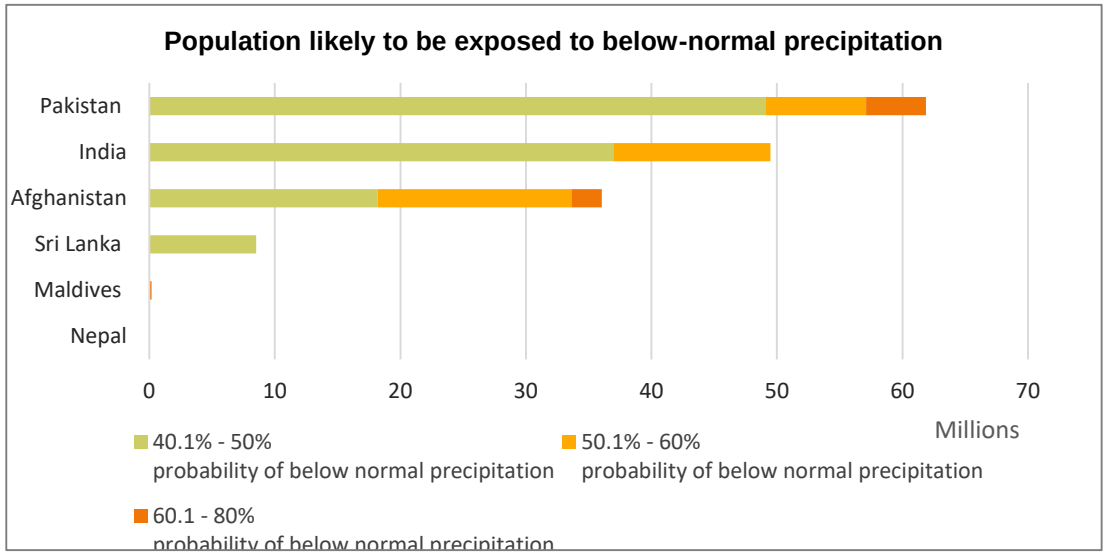
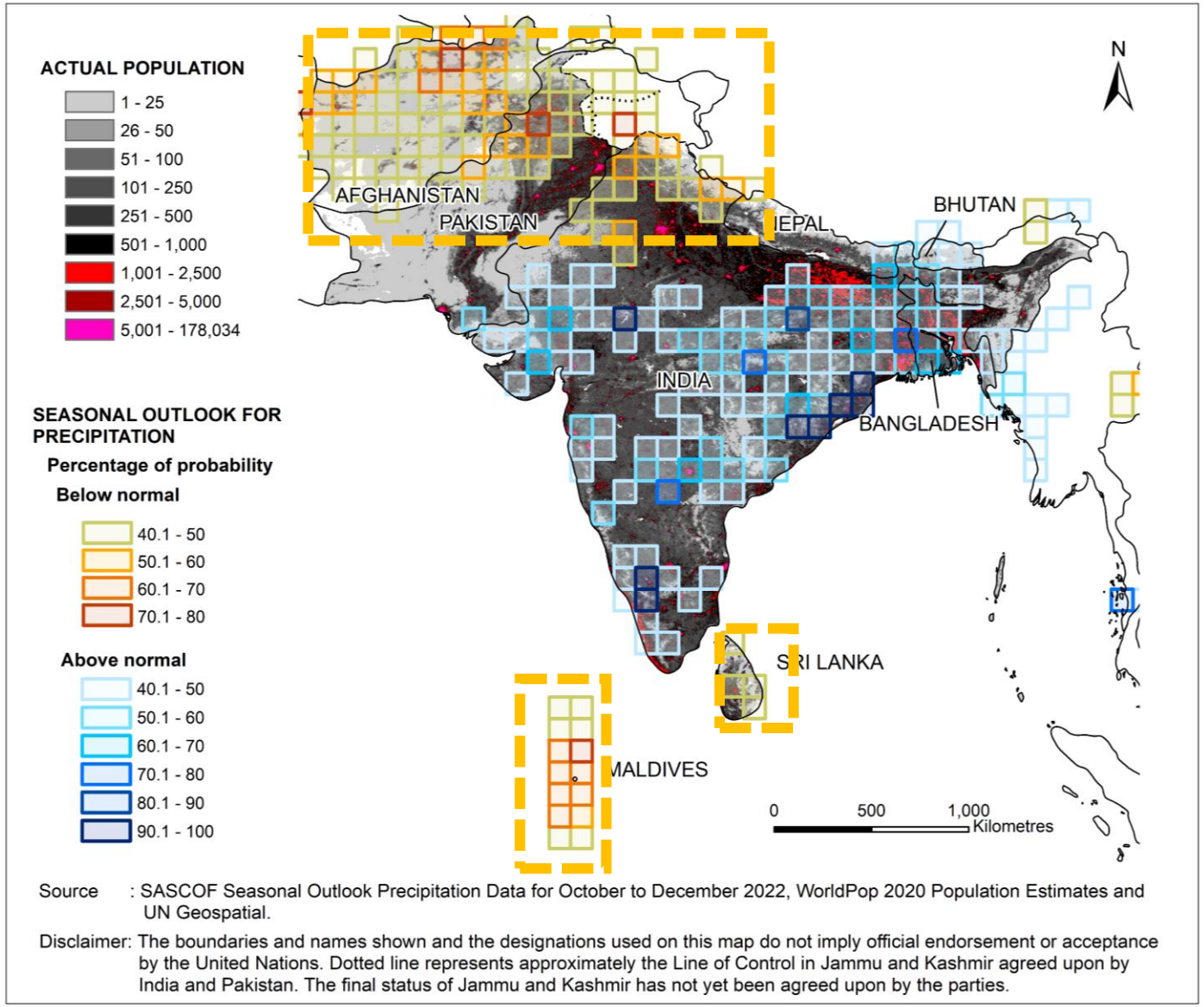
Estimation of population likely to be exposed to below normal precipitation

Country	Total population 2020 (thousands)	Percent of population exposure			
		40.1% - 50% probability of below normal precipitation	50.1% - 60% probability of below normal precipitation	60.1% - 80% probability of below normal precipitation	Below normal precipitation
Afghanistan	38,928	46.9%	39.8%	6.2%	92.9%
Bangladesh	164,689	0.0%	0.0%	0.0%	0.0%
Bhutan	772	0.0%	0.0%	0.0%	0.0%
India	1,380,004	2.7%	0.9%	0.0%	3.6%
Maldives	541	0.0%	2.8%	92.6%	95.4%
Nepal	29,137	0.0%	0.0%	0.0%	0.0%
Pakistan	220,892	22.7%	3.7%	2.2%	28.6%
Sri Lanka	21,413	40.4%	0.0%	0.0%	40.4%
Total	**1,856,376**	**6.2%**	**2.0%**	**0.4%**	**8.5%**

8.5% of South Asia population are likely to be exposed to **more than 40%** probability of below-normal precipitation.





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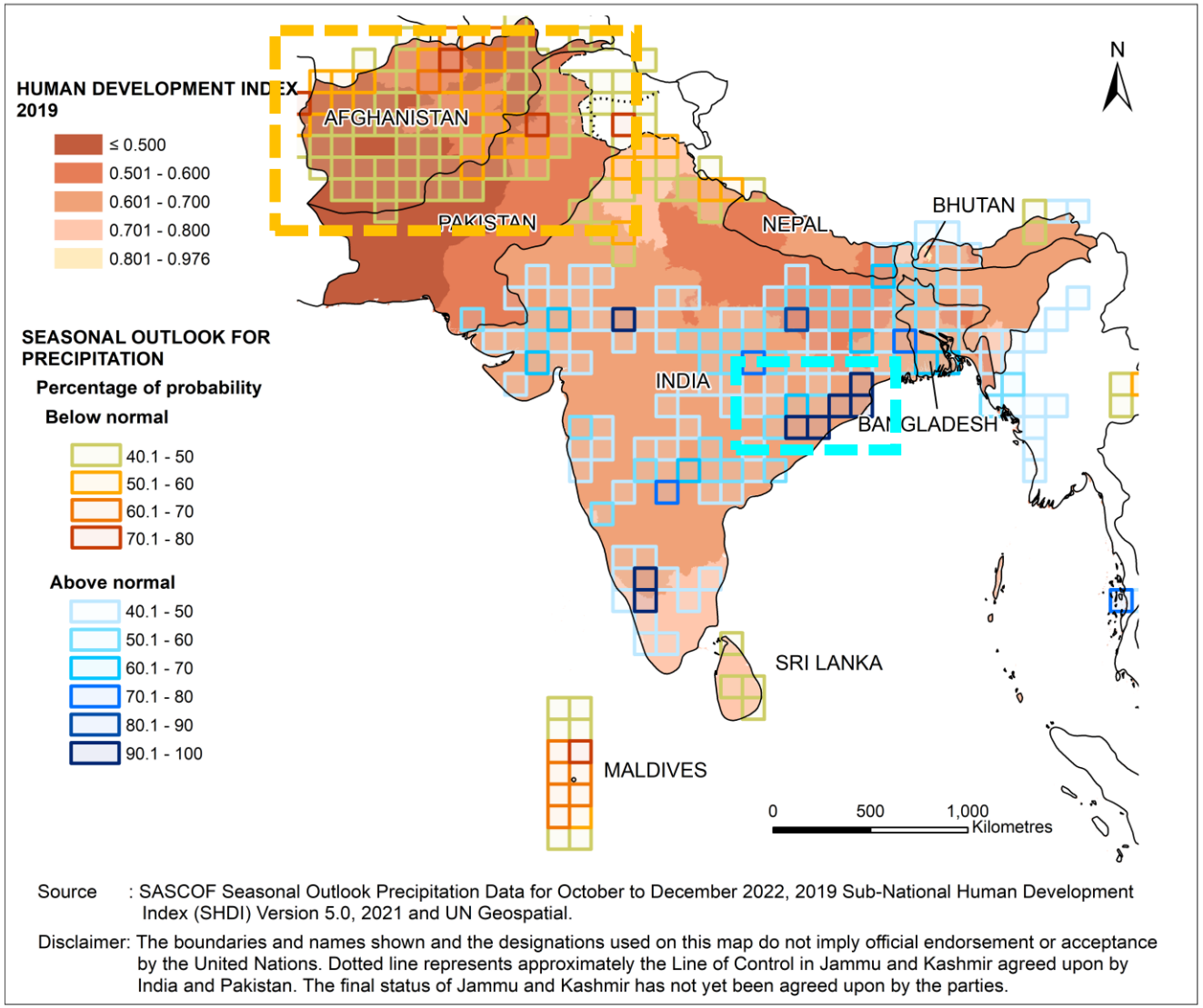
Vulnerability indicators can be added to understand the vulnerability of people likely to be affected.



Source : SASCOF Seasonal Outlook Precipitation Data for October to December 2022, 2019 Sub-National Human Development Index (SHDI) Version 5.0, 2021 and UN Geospatial.

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HDI is overlaid to understand the vulnerability of people exposed.

Sub-national Human Development Index (SHDI)

Dimension	Long and healthy life	Knowledge	A decent standard of living
Indicators	Life expectancy at birth	Expected year of schooling Mean years of schooling	GNI per capita(PPP)
Dimension Index	Life expectancy index	Education index	GNI index

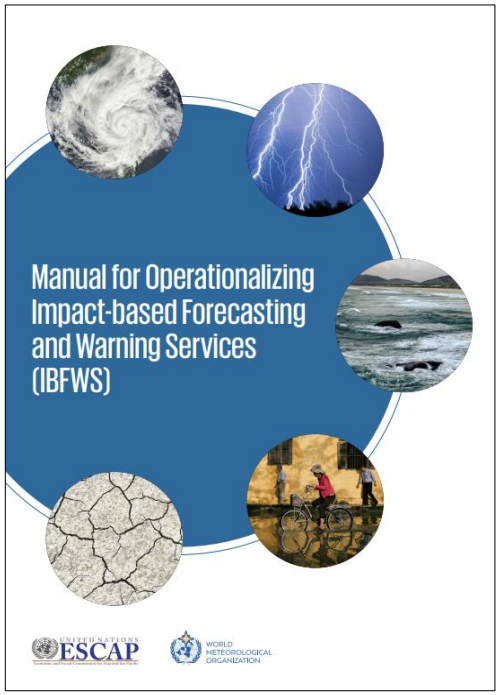
Human development index(HDI)

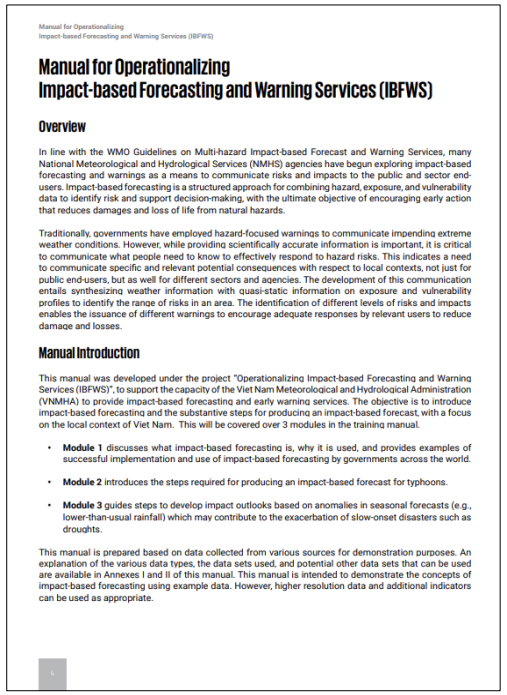
Source: UNDP, 2019.

Other indicators (poverty, income, education, literacy, or other vulnerability indicators) can be used as appropriate.

Impact-based forecast and warning services - Training manual

A project funded by WMO's CREWS-Canada





Manual for Operationalizing
Impact-based Forecasting and Warning Services (IBFWS)

Manual for Operationalizing Impact-based Forecasting and Warning Services (IBFWS)

Overview

In line with the WMO Guidelines on Multi-hazard Impact-based Forecast and Warning Services, many National Meteorological and Hydrological Services (NMHS) agencies have begun exploring impact-based forecasting and warnings as a means to communicate risks and impacts to the public and sector end-users. Impact-based forecasting is a structured approach for combining hazard, exposure, and vulnerability data to identify risk and support decision-making, with the ultimate objective of encouraging early action that reduces damages and loss of life from natural hazards.

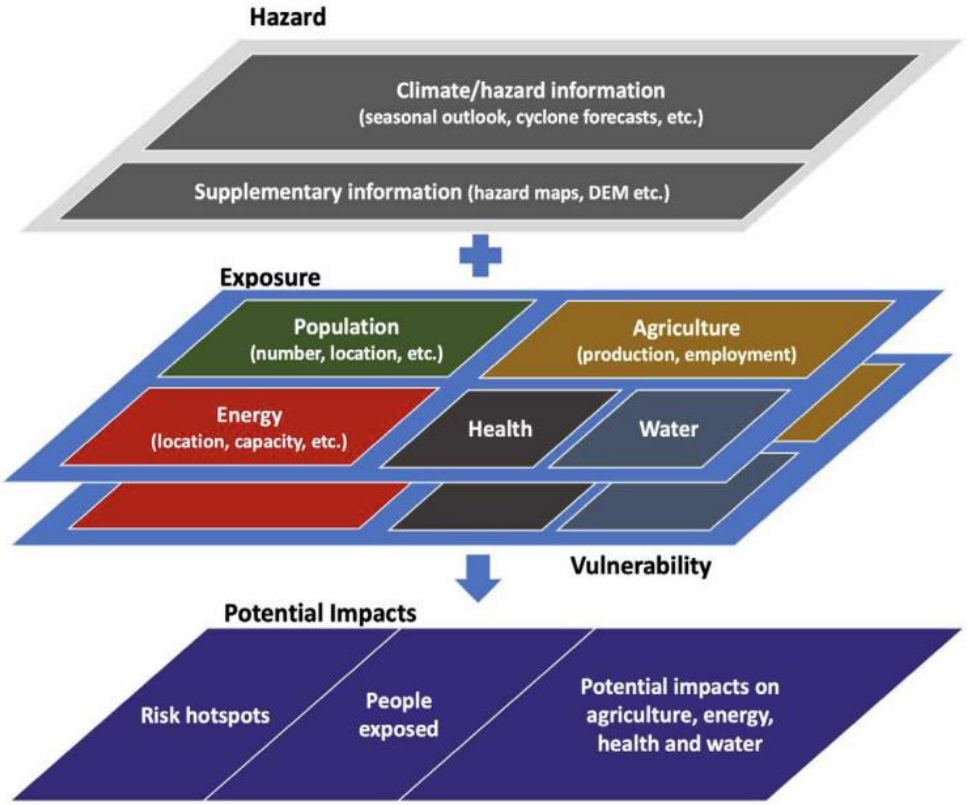
Traditionally, governments have employed hazard-focused warnings to communicate impending extreme weather conditions. However, while providing scientifically accurate information is important, it is critical to communicate what people need to know to effectively respond to hazard risks. This indicates a need to communicate specific and relevant potential consequences with respect to local contexts, not just for public end-users, but as well for different sectors and agencies. The development of this communication entails synthesizing weather information with quasi-static information on exposure and vulnerability profiles to identify the range of risks in an area. The identification of different levels of risks and impacts enables the issuance of different warnings to encourage adequate responses by relevant users to reduce damage and losses.

Manual Introduction

This manual was developed under the project "Operationalizing Impact-based Forecasting and Warning Services (IBFWS)", to support the capacity of the Viet Nam Meteorological and Hydrological Administration (VNMHA) to provide impact-based forecasting and early warning services. The objective is to introduce impact-based forecasting and the substantive steps for producing an impact-based forecast, with a focus on the local context of Viet Nam. This will be covered over 3 modules in the training manual.

- **Module 1** discusses what impact-based forecasting is, why it is used, and provides examples of successful implementation and use of impact-based forecasting by governments across the world.
- **Module 2** introduces the steps required for producing an impact-based forecast for typhoons.
- **Module 3** guides steps to develop impact outlooks based on anomalies in seasonal forecasts (e.g., lower-than-usual rainfall) which may contribute to the exacerbation of slow-onset disasters such as droughts.

This manual is prepared based on data collected from various sources for demonstration purposes. An explanation of the various data types, the data sets used, and potential other data sets that can be used are available in Annexes I and II of this manual. This manual is intended to demonstrate the concepts of impact-based forecasting using example data. However, higher resolution data and additional indicators can be used as appropriate.



- Module 1. Introduction to impact-based forecasting
- Module 2. Impact-based forecasting for typhoons
- Module 3. Impact outlooks using seasonal forecasts

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OPERATIONALIZING IMPACT-BASED FORECASTING AND WARNING SERVICES

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ABSTRACT

Traditionally, governments have employed hazard-focused warnings to communicate impending extreme weather conditions. However, while providing scientifically accurate information is important, it is critical to communicate what people need to know to effectively respond to hazard risks. This indicates a need to communicate specific and relevant potential consequences with respect to local contexts, not just for public end-users, but as well for different sectors and agencies. The development of this communication entails synthesizing weather information with quasi-static information on exposure and vulnerability profiles to identify the range of risks in an area. The identification of different levels of risks and impacts enables the issuance of different warnings to encourage adequate responses by relevant users to reduce damage and losses.

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Shashwat Avi

Thank you