

# Developing a Customized Composite Drought Index for Pakistan

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## Abstract

Pakistan map of Köppen climate classification

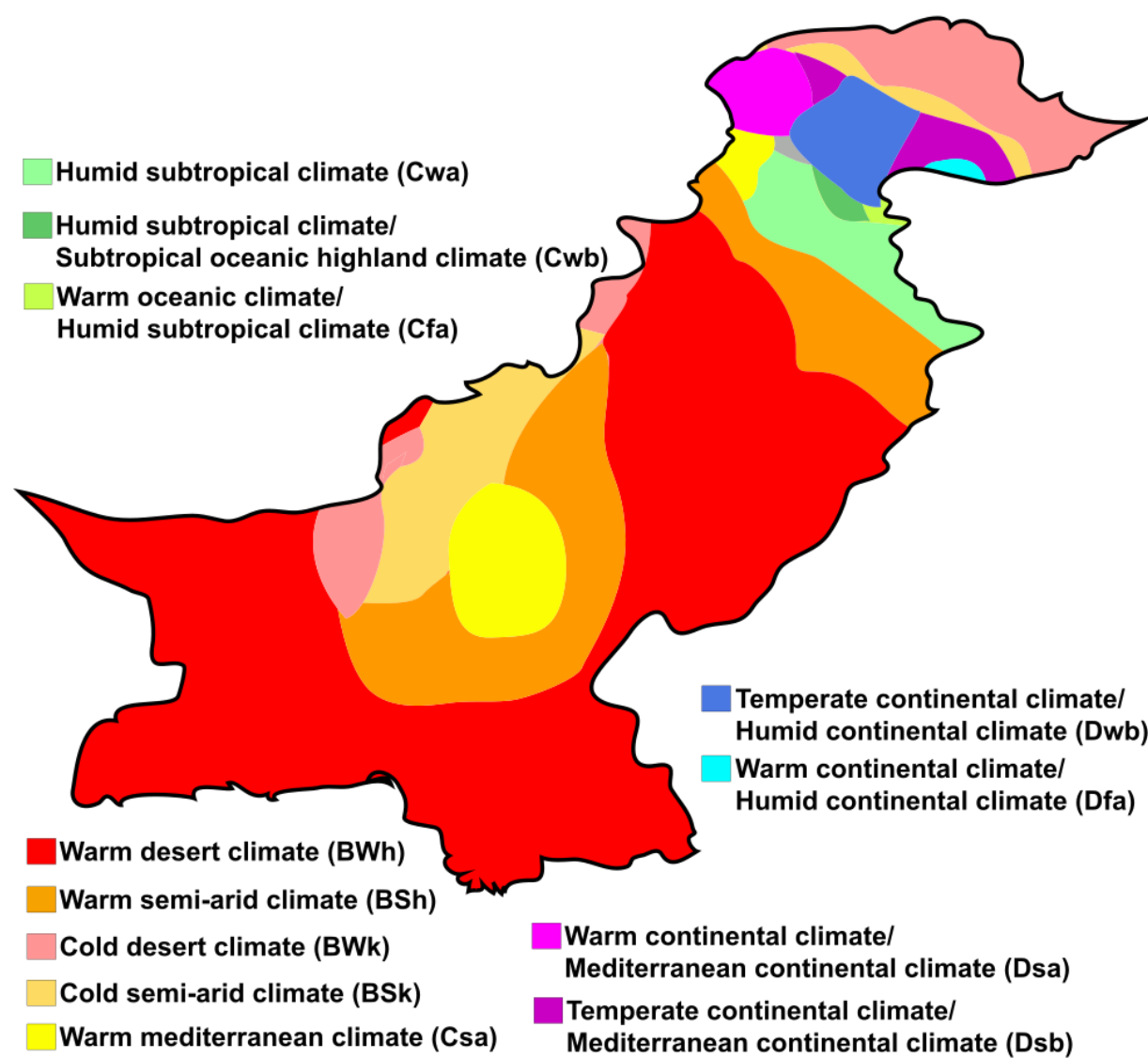
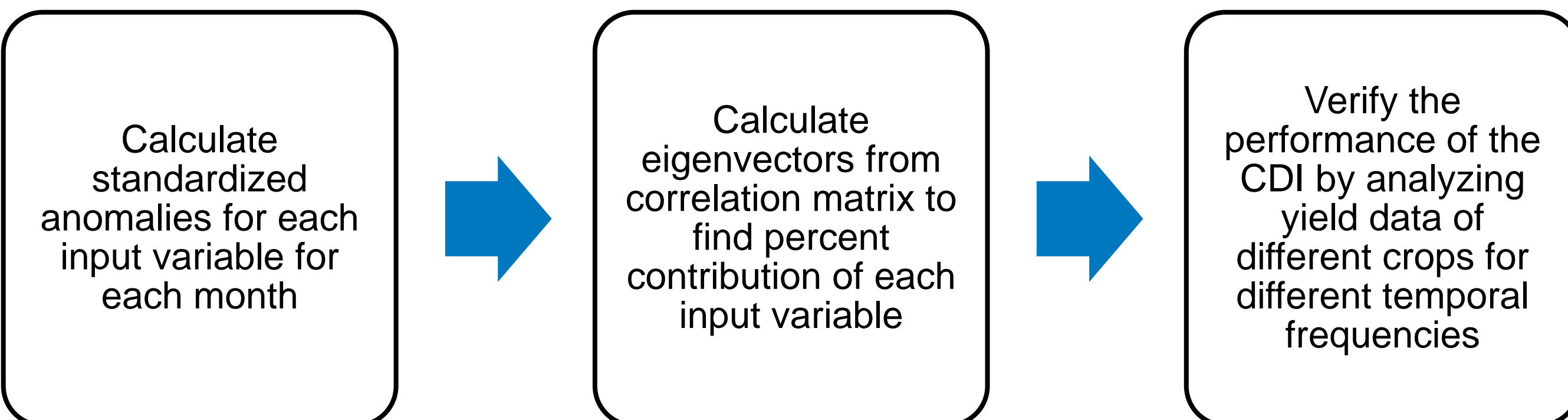


Image 1: Photo under Creative Commons license provided by Peel, M. C., Finlayson, B. L., and McMahon, T. A. and enhanced, modified, and vectorized by Zifan, A.

Pakistan experiences frequent and intense agricultural drought, varying spatially and temporally. Prolonged dry conditions often result in failed crop production. Using multiple variables, different components of drought can be captured across a multitude of climatic zones and throughout different seasons. Developing a composite drought index (CDI), specific for each district, will provide a more complete view of agricultural drought and enhance early warning systems.

## Methods



Inputs used to determine intensity of agricultural drought:

- Standard precipitation index for 1 month (CHIRPS), 3 months (SPI3) and 6 months (SPI6)
- Soil moisture (SLDAS)
- Vapor pressure deficit (VPD)
- Evaporative stress index (ESI)
- Total terrestrial water storage anomalies (GRACE)
- Normalized difference vegetation index (NDVI)

## Results and Conclusions

From preliminary results, the visualized schematic representation of the CDI shows that different districts experienced drought during different years. Next steps include analyzing crop production data and determine if drought was captured with the CDI.

This framework can improve drought monitoring and forecasting systems that will have the ability to enhance mitigation methods.

## Acknowledgements

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NDVI Standard Anomalies for June, 2004

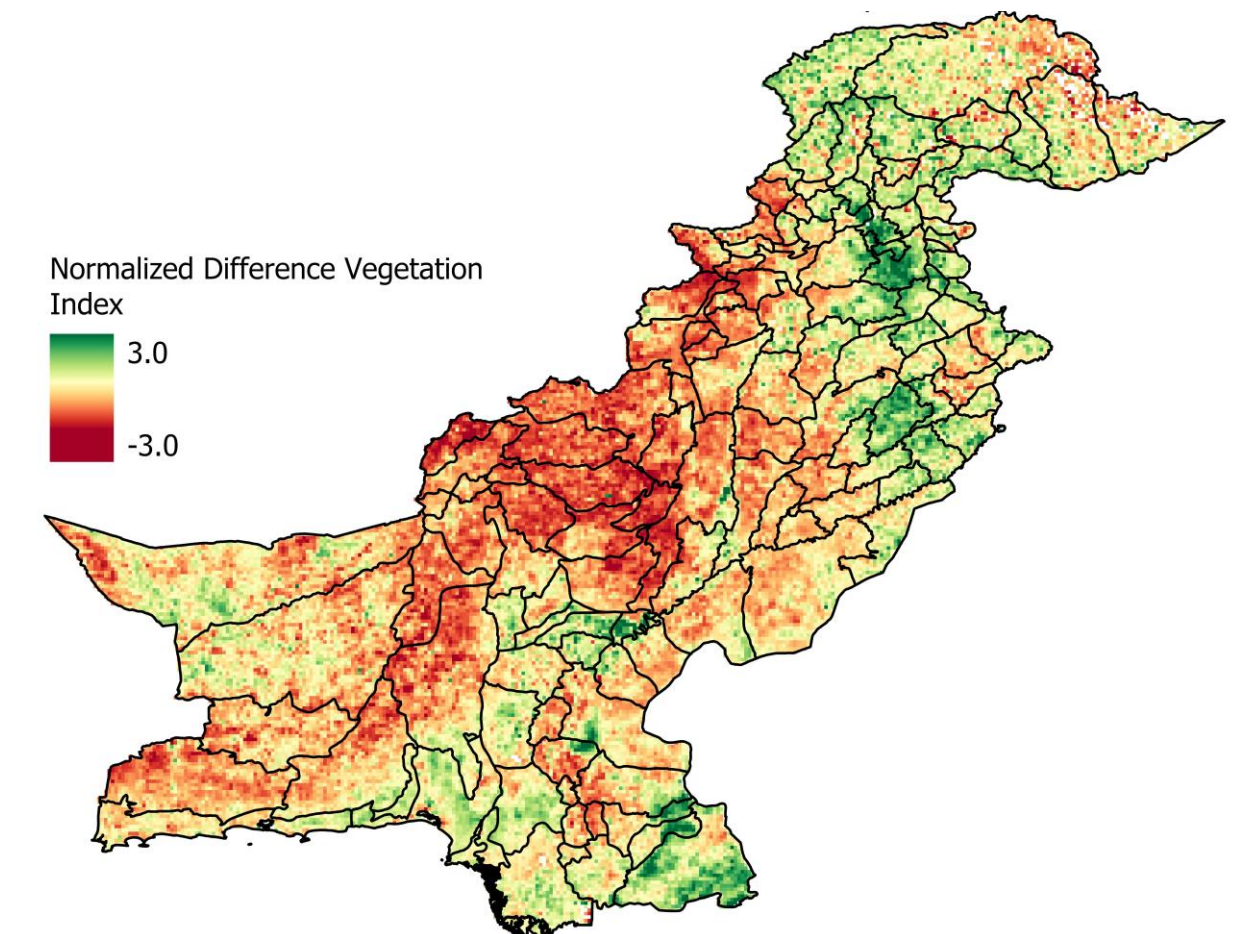


Figure 1: Map representing the standard anomaly of NDVI for June 2004, an input into the CDI.

ESI Standard Anomalies for June, 2004

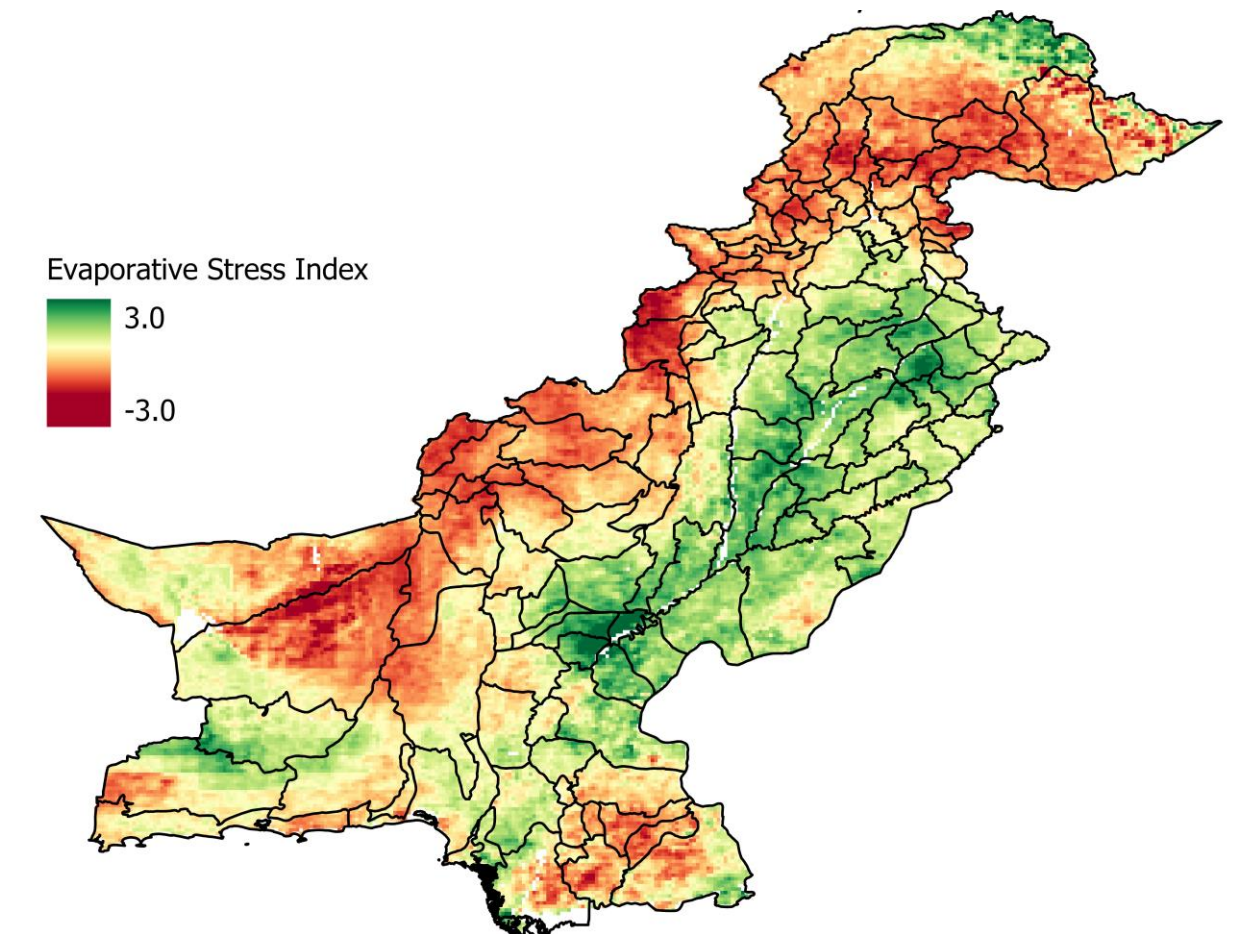


Figure 2: Map representing the standard anomaly of ESI for June 2004, an input into the CDI.

SPI Standard Anomalies for June, 2004

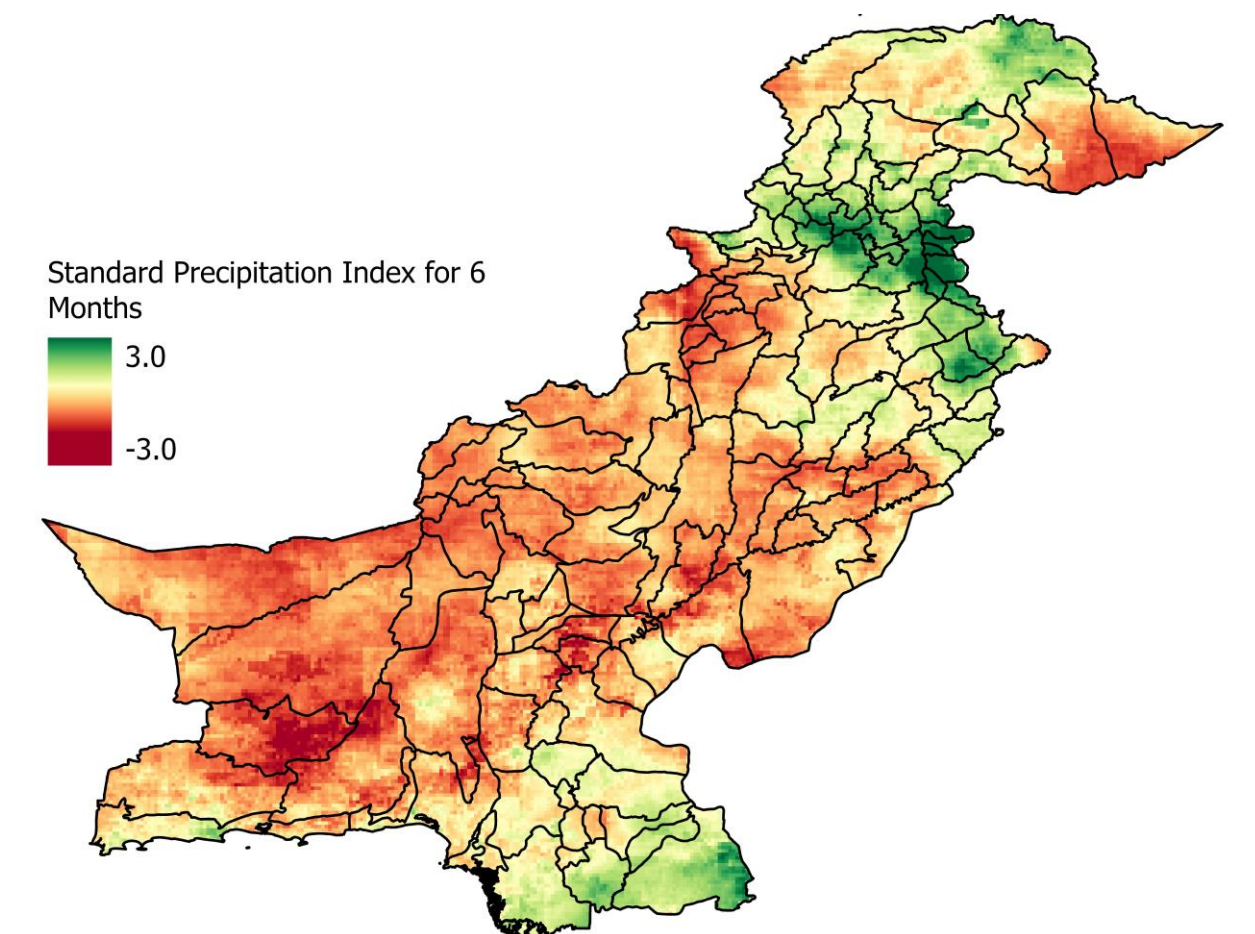


Figure 3: Map representing the standard anomaly of SPI of 6 months for June 2004, an input into the CDI.

Means of the schematic representation of the CDI for 2004

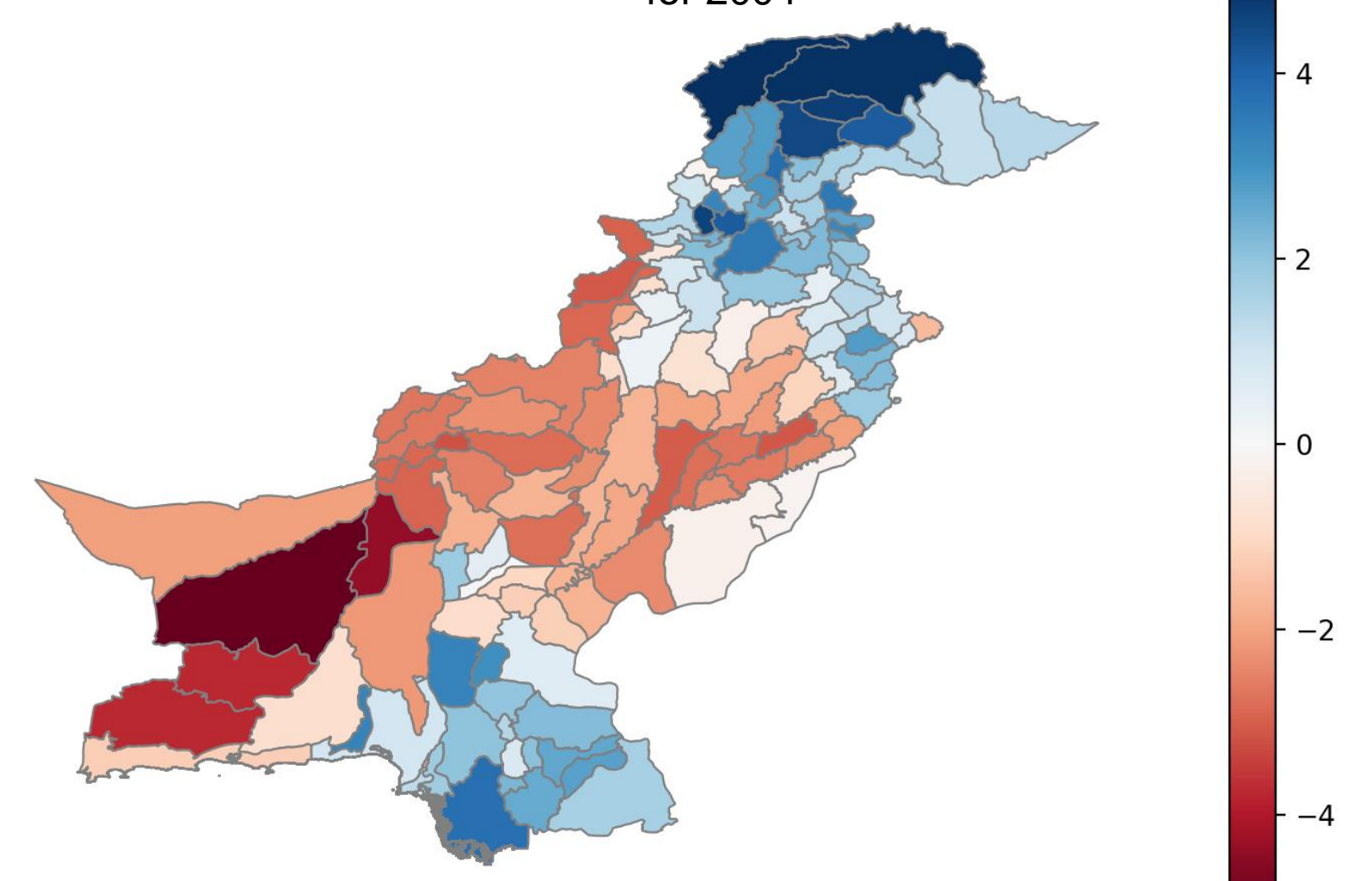


Figure 4: Map of means of the CDI schematic representation in 2004 by district in Pakistan