Evaluating Exposure to Hydrologic Extremes Under Future Climate over High Mountain Asia

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1. Introduction

Climate change poses major challenges to populations in different parts of the world. The shift to a warmer world brings along increasing frequency and intensity of hydrologic extremes, endangering people's lives, especially in vulnerable communities. Information on exposure to such extremes is key to building adaptation and attenuation measures. In this study we utilized downscaled climate projections to quantify future changes in the severity of droughts, heatwaves and intense precipitation over High Mountain Asia (HMA), estimating the exposure of general and vulnerable communities to these hazards.

Therefore, the objectives of this study include:

- Quantify future changes in three major extremes: droughts, heatwaves and extreme precipitation over HMA.
- Analyze exposure of general and most vulnerable populations to these extremes.
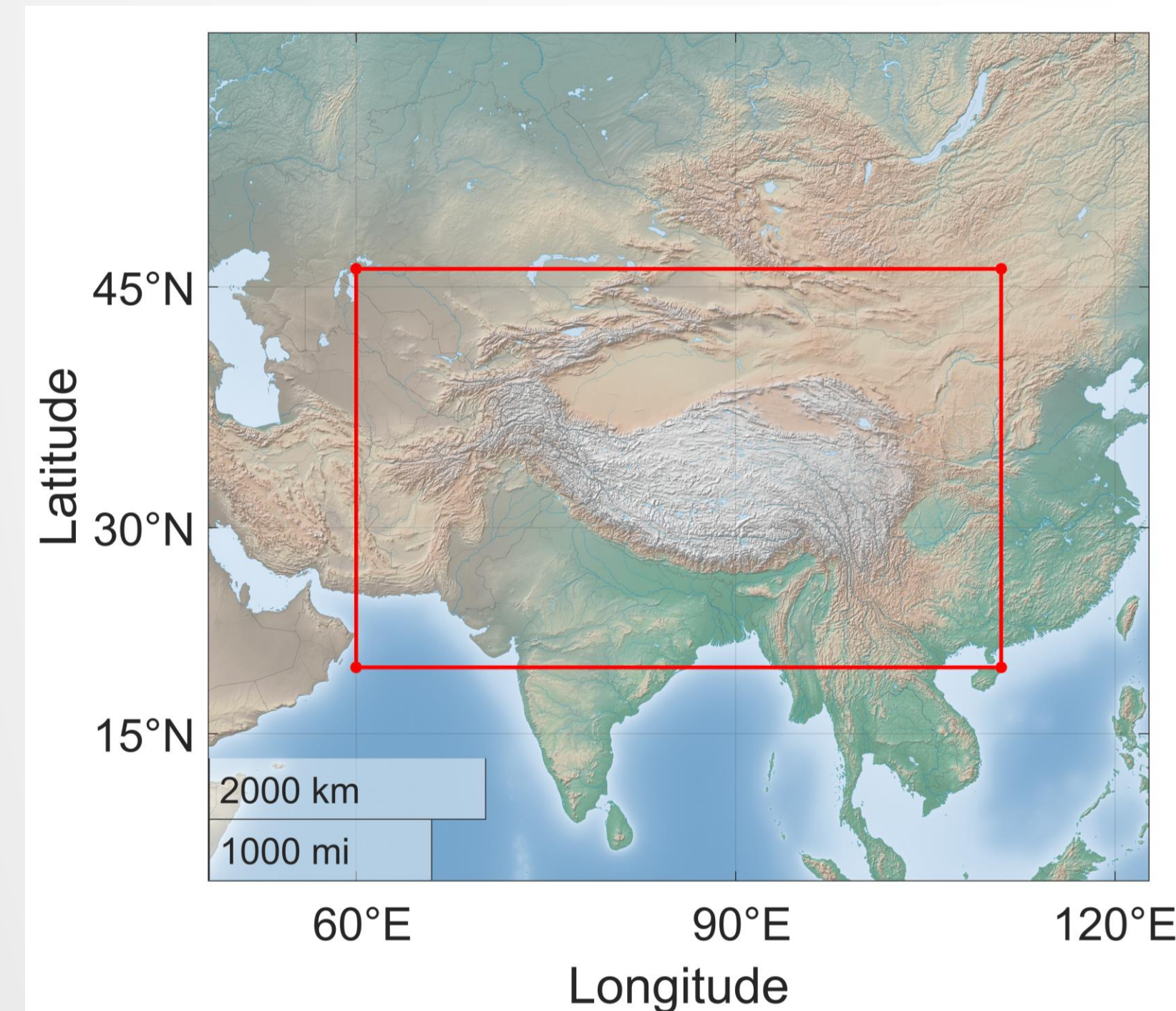
## 2. Study Area & Data

Table 1. Datasets used in the Study

Dataset	HMA2 DSPAT	GLOBAL POP.	GRDI
Resolution	0.05° (5 km)	0.01° (1 km)	0.01° (1km)
Period	1990-2100	2000-2100	2010-2020
Variable	Daily Pr., Tasmin, Tasmax and Tas.	Population	Global Gridded Deprivation Index
Scenario	Historical, SSP5-8.5	Historical, SSP5-8.5	Obs.
Realization	r1i1f1p1	NA	NA

Source:
HMA2 DSPAT (Nikolopoulos & Araujo, 2023).
GLOBAL POP. (Gao, 2020)
GRDI (CIESIN., 2022)

Figure 1. Study Area, High Mountain Asia. The Highlighted rectangle represents the boundaries used in this study.

3. Methodology

4. Exposure to Hydrologic Extremes

MID-CENTURY (2015-2050)   **END-CENTURY (2051-2100)**
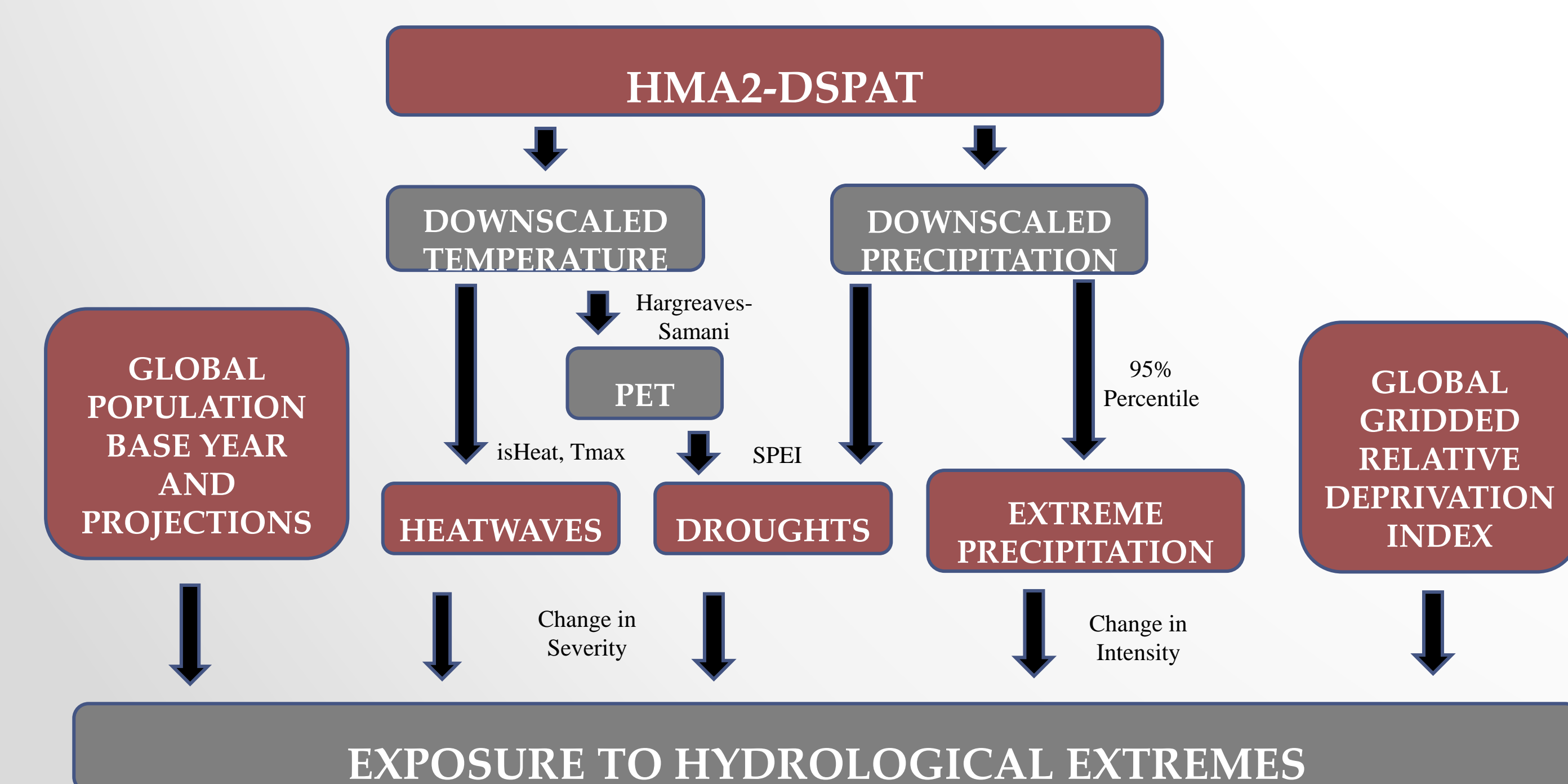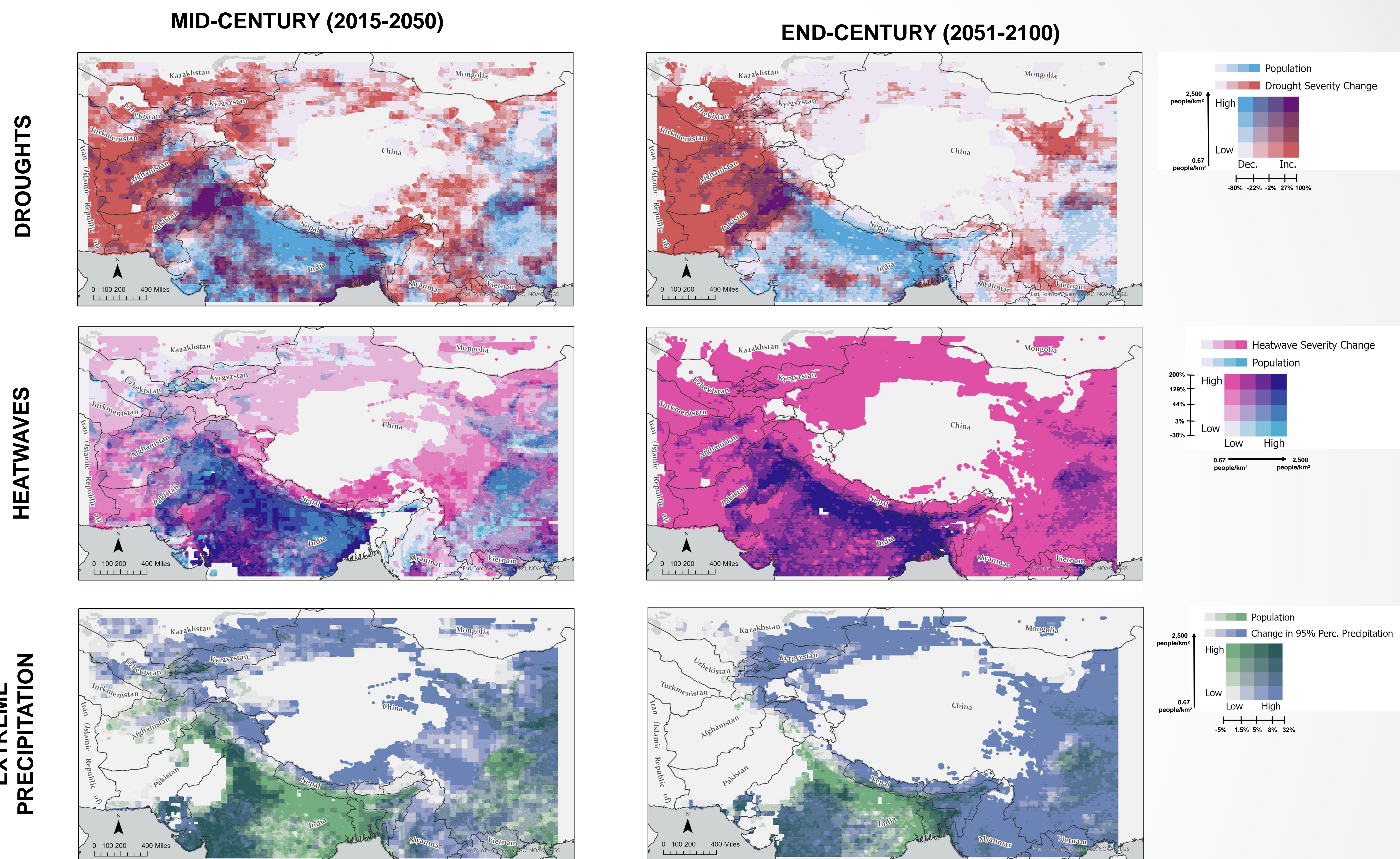
DROUGHTS

HEATWAVES

EXTREME PRECIPITATION

Figure 2. Exposure to droughts, heatwaves and extreme precipitation for mid (2015-2050) and end (2051-2100) century. Results based on projection SSP5-8.5.
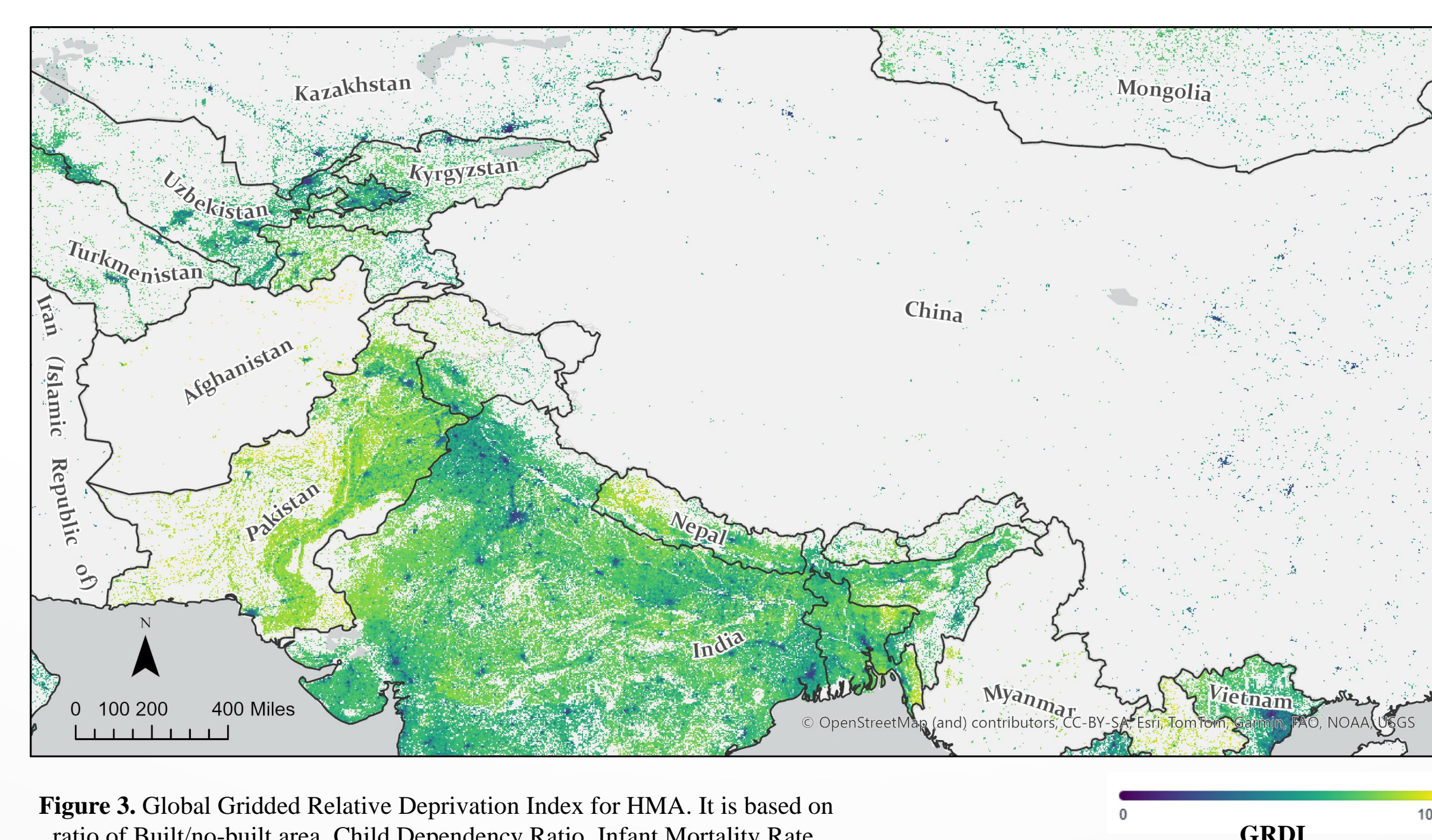
5. Deprivation Index

Figure 3. Global Gridded Relative Deprivation Index for HMA. It is based on ratio of Built/no-built area, Child Dependency Ratio, Infant Mortality Rate, Subnational Human Development Index and intensity of nighttime lights.

6. Conclusions

- Drought exposure is more pronounced on the west HMA.
- Heatwaves are increasing over almost the whole domain.
- Extreme precipitation increasing on the north and east HMA.
- Deprivation Index show vulnerable areas potentially sensitive to future extremes, e.g. North of Pakistan and India.

7. Acknowledgments and References

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