

# Decentralized Energy Options For An Ecologically Fragile Himachal Pradesh, India

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Presented at



## Study area and objective

- Himachal Pradesh is located between 30.38° to 33.21° North latitudes and 75.77° to 79.07° East longitudes, lying in the Western Himalayas, covering a geographical area of 55673 km<sup>2</sup>
- One of the highest consumers of bio-energy (fuel-wood, crop-residue, dung-cake) in the country resulting in increased environmental issues like excessive depletion of vegetation, desertification, indoor air pollution etc
- The centralized electrification policies as well as the proposed hydro projects are posing serious threats to the already fragile ecosystem in the state<sup>1</sup>.
- In this scenario, we assessed the solar potential of Himachal Pradesh to encourage solar as a decentralized and eco-friendly energy source in the region.

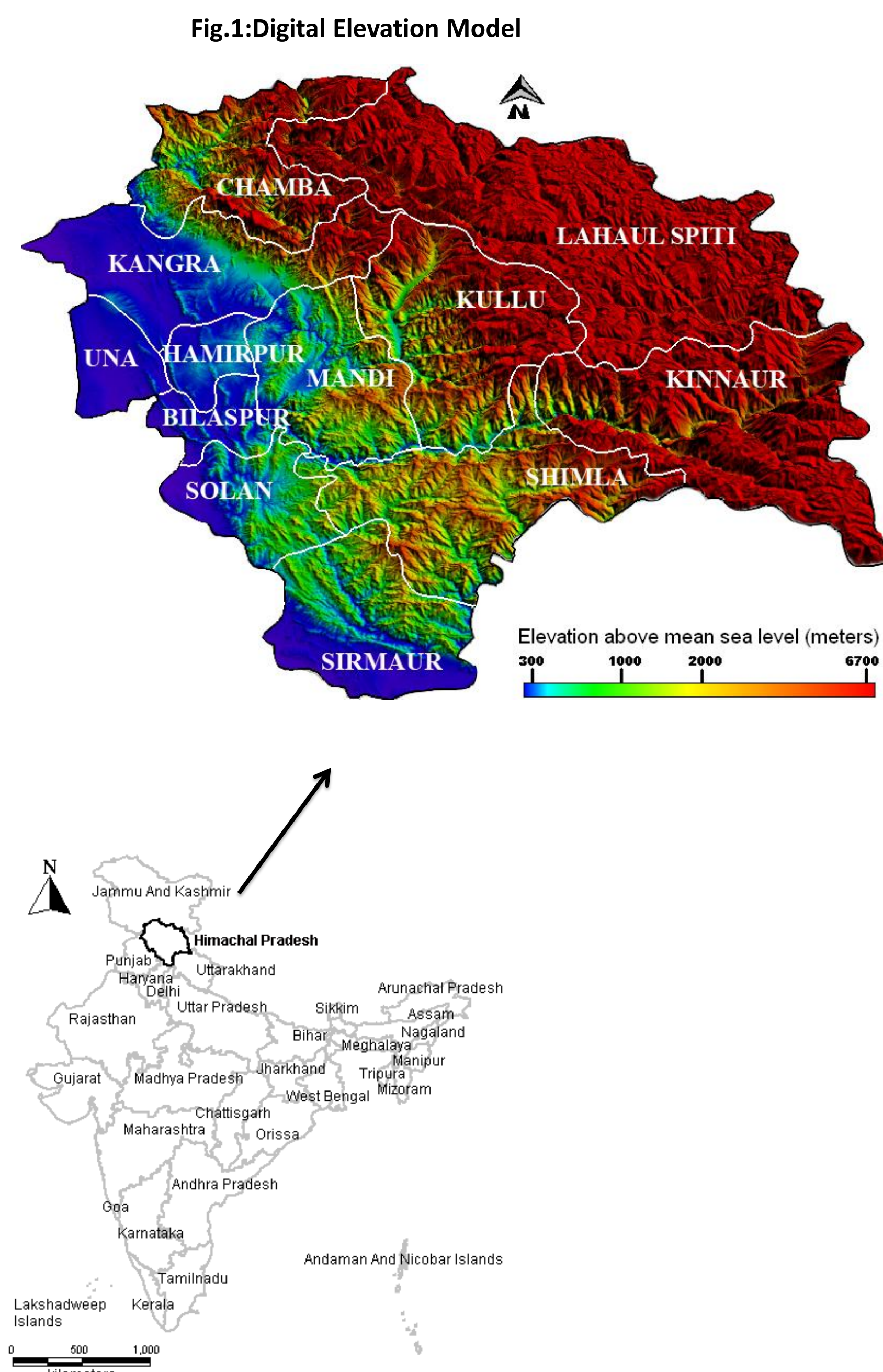


Fig.2: Monthly average rainfall variation

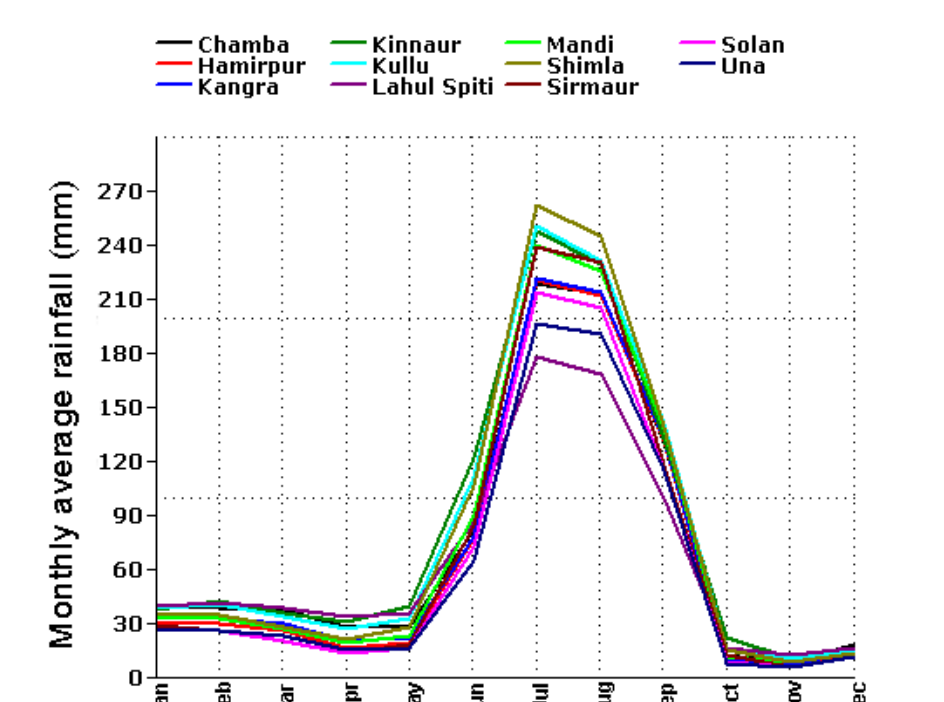
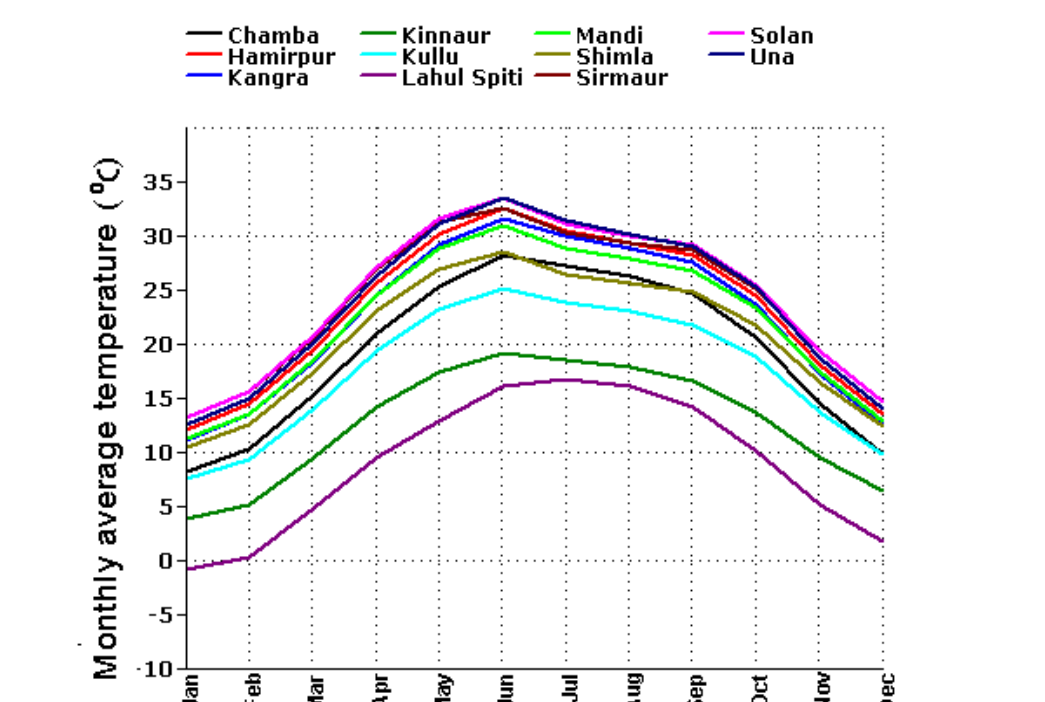


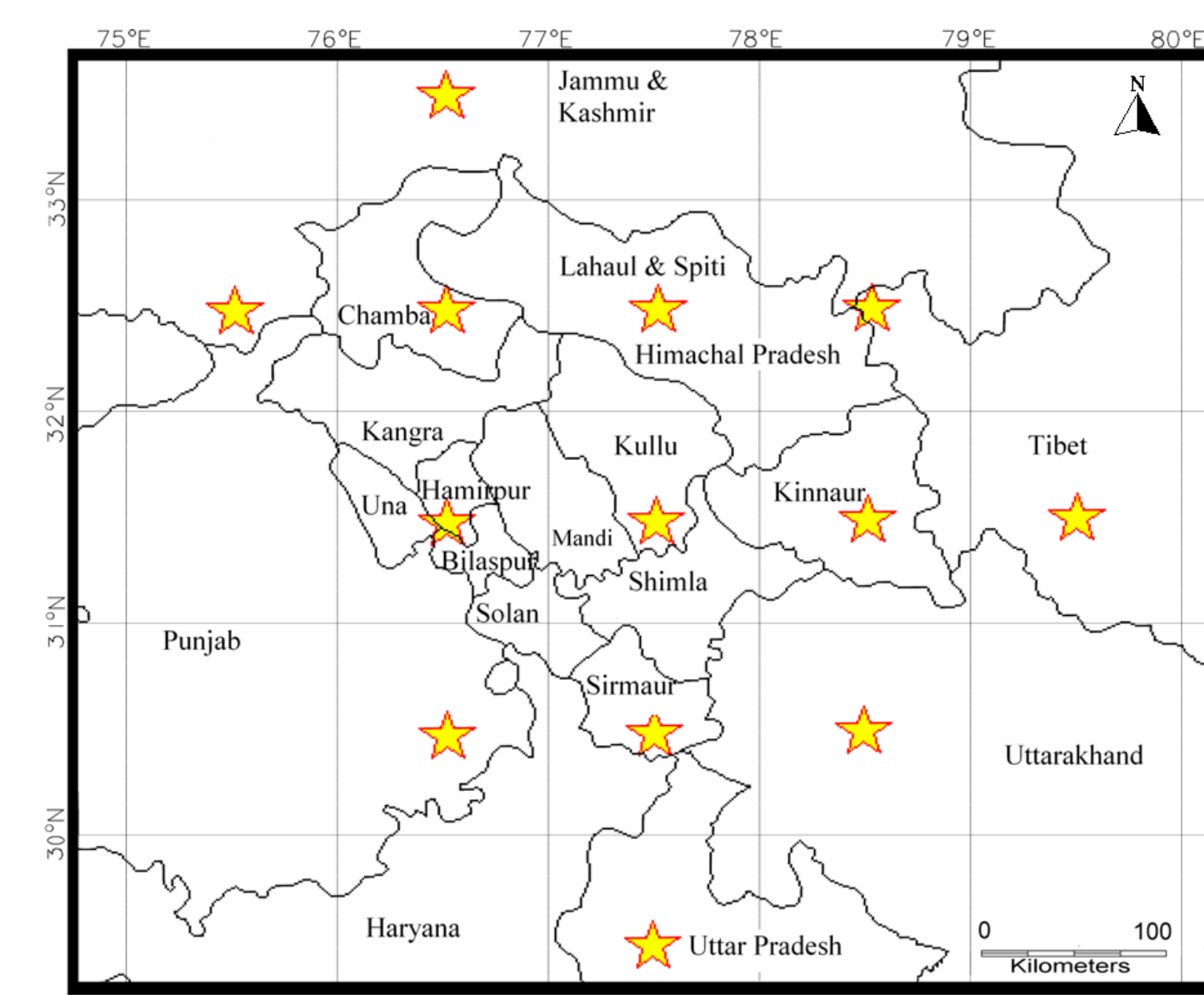
Fig.3: Monthly average temperature variation



## Methodology

- Satellite based high spatiotemporal resolution (1°X1°, 22 years) monthly Global insolation datasets from National Aeronautics and Space Administration (NASA) Surface Meteorology and Solar Energy (SSE)<sup>2</sup> were collected (Figure 4) and validated with ground data<sup>3</sup>
- The monthly Global insolation data were represented in Geographical Information Systems (GIS) as solar maps for Himachal Pradesh (Figure 5) and altitude based variations were also observed (Figure 6)

Fig.4: Selected grids for monthly average Global Insolation



## Results

- March to October favorable for large-scale/commercial solar applications throughout Himachal Pradesh
- November and February favorable for large-scale/commercial applications in regions below 3500m above sea level
- December and January only favorable for domestic applications like solar cookers and water heaters throughout the state

Fig.6: Variations of global insolation (kWh/m<sup>2</sup>/day) at a) low altitude (<1000m) b) mid altitude (1000-3500m) c) high altitude (>3500m)

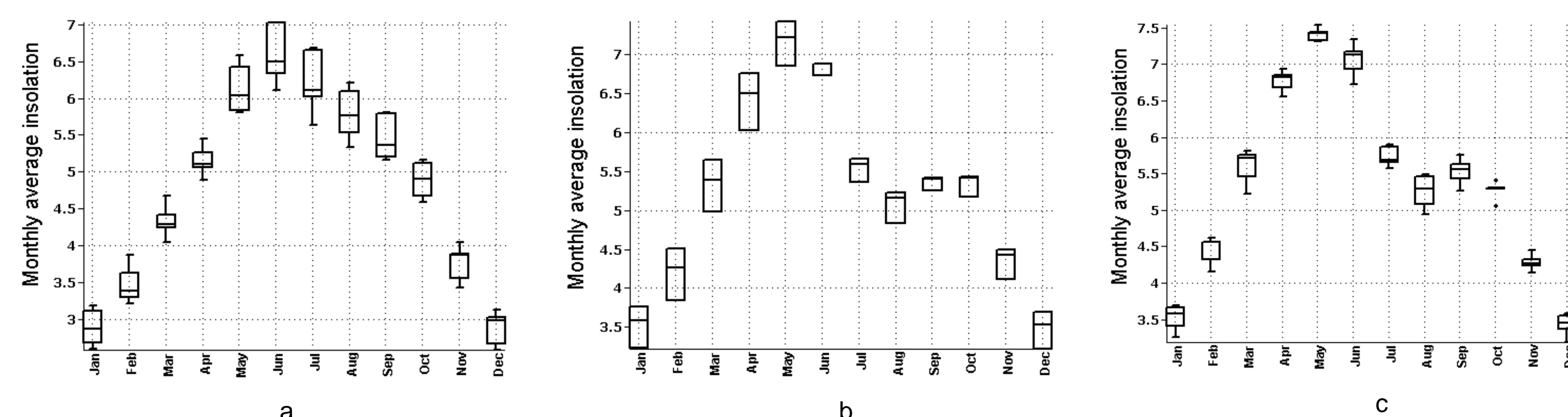
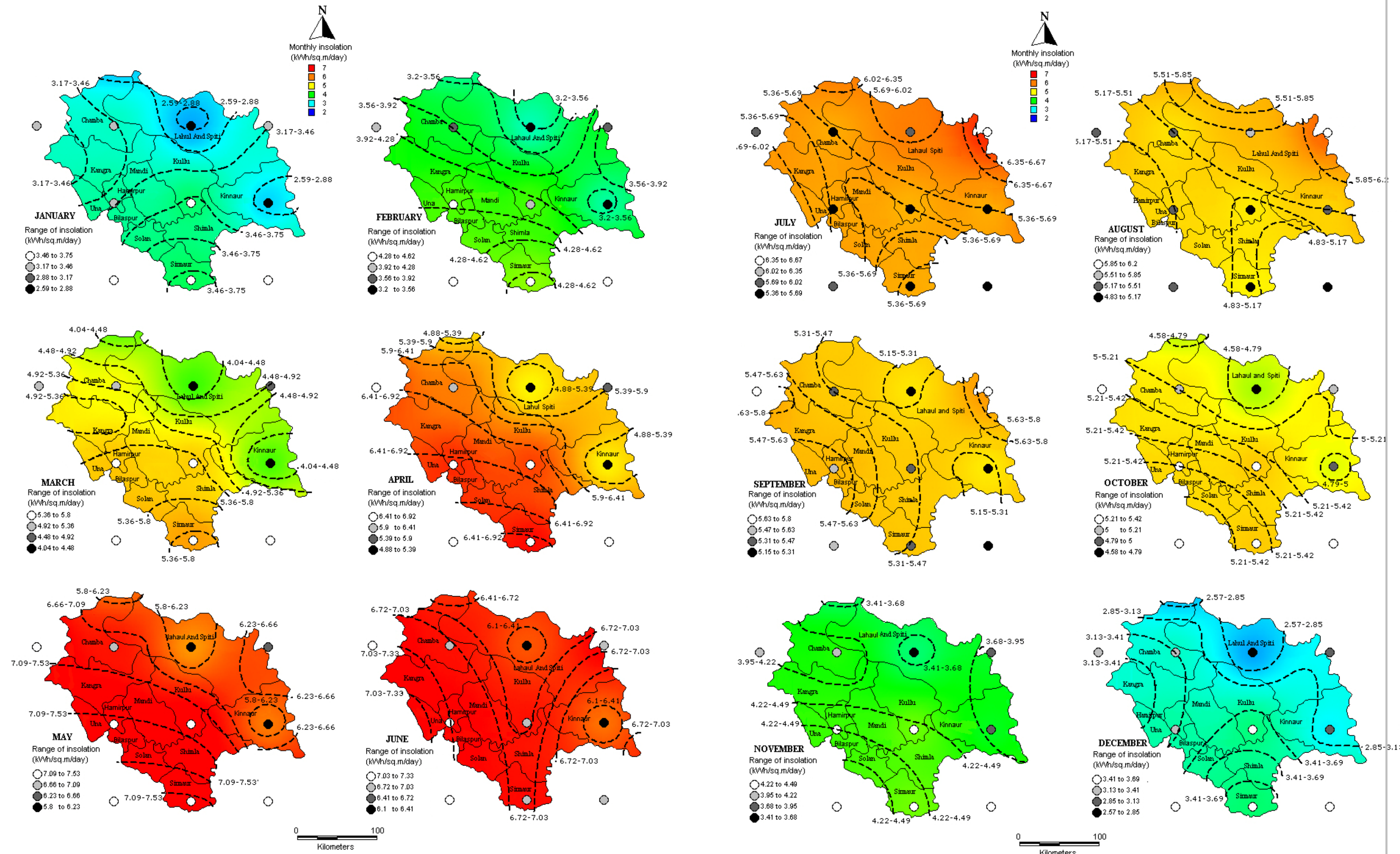


Fig.5: Solar maps showing monthly average Global insolation with contours



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## References

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