THE ECONOMICS OF ECOSYSTEM-BASED ADAPTATION: MEASUREMENT, VALUATION AND UNCERTAINTIES

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WHAT IS ECOSYSTEM-BASED ADAPTATION?

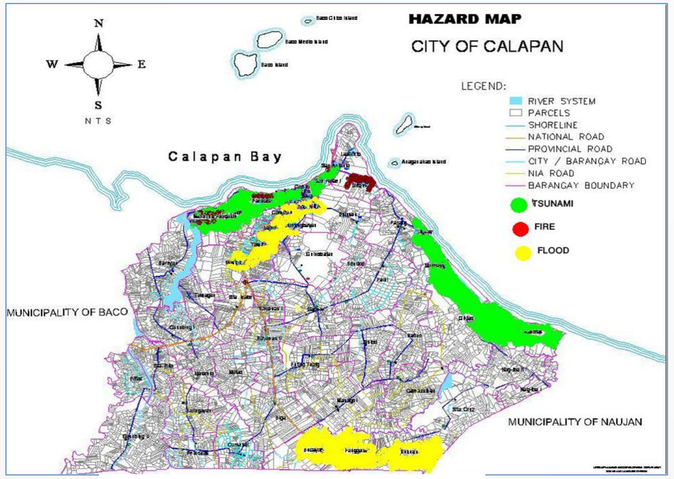
Ecosystem-based adaptation (EbA) is the use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people adapt to the adverse effects of climate change.

CASE STUDIES

Corumbau, Brazil

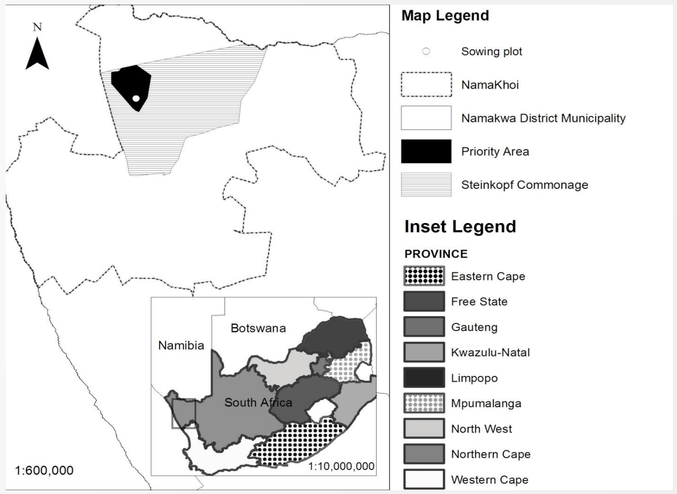
CI (2015)

Calapan, The Philippines



Source: Calapan City 2011

Nama Khoi, South Africa



Bourne et al (2016)

UNDERSTANDING ECONOMIC IMPLICATIONS

Sectors	Areas of investments	Investments and financial flows needed in 2030 (billion US$)
Agriculture, forestry and fisheries	Irrigations, adopt new practices and to move processing facilities	11
	Research and extension	3
Water supply	Construction of additional infrastructure needed to meet the projected demand for water supply	11
Human health	To cover the cost of treating the additional number of cases of diarrhoeal disease, malnutrition and malaria due to climate change	4-5
Natural ecosystems	Improving protection, expanding the network of protected areas and compensating local communities	12-22
Coastal zones	To cope with sea-level rise	11
Infrastructure	To adapt new infrastructure vulnerable to climate change	8-130
All sectors total		60-157

UNFCCC 2007

UNDERSTANDING ECONOMIC IMPLICATIONS

- What is the cost of non-adaptation?
- Is EbA more cost-effective than non-EbA options?
- From a range of EbA options which one is most cost-effective?

WHAT VALUATION TOOLS DO WE HAVE?

Benefits and co-benefits	Indicators and data needs	
	Physical measurements	**Economic valuation**
All provisioning services	Quantity harvested annually	Market price and shadow price
Carbon	Tons of carbon sequestered or emitted	Social cost of carbon; REDD+ transaction equivalent
Water quality regulation	Changes in water quality parameters such as dissolved nutrients	Changes in water purification cost
Tourism/Ecotourism	Changes in the number of tourist visits	Changes in the income of local businesses Revenue earned
Water provision	Amount of water supplied for different sectors such as irrigation, domestic water	Beneficiary-specific value of water, such as tariff for domestic water consumption
Erosion control	Sediment loads in irrigation channels, hydroelectric dams etc.	Dredging costs or equipment depreciation costs
Pollination	Changes in crop productivity	Cost of replacing natural pollination
Non-timber forest products	Total volume harvested by communities	Equivalent market price

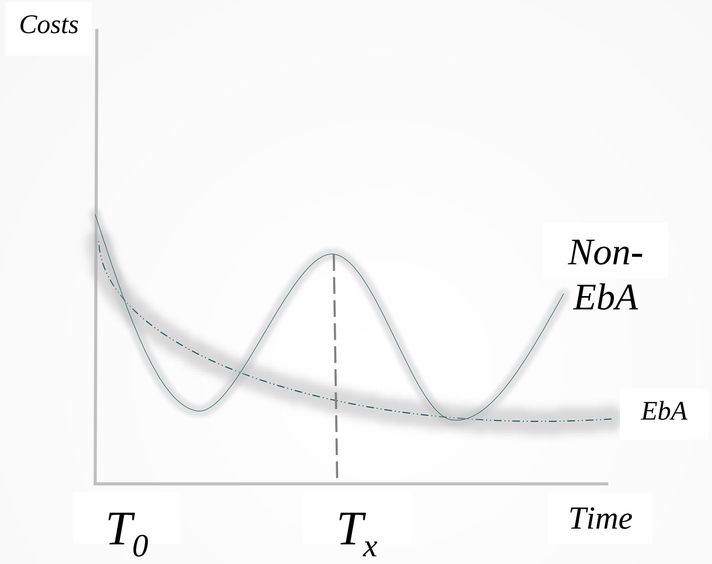
WHAT ECOLOGICAL-ECONOMIC MODELS DO WE HAVE?

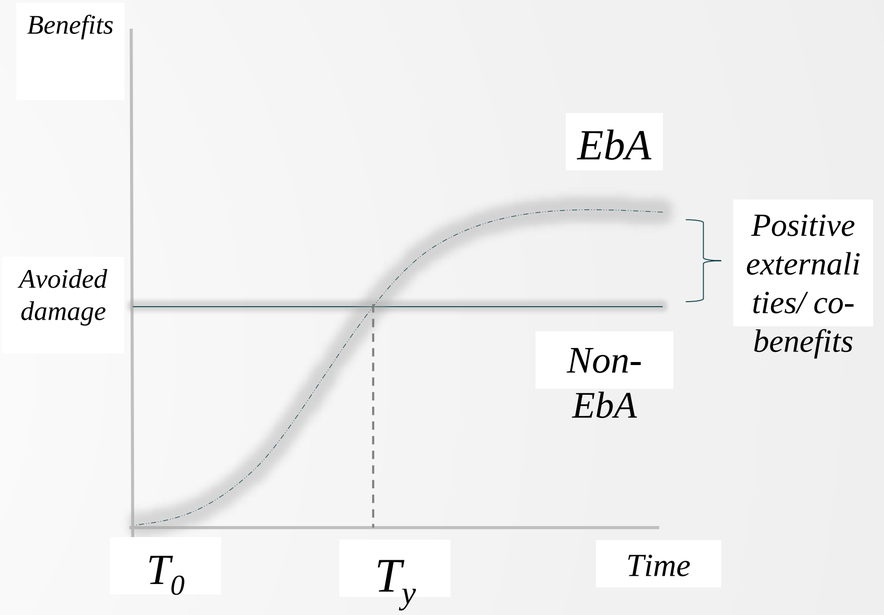
Models and tools	Description	Potential application in EbA
InVEST (Kareiva et al 2011)	Spatially explicit ecosystem services modeler, capable of physical quantification and economic valuation	Develop potential **future scenarios** of ecosystem services and tradeoffs and synergies
ARIES (Bagstad et al 2013)	Connects ecosystem services with beneficiaries in a spatially explicit way	Beneficiary-specific valuation of EbA and non-EbA externalities
TerrSet (http://www.clarklabs.org/products/land-change-modeler.cfm)	Allows rapidly analyze land cover change, model relationships to explanatory variables, and simulate future land change scenarios	Develop future land use scenarios and understanding impacts of various landscape scale adaptation options
MIMES (Boumans et al 2015)	A dynamic approach for modeling and valuing ecosystem services	Apply system dynamic approach to understand ecosystem services tradeoffs
SolVES (Sherrouse et al 2014)	Assess, map, and quantify nonmarket values perceived by various groups of stakeholders	Measure stakeholder perceptions, attitudes and preferences in an EbA application
Delphi-based assessments (Scolozzi et al 2012)	Expert-based estimation of land use potential in providing ecosystem services	In the absence of high volume of data expert-based evaluation of ES
TSA (Aplizar and Bovarnick 2013)	Provides a way to compare the implications of two contrasting management strategies on the basis of relevant socioeconomic indicators	A step-by-step approach that captures and presents the value of ecosystem services within decision making, to help make the business case for investment choice
Ecosystem Services Valuation Database (Van der Ploeg et al 2010)	The TEEB Valuation Database – a searchable database of 1310 estimates of monetary values	Apply a “benefit transfer” approach for rapid quantification and valuation

Adam *et al* (in preparation)

CHALLENGES

- Scale of analysis
- Spatial and temporal distribution of costs and benefits
- Data availability
- Uncertainty





UNCERTAINTIES

(i) uncertainty related to physical measurements;

(ii) uncertainty in the valuation of benefits and co-benefits;

(iii) uncertainty related to the dynamics of ecosystems and changes in flows of services from them; and

(iv) uncertainty regarding future economic value of externalities

CONCLUSIONS

1) Ecosystem based adaptation can be a viable and economically feasible alternative
2) But we need the right tools to establish this viability and feasibility
3) There has been a lot of recent advances in ecological economics, but not much from EbA perspectives

THANK YOU!