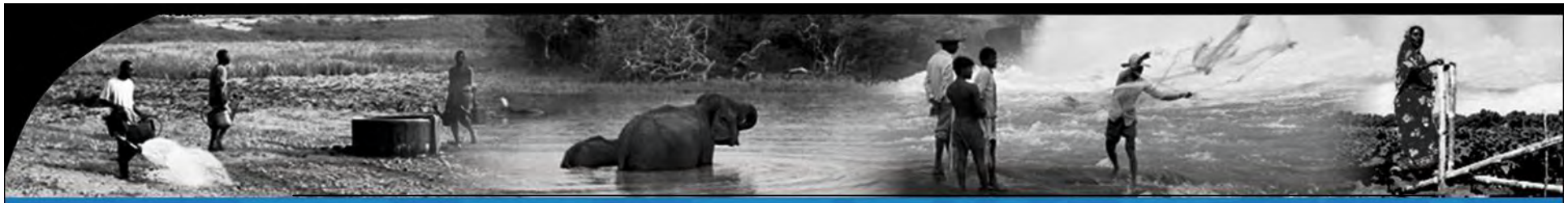

GLOBAL DROUGHT CHARACTERISTICS, PATTERNS, VULNERABILITIES AND IMPACTS

Nishadi Eriyagama, Vladimir Smakhtin and Nilantha Gamage

International Water Management Institute (IWMI), Colombo, Sri Lanka

XEROCHORE Conference on Drought Science and Policy

Brussels, Belgium

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www.iwmi.org

OBJECTIVE AND RATIONALE

To examine the global patterns and impacts of droughts as an individual natural disaster

Why?

- Affect all world regions
- Severe social and economic impacts, especially in developing countries
- Climate change: more frequent, more severe and longer lasting droughts
- Studies that map global patterns, impacts of droughts are limited or non-existent

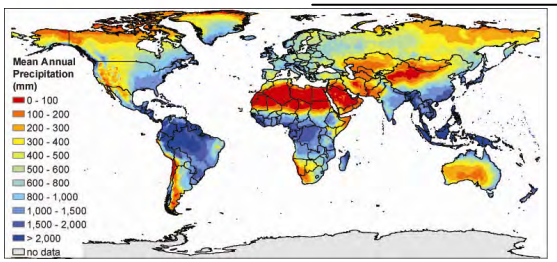
METHODOLOGY

How?

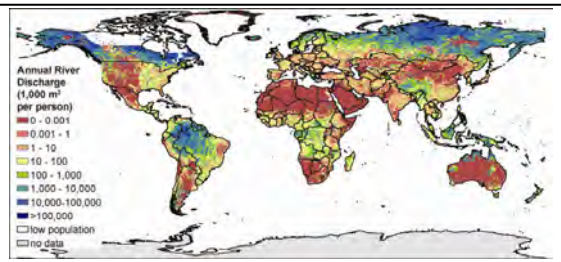
- Mapped 14 drought related characteristics and indices
- Cover various aspects: meteorology, social vulnerability, drought preparedness
- At either country scale or a regular grid scale
- Produced by integrating about 15 publicly available global data sets:
  - AQUASTAT (FAO), ProdSTAT (FAO)
  - Gridded Population of the World (Columbia University)
  - World Register of Dams (International Commission on Large Dams)

International Water Management Institute

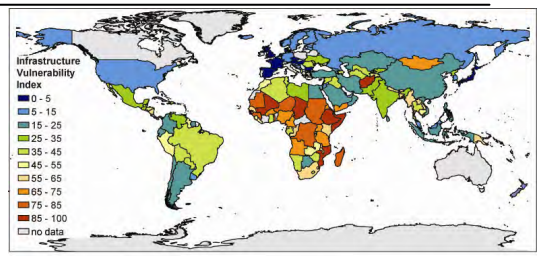
SOME EXAMPLE INDICES



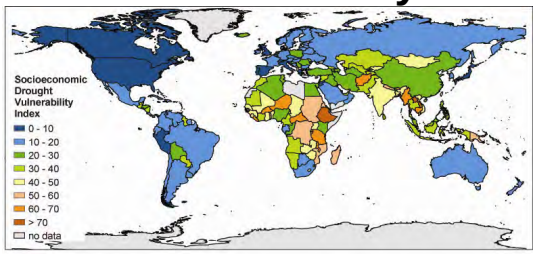
Mean Annual Precipitation and variability



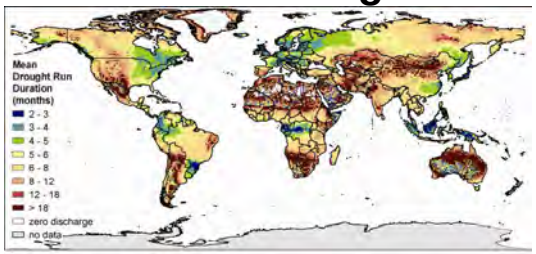
Per Capita Mean Annual River Discharge



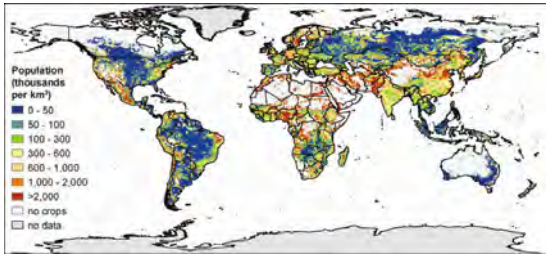
Infrastructure Vulnerability Index



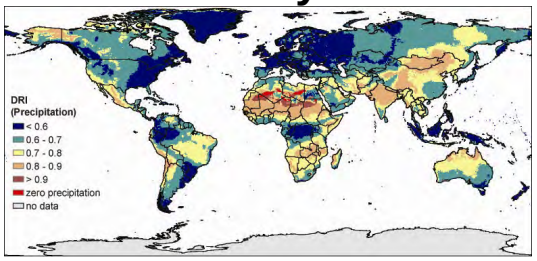
Socioeconomic Drought Vulnerability Index



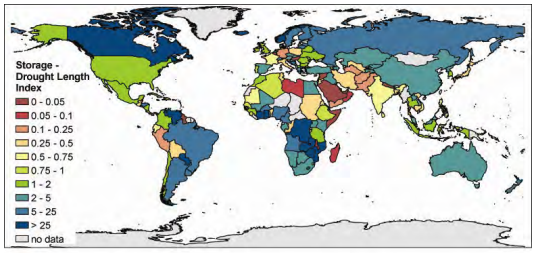
Mean Drought Run Duration



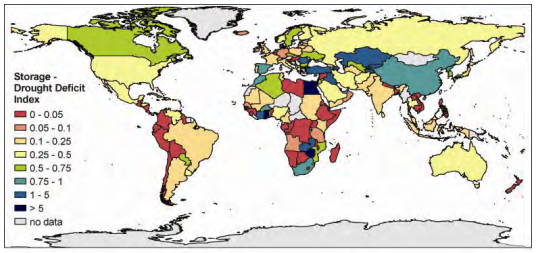
Agricultural Water Crowding



Drought Risk Index



Storage-Drought Duration Index



Storage-Drought Deficit Index

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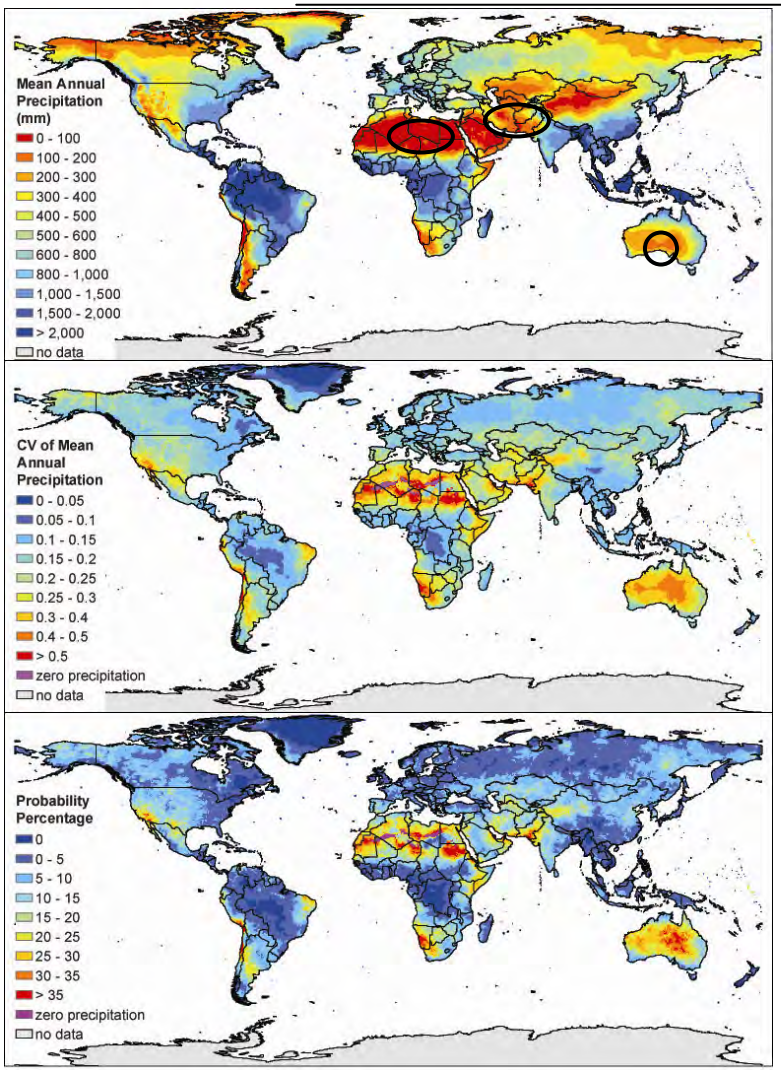
MEAN ANNUAL PRECIPITATION, COEFFICIENT OF VARIABILITY & DROUGHT



Mean Annual Precipitation

Coefficient of Variability (CV) of Mean Annual Precipitation

Probability (%) of annual precipitation in any year being less than 75% of its long term mean

Naturally arid and semi-arid areas have higher CV and higher probability of drought occurrence

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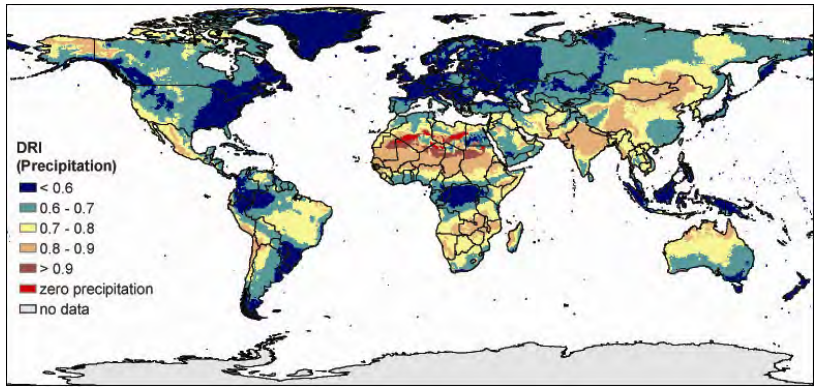
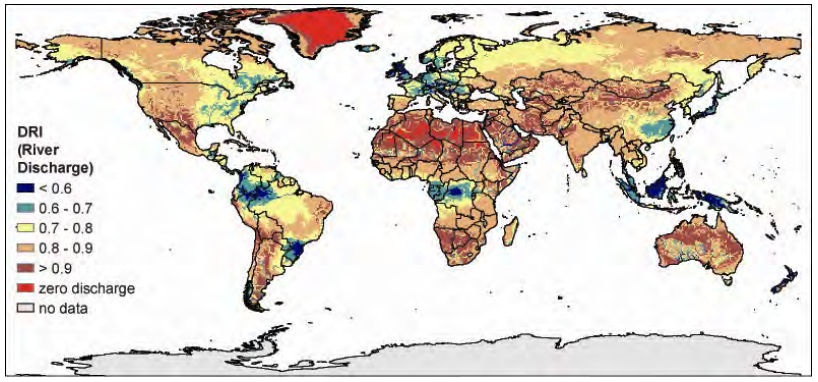
DROUGHT RISK INDEX



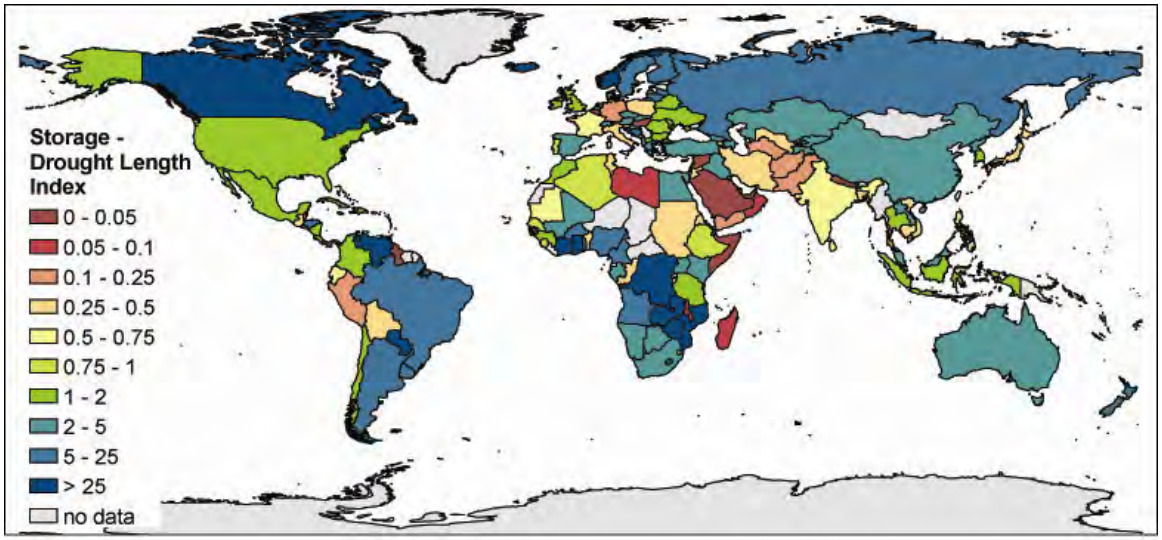


Precipitation Drought Risk Index **River Discharge Drought Risk Index**

Measure of frequency of drought occurrence and drought intensity (after Hashimoto et al. 1982 and Zongxue et al. 1998) Range: 0-1

- **River discharge drought risk higher than precipitation drought risk**
- **Naturally arid and semi arid areas show higher drought risk**
- **Europe: "better-off" Africa: the worst case**

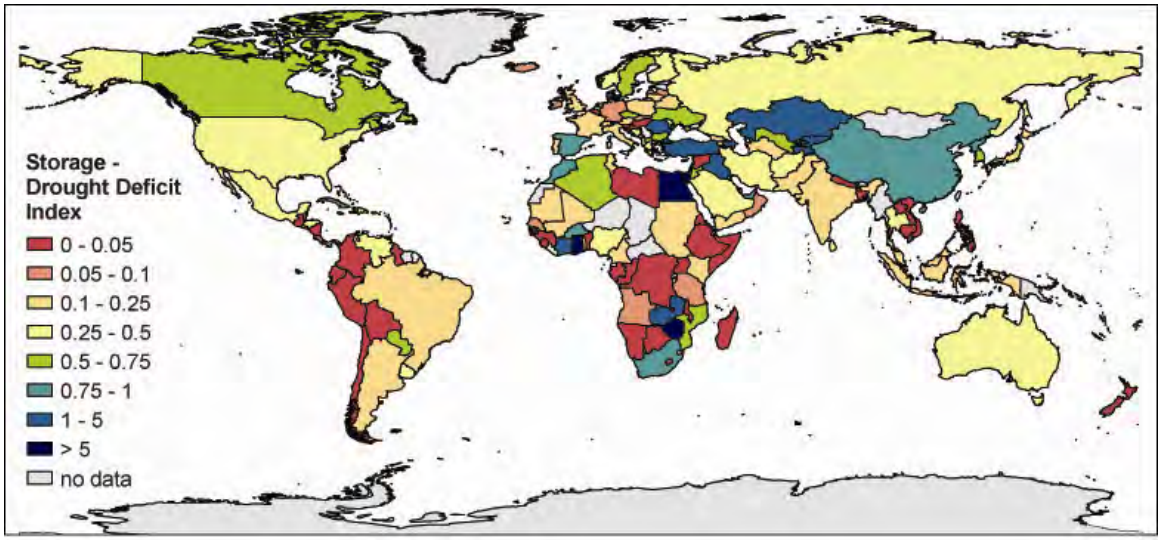
STORAGE DROUGHT DURATION INDEX (SLI)



What proportion of the annual hydrological drought duration can a country's present storage satisfy, based on its monthly water needs

If SLI>=1: Satisfactory Storage (green and blue)

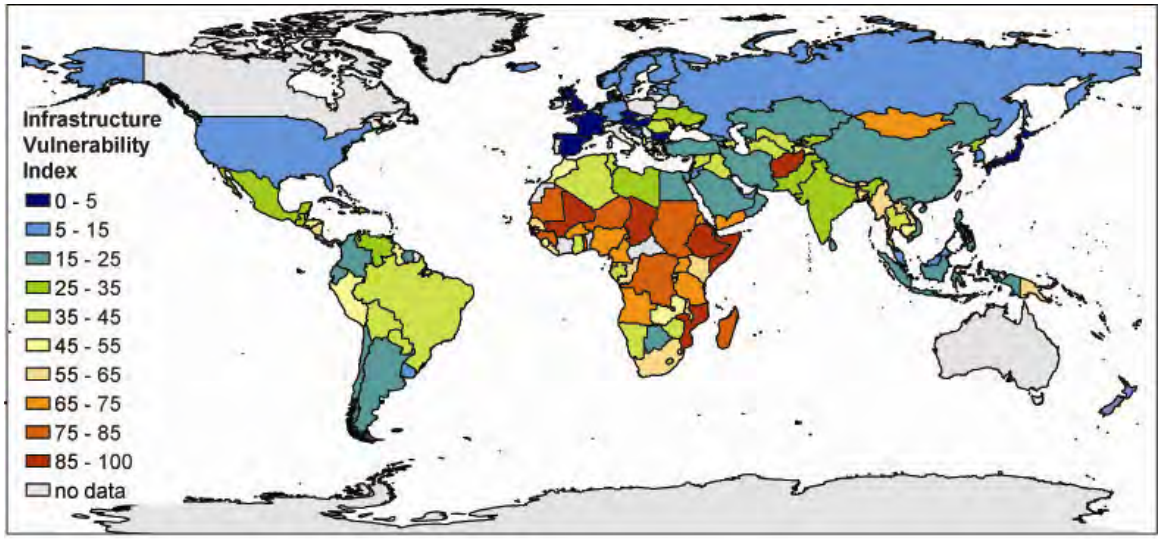
STORAGE DROUGHT DEFICIT INDEX (SDI)



What proportion of the annual hydrological drought deficit can a country's present storage satisfy, based on its monthly water needs

If SDI>=1: Susceptible to river fragmentation, overexploitation of freshwater resources (green and blue)

INFRASTRUCTURE VULNERABILITY INDEX



Infrastructure Vulnerability Index (0-100)

rural accessibility

improved drinking water availability

Measure of Anti-drought coping capacity

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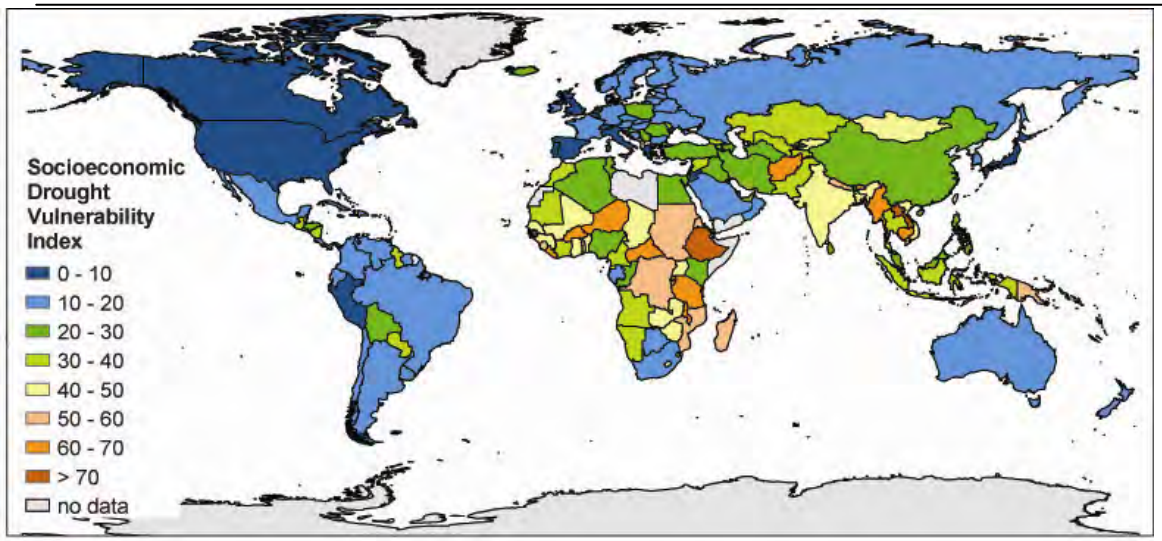
SOCIOECONOMIC DROUGHT VULNERABILITY INDEX



Socioeconomic Drought Vulnerability Index (0-100)

- **Percentage employed in agriculture**
- **Share of agricultural GDP**
- **Crops diversity**

Measure of dependence on agriculture and diversity of crops

SOME KEY MESSAGES (1)

- **Naturally arid and semi-arid areas: higher probability of drought occurrence**
- **Generally river discharge drought risk is higher than precipitation drought risk**
- **Areas more prone to multi-year hydrological droughts: Majority of Africa; South, Southwest, Central Asia; and northern Australia**
- **Out of them, Australia and southern Africa appear to have sufficient storage to satisfy their water needs during drought**
- **South and Central Asia have no apparent hydrological barriers for increasing storage in the future**

SOME KEY MESSAGES(2)

- **In drought years the highest per capita water losses occur in areas which are not normally water scarce due to climate**
- **Potential for rainwater use in agriculture which could be tapped with increased rainwater harvesting**
- **Agricultural economies (Asia and Africa) are much more vulnerable to adverse societal impacts of meteorological droughts**
- **The African continent lags behind the rest of the world on many indicators related to drought preparedness**

CONCLUSIONS AND THE WAY FORWARD

- **It is hoped that this study may:**
  - develop into a Global Drought Indicators 'Atlas'
  - feed into operational drought tools (drought monitoring, drought early warning systems) and national drought preparedness plans
- **Future research should concentrate on:**
  - quantifying and indexing vulnerability to droughts within countries and at local and household levels to identify vulnerable regions or populations
  - the differences between short term and long term droughts (impacts and response options)
  - identifying how some of the mapped indices might change with climate change

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THANK YOU!

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