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Duke University

Economics of Coastal Blue Carbon

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Based on work by
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The Blue Carbon Story

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Soil Carbon Loss from Habitat Change

Habitat area

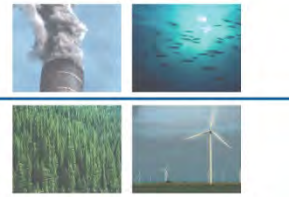
Habitat Loss

Carbon in top meter

Social Cost of Carbon ($41/mt)

Photos from UNEP GRID Arendal,
data: Pendleton et al. 2012, PLoS One

Ecosystem	Global extent (Mha)	Current conversion rate (% yr^{-1})	Near-surface carbon susceptible (top meter sediment + biomass, Mg CO_2 ha^{-1})
Tidal Marsh	2.2 – 40 (5.1)	1.0 – 2.0 (1.5)	237 – 949 (593)
Mangroves	13.8 – 15.2 (14.5)	0.7 – 3.0 (1.9)	373 – 1492 (933)
Seagrass	17.7 – 60 (30)	0.4 – 2.6 (1.5)	131 – 522 (326)
Total	33.7 – 115.2 (48.9)		

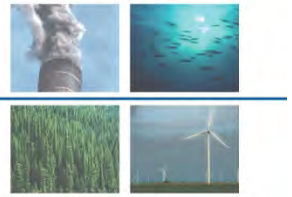


Ecosystem	Carbon emissions (Pg CO_2 yr^{-1})	Economic cost (Billion US$ yr^{-1})
Tidal Marsh	**0.02 – 0.24 (0.06)**	**0.64 – 9.7 (2.6)**
Mangroves	**0.09 – 0.45 (0.24)**	**3.6 – 18.5 (9.8)**
Seagrass	**0.05 – 0.33 (0.15)**	**1.9 – 13.7 (6.1)**
Total	**0.15 – 1.02 (0.45)**	**6.1 – 41.9 (18.5)**

Carbon Loss from Habitat Change

- 25-50% habitat loss over last 50 years (McLeod et al. 2011)
- 150m to 1 billion mt CO_2e /yr
- 4-20% annual emissions deforestation

Photos from UNEP GRID Arendal, data: Pendleton et al. 2012, PLoS One



Price vs. Value

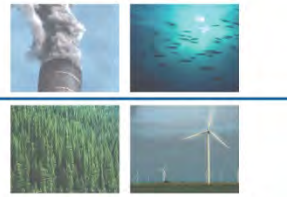
Social Cost of Carbon

Social Cost of Carbon

	Discount Rate		
Year	5%	3%	2.50%
2010	5	21	35
2015	6	24	38
2020	7	26	42
2025	8	30	46
2030	10	33	50
2035	11	36	54
…	…		
2050	16	45	65

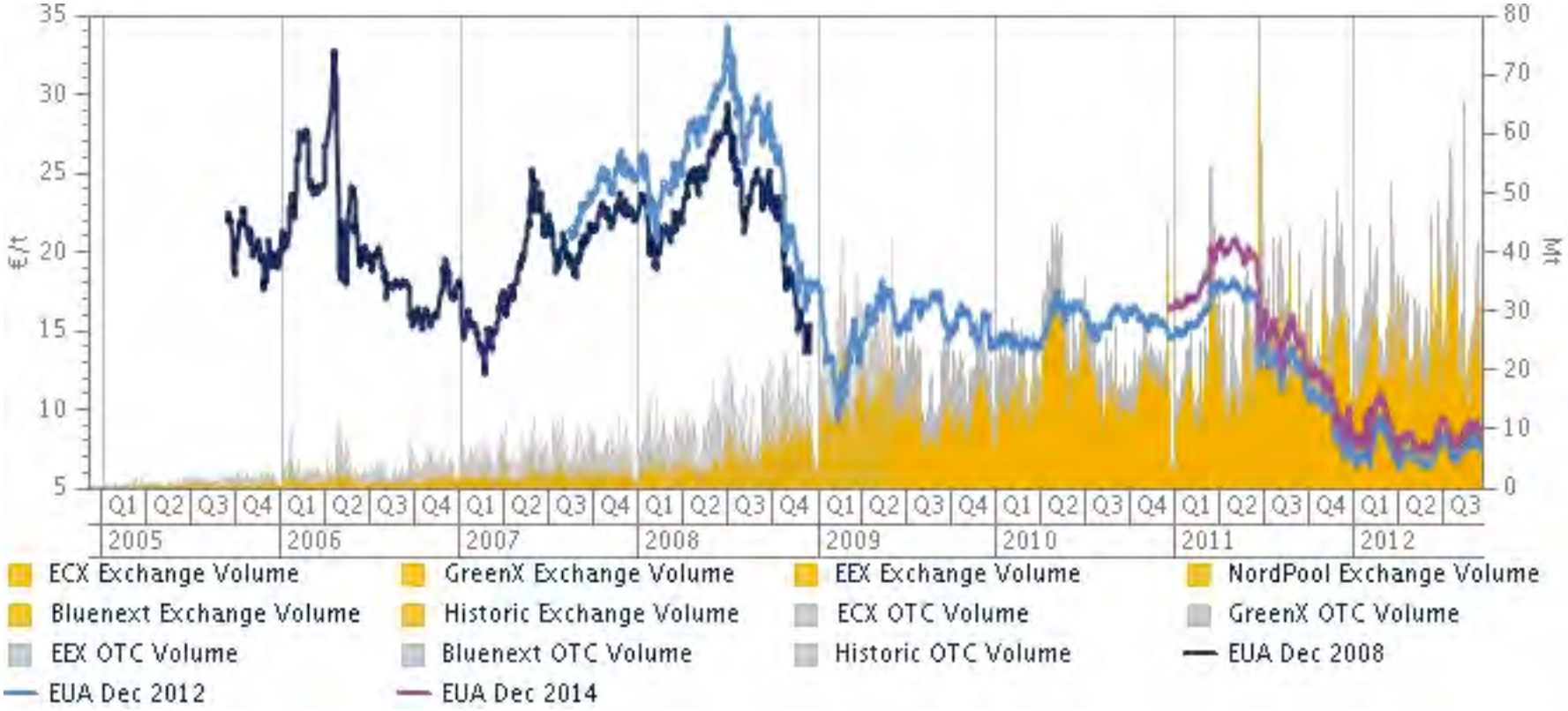
SOCIAL COST OF HABITAT DESTRUCTION =

$US 6-42 billion/yr



Nowadays, people know
the **PRICE** of
everything,
the value of nothing

Oscar Wilde, Picture of Dorian Gray



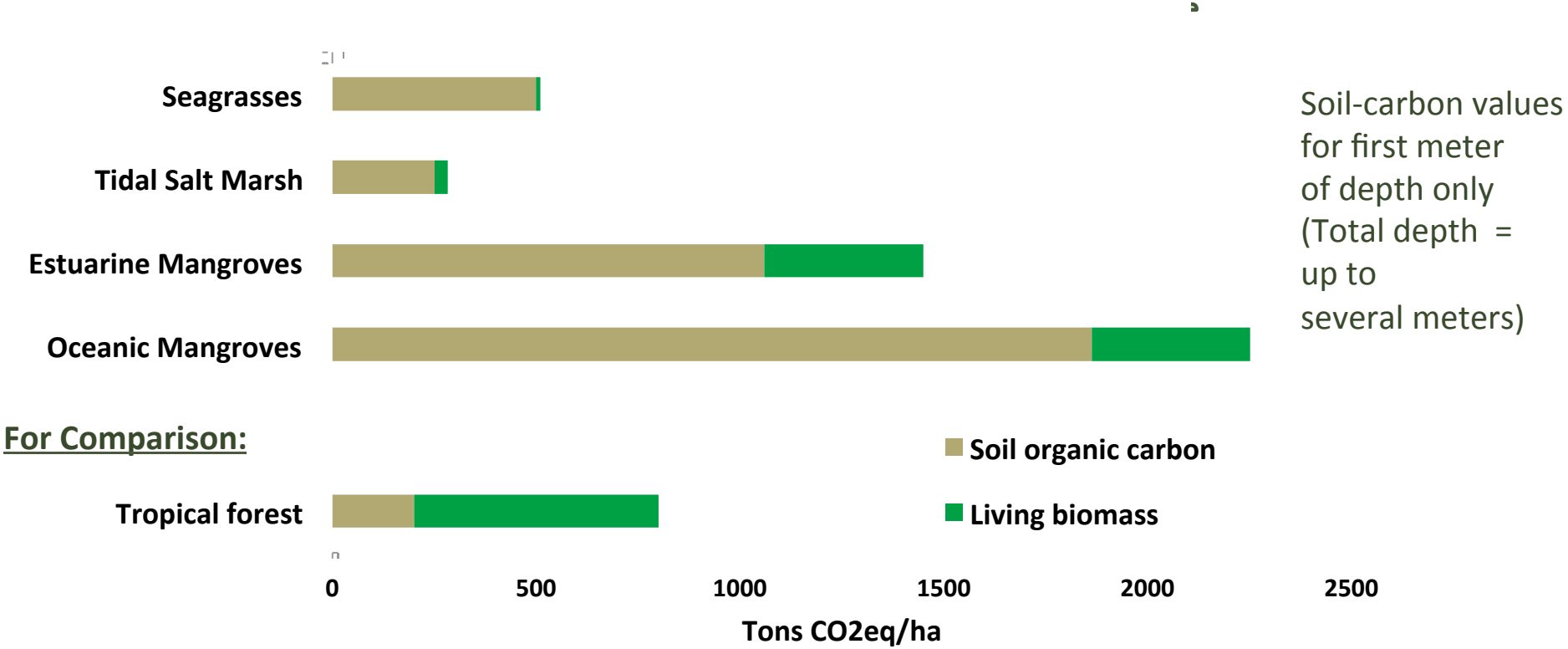
From Pointcarbon.com

CO2 Loss

Potential Credit Source	Time Period	Ecosystems
Avoided Loss of Sequestration Flux	Perpetuity*	Seagrasses Tidal Salt Marshes Mangroves
Avoided Emissions from Soil Carbon	Several Years to Decades	Seagrasses Tidal Salt Marshes Mangroves
Avoided Emissions from Biomass (REDD)	Immediate	Mangroves

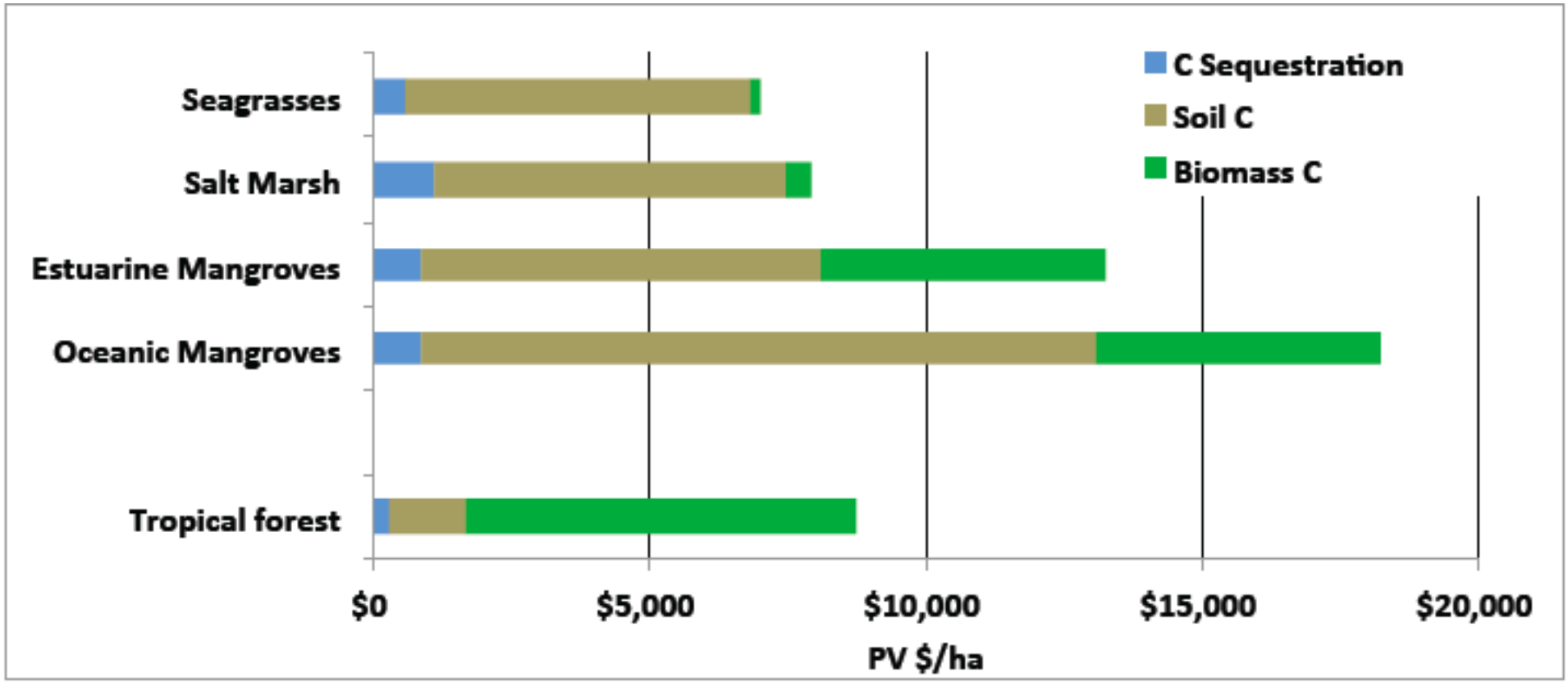
* Based on input from science team that blue carbon systems continue to sequester without saturation

…Coastal Habitat Protects Massive Amounts of Carbon



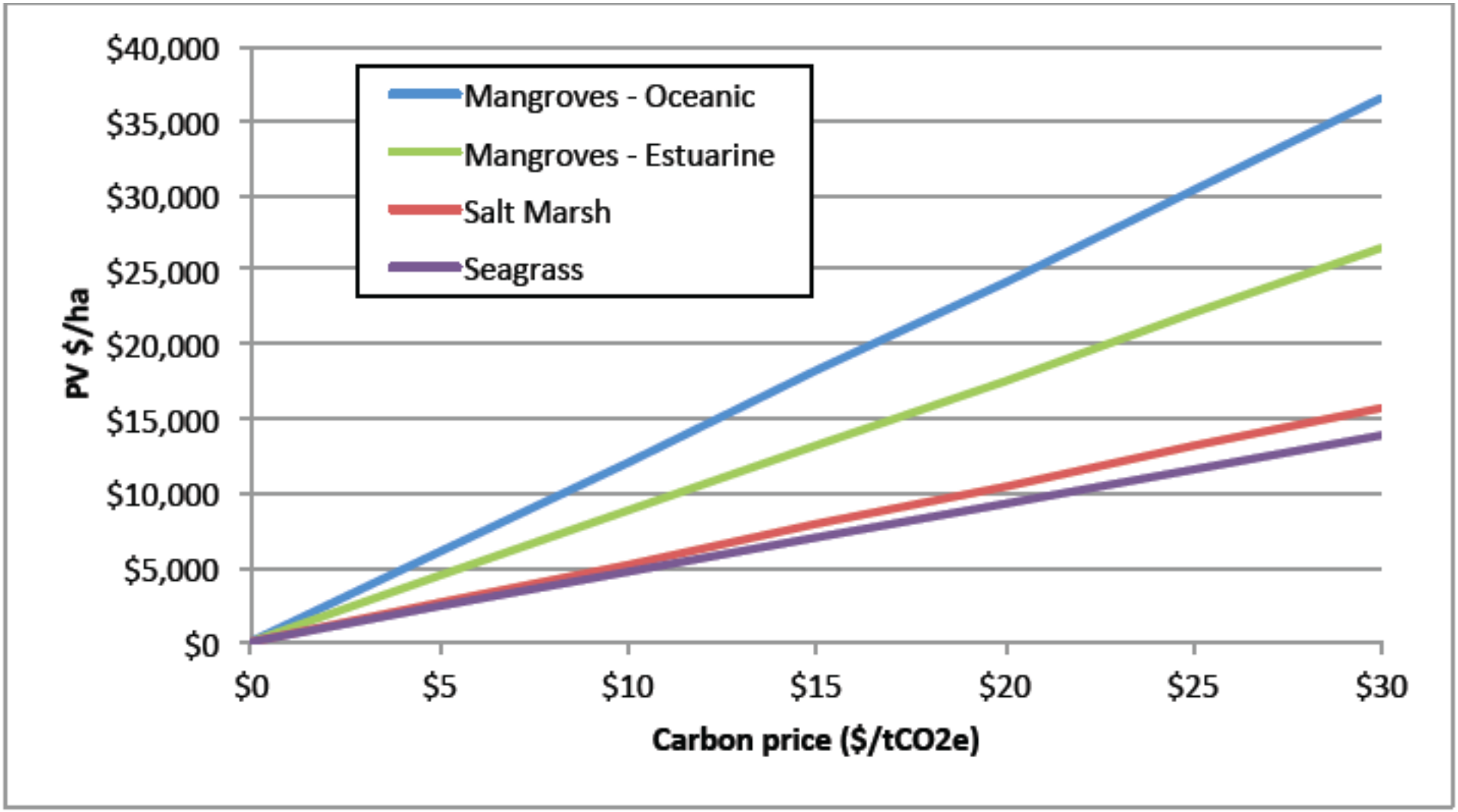
Soil-carbon values for first meter of depth only (Total depth = up to several meters)

Potential Carbon-Credit Values



Source: Authors:

Gross Financial Returns



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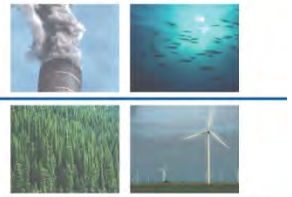
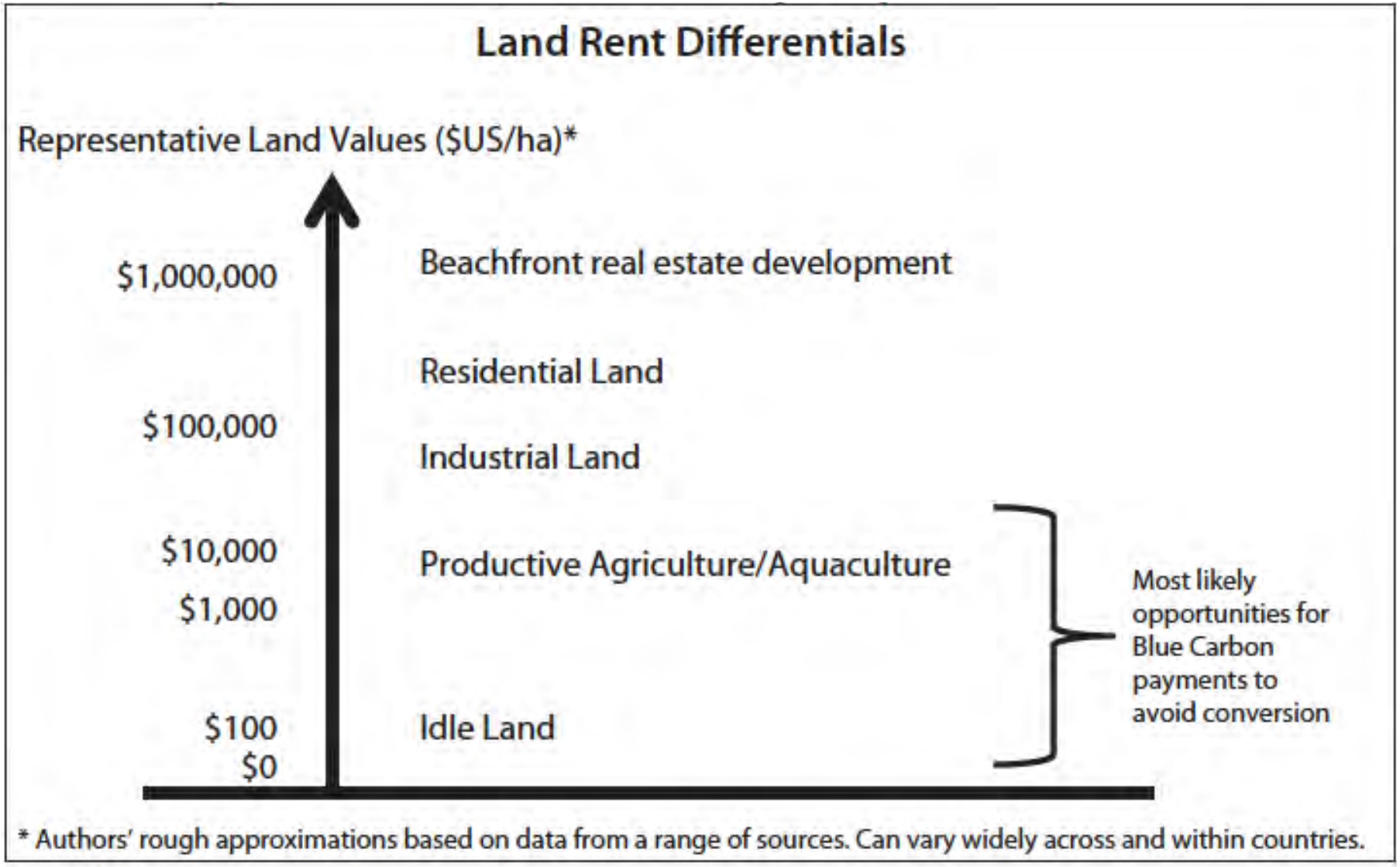


CREDIT?

Additionality

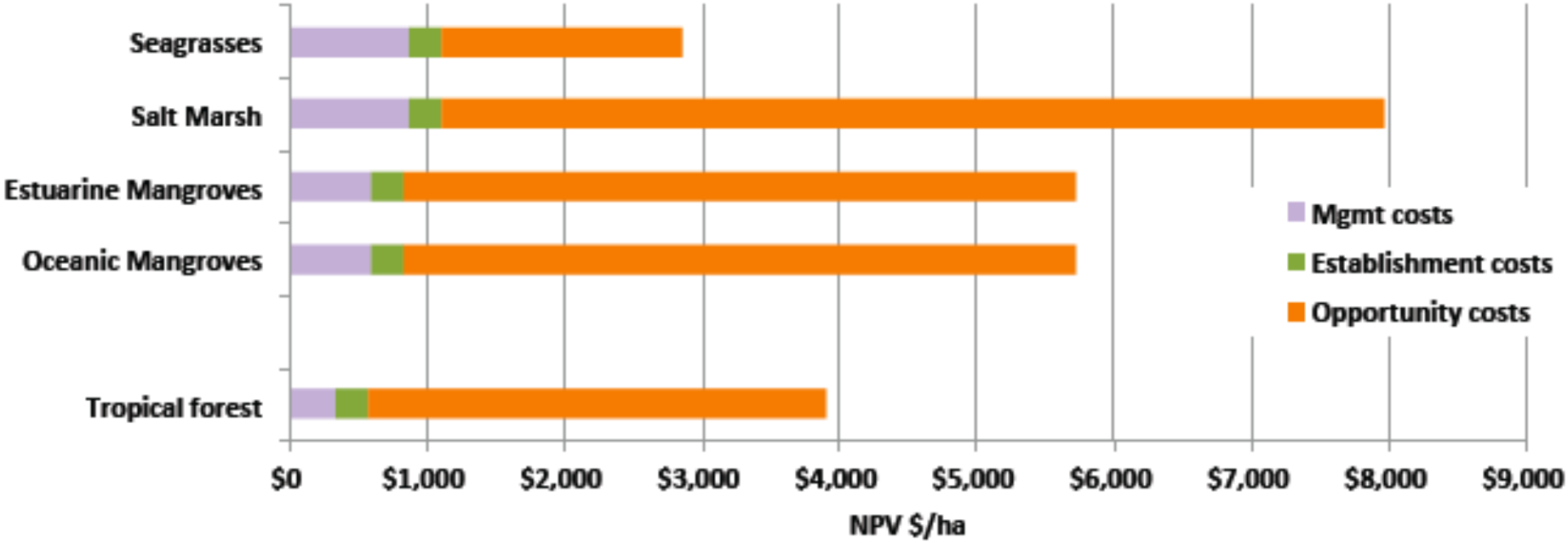
What Do You Have to Do to Protect Carbon

Opportunity Cost

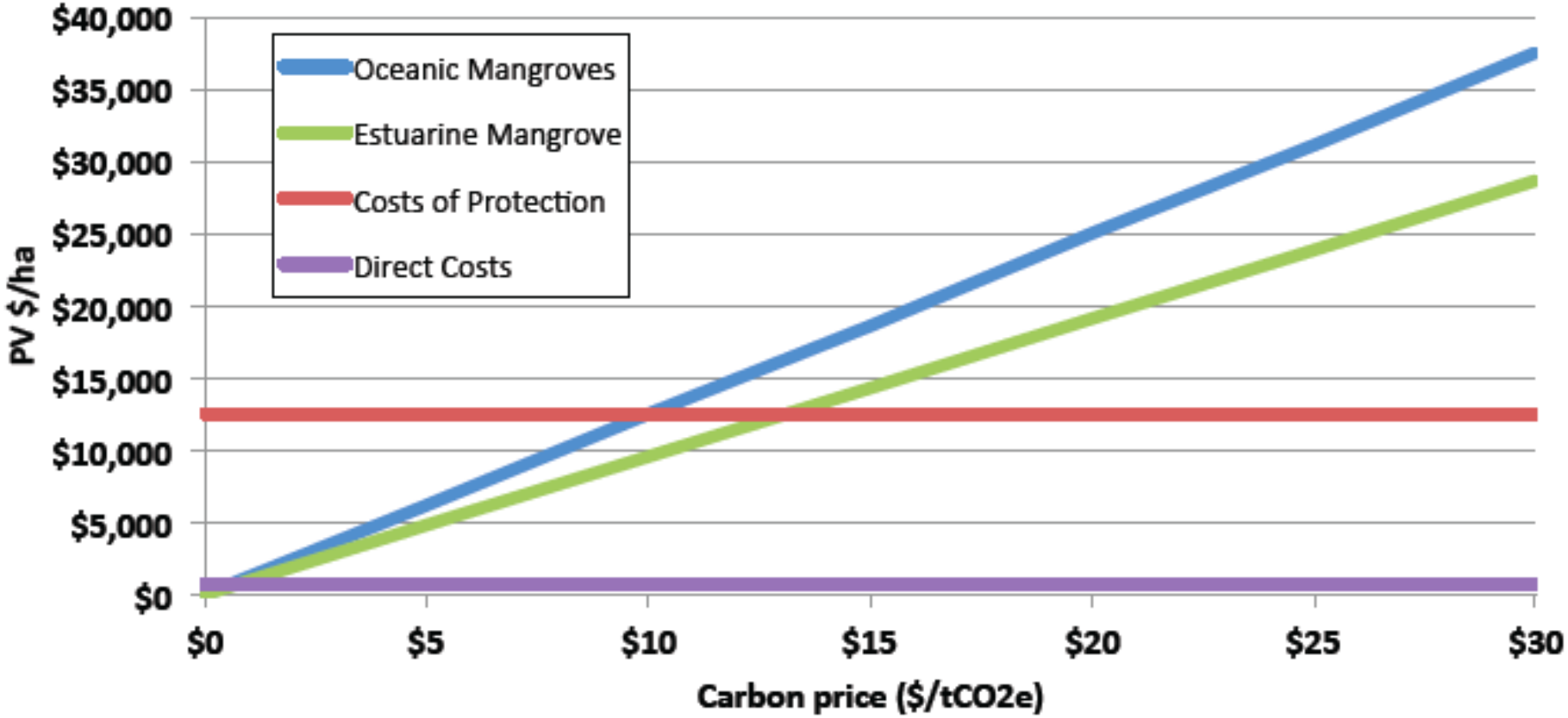


Source: Authors.

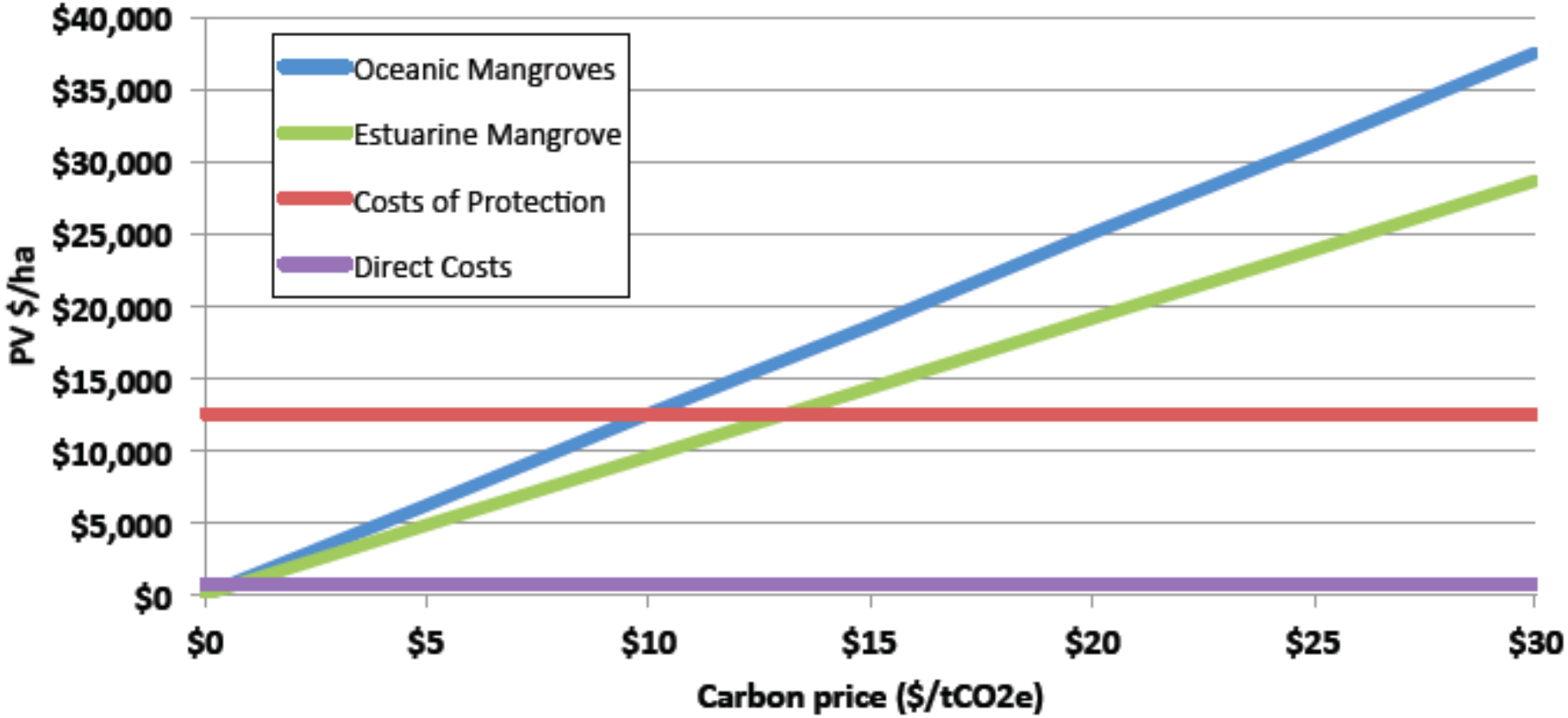
Cost of Protection



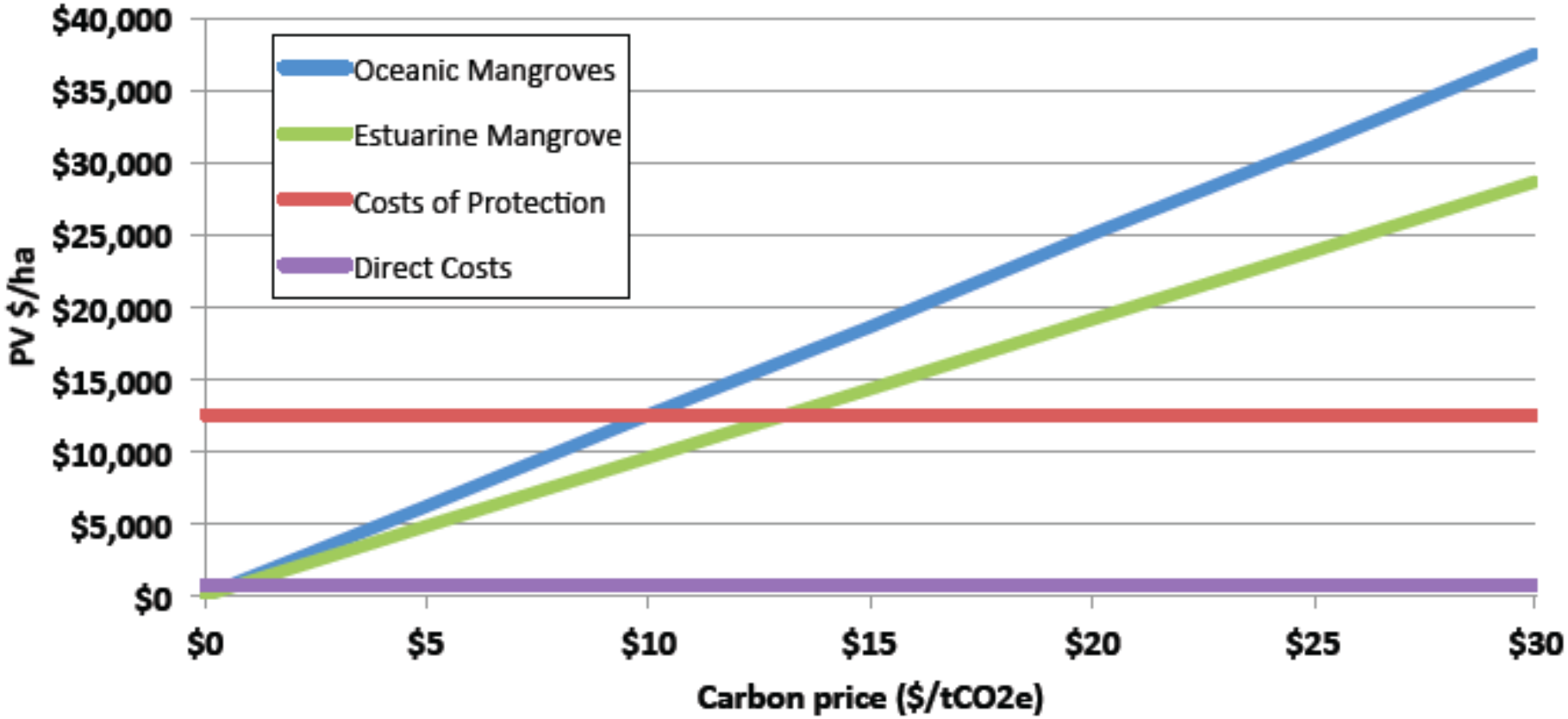
Net Revenue of Blue Carbon: mangroves



Net Carbon Benefits of Blue Carbon: mangroves



Net Ecosystem Services Benefits of Blue Carbon: mangroves



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Climate Mitigation vs Habitat Protection

Cost competitiveness

Stacking

Restoration vs. Protection Mitigation?

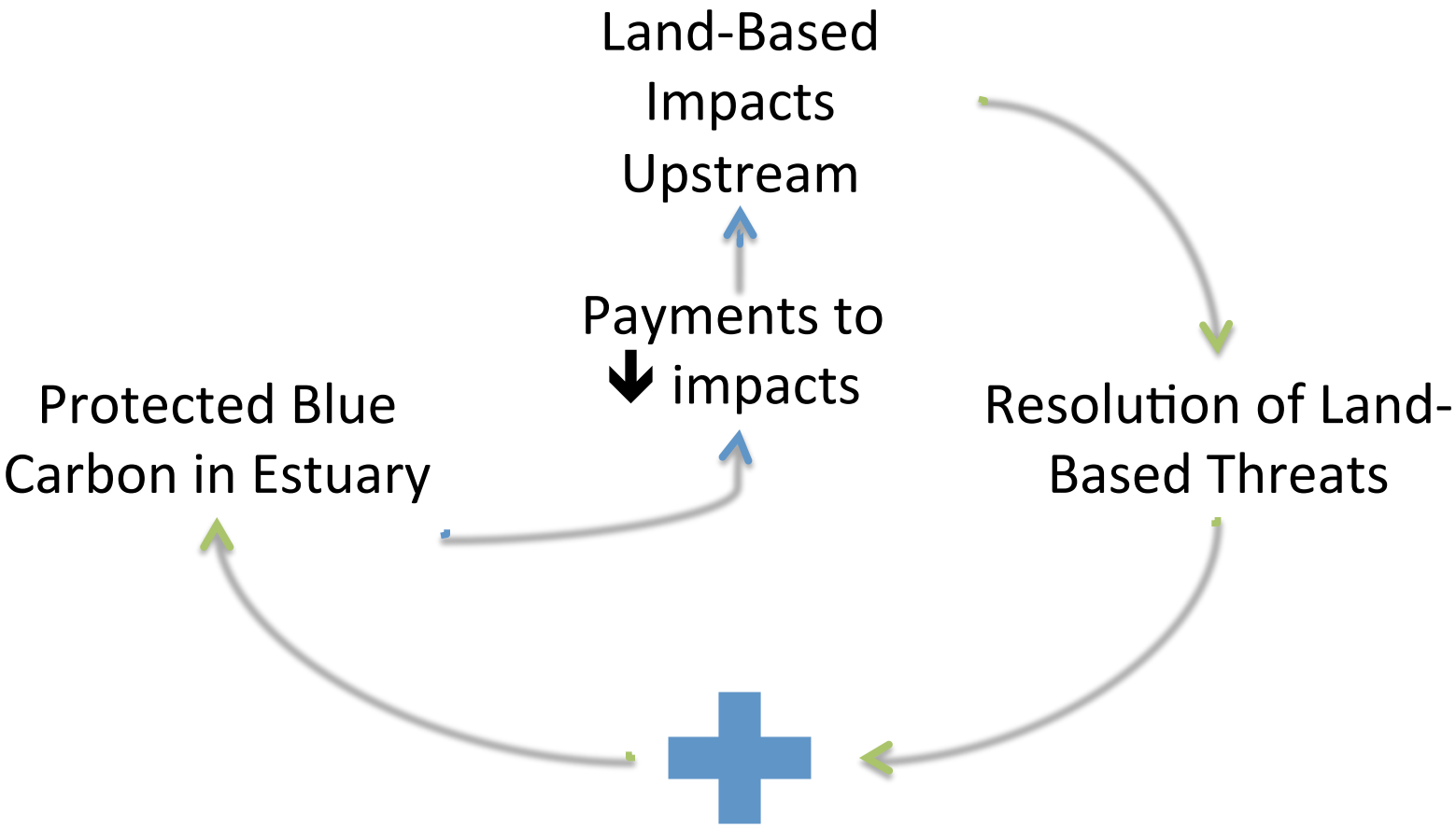
BC markets could catalyze other markets

Land-Based Impacts Upstream

Lost Blue Carbon Due to Upstream Sources (e.g. pollutants, nutrients)

Protected Blue Carbon in Estuary

Land-Based Threats



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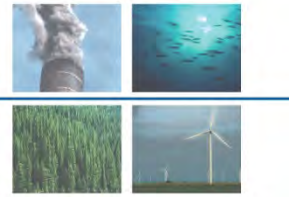
Will Environmental Markets Work for Coastal Carbon ?

Regine Lheritier,
Odon Wagner
Gallery



Will Environmental Markets Work for Coastal Carbon ?

- Sellers – produce environmental services for compensation at an agreed upon price and quantity

- Buyers – pay the seller for the environmental services.
  - Government – traditional payment programs (e.g., Conservation Reserve Program, USDA)

  - Private parties
    - Voluntary/stewardship/philanthropy
    - Industry sustainability/supply chain standards
    - To meet compliance obligations

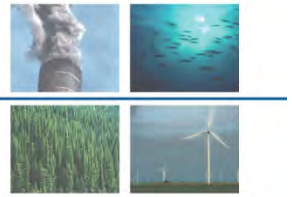
Markets for compliance obligation

- CAP
- TRADE
  - within the regulated sector
  - outside the regulated sector: offsets
- E.g. SO2/NOX trading, GHG cap-and-trade, nutrient trading,…
- Carbon (rich) …offsets

Tropical Forest Offsets

Reduced
Emissions from
Deforestation
Degradation
+ Carbon stock enhancement

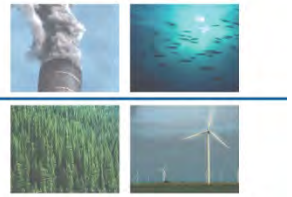
REDD+



Establishing Markets is Costly: REDD +

Planning and Institutional Capacity	$1.6 billion
Pilots and Projects	$234 million
Verified Emissions Reductions	~ $97 million in credits sold

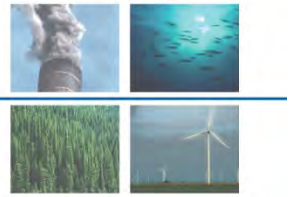
Voluntary Markets



Beyond Markets

Federal Regulations

- National Environmental Protection Act
- Clean Water Act (Mitigation)
- Endangered Species Act
- Natural Resources Damage Assessment



Take Home

- Societal value > financial value
- Payments of blue carbon → conservation
- Polluters pay for habitat protection
- Value of protection >> Value of restoration
- Policy and financial challenges remain
- Upstream land impacts may be important

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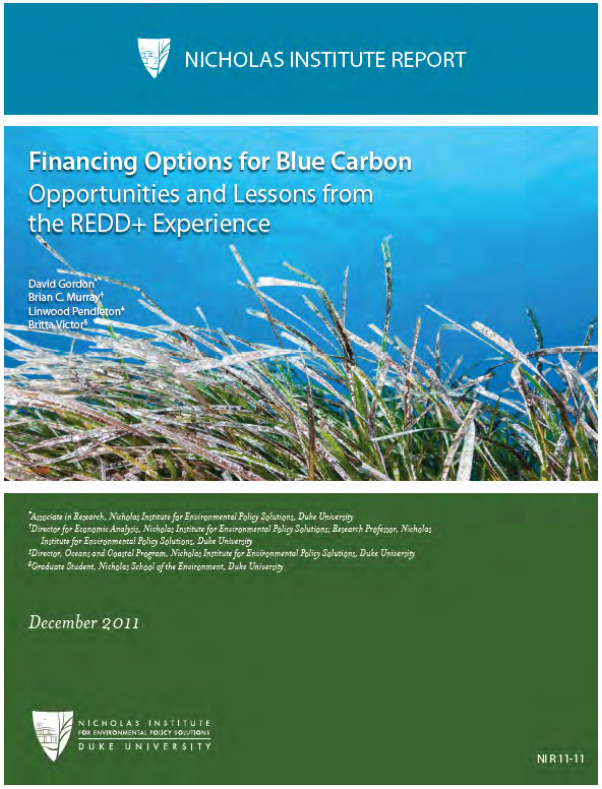
Keep Up With Blue Carbon Policy



http://nicholasinstitute.duke.edu/oceans/bluecarbon