

# LOCATING CLIMATE INSECURITY

## Where Are the Vulnerable Places in Africa?

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**CLIMATE CHANGE AND AFRICAN POLITICAL STABILITY (CCAPS)**

# Climate Change and AFRICAN Political Stability (CCAPS)

- 5-year, \$7.6m grant from the U.S. Department of Defense
- **UT**
  - Alan Kuperman
  - Kate Weaver
  - Ambassador Greg Engle
  - Dara Francis
- **North Texas**
  - Idean Salehyan
  - Cullen Hendrix
- **Trinity College**
- **William and Mary**
  - Clionadh Raleigh
  - Timmons Roberts
  - Mike Tierney
  - Rob Hicks
- **Southwestern**
  - Michael Mosser

# Objective

- To develop sub-national maps of climate change vulnerability
  - *Not enough to say that Ethiopia is vulnerable to climate change but specific places within Ethiopia are vulnerable for particular reasons*
  - Include physical hazards but also socio-economic and political contributors

# Vulnerability

- **Fragmented definitions**

- IPCC

- “the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity” (AR4)

- UNISDR

- “a propensity or susceptibility to suffer loss and is associated with a range of physical, social, political, economic, cultural and institutional characteristics”

- Risk = hazard x vulnerability



# Other approaches

- Raleigh and Jordan
- Levy et al.
- Brooks, Adger, and Kelly
- Brenkert and Malone

# Other approaches

- **Raleigh and Jordan**

- (1) GDP per capita, (2) pop. growth by 2050 (3) historic disaster frequency
- *Too sparse*

- **Levy et al.**

- Exposure - (1) Future sea-level rise (2) Temp. change (3) Water scarcity
- Politics - (1) Political Violence (2) Dangerous neighborhood (3) Weak capacity
- *No maps or aggregate measures*
- *Missing community vulnerability, historic data*



# Other approaches

- **Brooks, Adger, and Kelly**

- Monte Carlo simulations of disaster mortality
- 11 indicators, (1) education (2) health (3) governance
- *Many highly correlated*
- *No exposure*

- **Brenkert and Malone, PNNL, VRIM**

- Disaster mortality, 17 variables
- (1) Sensitivity (-) -- food security, water resources, settlement/infrastructure, human health, ecosystem
- (2) Adaptive capacity (+) -- environmental capacity, economic capacity, and human and civic resources
- *No governance*
- *Little exposure*
- *Strange proxies*



# Our Approach

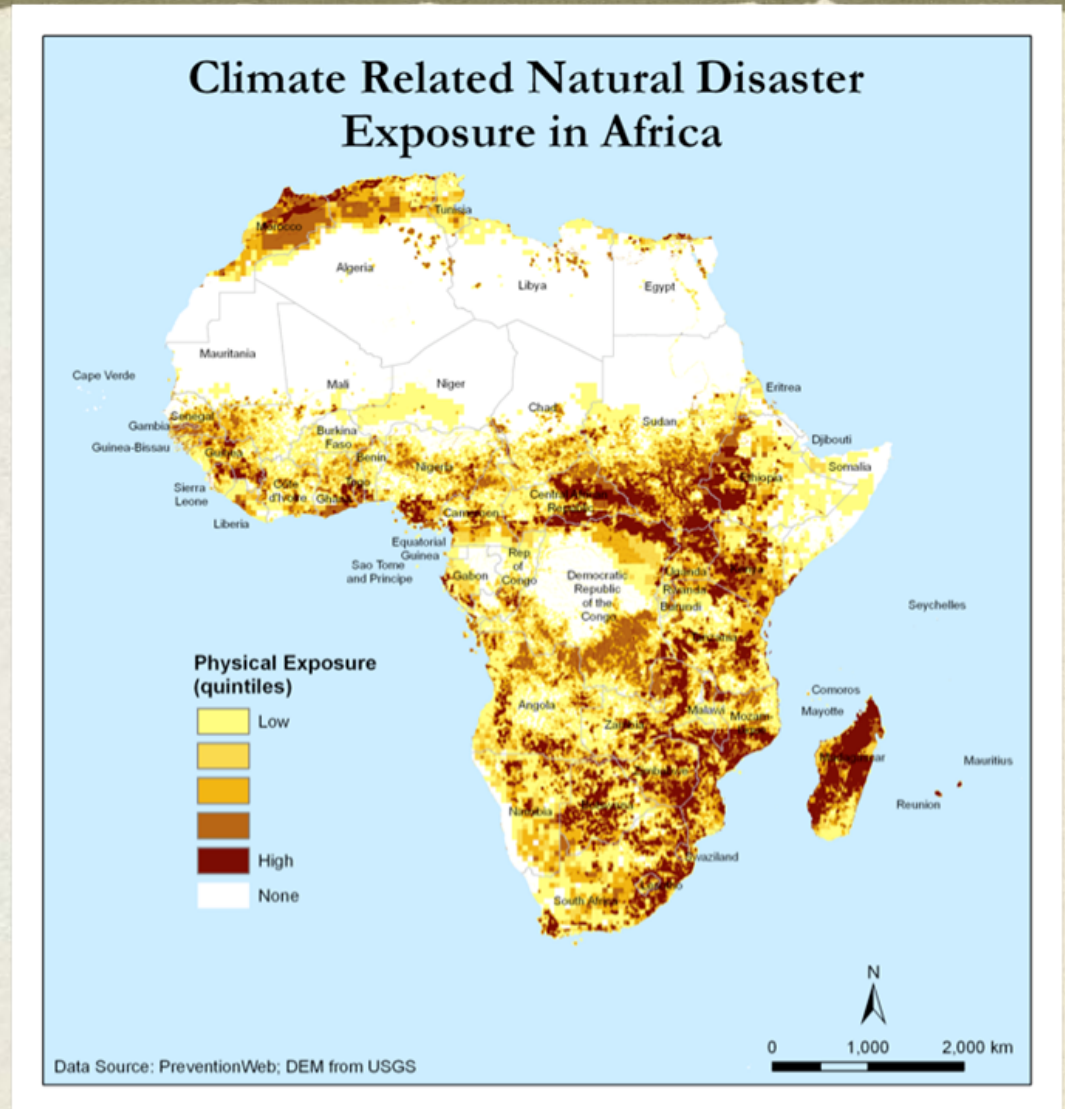
- **Four Baskets or Processes**
  - Physical Exposure (25%)
  - Community/Household Vulnerability (25%)
  - Governance and Political Violence (25%)
  - Population (25%)





# Physical Exposure

- **Disasters**
  - Cyclone surge frequency
  - Cyclone wind frequency
  - Flood frequency
  - Drought frequency
  - Wildfires frequency
- **Future Vulnerability**
  - Low-elevation coastal zones



# Household/Community

- **Education**

- Literacy rate
- School enrollment

- **Health**

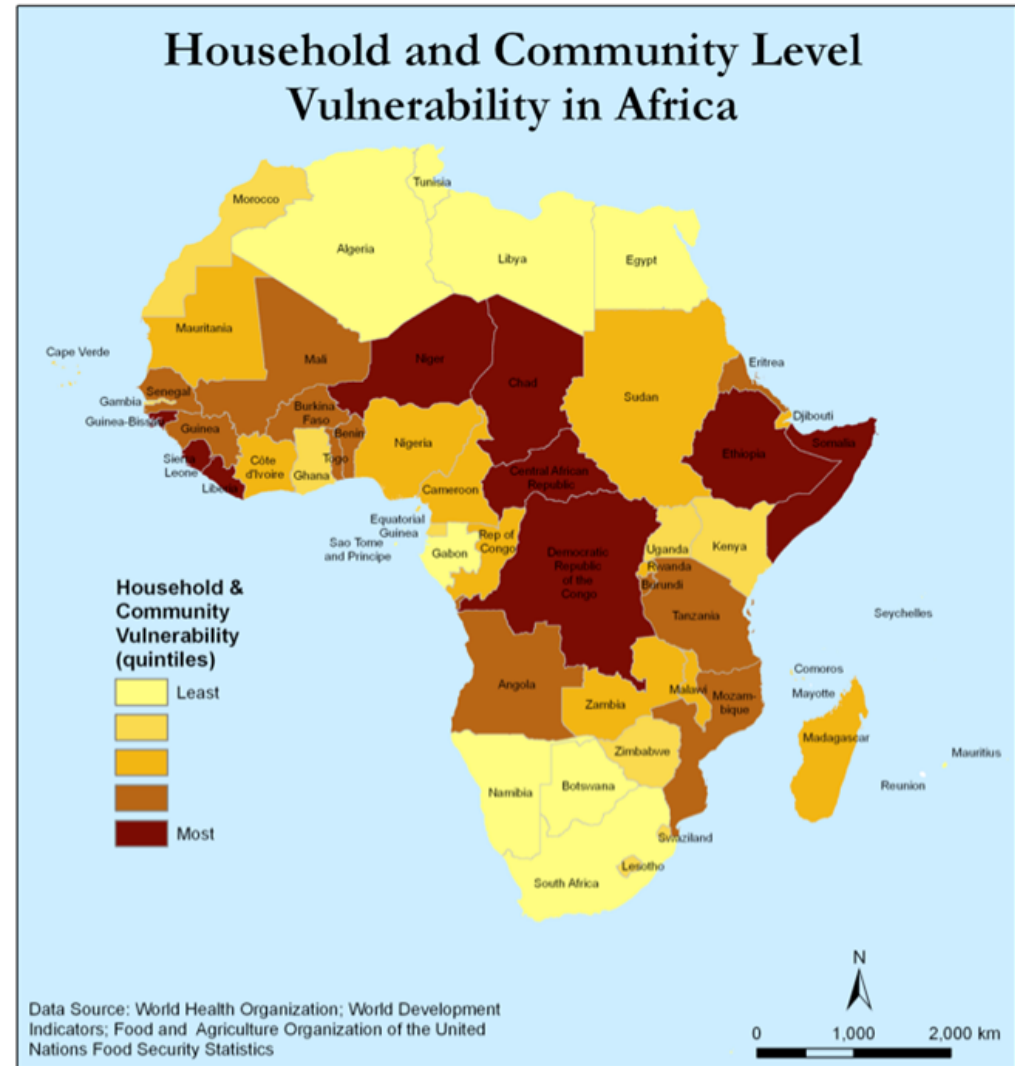
- Maternal mortality
- Life expectancy

- **Daily necessities**

- Dietary energy consumption
- % access to clean water

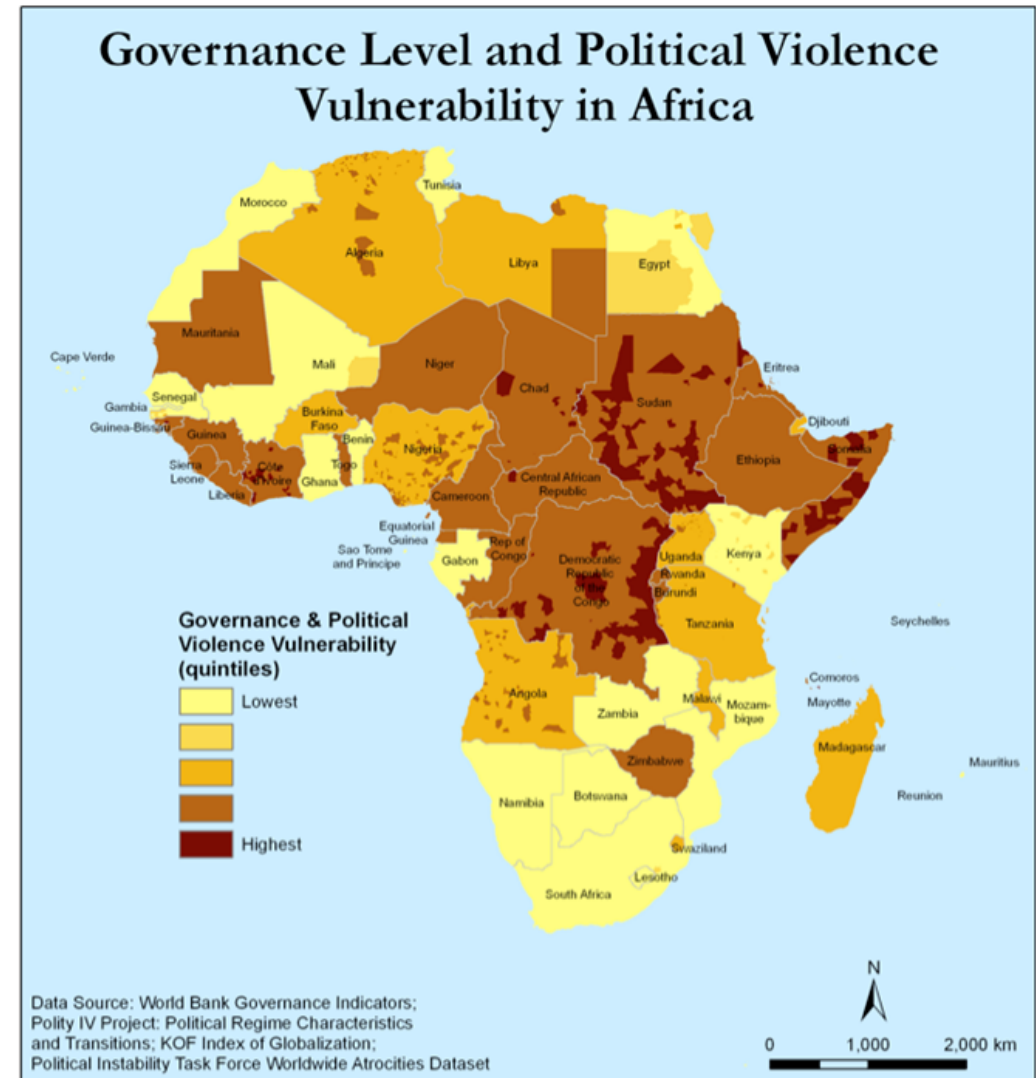
- **Access to health care**

- Per capita spending on health
- Nursing and midwifery density



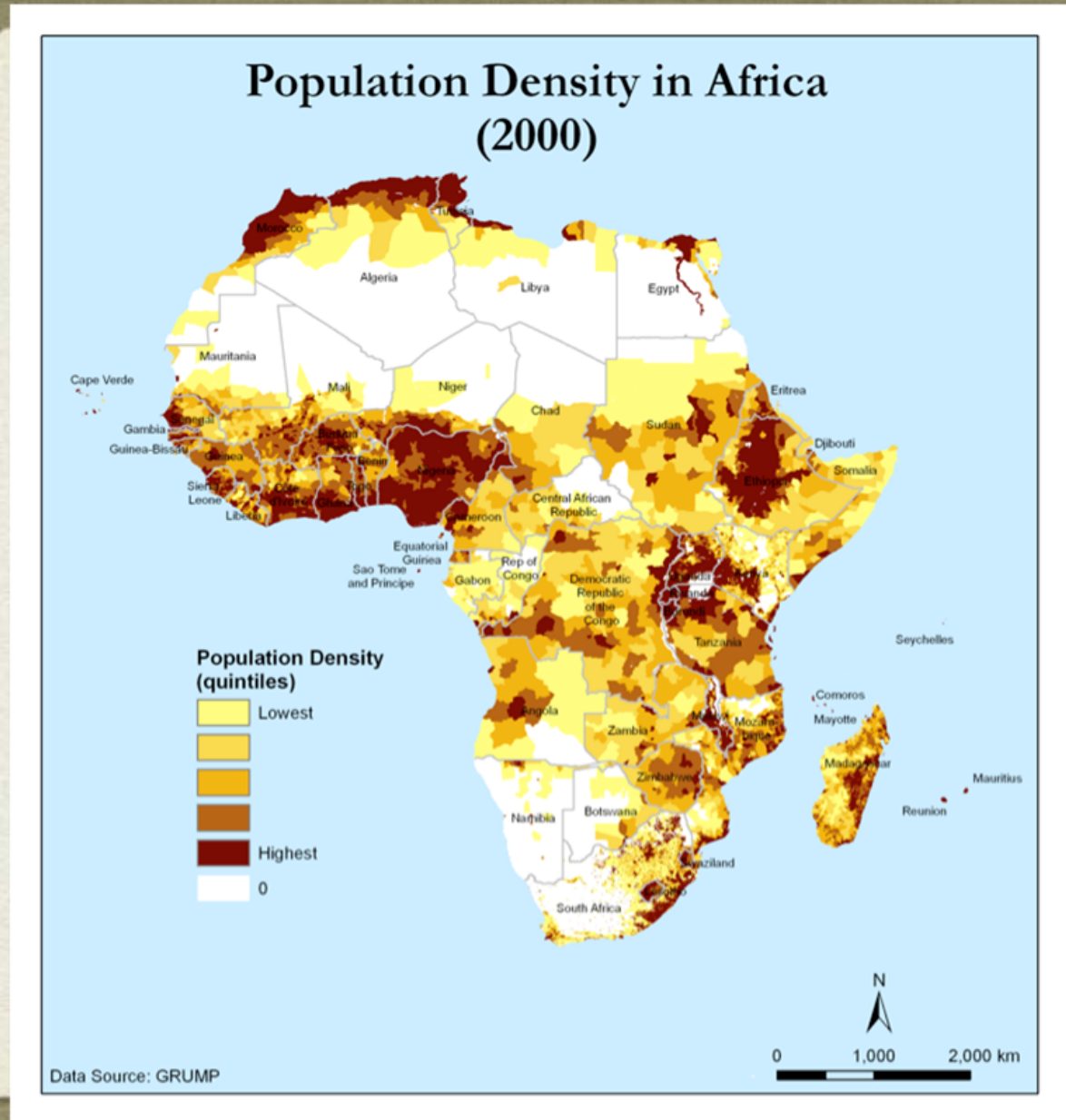
# Governance and Political Violence

- **Governance (80%)**
  - Government Effectiveness
  - Voice and Accountability
  - Global Integration
  - Political Stability
    - Volatility in regime
    - Years since last major change
- **Political Violence (20%)**
  - Atrocities



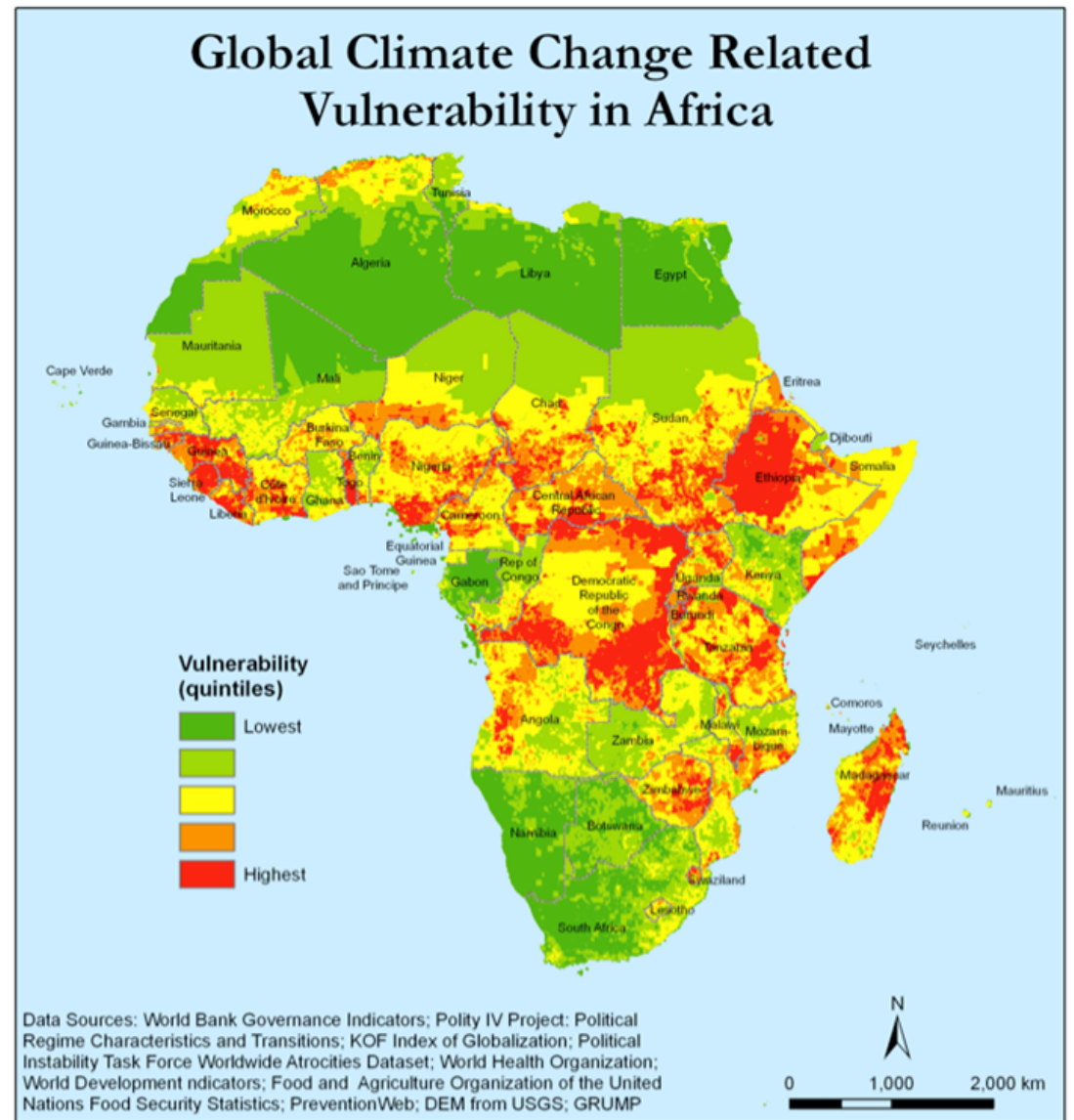
# Population

- Population Density



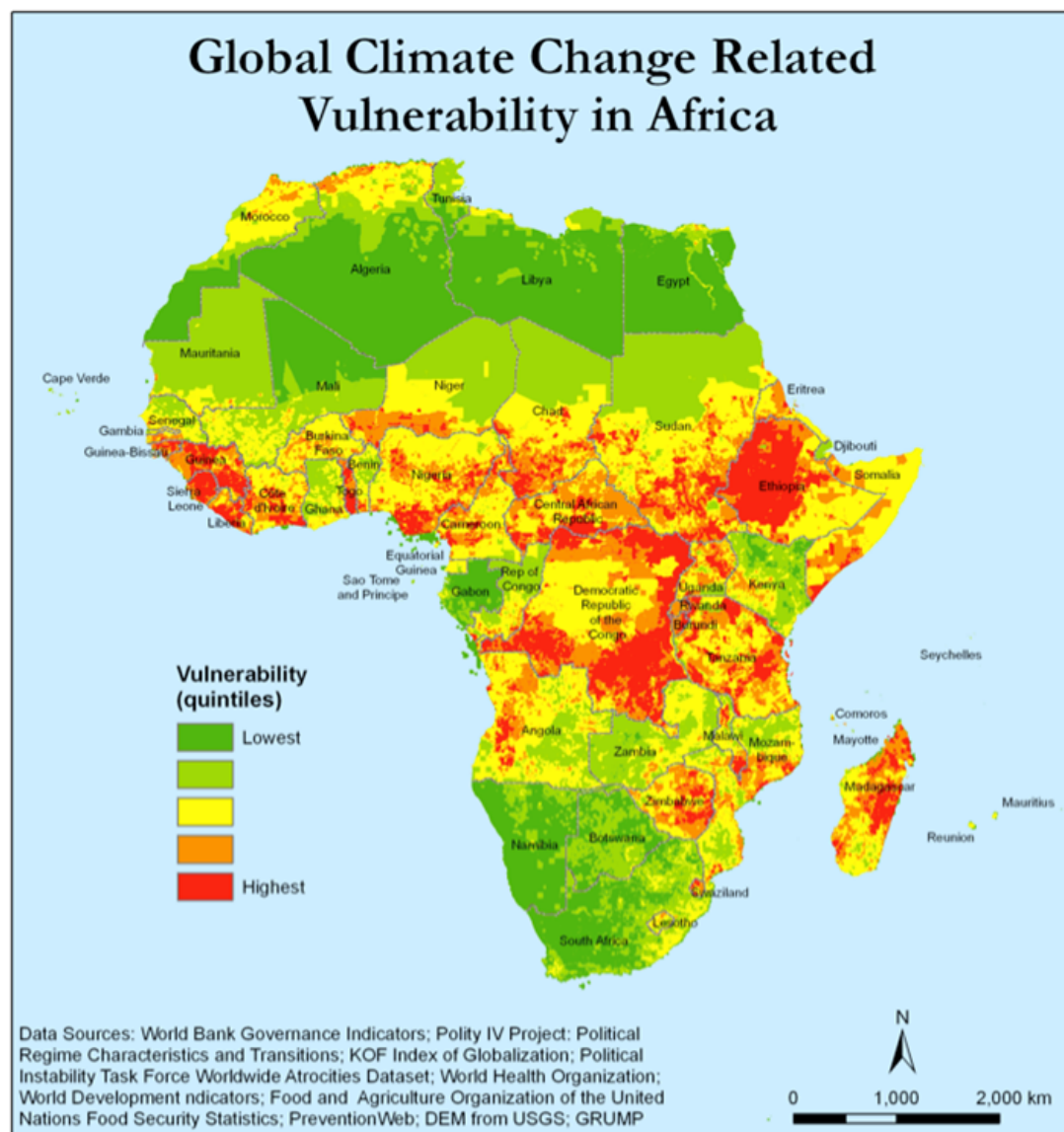
# AGGREGATE MEASURE

- Physical Exposure
- Household/Community Vulnerability
- Governance and Political Violence
- Population Density



# Findings

- **Horn**
  - Western Ethiopia
  - S. Somalia
- **Sahel**
  - S. Sudan
  - CAR
  - Chad
- **Central Africa**
  - N. and S. DRC
  - Rwanda
  - pockets Tanzania
- **Southern Africa**
  - E. Zimbabwe
  - Swaziland
  - Madagascar
- **West Africa**
  - Central and Coastal Nigeria
  - Sierra Leone, Liberia, Guinea, Cote d'Ivoire



# Extensions

- **Additional Indicators**

- Geo-referenced data for household/community vulnerability and governance
- Projections of future climate change vulnerability
- Infrastructure data on roads and airports
- Projections of future population density
- Agriculture and commodity dependence
- Ethnic political marginalization
- Civil wars
- Strategic significance to the United States

- **Sensitivity Analysis**

- Change weights, change break-points
- Identify country-level sources of influence

- **Statistical Analysis**

- Disaster Mortality and Economic Losses

- **Case Studies and Fieldwork**

