

# The economics of marine biodiversity conservation

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# Key points

- Protecting and enhancing marine biodiversity generates economic benefits, even if these are not measured by markets
- Variety of approaches
- Much experience now of applying these approaches in multiple contexts: deep sea, coastal, coral reefs...
- Persuasive evidence in policy making?

## Protecting and enhancing marine biodiversity generates economic benefits, even if these are not measured by markets

- Biodiversity conservation is associated with increases in well-being
- We can estimate the utility value of these increases, using conventional economic idea of willingness to pay
- Biodiversity also has key role in maintaining ecosystem function and thus the flow of beneficial ecosystem services → value as part of natural capital, a component of any country's comprehensive wealth

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  - Most of these economic values (direct, indirect) do not get recorded in market prices, due to market failure/missing markets.
- Inadequate incentives for firms to take them into account in the investment planning and resource management.

# Empirical approaches to estimating economic benefits of biodiversity conservation

- Direct impacts on utility: stated and revealed preferences
  - *Stated preferences*: choice modelling and contingent valuation
  - *Revealed preferences*: recreational demand modelling
  - Indirect effects: production function approaches
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- How to (correctly) price changes in natural capital

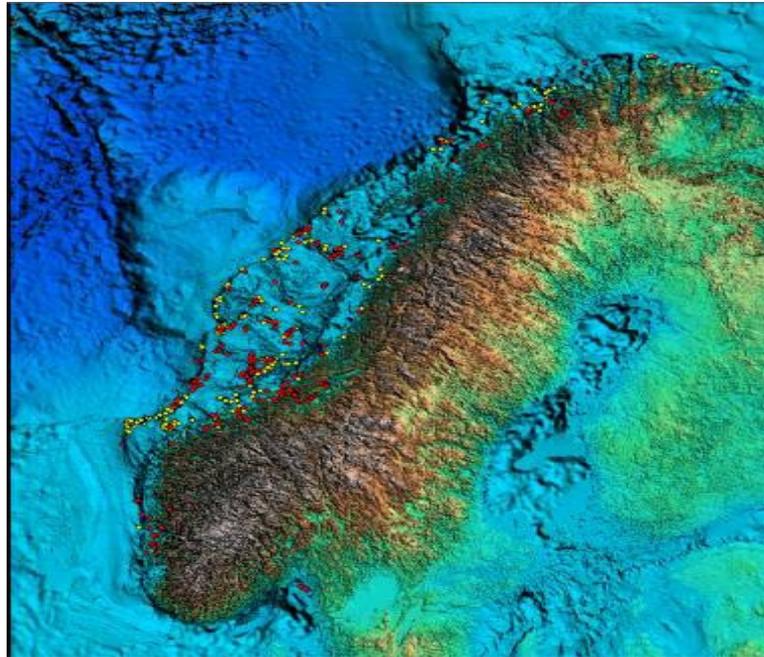
Much experience now of applying these approaches in  
*multiple contexts:*

...deep sea

...coastal

...coral reefs

# protecting cold water corals off the coast of Norway



Figur 1 Gule prikker er korallrev som er rapportert av fiskere og andre, røde prikker er verifiserte forekomster av KK langs norskekysten per 2004 (Havforskningsinstituttet, hentet fra MD sin hjemmeside)

- CWC are biodiversity hotspots
- A choice experiment with Norwegian voters
- Preferences for area of CWC protected, whether area was used for fisheries or oil/gas exploration, and how important it was as a habitat for fish
- Trade these off against the costs of establishing, monitoring and policing these protected areas

Aanesen M., Claire Armstrong, Mikolaj Czajkowski, Jannike Falk-Petersen, Nick Hanley and Ståle Navrud (2015) Willingness to pay for unfamiliar public goods: Preserving cold-water corals in Norway. *Ecological Economics*. Volume 112, Pages 53-67

# Reducing plastics pollution around Svarlbard, Norway

Abate et al, Ecological Economics, 2021

Contingent valuation study of Norwegian households

Programme to reduce plastics deposited on beaches, **impacts on mammals, impacts on birds** and impacts on microplastics

Median WTP for the plastics reduction programme was \$642 US per hsl d per year

Much higher value than “comparable” studies: analysis showed that WTP was increased due to special ecological status of Svarlbard and the high profile of marine plastics pollution

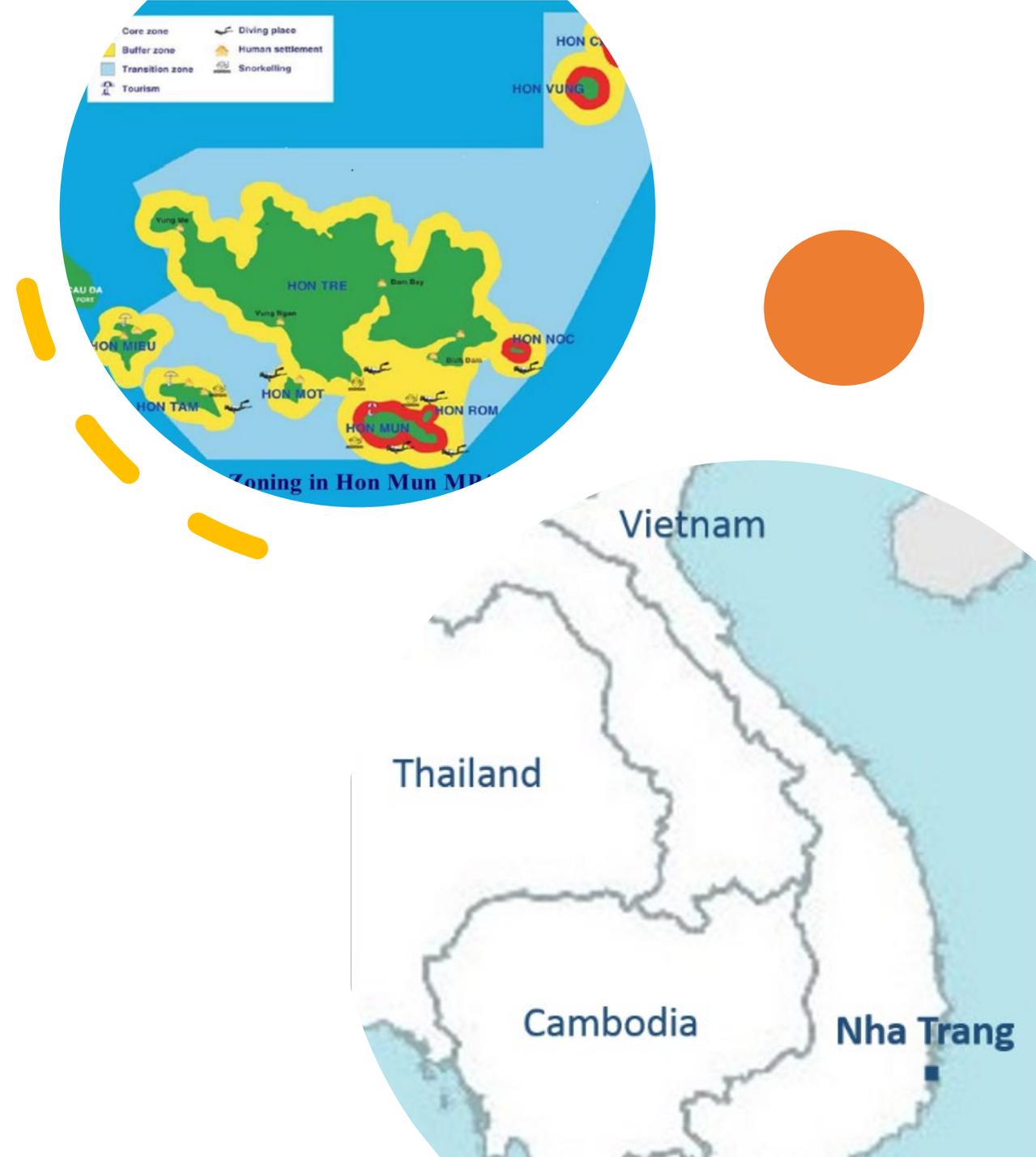


Fig. 1. Map showing the location of Svalbard.

# Public preferences for marine conservation measures in Nha Trang bay, Vietnam

- Again, a stated preference choice experiment

Borger T, Hanley N, Campbell D, Kuhfuss L (2020)  
“Preferences for coastal and marine conservation in Vietnam “ *Ecological Economics*, 180, 106885



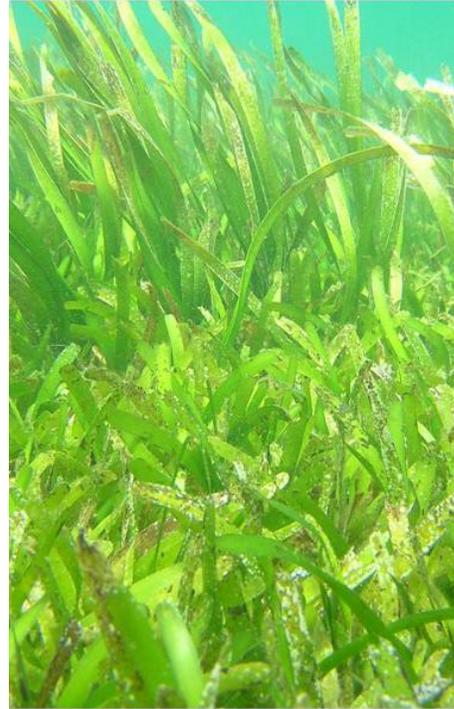
# Context

- High level of marine biodiversity
- But many stressors:

Sewage waste water from households (Nha Trang: 500,000 inhabitants)

Aquaculture: pollution from feed and fertilizer

Plastics waste in water and on beaches



## **Focus on proposed changes to the environmental management of Nha Trang Bay:**

- Better treatment of municipal waste water.
- More stringent regulations for aquaculture operators
- Improve the protection of coral reefs and seagrass which filter the water
- More regular collection of plastic waste
- Reduce the use of plastic bags in the city

# Example of choice card

Description	Current status "No change"	Management Plan A	Management Plan B
Water quality 	No change	Large improvement	No change
Coral cover 	Coral cover 20%	Coral cover 30%	Coral cover 50%
Plastic waste 	No change	Regular waste collection and filtering	Limit use of plastic bags
Additional water fee 	VND 0 for your household per month	VND 15.000 for your household per month	VND 5.000 for your household per month
I prefer <input checked="" type="checkbox"/> 	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

6 choice-cards per respondent, 2 blocks

*Mean WTP estimates*

	MNL	MXL	IA-MXL
ASC	-27.66	-47.95	2.29
WATER1	9.08	11.08	10.76
CORAL30	8.12	7.57	7.20
CORAL50	6.41	6.38	9.19
WASTE_COLLECT	10.06	15.91	16.21
LIMIT_BAGS	8.97	13.66	12.82

Notes: In 1,000 VND (0.033 GBP)

“Water” is improvement in coastal water Q; “coral” is improvement in coral cover; “waste” and “limit” address plastics pollution to bay

- Results showed that highest benefits to local people were for reductions in plastic pollution in the bay, followed by improvements in water quality and improvements in coral cover.

# Roberts et al, 2017

- Are divers in the Caribbean willing to pay to reduce damages to coral reefs?
- Here the damage comes from terrestrial over-grazing

Roberts, MH, Hanley, N & Cresswell, WRL 2017,  
'User fees across ecosystem boundaries: Are SCUBA  
divers willing to pay for terrestrial biodiversity  
conservation?' *Journal of Environmental Management*



# This is the problem



Soil run-off from land is one cause of reef health decline. On Bonaire this is increased due to grazing by introduced goats, donkeys and pigs.

Goats, donkeys and pigs were introduced to Bonaire by Spanish settlers, they are not native to the island. Grazing by these animals reduces plant numbers, meaning that there are fewer roots to hold the soil, and it is washed onto the reef.

Increased soil on the reef reduces the number of young corals. In time this will lead to reduced coral cover and fish diversity. Increased soil in the water also reduces visibility for divers.

# This is how we might solve the problem



One way to maintain the health of Bonaire's coral reef is therefore to reduce grazing. This could be done by:

- Restricting movements of grazing animals;
- Reducing the number of grazing animals on Bonaire;
- Restricting where goat farmers can graze their goats.

To maintain the reef requires funding. You already pay an annual nature (dive tag) fee of \$25 to STINAPA, which is used for the running of the Bonaire National Marine Park. This study is to find out if you would be willing to pay a higher fee in the future, to be used to reduce grazing. This fee would be collected at the same time as the current nature (dive tag) fee, but would be administered by a new non-governmental organisation. The fee would be guaranteed to be used for this purpose.

Bonaire is internationally renowned as a high quality SCUBA dive destination (SCUBA Diving Magazine, 2015). However, like coral reefs worldwide, the health of Bonaire's reef is declining over the long-term.

Studies carried out on Bonaire's reef by the University of Maine (Steneck and colleagues 2003-2013) have shown the number of young corals is falling, and the diversity of fish species is changing. This will reduce the quality of the coral reef for diving.



# This is the cause of the problem

<b>Grazer Management</b>
<b>Visibility</b> 75ft (25m) 
<b>Coral Cover</b> Over 75% 
<b>Fish Decline</b> 5% 
<b>Fee</b> \$55

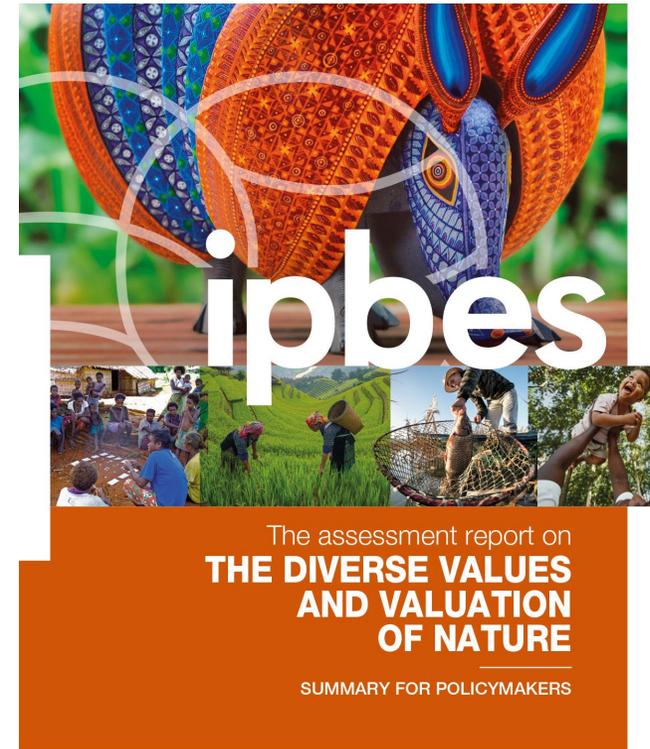
<b>Grazer Management</b>
<b>Visibility</b> 100ft (30m) 
<b>Coral Cover</b> Under 25% 
<b>Fish Decline</b> 35% 
<b>Fee</b> \$55

<b>No Management - current</b>
<b>Visibility</b> 25ft (8m) 
<b>Coral Cover</b> Under 25% 
<b>Fish Decline</b> 35% 
<b>Fee</b> \$25

➔ Our analysis showed that the benefit to divers of improved coral cover greatly exceeded the costs of a management plan to reduce sedimentation so as to improve coral health

# Persuasive evidence in policy making?

- High profile of IPBES reports
- Dasgupta review on economics of biodiversity
- Use of cost-benefit analysis to assess public policy and private sector investments in marine environments
- World Bank recommendations on *appropriately accounting for changes in natural capital*; recent US government moves in same direction (US Federal Register, 2022)



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