



Economics of Coastal Blue Carbon

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The Blue Carbon Story





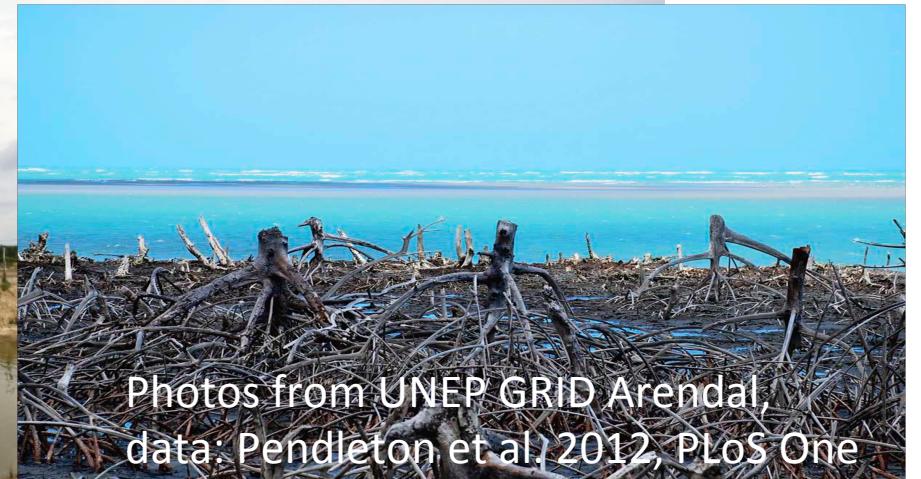
Soil Carbon Loss from Habitat Change

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)		

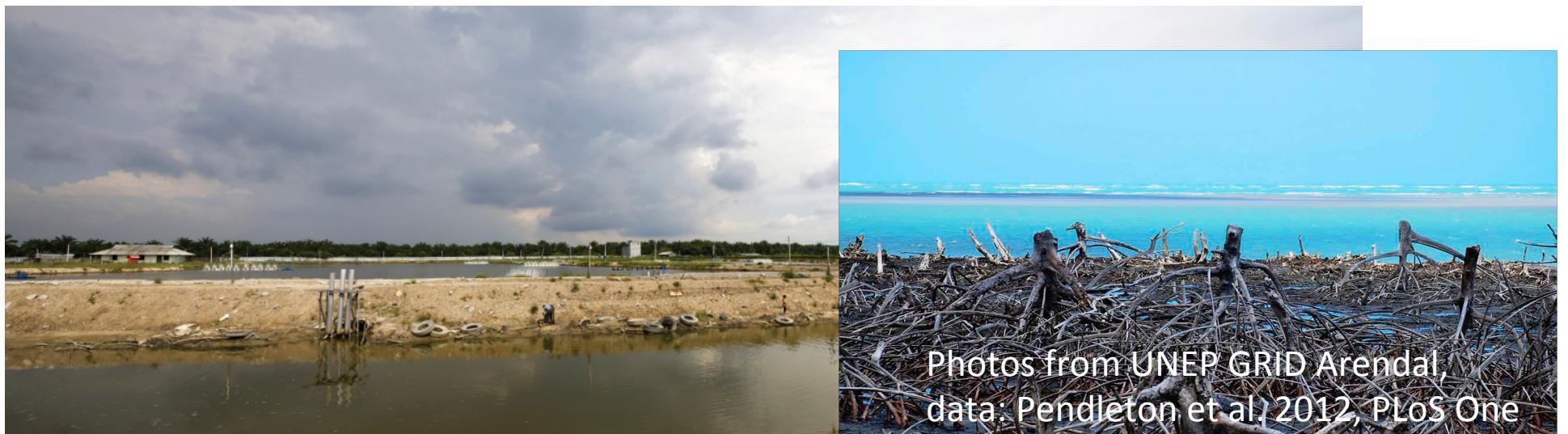


Ecosystem	Carbon emissions (Pg CO ₂ yr ⁻¹)	Economic cost (Billion US\$ yr ⁻¹)
Tidal Marsh	0.02 – 0.24 (0.06)	0.64 – 9.7 (2.6)
Mangroves	0.09 – 0.45 (0.24)	3.6 – 18.5 (9.8)
Seagrass	0.05 – 0.33 (0.15)	1.9 – 13.7 (6.1)
Total	0.15 – 1.02 (0.45)	6.1 – 41.9 (18.5)



Carbon Loss from Habitat Change

- 25-50% habitat loss over last 50 years (McLeod et al. 2011)
- 150m to 1 billion mt CO₂e /yr
- 4-20% annual emissions deforestation



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



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Price vs. Value



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Social Cost of Carbon



Social Cost of Carbon

Year	Discount Rate		
	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



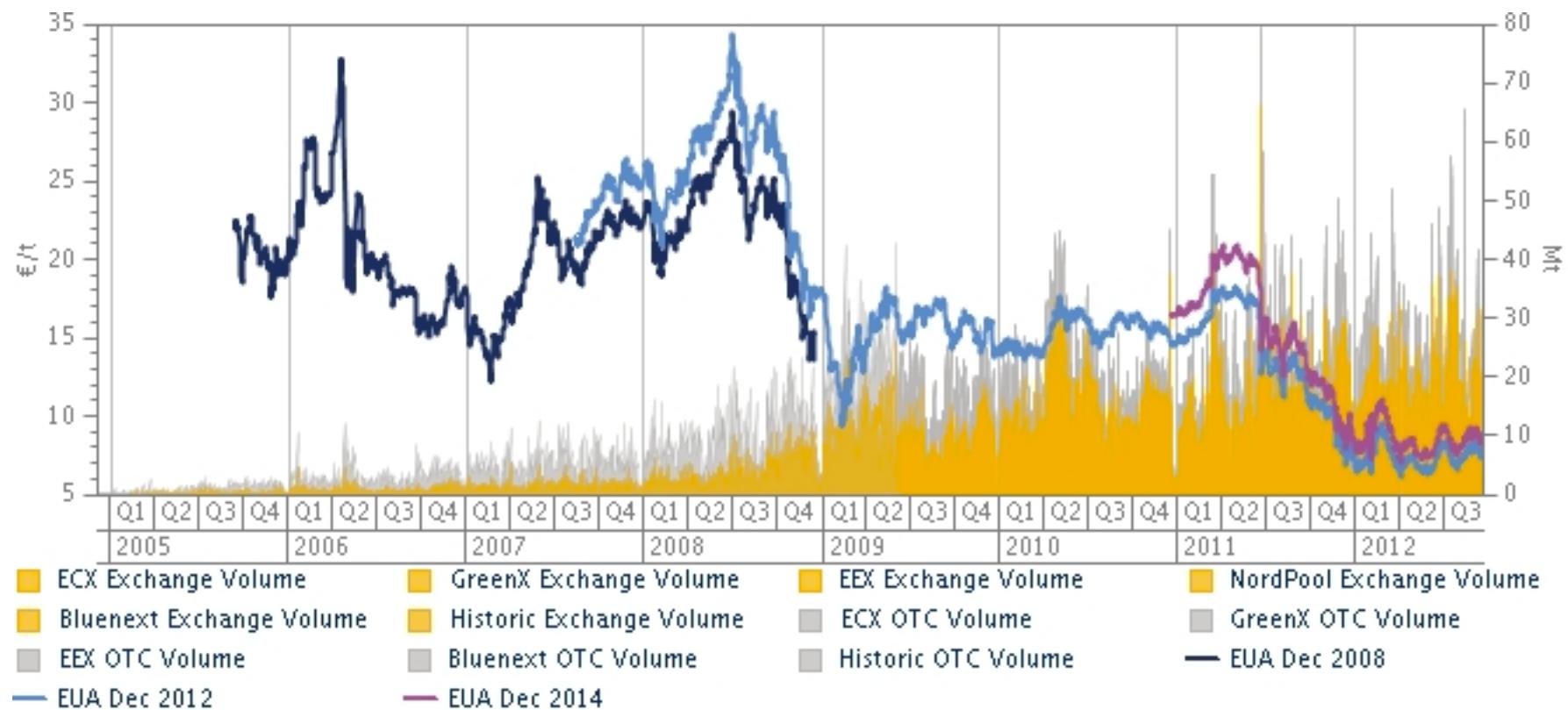
SOCIAL COST OF HABITAT DESTRUCTION =

\$US 6-42 billion/yr



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

Oscar Wilde, Picture of Dorian Gray





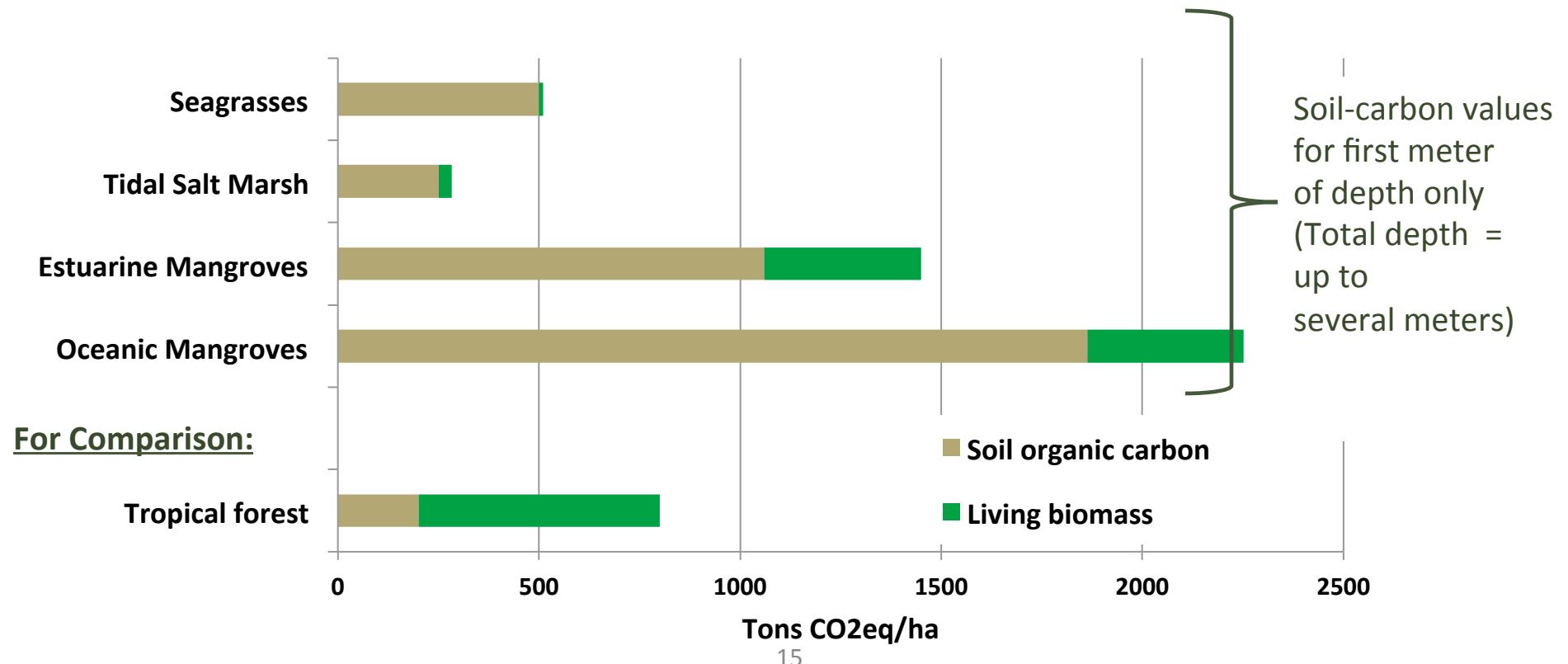
CO₂ Loss

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

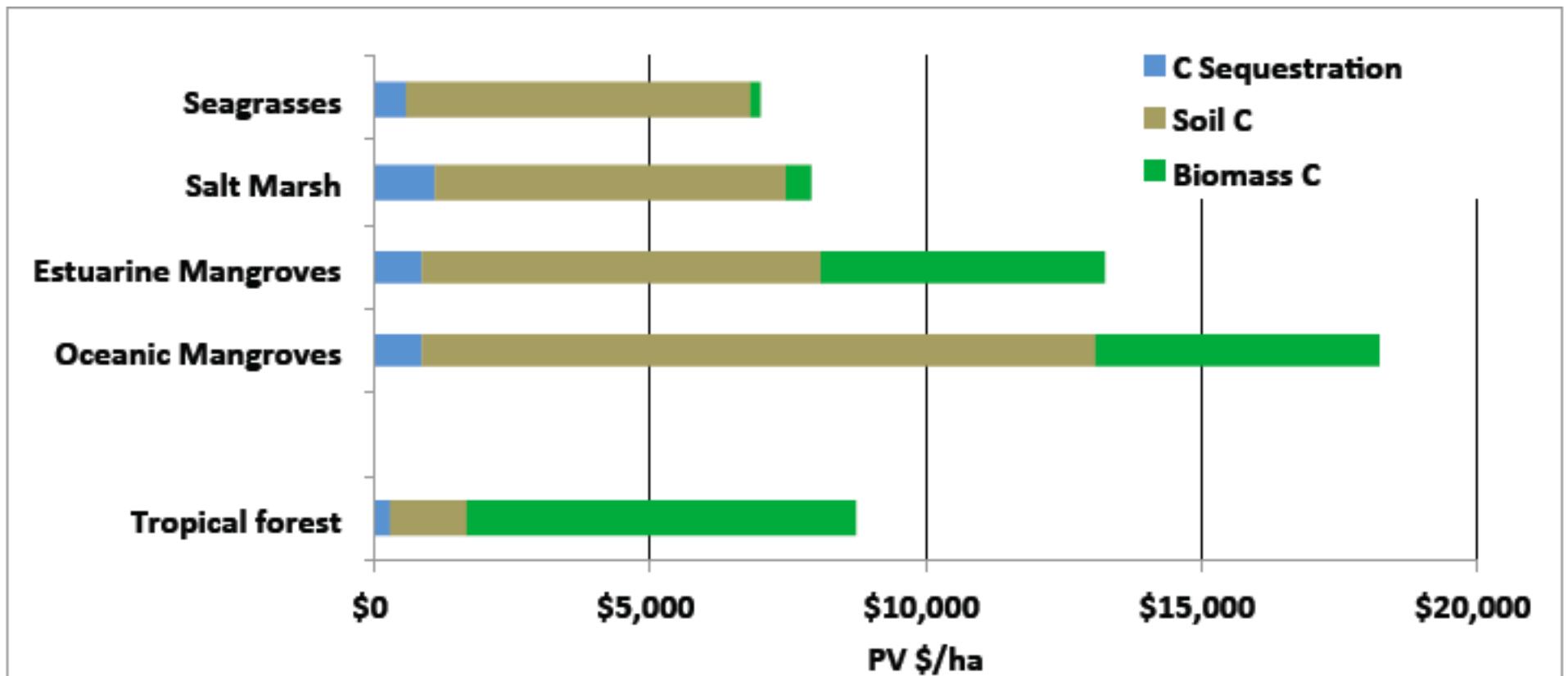


...Coastal Habitat Protects Massive Amounts of Carbon





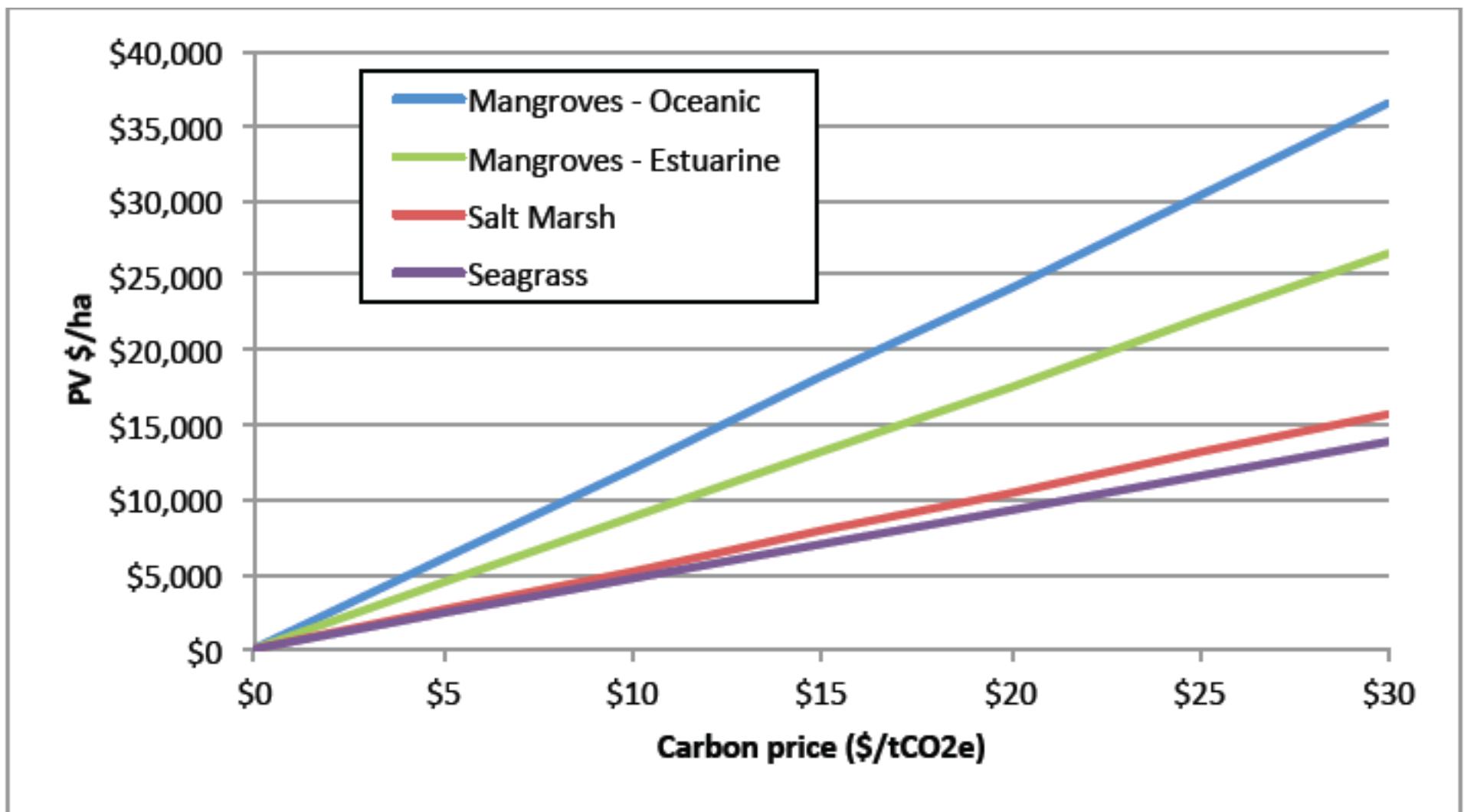
Potential Carbon-Credit Values



Source: Authors:



Gross Financial Returns



Source: Authors.



CREDIT?

Additionality

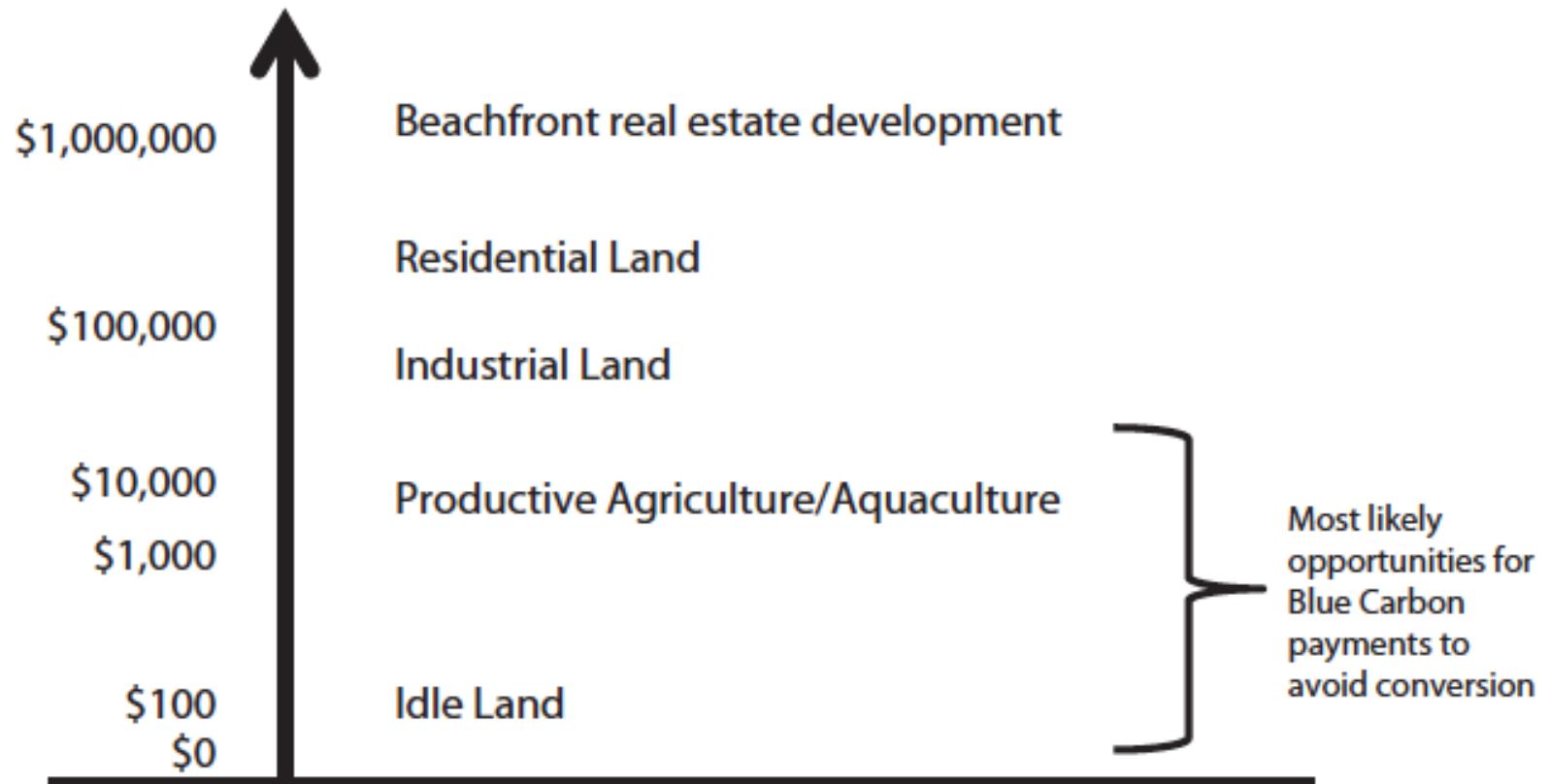
What Do You Have to Do to
Protect Carbon



Opportunity Cost

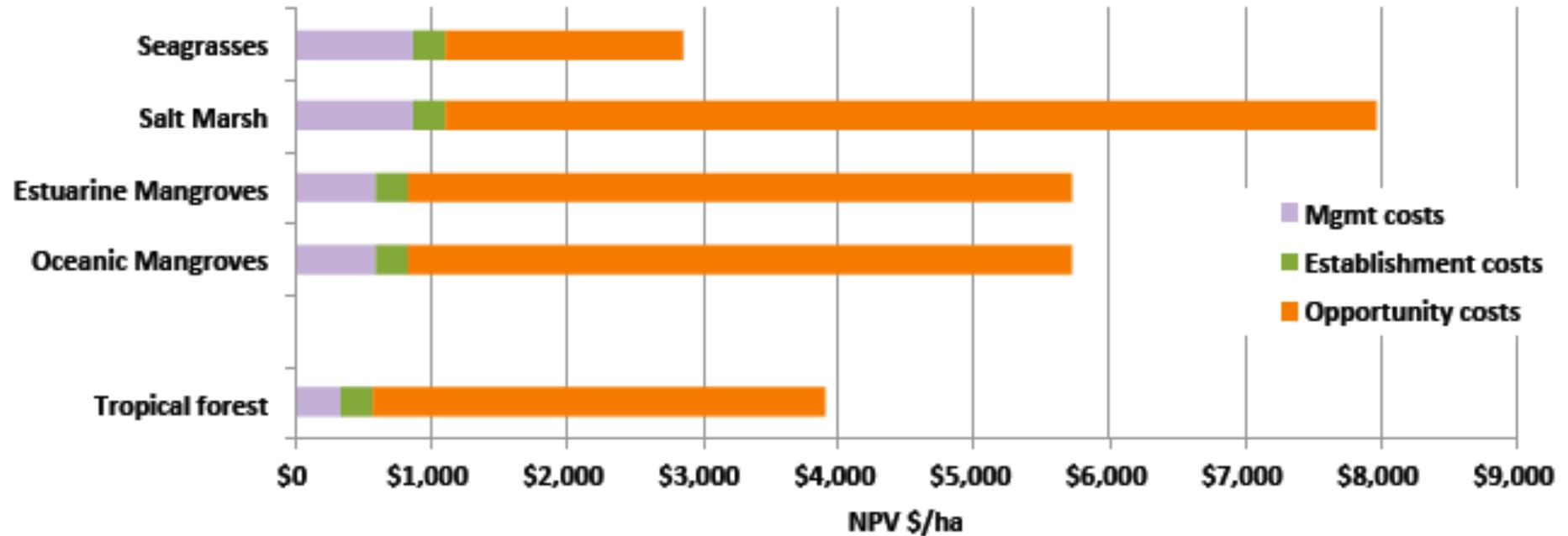
Land Rent Differentials

Representative Land Values (\$US/ha)*



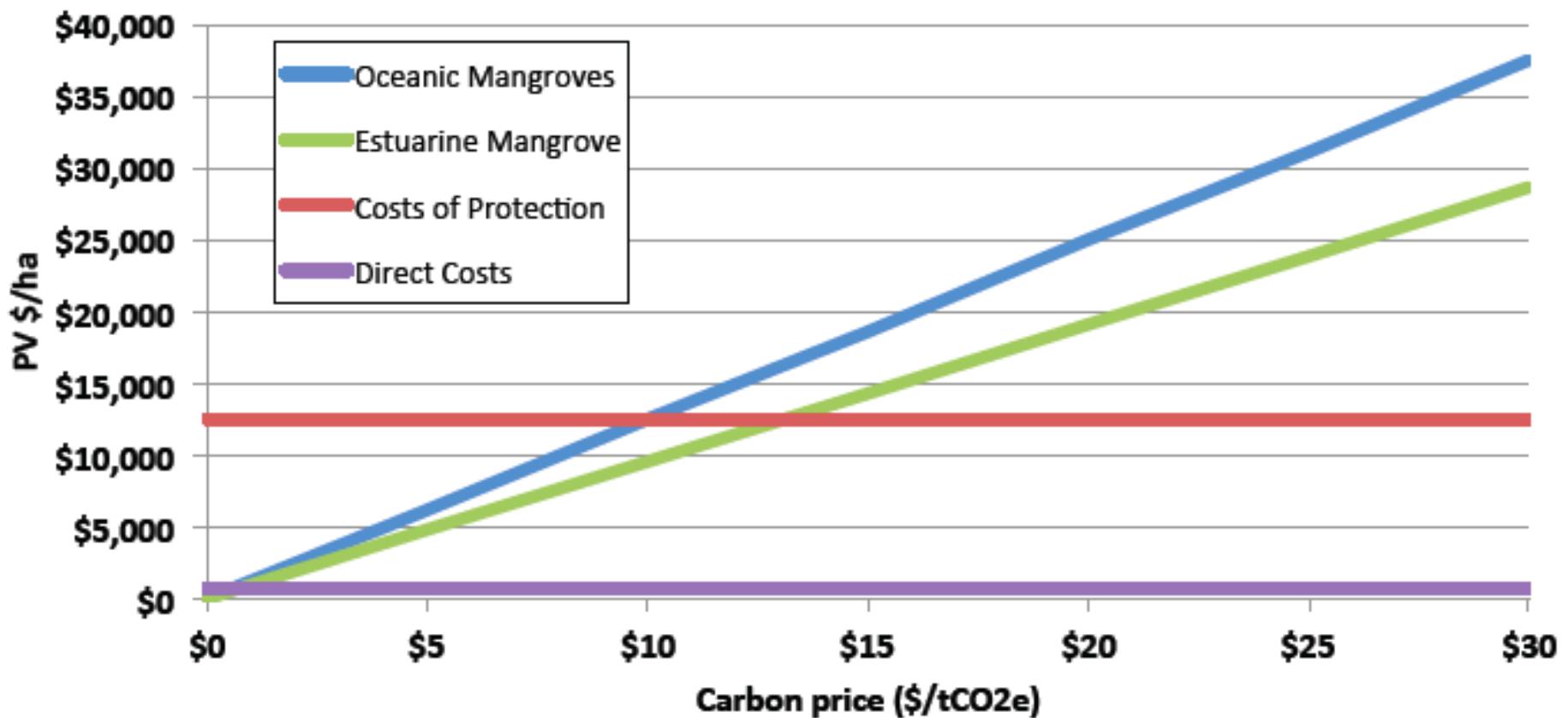


Cost of Protection



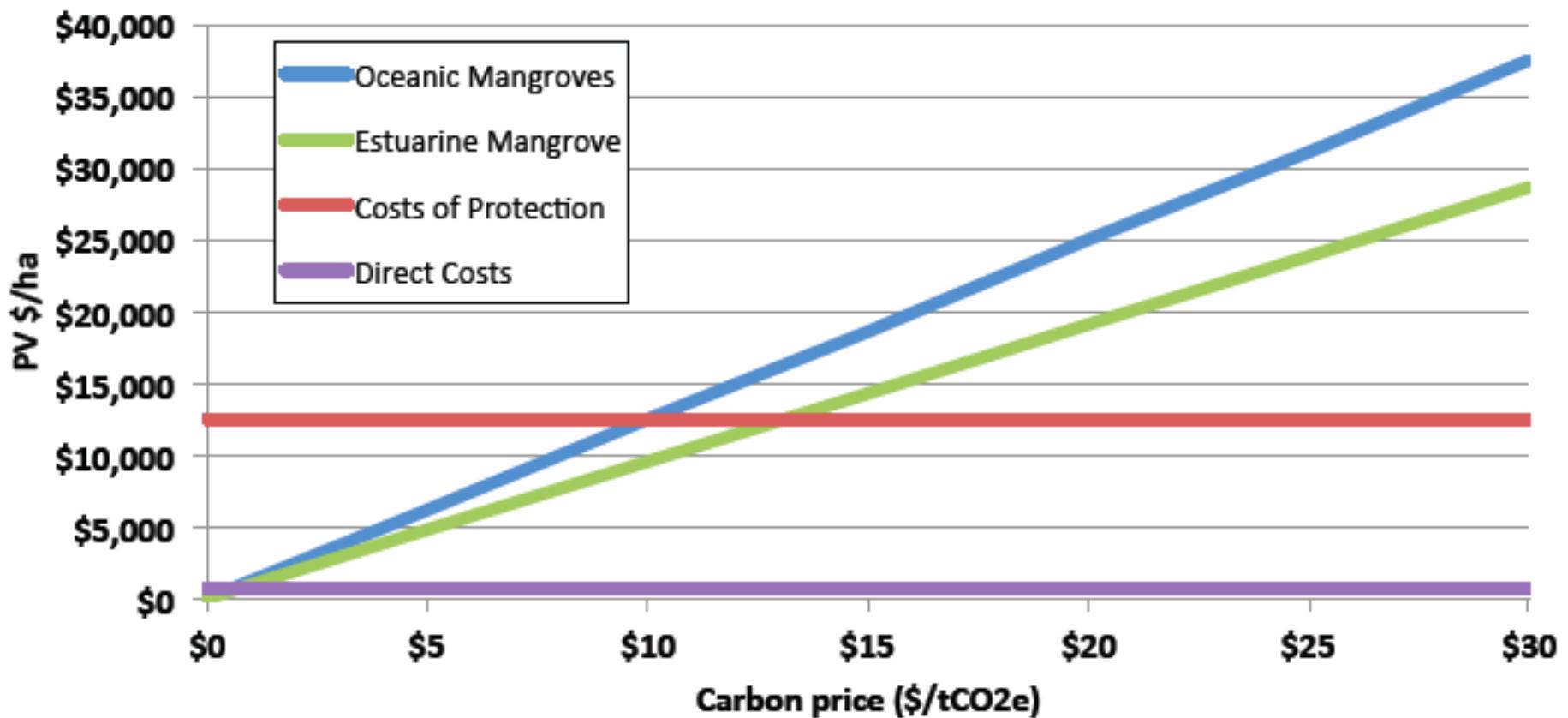


Net Revenue of Blue Carbon: mangroves



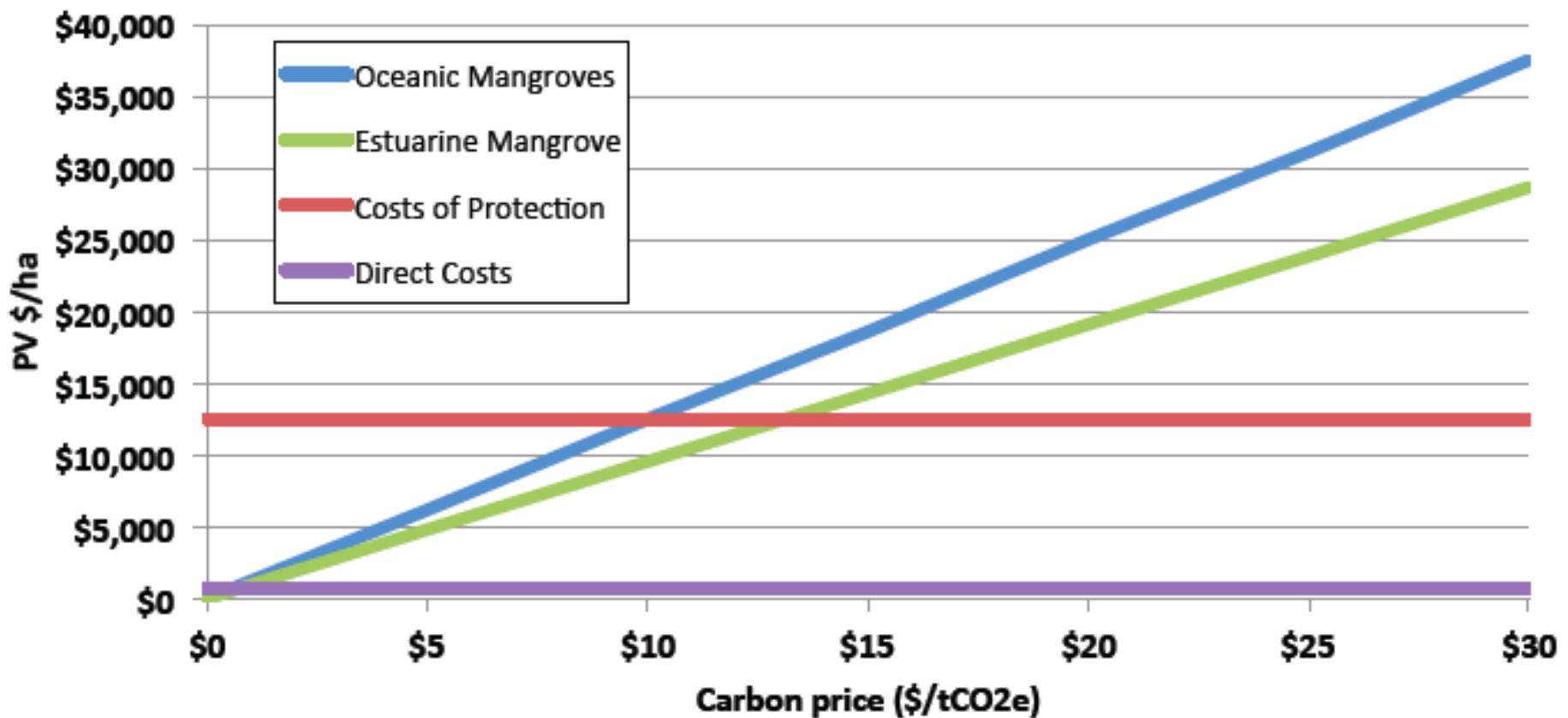


Net Carbon Benefits of Blue Carbon: mangroves





Net Ecosystem Services Benefits of Blue Carbon: mangroves





Climate Mitigation vs Habitat Protection

Cost competitiveness

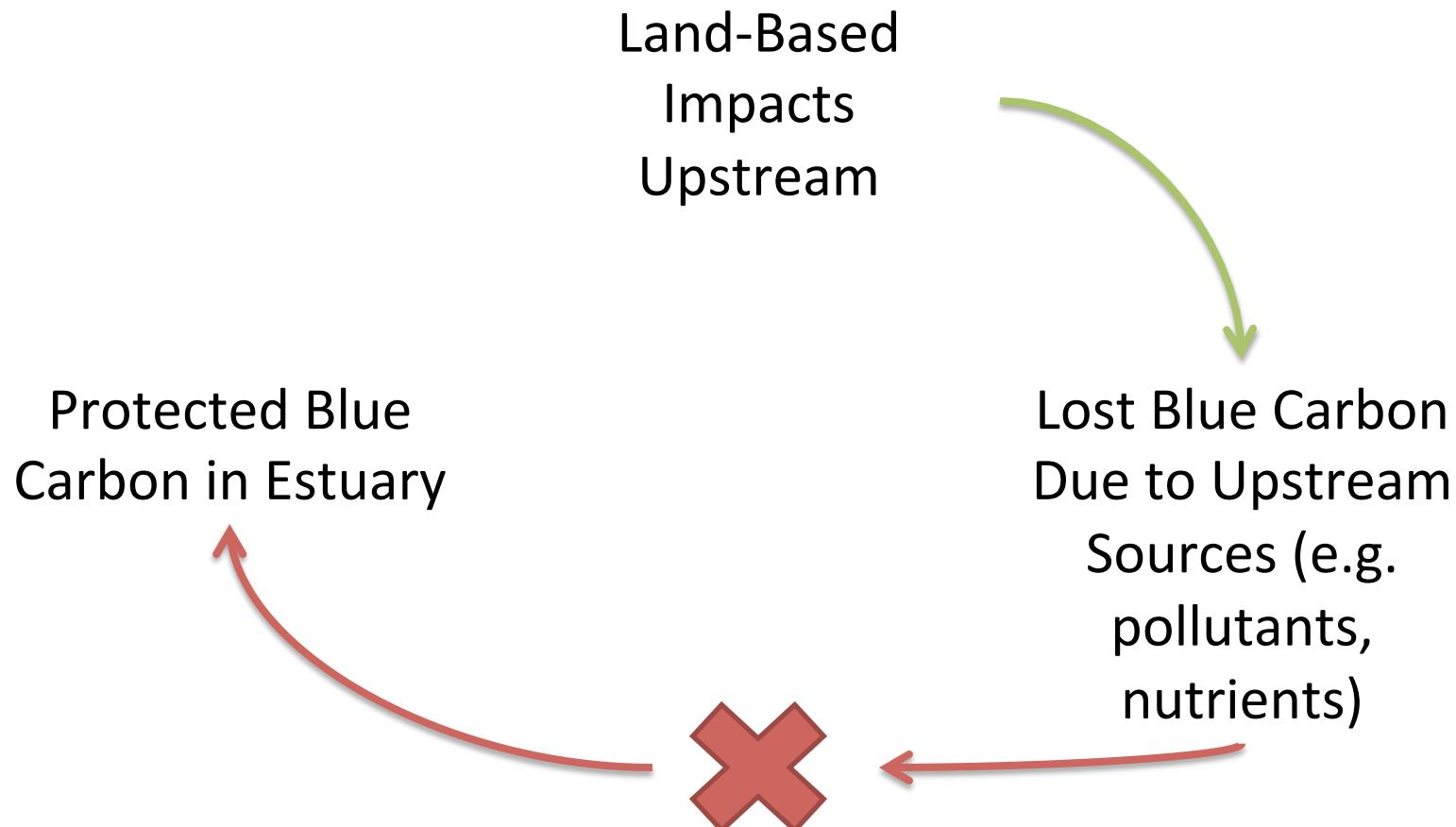
Stacking



Restoration vs. Protection Mitigation?

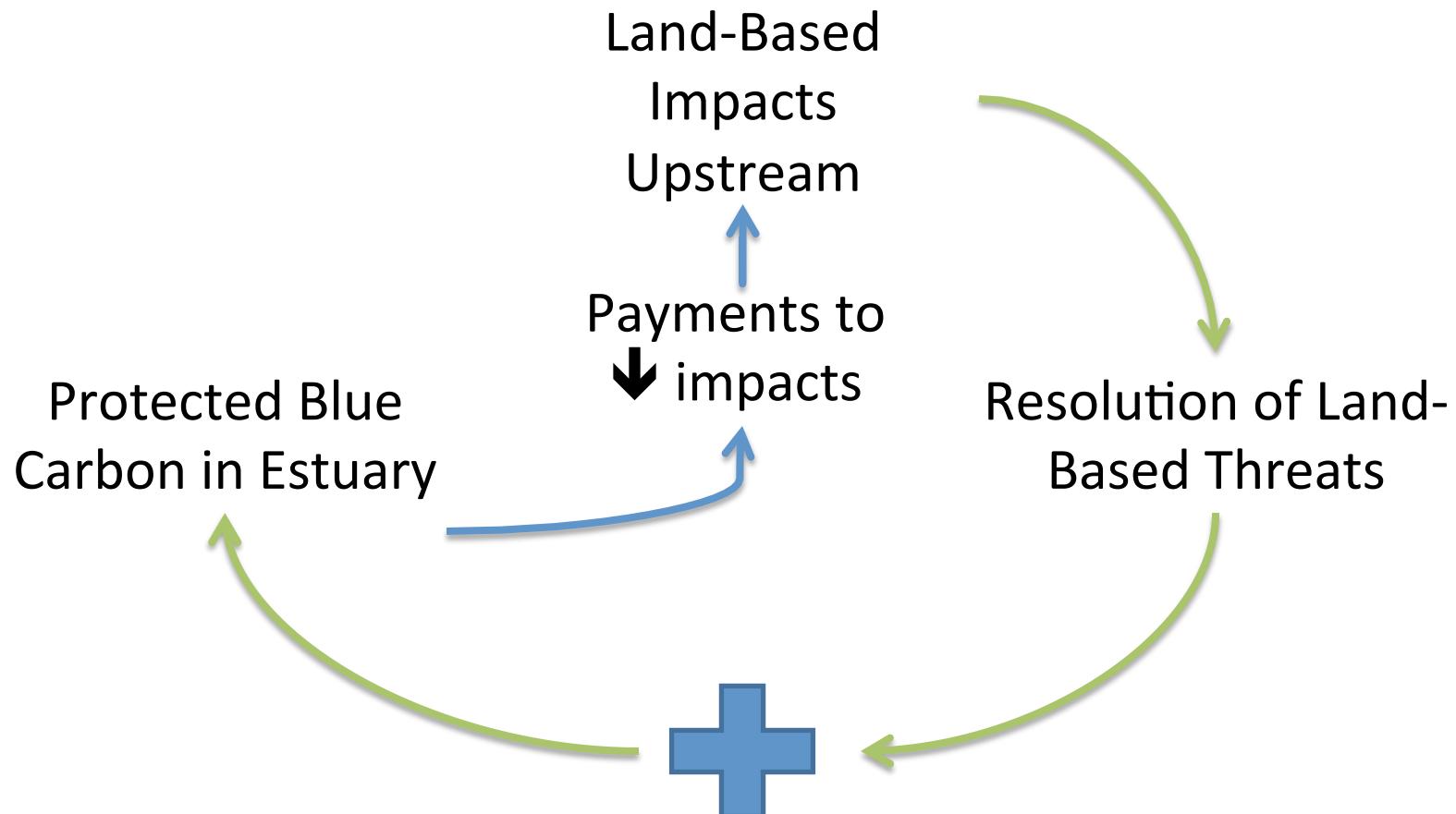


BC markets could catalyze other markets





Land-Based Threats





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/NO_X 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



Keep Up With Blue Carbon Policy

 NICHOLAS INSTITUTE REPORT

Green Payments for Blue Carbon
Economic Incentives for Protecting Threatened Coastal Habitats

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NIR11-04

 NICHOLAS INSTITUTE REPORT

Financing Options for Blue Carbon
Opportunities and Lessons from the REDD+ Experience

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December 2011

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 NICHOLAS INSTITUTE REPORT

State of the Science on Coastal Blue Carbon
A Summary for Policy Makers

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May 2011

NIR11-06

[http://nicholasinstitute.duke.edu/oceans/
bluecarbon](http://nicholasinstitute.duke.edu/oceans/bluecarbon)