

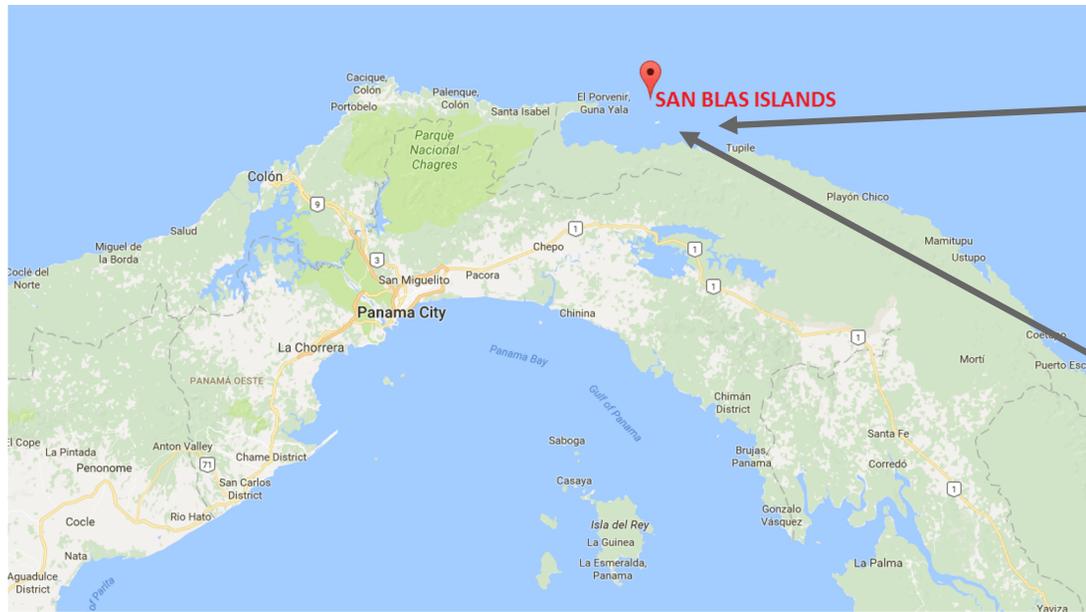
Exploring Climate Change Adaptation Pathways for the Guna Yala in San Blas, Panama

Environmental Economics and Policy Honors Thesis
Rausser College of Natural Resources

Supervised by Professor Sofia Villas-Boas

Ariana Jessa

Background



Literature Review of Modeling Approaches

Instrumental Variable Approach

- Utilizing agricultural yield to estimate climate migration
- Empirically robust
- Requires a high level of detailed data

Gravity Model

- Models mobility as dependent on population capacity and distance
- Does not offer reliable enough projections for planning
- Requires only population data

Radiation Model

- Couples mobility modeling and inundation due to SLR
- Does not offer reliable enough projections for planning
- Requires only population data

Methodology

Sea Level Rise Modeling

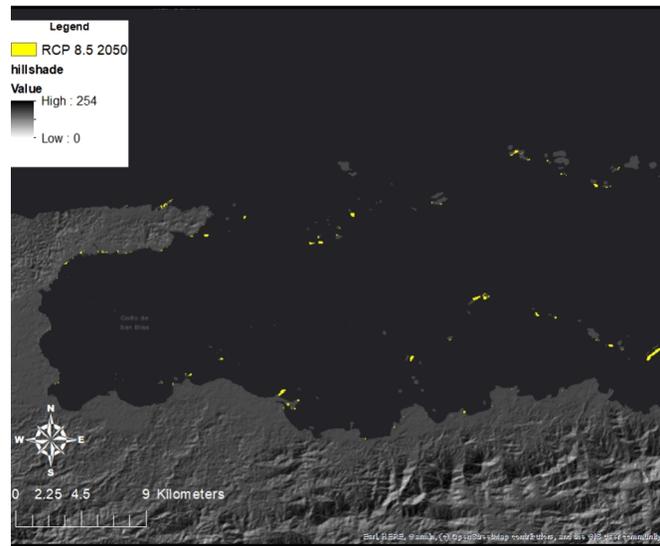
- **RCP 2.6**
 - 0.98 ft by 2050
 - 1.55 ft by 2100
 - 3.19 ft by 2300
- **RCP 8.5**
 - 0.98 ft by 2050
 - 4.41 ft by 2100
 - 11.9 ft by 2300
- **Storm Surge**
 - Average of 15 ft above GMSL
 - Expected to become annual events by 2100

Suitability Analysis for Relocation

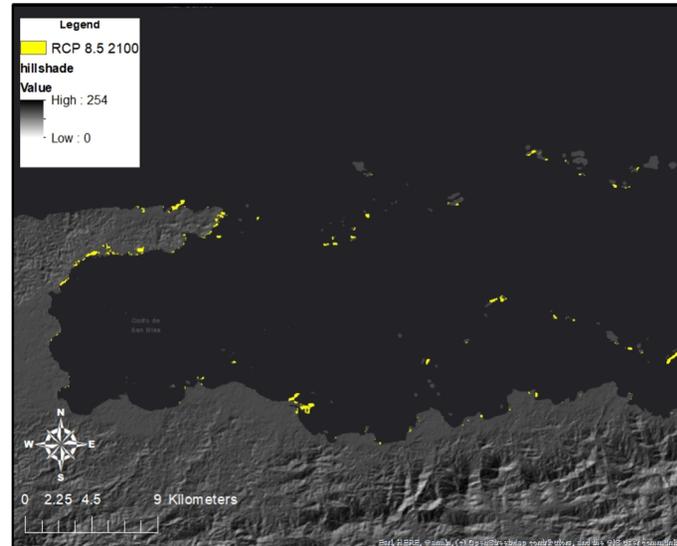
- **Opportunities**
 - Available electricity
 - Proximity to San Blas
 - Near to major roads
 - Highly arable land
 - Near to healthcare facilities
- **Constraints**
 - No water availability
 - No toilet availability
 - Near occupied homes
 - Not in National Parks
 - Not in likely flood zones
 - Not in likely storm surge

Sea Level Rise Model

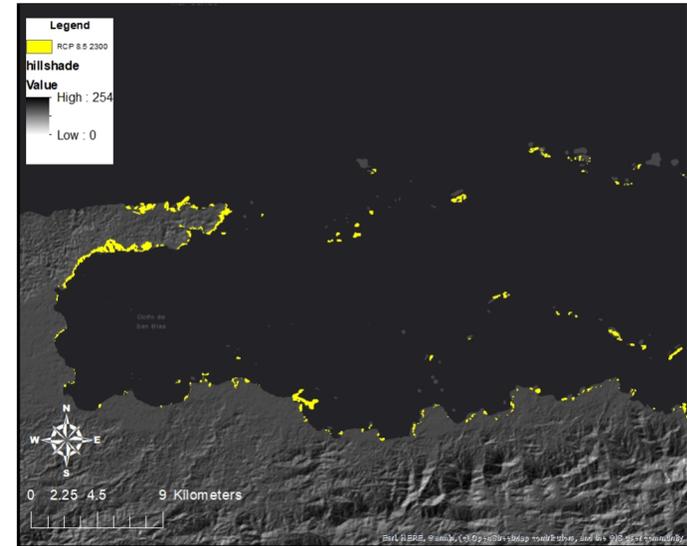
2050 RCP 8.5 Prediction



2100 RCP 8.5 Prediction

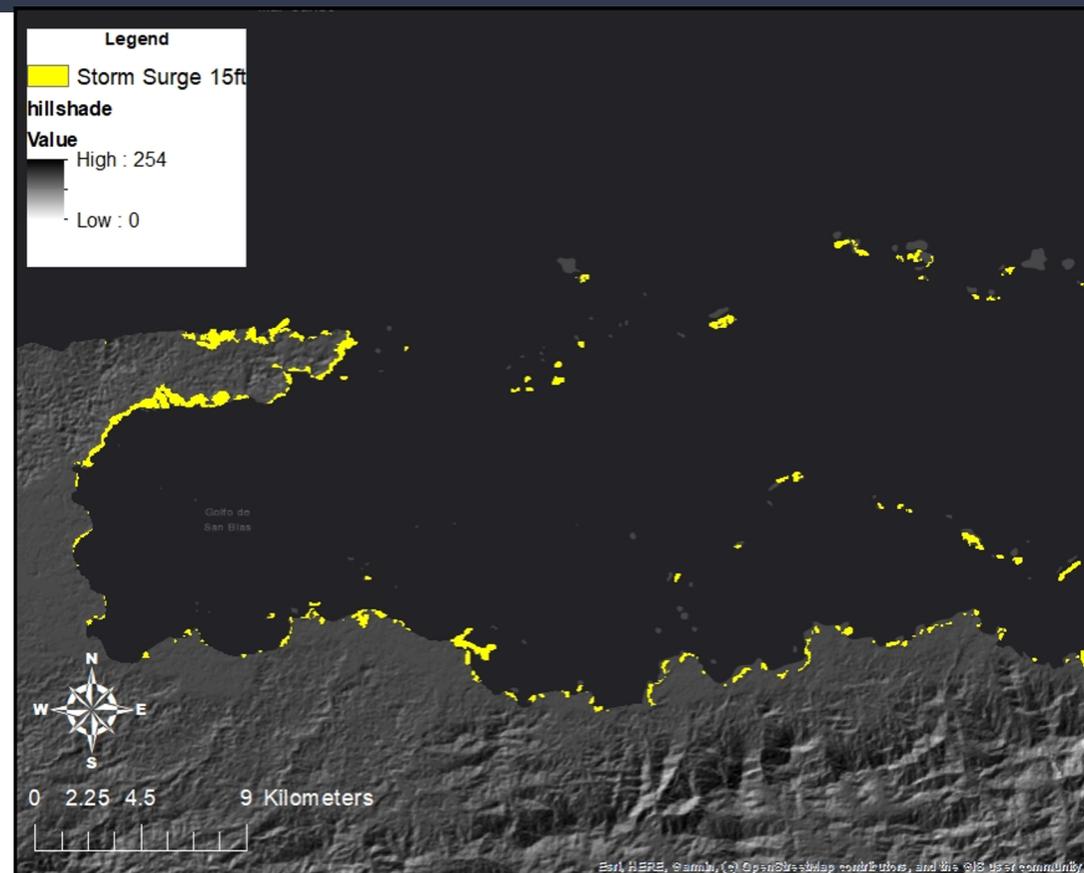


2300 RCP 8.5 Prediction



Impact of Storm Surges

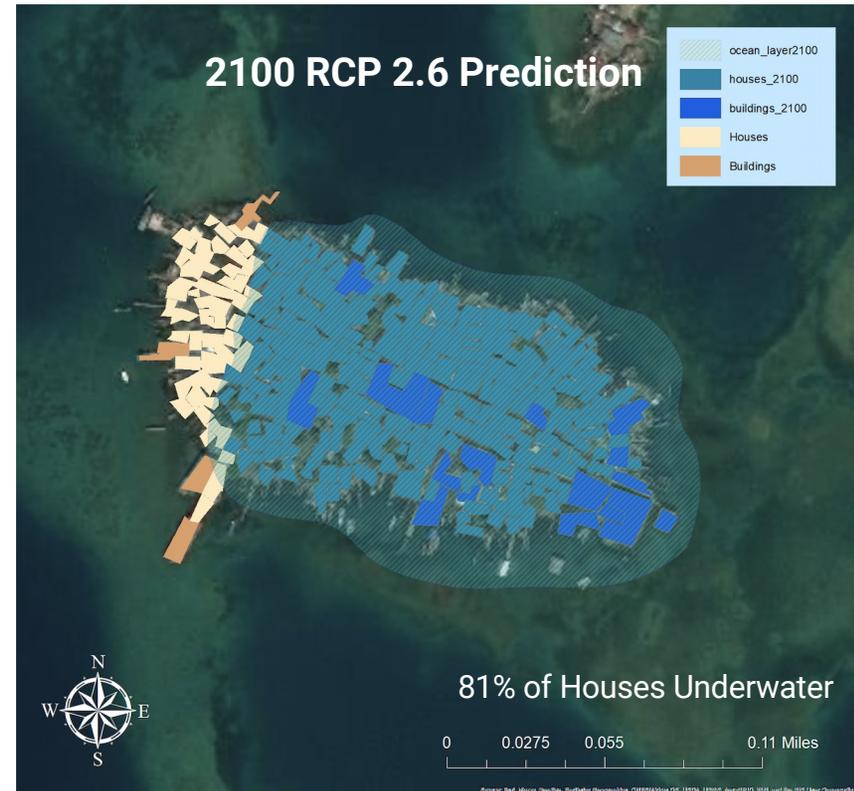
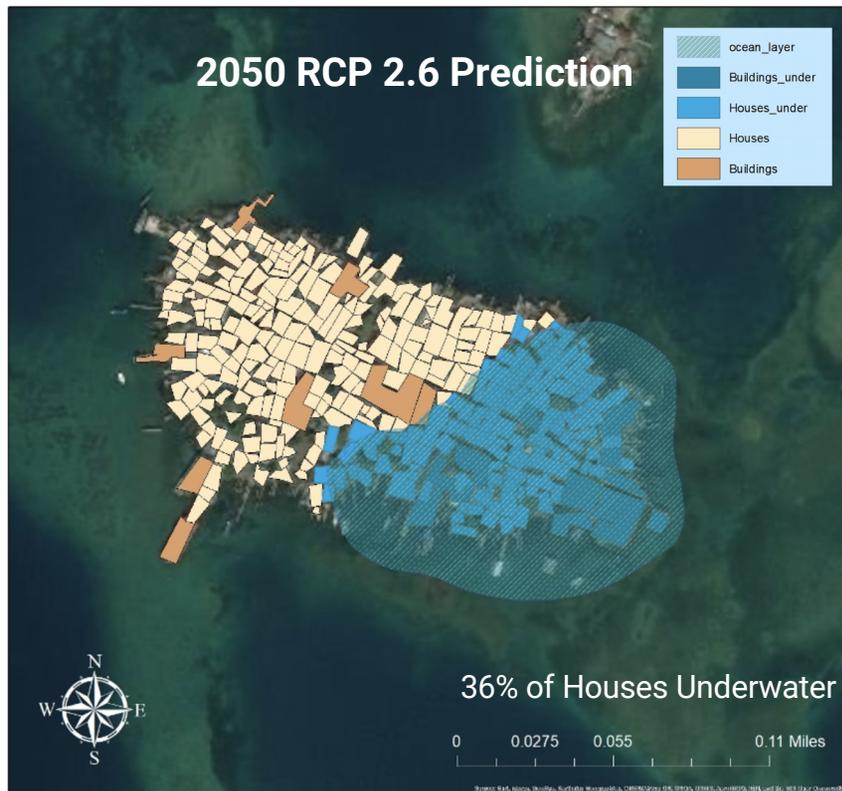
- Storm surges are an example of an extreme weather event that is expected to be annually occurring by 2100
 - Flooding to this degree will devastate the infrastructure of all occupied islands



Flooding Animation



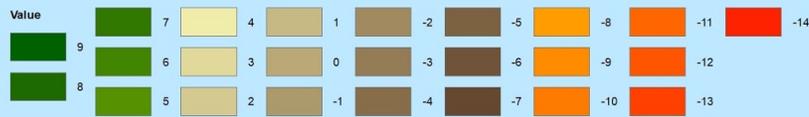
Case Study: Gardi Sugdub



Suitability Analysis

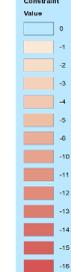
Final Suitability Map

Legend



ID_DISTRIT	PROVINCIA	DISTRITO
02	Panamá	Barboza
05	Panamá	Chepo
06	Panamá	Chimán
08	Panamá	Panamá
10	Panamá	San Miguelito

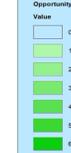
Legend



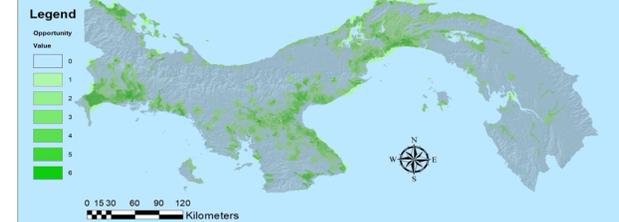
Constraint Map



Legend



Opportunity Map



Key Findings and Discussion

Sea Level Rise Modeling

- **The Gardi Sugdub**
 - will likely be forced to migrate by 2050 in both RCP scenarios
 - Eastern infrastructure is at the most risk
- **Under both RCP's**
 - The majority of islands are at risk by 2050
 - By 2300, the mainland will be impacted
 - Storm surges will flood all 400+ islands

Suitability Analysis for Relocation

- Four districts offer the highest suitability based off the 11 socio-ecological factors:
 - Panamá
 - Chepo
 - Chimán
 - San Miguelito