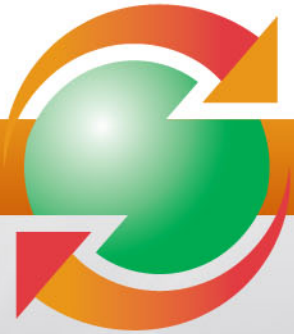
Joint **Global Change** Research Institute



Representing Resilience: The effect of access to family planning on resilience to climate change

Elizabeth L. Malone

Joint Global Change Research Institute

Pacific Northwest National Laboratory

18 March 2013

Pacific Northwest
NATIONAL LABORATORY

UNIVERSITY OF MARYLAND

Family Planning and Climate Resilience

- Problem statement
- Method (focus on 7 countries, data, models)
- Results (differences in resilience in two scenarios)
- Conclusions
- Caveats and potential improvements

Research question

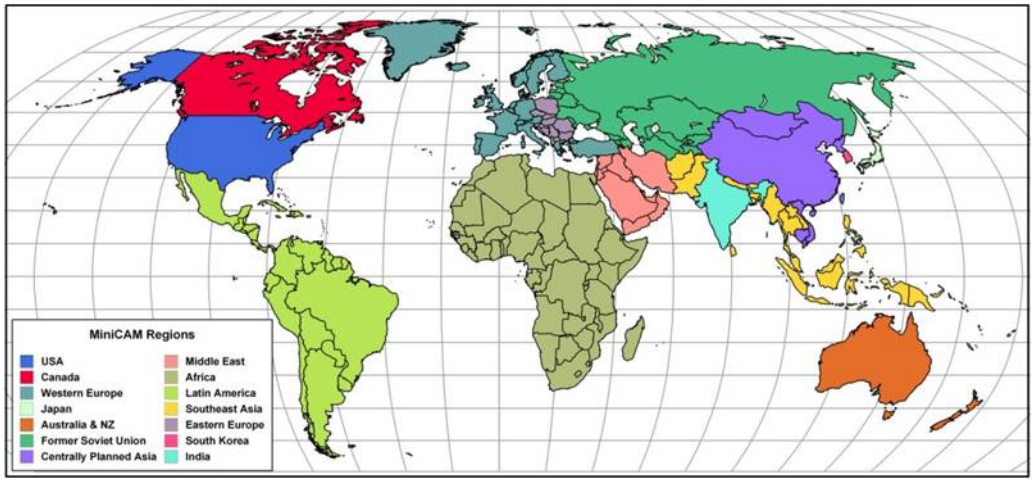
Does universal access to family planning services also improve people's resilience to climate change?

Method

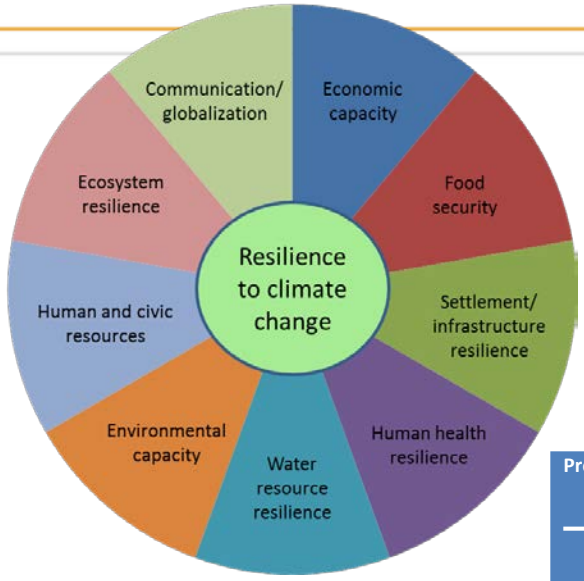
- 7 countries: Bangladesh, Nepal, Haiti, Ethiopia, Kenya, Malawi, and Uganda
- Population data from United Nations and Moreland et al.
- Global Change Assessment Model (GCAM), integrated assessment model, for projections of economic growth
- Vulnerability-Resilience Indicators Model (VRIM) to examine resilience under different population scenarios

GCAM inputs

Results from linking an energy-economy model and an agriculture-land use model with an earth system model of intermediate complexity, returning information on future energy and agricultural production, economics, and land use. Results were downscaled from the regions in which the seven countries are.



VRIM, modified for the study



Proxies in VRIM-PAI Model

- Economic capacity: 1) GDP per capita; 2) poverty headcount ratio at national poverty line; 3) agricultural raw materials exports/imports ratio
- Food security: 1) cereal yield; 2) food and livestock production indices; 3) malnutrition prevalence by weight and height for age, children under 5; 3) depth of hunger
- Settlement/infrastructure resilience: 1) % population in coastal zones; 2) % population with access to improved water source and improved sanitation facilities; 3) electric power consumption
- Human health resilience: 1) total fertility rate and adolescent fertility rate; 2) infant mortality rate; 3) maternal mortality ratio; 4) life expectancy at birth
- Water resource resilience: 1) renewable internal freshwater resources; 2) % agricultural irrigated land; 3) average precipitation
- Environmental capacity: 1) population density; 2) % agricultural land area; 3) population in the largest city, % of urban population
- Human and civic resources: 1) total dependency ratio; 2) adult literacy and % women in secondary education; 3) % of seats held by women in national parliaments
- Ecosystem resilience: 1) % terrestrial protected areas and GEF benefits index for biodiversity; 2) international tourism expenditures, % of total imports; 3) PM10 country level
- Communication/globalization: 1) paved roads, % of total roads; 2) telephone lines & mobile cellular subscriptions; 3) internet users

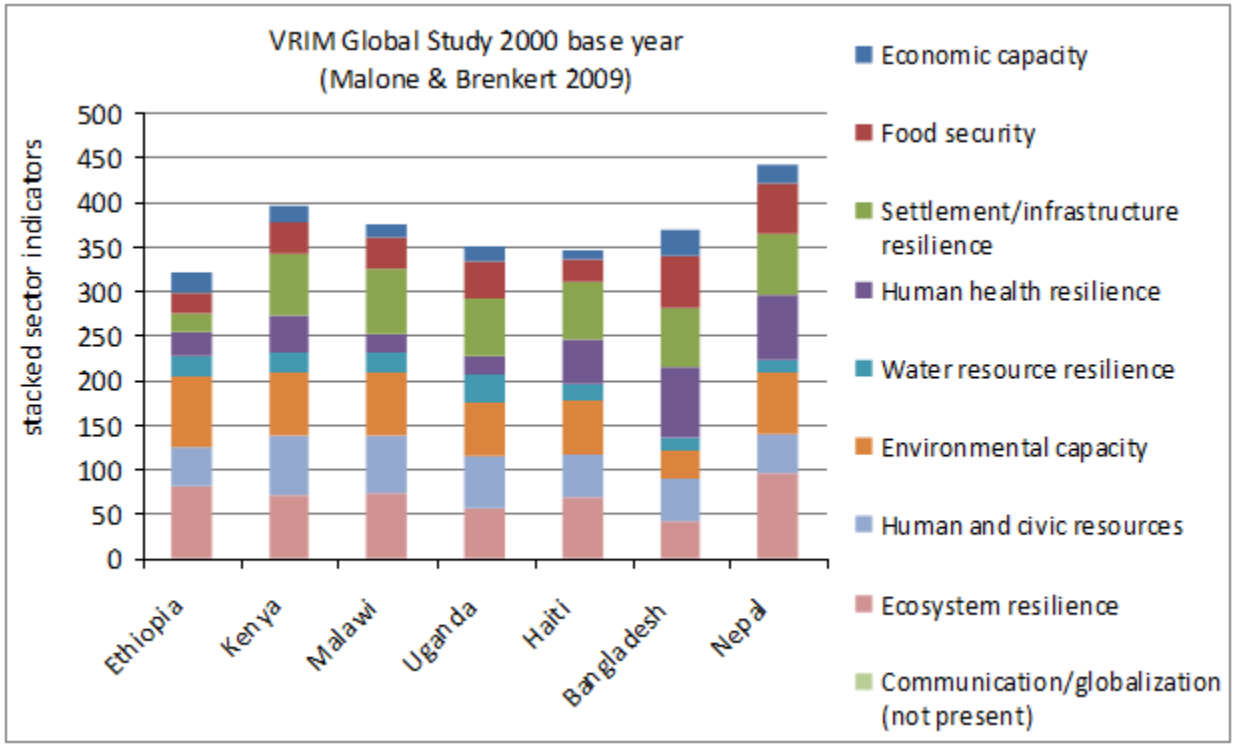
Results

- **Resilience to climate change was higher in all seven countries under the UAFP scenario in 2050.** The differences between scenarios were modest, ranging from 2% to 10%, with Uganda and Haiti experiencing the most improvement under the UAFP scenario.
- **In the areas of human health and human & civic resources, most of the countries were projected to increase resilience to climate change by more than 30%.**
- **Food security projections varied widely by both scenario and country.** In Haiti, Kenya, Malawi and Uganda, food security worsened under the medium scenario but experienced positive increases under the UAFP scenario. Ethiopia experienced a slight increase in the medium scenario but did more than three times as well in the UAFP scenario. Bangladesh and Nepal showed substantial gains under the medium scenario, with only a slight additional gain for Bangladesh and a much more substantial gain for Nepal under the UAFP scenario.
- **In all countries, environmental capacity worsened under both scenarios (but not as badly under the UAFP scenario).**

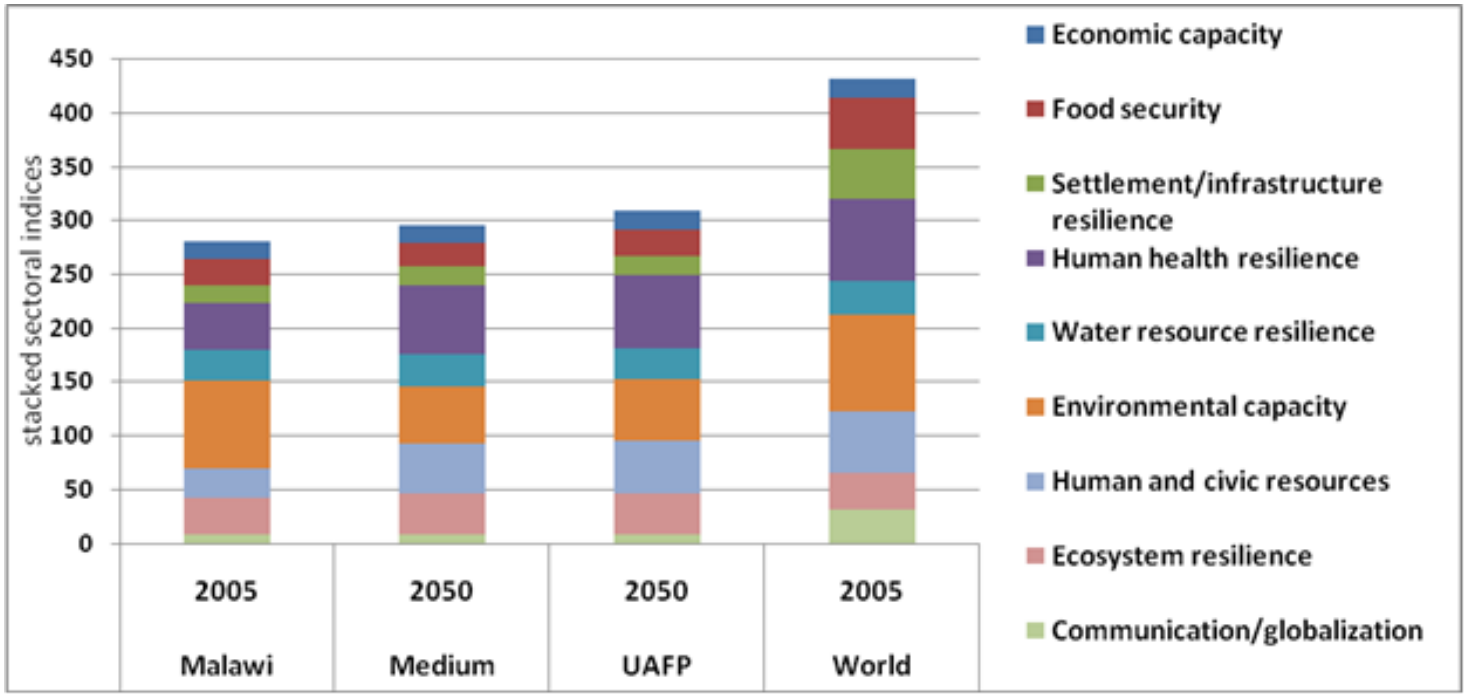
Caveats: results likely understate

- Universal access to family planning services is achieved over time (not suddenly at the beginning) in the UAFP scenario; therefore, the full effect of universal access is not in place by 2050.
- Life expectancy is unchanged across scenario projections (as assumed in the referenced demographic projections used).
- GCAM's connection between population projections and labor productivity was the same in all scenarios (a weakness in the model), so the relationship between UAFP and economic well-being was not adequately represented.
- The VRIM does not account for interactions among resilience factors, although interactions would doubtless occur, likely to the benefit of the UAFP scenario.

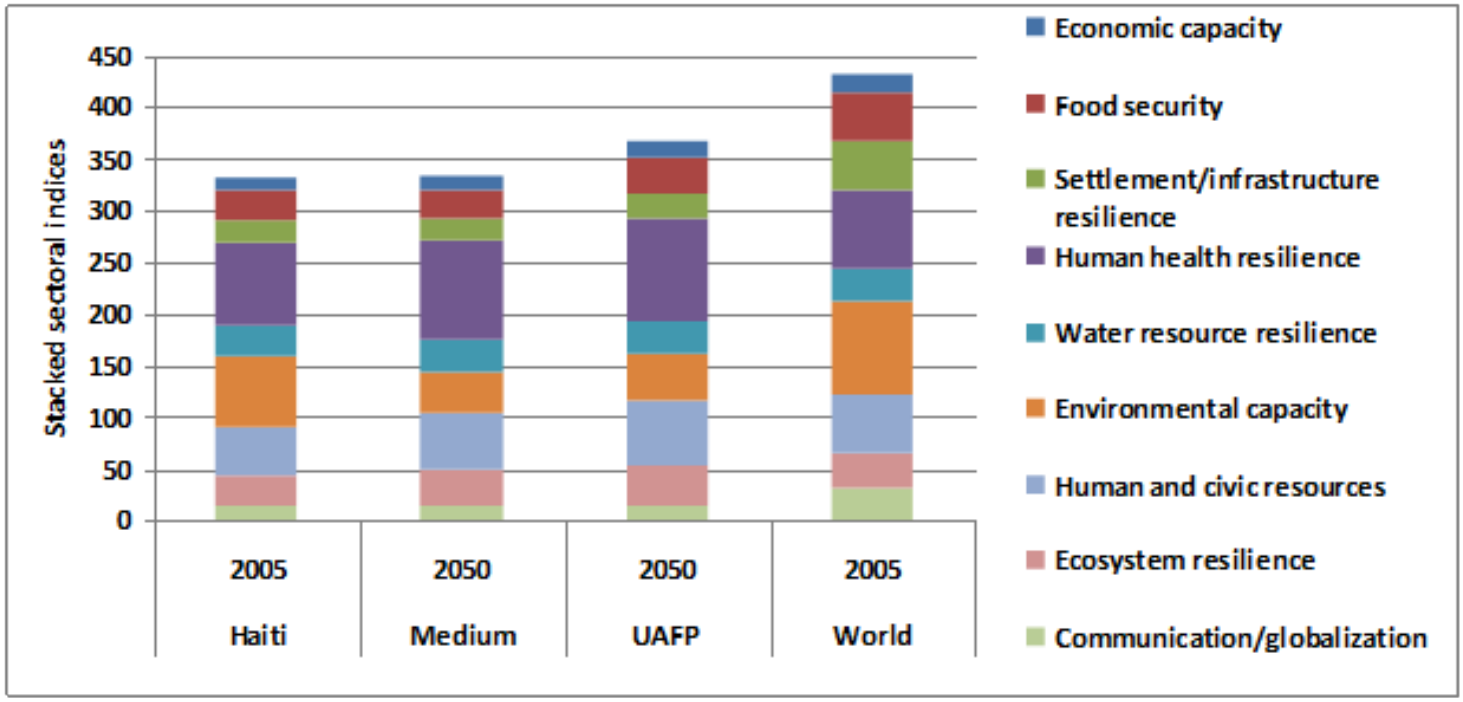
VRIM analysis of 7 countries' resilience



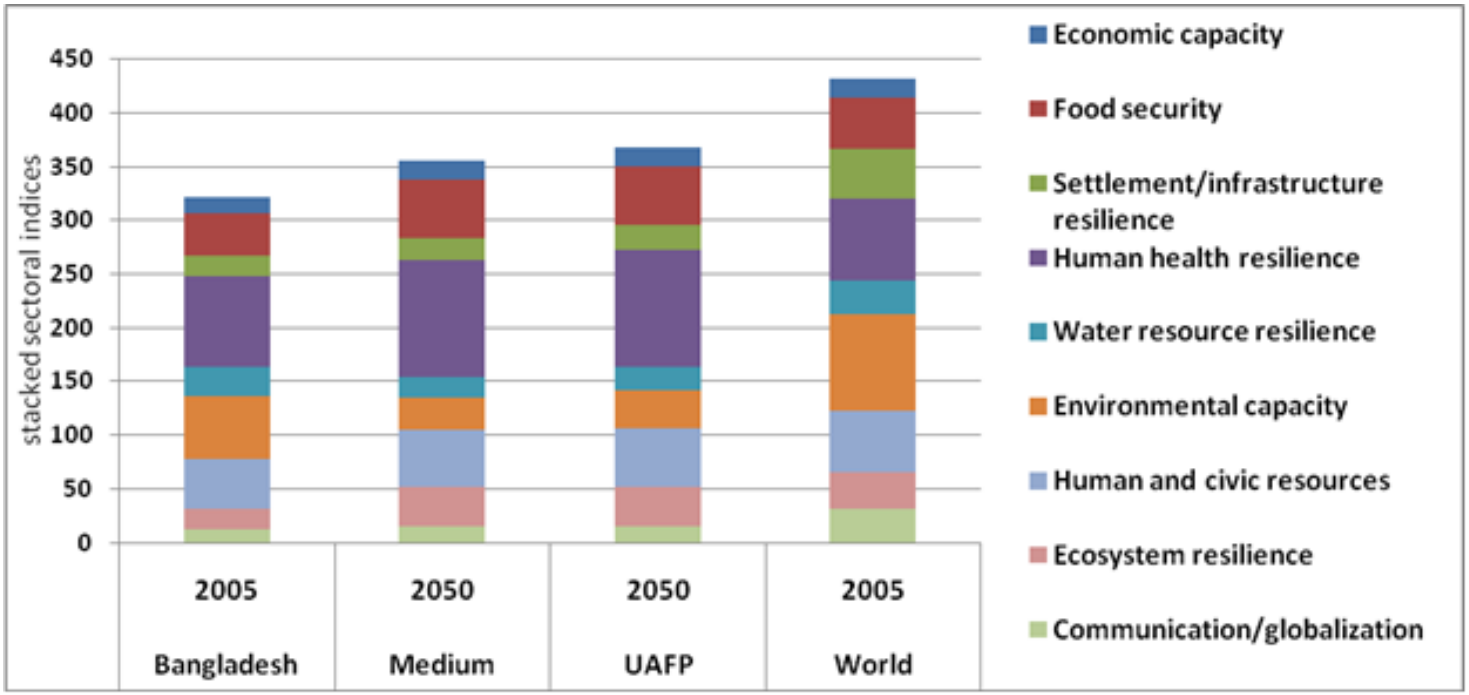
Two-model analysis of Malawi



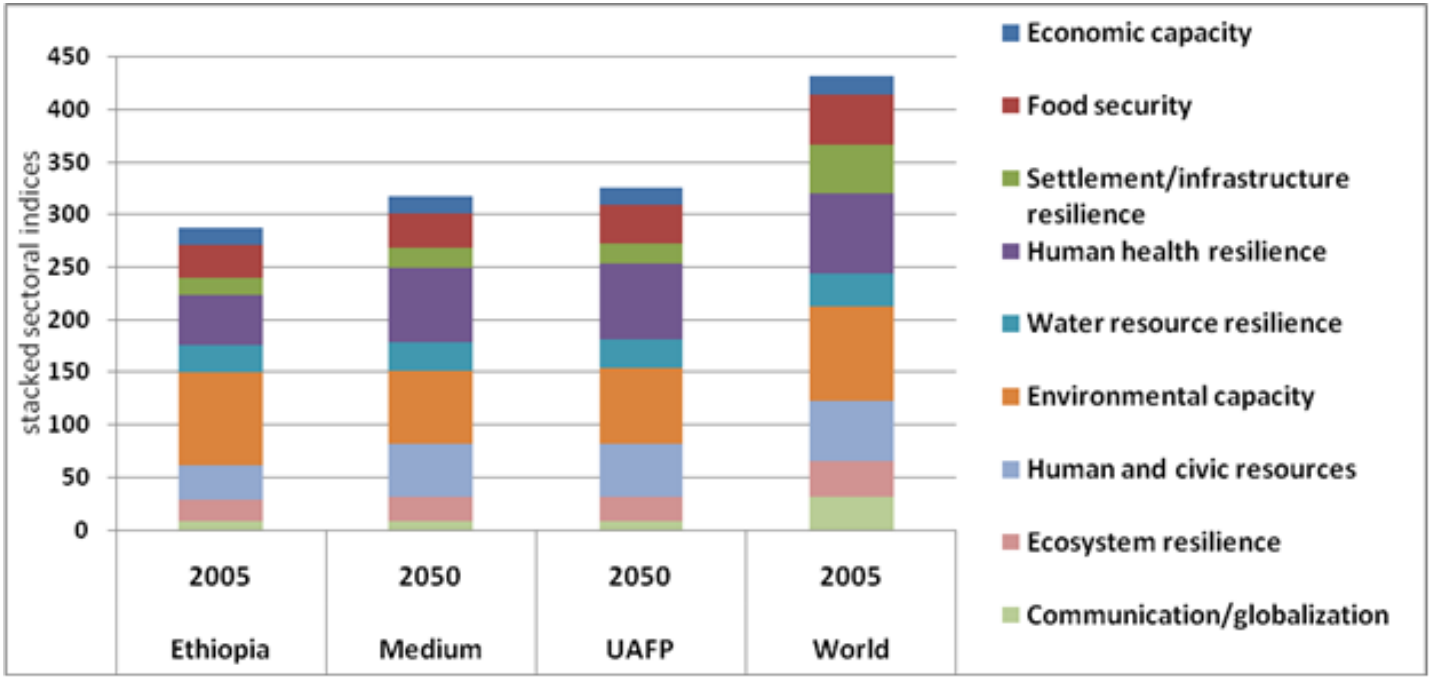
Two-model analysis of Haiti



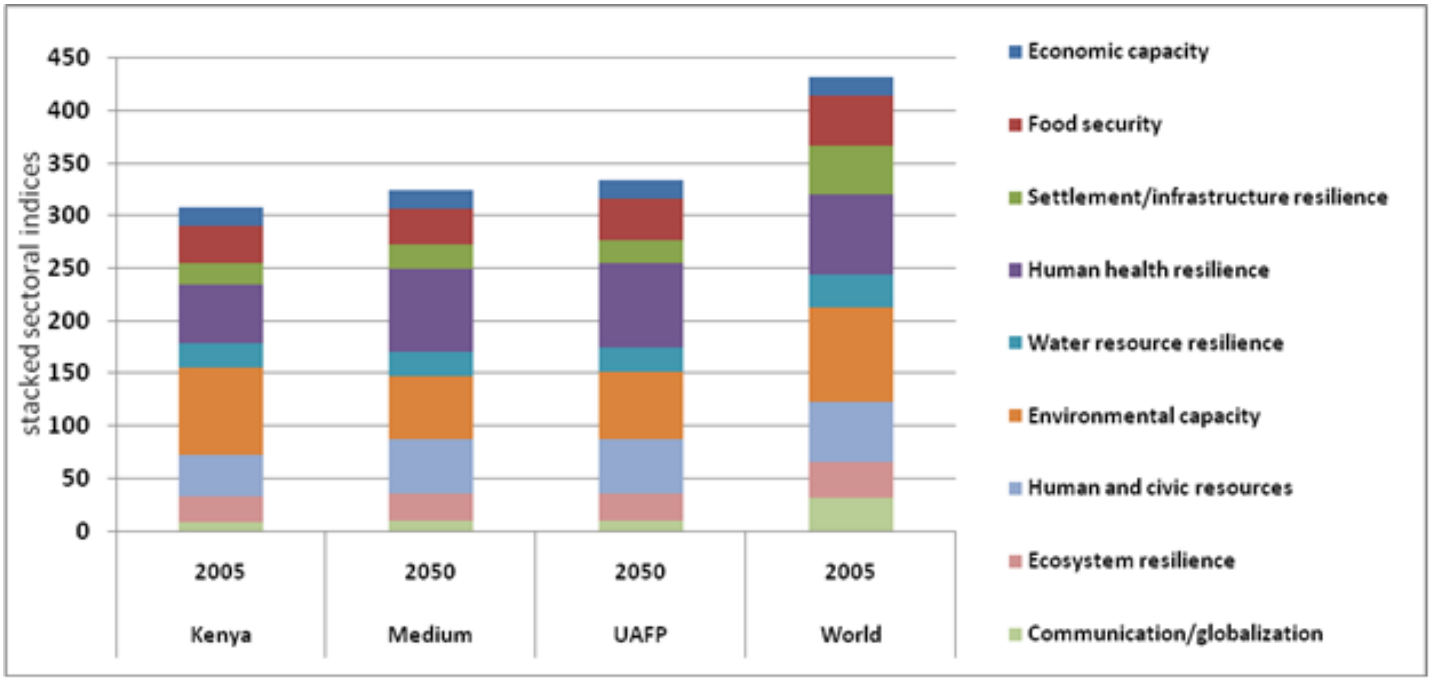
Two-model analysis of Bangladesh



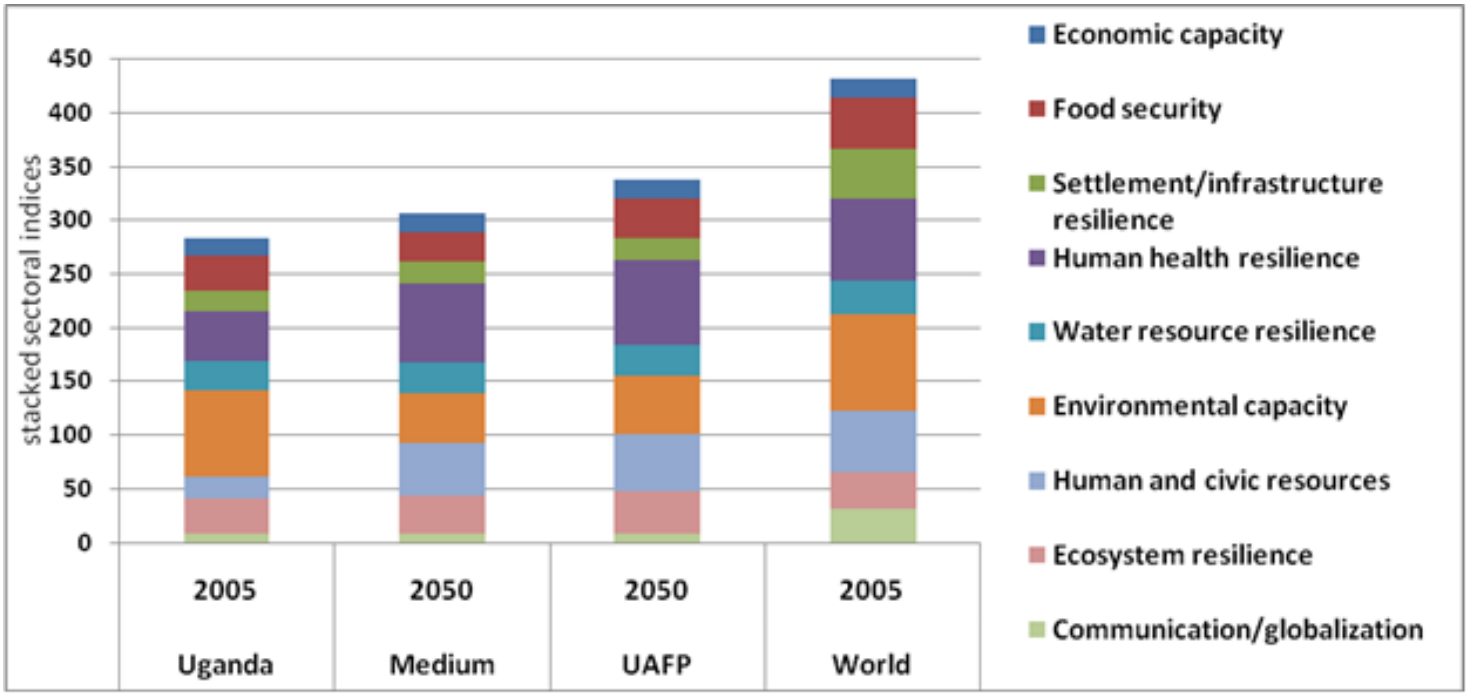
Two-model analysis of Ethiopia



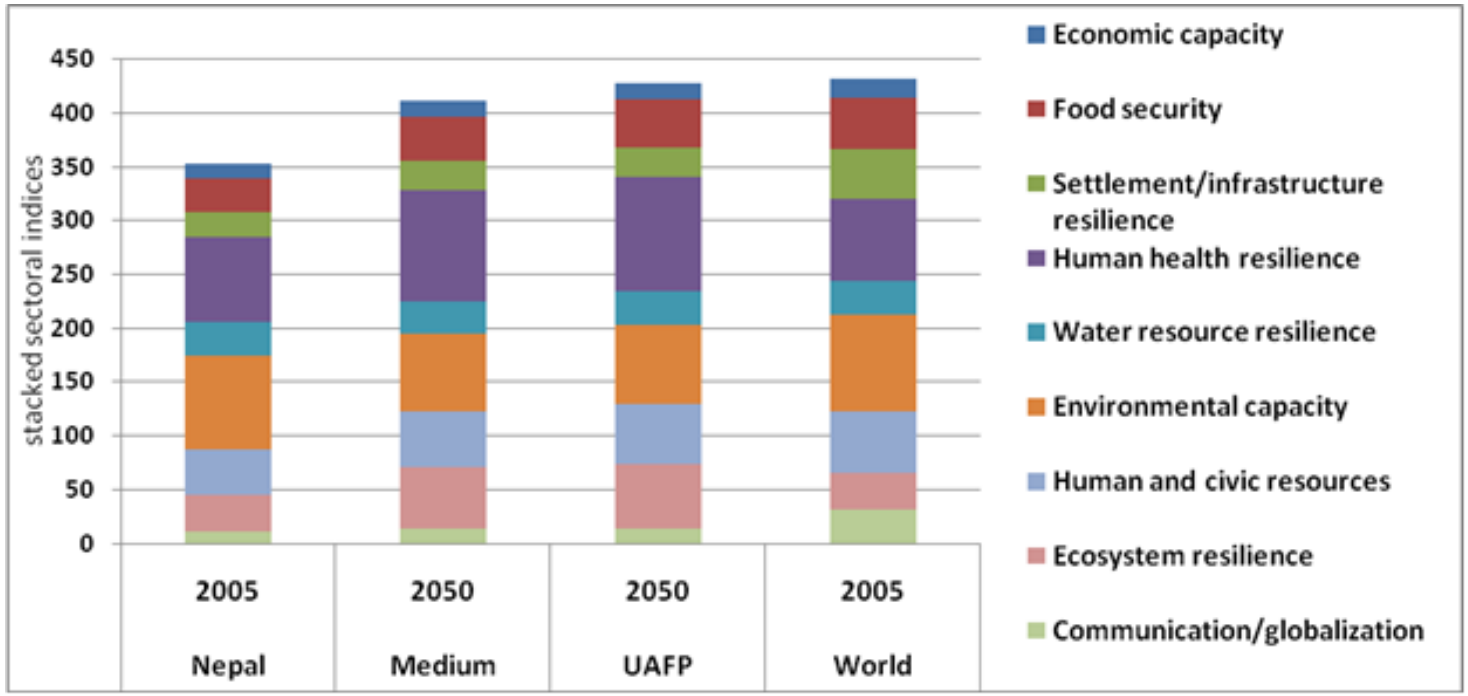
Two-model analysis of Kenya



Two-model analysis of Uganda



Two-model analysis of Nepal



Discussion

- Questions
- Comments
- Follow-up contact: e.malone@pnnl.gov