Valuing Mangrove Ecosystems in Ca Mau Province, Vietnam

Road to U Minh Ha © Le Phuong Bang

Rapid Assessment

Gregg Verutes

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Acknowledgements

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ProEcoServ Team (Project for Ecosystem Services)

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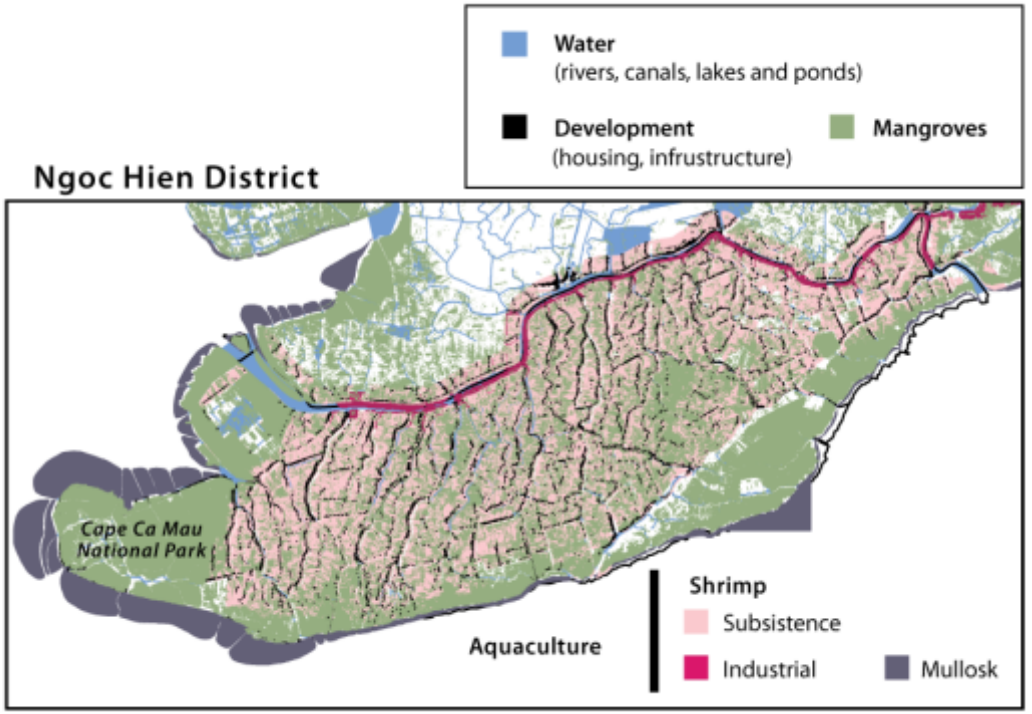
Ca Mau Study Area

- Delta -- interlacing rivers and canals, low and flat terrain, and freq flood silt and sediment accretion, accumulated over many yrs
- Fertile land -- ideal for aquaculture, rice, mangroves
- Fishing -- an important industry in the province



Why is this Important?

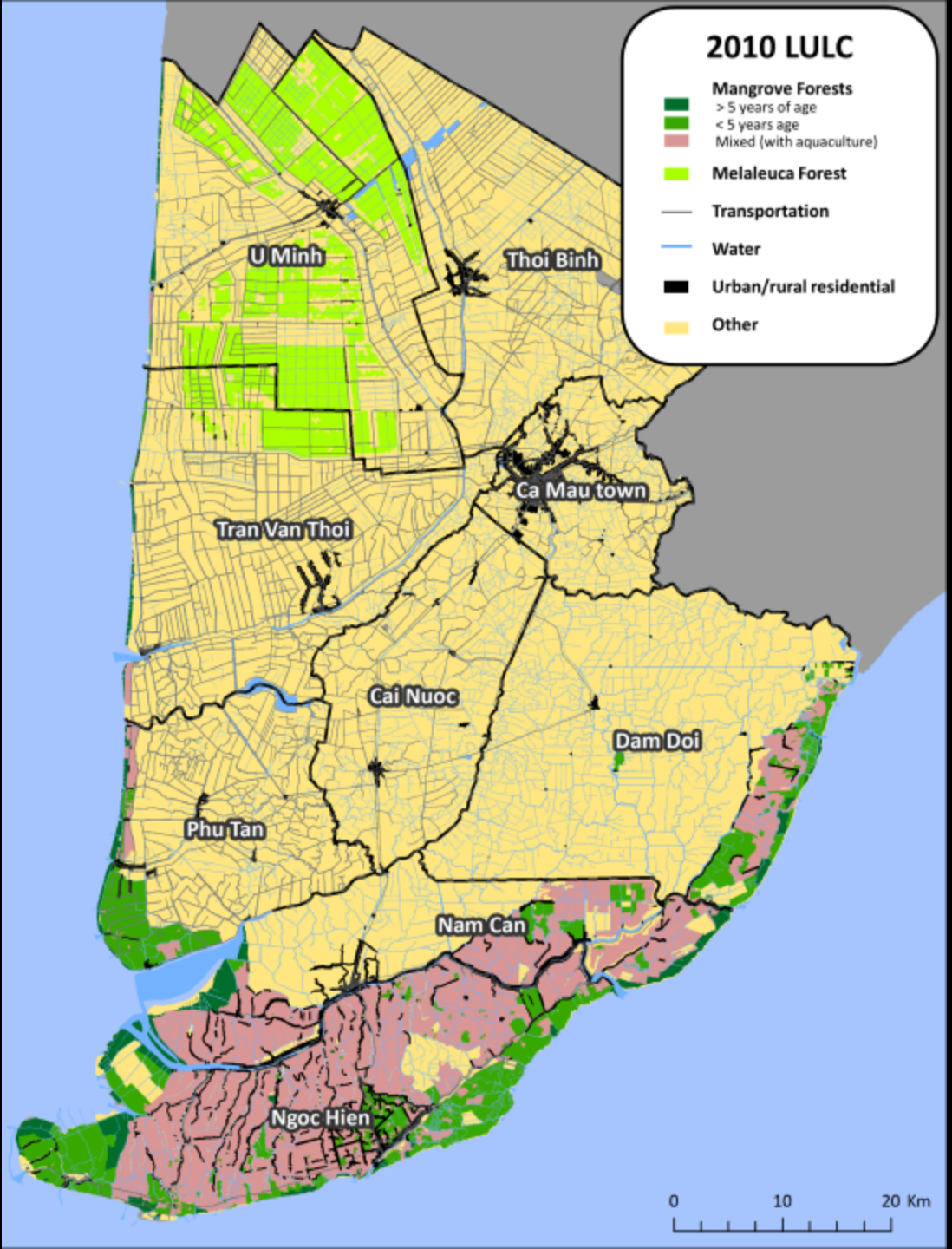
1. Conservation/restoration planning in new system
   – Spatially-explicit values of key mangrove ES

2. Inform dev of our tools and how they are applied
   – Put the "In" back in InVEST (new linkages!)
   – Data acquisition and processing workflows

3. Sustainable dev planning and accounting at national and sub global scales

Project Timeline

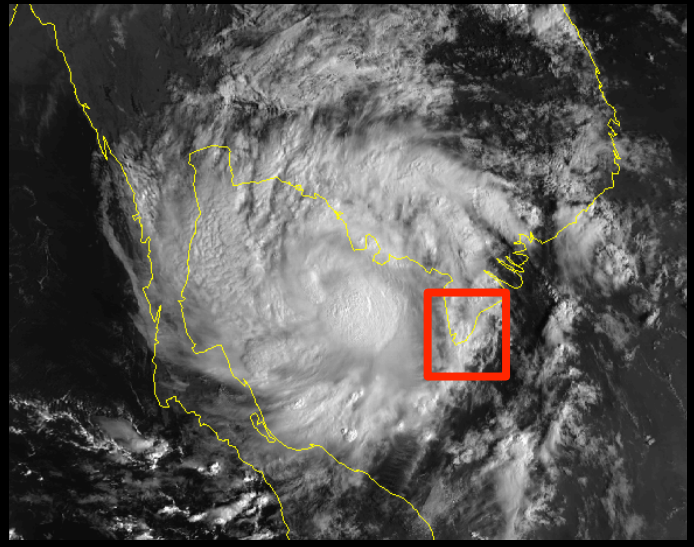
- **June 2011** – Nairobi, Kenya
  - –ProEcoServe Kickoff



ES Prioritization

- Regulating
  - Coastal protection
  - Coastal blue carbon
- Supporting
- Provisioning
- Cultural

Coastal Hazards and Threats to Mangroves



- Typhoon Linda (1997)

- **Development**
  - 35% increase in population by 2030

Human activities

- Mixture of agriculture (rice) and aquaculture (shrimp, mollusk)
- NTFPs (mangroves harvested for charcoal)

Project Timeline (cont.)

- **June 2011** – Nairobi, Kenya
  - ProEcoServe Kickoff
- **Sept 2012** – Ha Noi, Vietnam
  - Ecosystem service prioritization and expert feedback on methodology
- **Sept 2013/14** – Ca Mau Province, Vietnam
  - Stakeholder consultations

    (spatial data collection + expert opinion = scenarios)

Future Scenarios

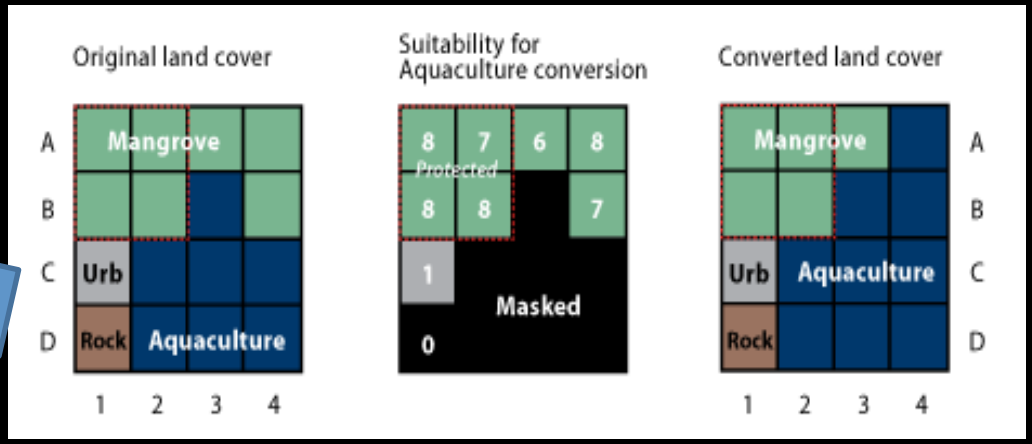
- **Land Use Plan (LUP)**
  Spatial representation of the Ca Mau provincial land use plan for the year 2020
- **Forest Development (FOR)**
  Sets a ratio of 3:7 for shrimp farming and mangrove forest by the year 2020



Methods (Future Scenarios)

- How might future policy and management change land use and cover in Ca Mau province?

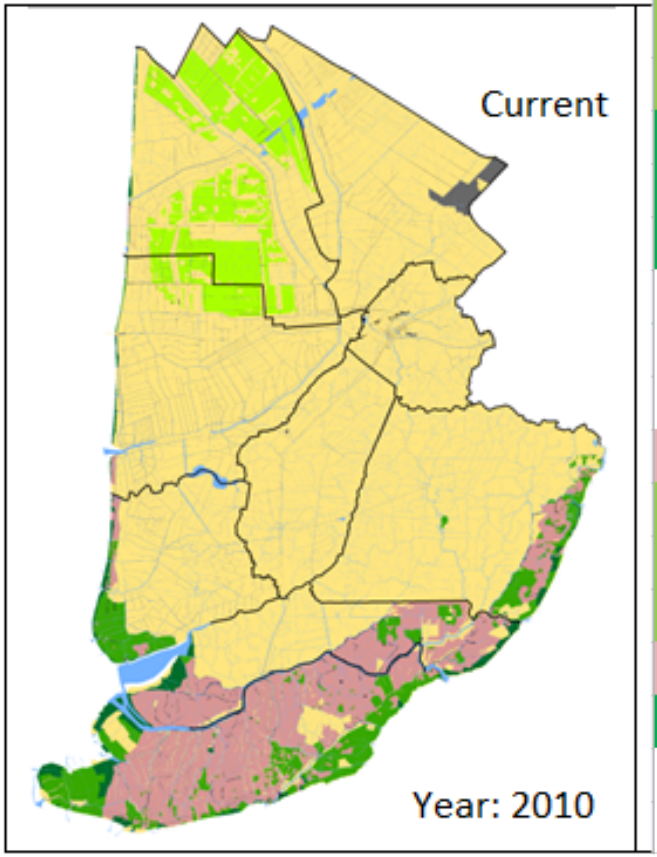
QUANTITY OF CHANGE	TRANSITION LIKELIHOOD	PRIORITY	FACTORS	PROXIMITY SUITABILITY	CONSTRAINTS



Results (Future Scenarios)

Mangrove Forests
- > 5 years of age
- < 5 years age
- Mixed (with aquaculture)

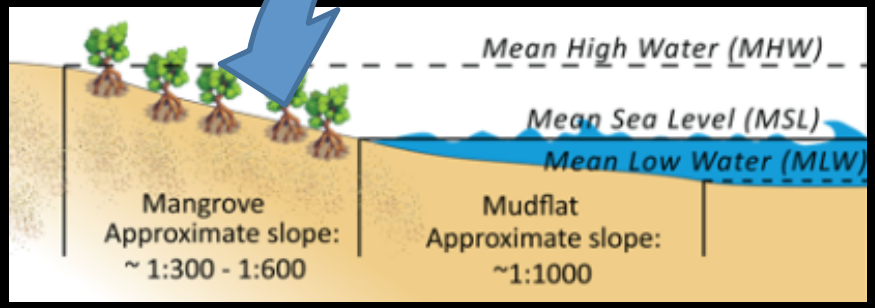
- InVEST Scenario Generator Inputs/Outputs
  - 45 unique LULC classes (13 mangroves)



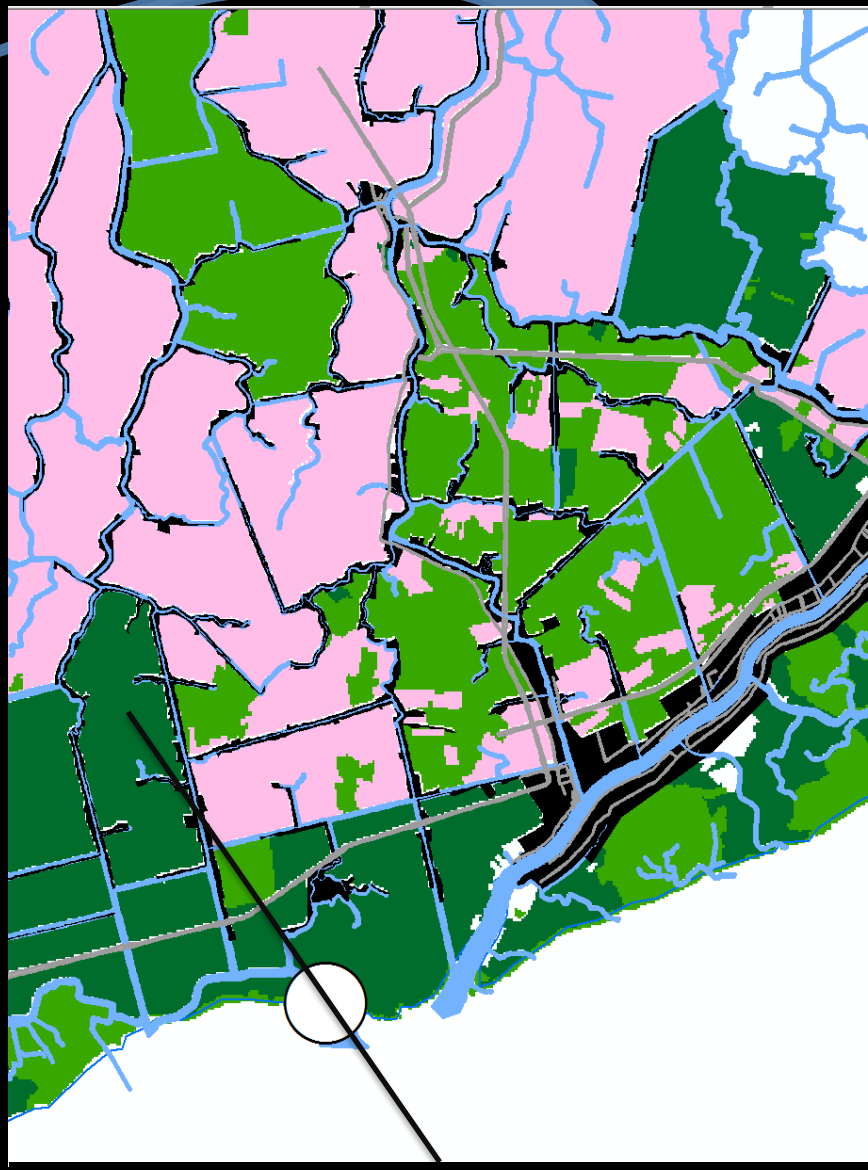
Bareland	RDD - Dat trong
Mangrove + Aquaculture	RDD - Duoc + Thuy san
Plantation Mangrove - Rhizophoraceae 1-2 year	RDD - Duoc trong cap tuoi I,II
Plantation Mangrove - Rhizophoraceae 2-3 year	RDD - Duoc trong cap tuoi II,I
Plantation Mangrove - Rhizophoraceae 4-5 year	RDD - Duoc trong cap tuoi IV
Natural mangrove - Rhizophoraceae	RDD - Duoc tu nhien
Natural mangrove - Avicennia	RDD - Rung mam tu nhien
Mixed mangrove forest	RDD - Rung NM hon giao
Special forest - Plantation forest - Melaleuca 1 year	RDD - Tram trong cap tuoi I
Special forest - Plantation forest - Melaleuca 2-3 year	RDD - Tram trong cap tuoi II,I
Special forest - Natural forest	RDD - Tram tu nhien
Plantation Mangrove - young Rhizophoraceae	RPH - Duoc moi trong
Production forest - Plantation Mangrove - Rhizophoraceae 1-2 year	RSX - Duoc trong cap tuoi I,II
Production forest - Plantation Mangrove - Rhizophoraceae 2-3 year	RSX - Duoc trong cap tuoi II,I
Production forest - Plantation Mangrove - Rhizophoraceae 3-4 year	RSX - Duoc trong cap tuoi IV,
Production forest - Mangrove + Aquaculture	RSX - Duoc + Thuy san
Production forest - Mixed mangrove forest	RSX - Rung NM hon giao
Production forest - Plantation forest - Melaleuca 1 year	RSX - Tram trong cap tuoi I
Production forest - Plantation forest - Melaleuca 2-3 year	RSX - Tram trong cap tuoi II,I

Methods (Coastal Protection)

- Where is the Ca Mau coastline most exposed to coastal hazards?
- How will the distribution of risk-reduction provided by mangroves change as a result of future LULC change?



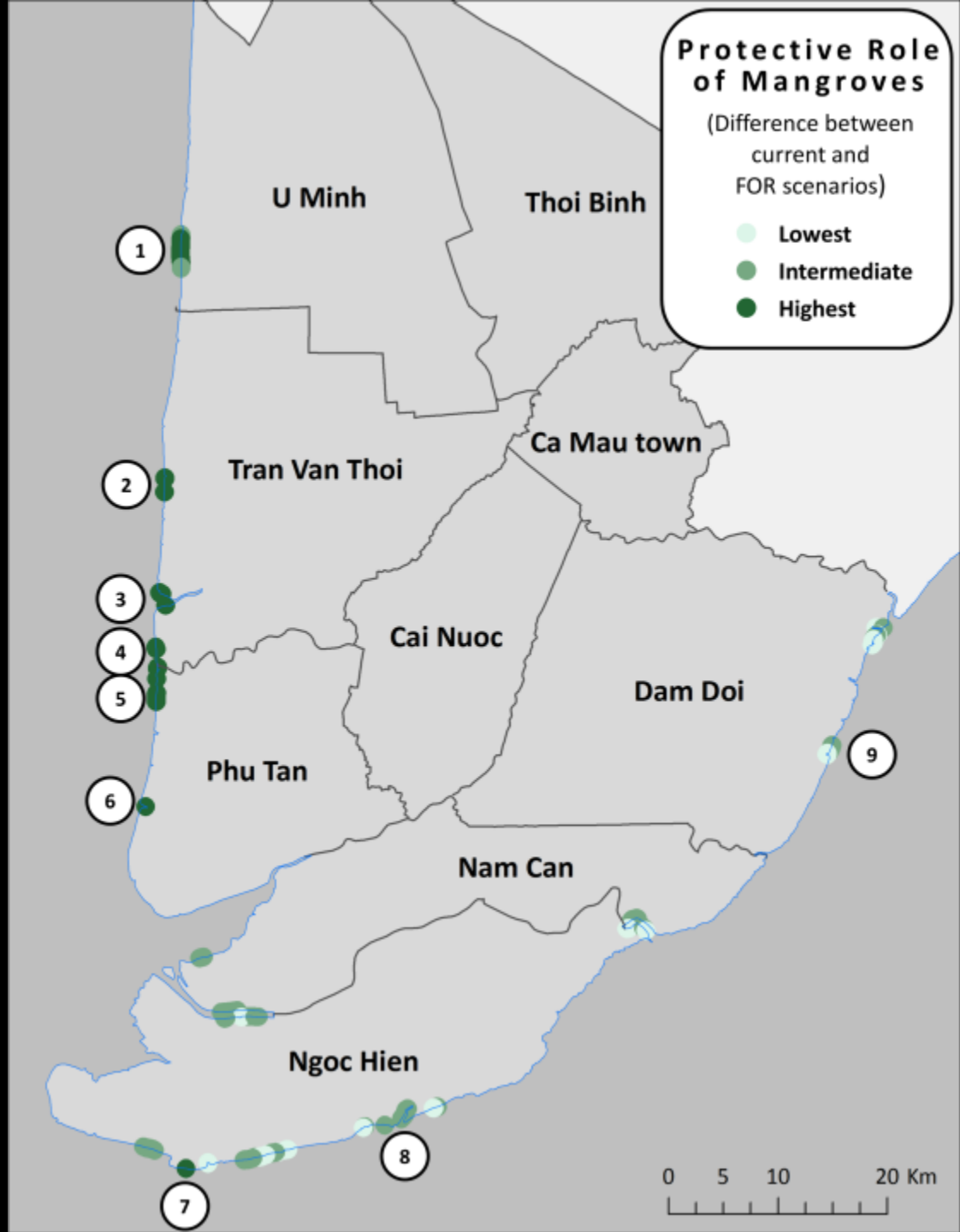
- In areas where mangroves provide high coastal protection value, how much in terms of avoided erosion and damages?



Post-Management (FOR)

Results
(Coastal Protection)

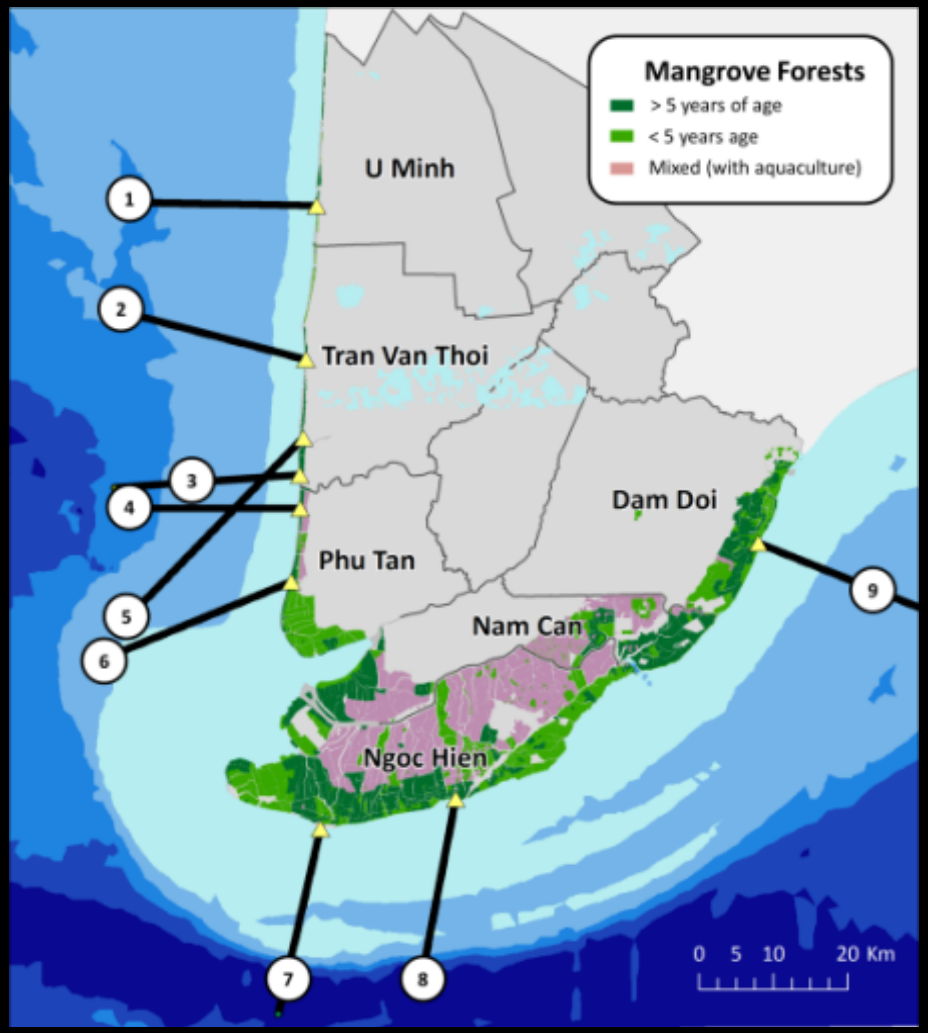
- Maps of highest coastal exposure
- Identify current <u>reduction in risk to people and property</u> due to coastal protection provided by mangroves



Results
(Coastal Protection)

- How much protection?

Site ID	Current to FOR	
	Avoided Mud Scour (m^3/m)	Avoided Damages (M of VND)
1	9,500	98.0
2	1,250	44.7
3	316,750	13,831
4	9,250	183.6
5	3,500	72.9
6	2,000	59.5
7	750	6.0
8	6,000	50.6
9	3,250	38.7

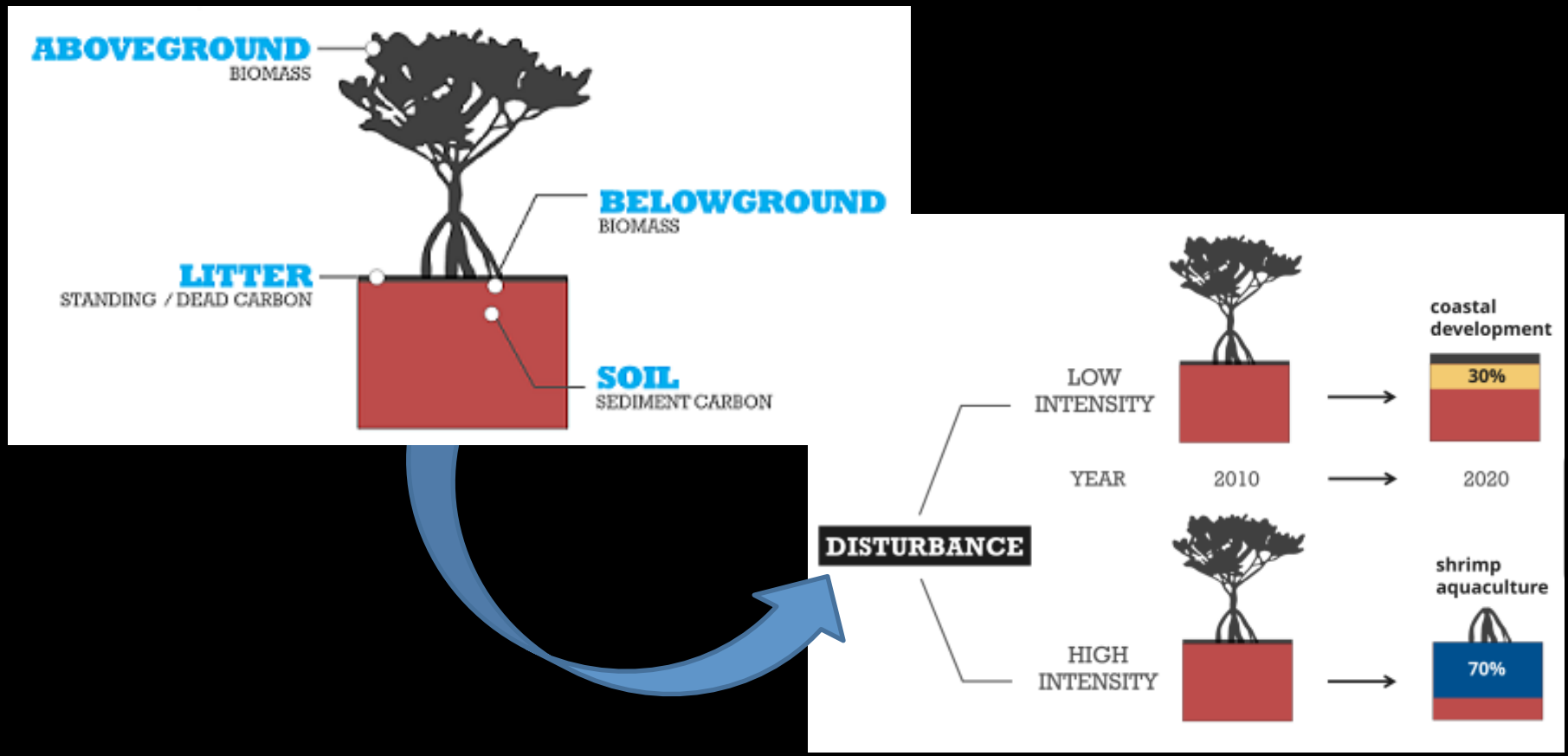


Variables:
Forcing conditions (wave height, bathymetry), physical characteristic of mangroves, value of land

Constants: muddy system, 2.3m surge elevation (Cat 2 storm), wind speed, tide elevation, sed size

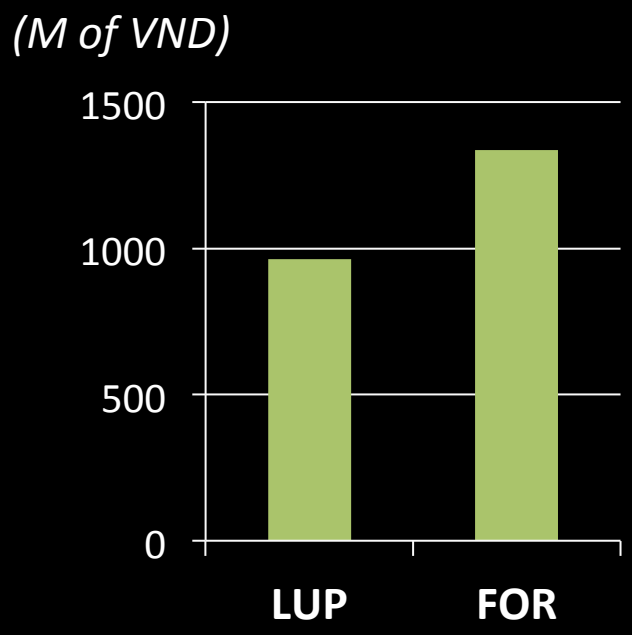
Methods (Coastal Blue Carbon)

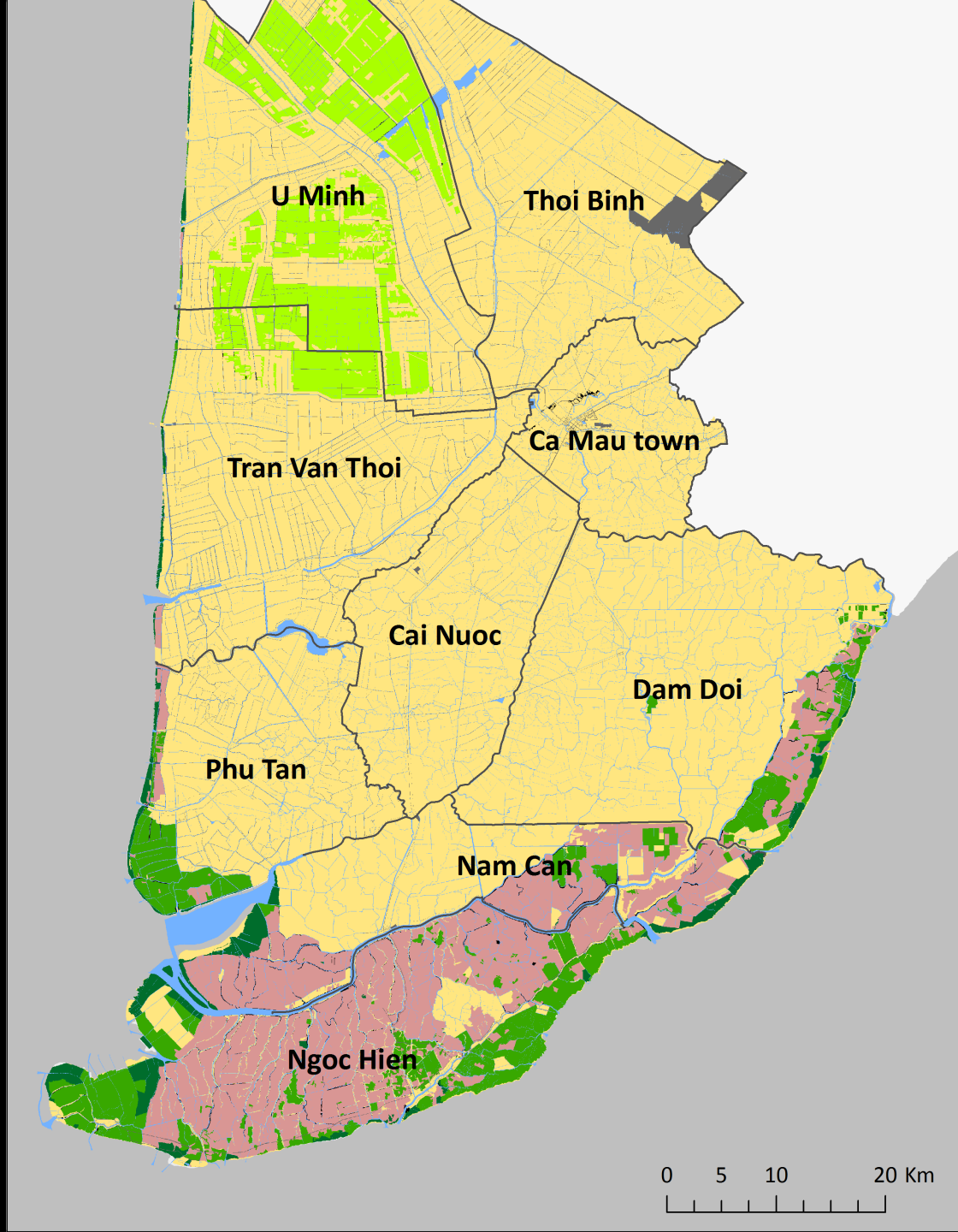
- Where are changes in the ability of mangrove ecosystems to <u>store and sequester carbon</u>?



Results
(Blue Carbon)

- Sequestration and value of damages avoided for emissions reduction





Challenges

- Remote collaboration and language barrier
- Ongoing InVEST model development (2011-2014)
- Designing future scenarios
  - Too many LULC classes (45!)
- Info about costs of restoration / protection

Summary

Spatially explicit information on mangrove ES values

- Build on mangrove valuation in one district (Nguyen 2013)

- Highlight most vulnerable populations and livelihoods
- Explored 2 future scenarios of land use change
- Results suggest mangroves most valuable on west coast

Potentially inform GEF Blue Forest and WAVES portfolios