

# An introduction to key methods for economic analysis

# Outline

1. Getting started
1. Cost Effectiveness Analysis (CEA)
2. Cost-Benefit Analysis (CBA)
3. Social Return on Investment (SROI)

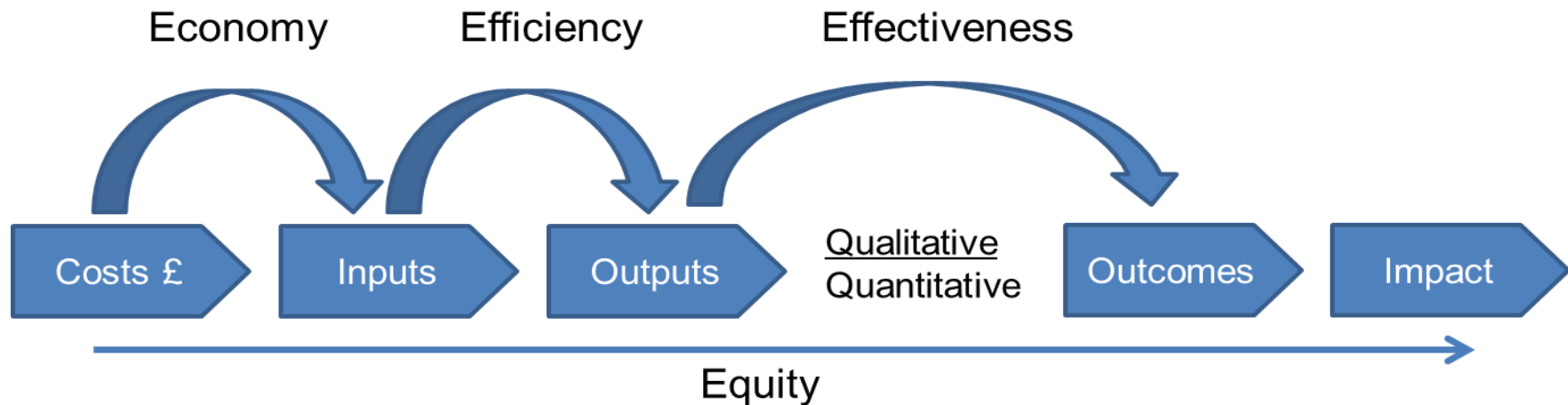
# 1. Getting started

## How “economic” analysis differs from “financial” analysis

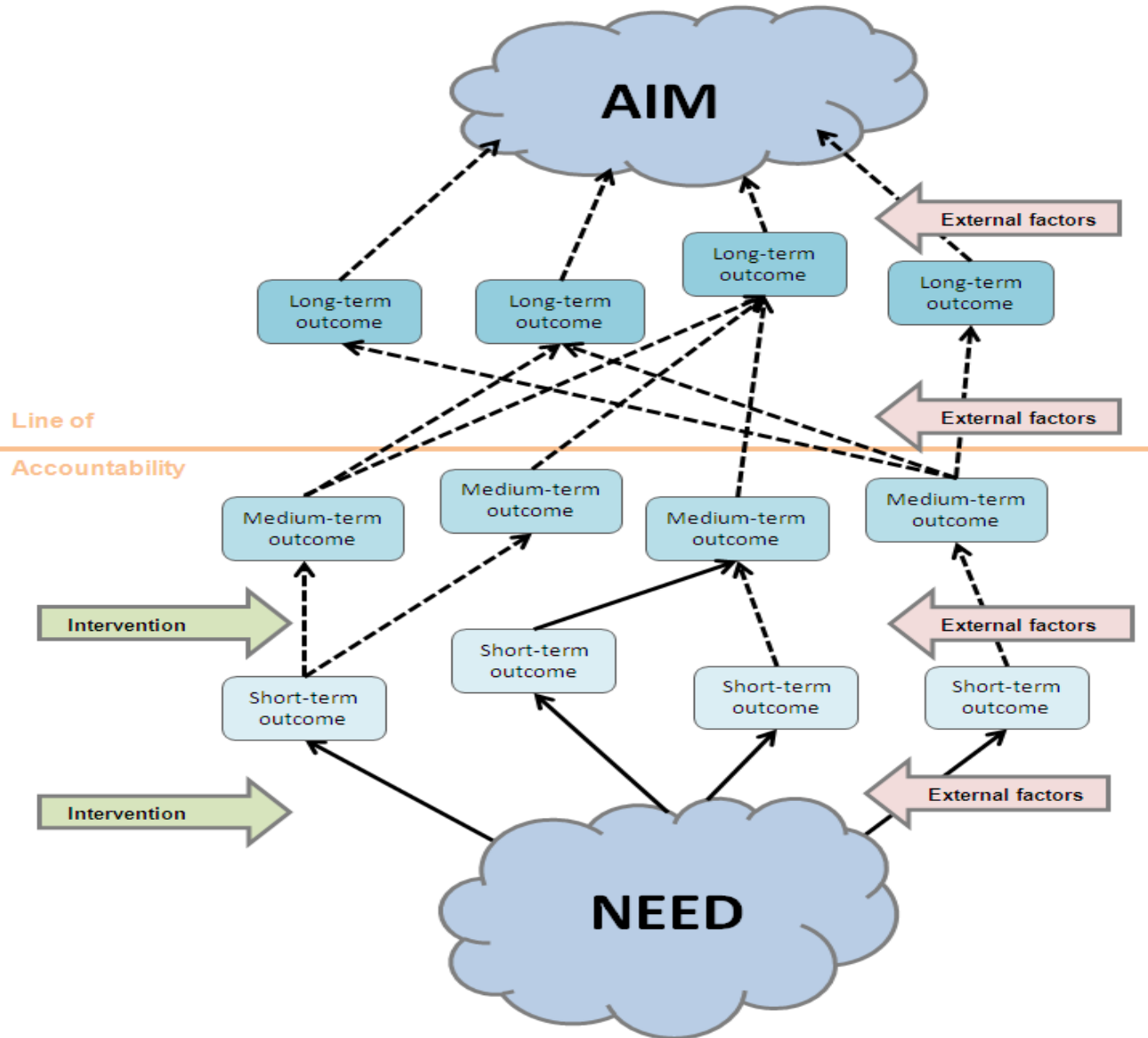
- ❑ A financial analysis looks at the private returns of an investment, whereas economic analysis aims to investigate broader returns for society as a whole.
- ❑ Private and social returns can be compatible in some circumstances – but they are not necessarily (remember externalities!)
- ❑ In other terms, the methodologies we will turn to focus on broader societal impacts rather than private impacts of an investment or policy decision.

Economic analysis can be restrictive or broad

Are we looking at how “cheap”, how “efficient” or how “effective” is a project/policy in driving change?



We first need to understand “what” changes: Mapping your outcomes



## 2. Cost Effectiveness Analysis

# Cost Effectiveness Analysis (CEA)

- ❑ CEA is a technocratic tool used to compare different alternatives (e.g. projects) aiming to achieve the same objectives (e.g. climate change mitigation).
- ❑ Its objective is to compare the cost of an intervention to **one** of its outcomes – e.g. average cost (\$) per Greenhouse Gas emission avoided (tCO<sub>2</sub>-eq).
- ❑ A CE ratio does not provide any self-standing information – it is only useful comparatively.



## CEA use - brief example

Example: What is the most effective way to reduce Greenhouse Gas Emissions?

Global Interventions	Average cost / tCO <sub>2</sub> -eq abated or avoided
Investment in rural Biogas plants	\$32
Investment in onshore Wind Farms	\$58
Investment in offshore Wind Farms	\$71
Investment in REDD (Reduced Emissions from Deforestation)	\$26
Investment in Biofuels	\$35

- Do these results tell us **anything useful** at all? What are their **implications** for policy-making?

# CEA process & application

We want to investigate different options for reducing shark depletion at a national level.

The objective of the analysis is to compare the costs of these different available options with their respective effectiveness.

Is CEA an appropriate tool? Why?

# CEA process & application

- **Let's look at ONE “flagship” outcome as an example.**

Increase in shark population (one can also select specific species which are particularly endangered for the sample)

- **Estimating the costs of each intervention:  
What type of costs? (\$ million)**

Years	1	2	3	4	TOTAL	TOTAL DISCOUNTED
Gear restrictions						
Anti-finning						
Closed areas (MPAs)						

# CEA process & application

## ➤ Estimate the net impact of each interventions on shark population

Net impact = impact minus **displacement** effects (number of sharks)

Years	1	2	3	4	TOTAL	TOTAL DISCOUNTED
Gear restrictions						
Anti-finning						
Closed areas (MPAs)						

What is displacement? Which can be these displacement effects?

What options are likely to have high displacement effects?

# CEA process & application

- **Discount the stream of costs and impacts for each policy option separately (example at 3% dr.)**

	Gear restrictions	Anti-fining	Closed Areas (MPAs)
Costs			
Shark population			
\$ per shark conserved / avoided loss			

# Assessing CEA

- What can an analysis of the sort tell us?
- What are its limits? What are the problems of not evidencing wider (multiple) outcomes?
- Can it be useful for charismatic “flagship” species?

## How can you use CEA?

- Any outcome metric is good for CEA as long as you have comparable data.
- Thinks of possible metrics: \$ per hectare protected; \$ per hectare of coral reef restored; \$ per mg of Nitrate per litre reduced.
- Overall, although it is a widely used tool in other areas of nature conservation it is not mainstreamed in marine economics

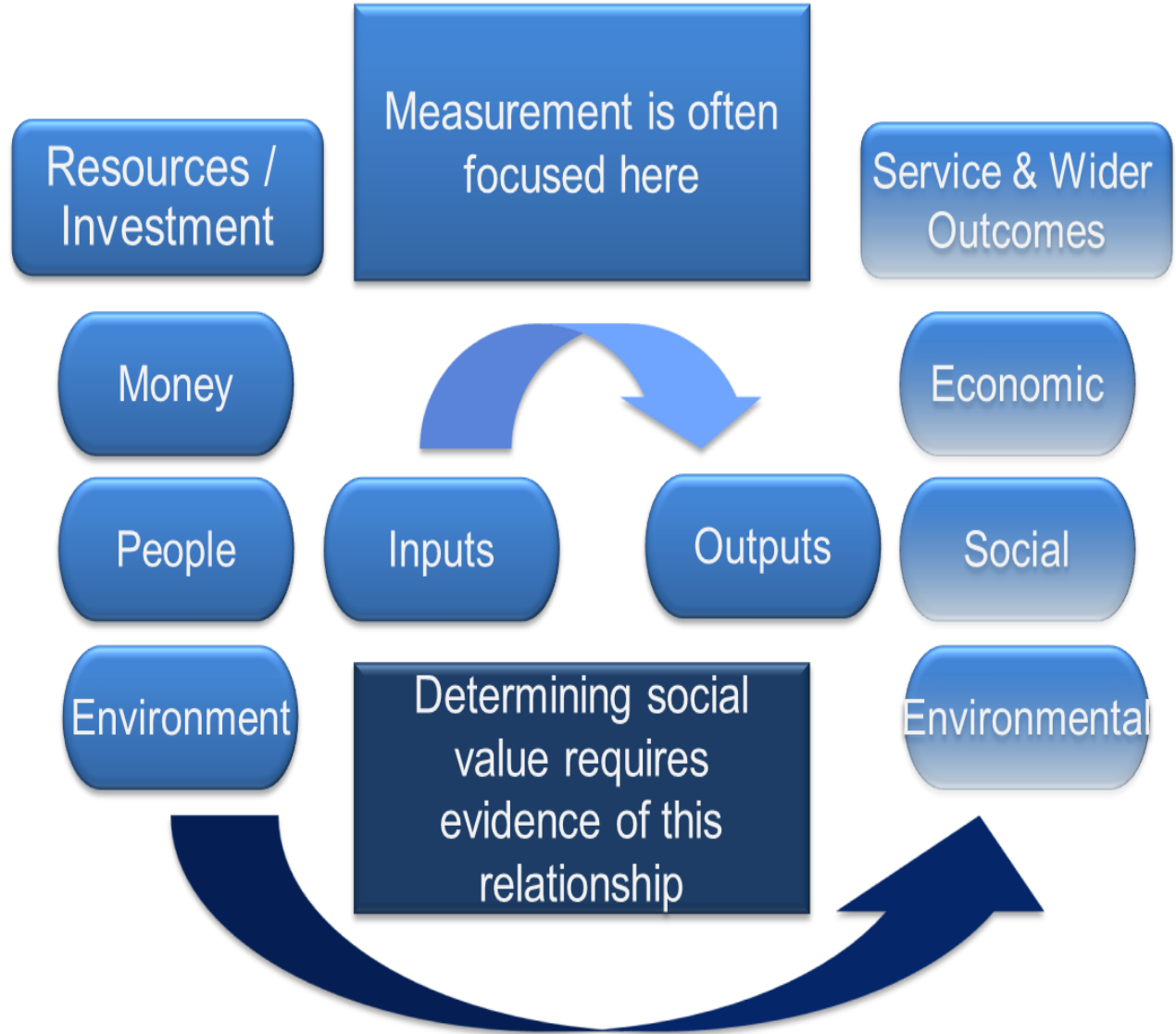
### **3. Social Cost Benefit Analysis (CBA) and Social Return on Investment (SROI)**



## Social CBA and SROI

- ❑ Cost-Benefit Analysis has originally been conceived a tool for financial analysis, comparing the costs of an investment to benefits (gains)...
- ❑ ...it has nonetheless been extended to reflect broader socio-economic and environmental benefits **AND** costs.
- ❑ Unlike CEA, CBA considers a range of impacts - not just one!
- ❑ **SROI** is an adjusted form of cost-benefit analysis and the methodological process is essentially the same – despite some differences. A good CBA would look like SROI

# A holistic approach



## Some key principles

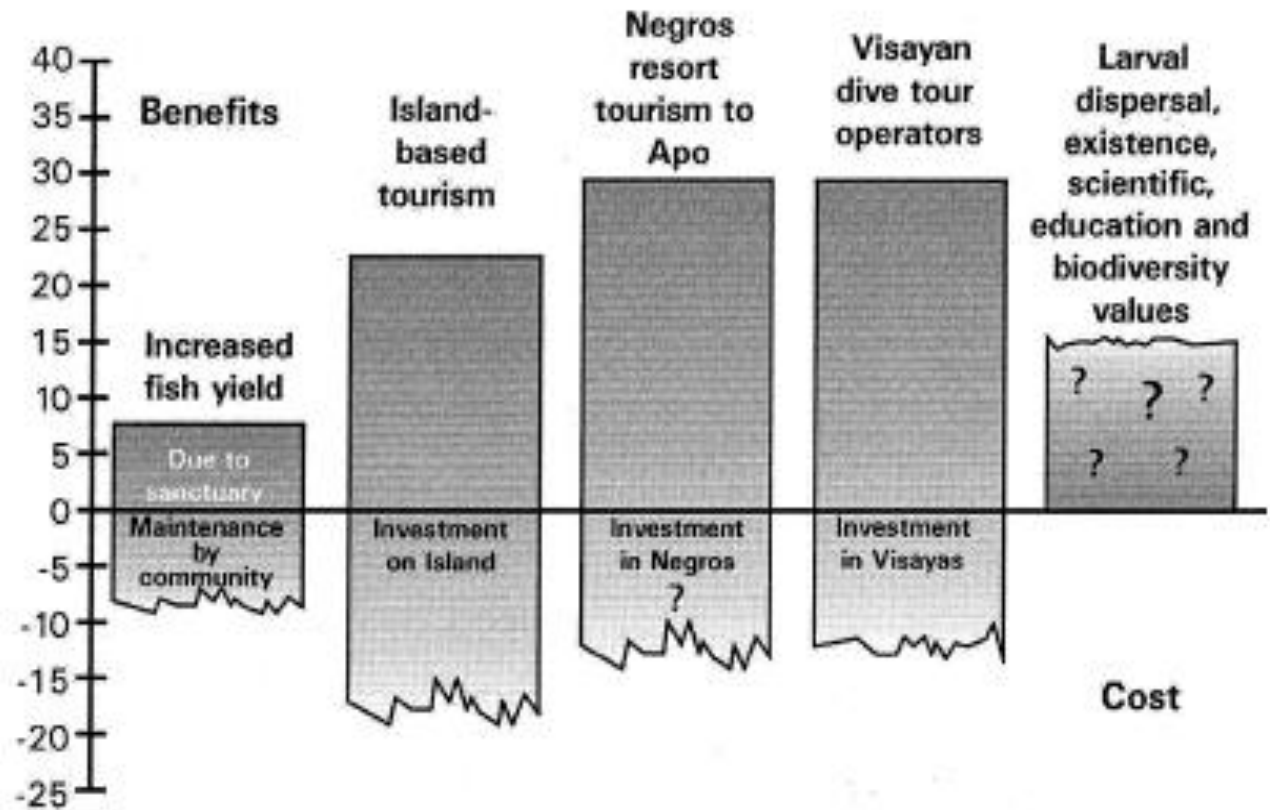
1. Involve Stakeholders
2. Understand what changes
3. Value the things that matter
4. Only include what is material
5. Do not over claim
6. Be transparent
7. Verify the result

## Stages

1. Use ToC to identify outcomes, stakeholder-based vs. top-down
  2. Data collection
    - Outcomes
    - Deadweight, attribution, displacement
    - Benefit period and drop off
    - Costs
  3. Model and calculate
    - Valuation of outcomes
  4. Report
-

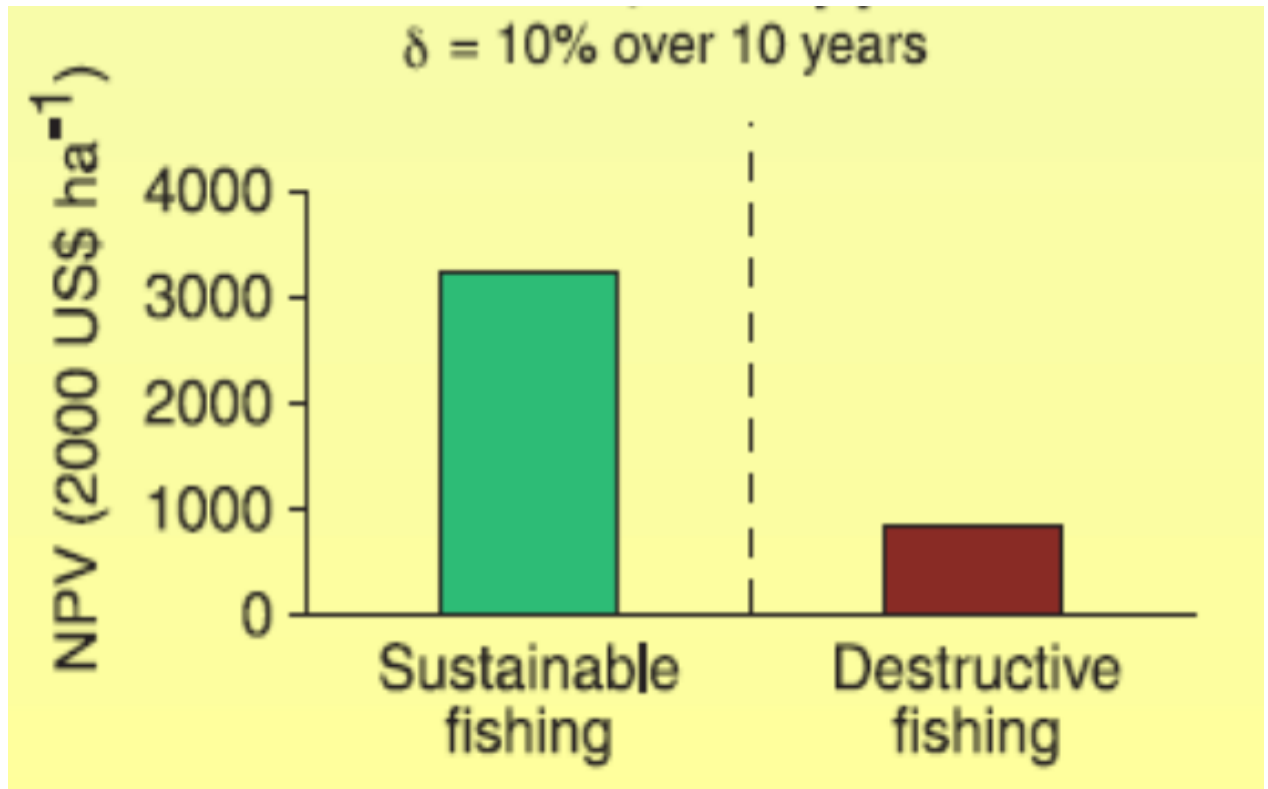
*CBA use -  
brief example  
(a)*

Example: Should we invest, or not, in sustainable fishing in the Philippines?



*CBA use -  
brief example  
(b)*

Like CEA, CBA can also be used comparatively, e.g. sustainable fishing versus destructive fishing.



## Worked example

**Appraisal context:** Developing a representative system of marine protected areas in South-West Australia

**Objective:** provide an estimation of the economic impacts of this system

**Method:** Cost-Benefit Analysis capturing wider (positive or negative) societal impacts in order to undertake an objective assessment of available options

## Mapping outcomes

### **Positive**

- Environmental & Resource benefits
- Spillovers to commercial fisheries
- Ecotourism direct benefits
- Bio-discovery?

### **Negative**

- Displacement of commercial fishing
- Displacement of recreational fishing
- Displacement of charter fishing
- Spillovers to local communities (e.g. fishery support services)



# Measuring change

Outcome	Outcome indicator	Amount of change
Environmental benefits	% increase of key marine species	5% to 10%
Spillovers to commercial fisheries	% increase in the Rock Lobster fishery	5%
Ecotourism direct benefits	% increase in ecotourism	50% to 100%
Displacement of commercial fishing	% reduction in economic rent	- 15%
Displacement of recreational fishing	% reduction in recreational catch	- 15%
Displacement of charter fishing	% reduction in industry profit	- 30% to 50%

# Valuing change

Outcome	Valuation approach	Value (\$) p.a.
Environmental benefits	WTP study estimates that respondents are willing to pay, on average, \$140 per year for a modest set of ecological improvements	22,000,000
Spillovers to commercial fisheries	Value of additional catch	2,400,000
Ecotourism direct benefits	Value of extra tourism revenue	5,000,000 to 10,000,000
Displacement of commercial fishing	Value of reduced fish catch (Lobster fishery = 8 million; other fishery = 1 million)	- 9,000,000
Displacement of recreational fishing	Value of reduced recreational catch, valued at \$10 per fish	- 1,800,000
Displacement of charter fishing	Value of reduced profits for industry	- 750,000 to - 1,200,000

# Environmental valuation

Ecological attribute	Annual values for improvements (\$/year)	
	Ningaloo	Ngari Capes
Increase in coral populations		
+ 5%	44	—
+ 10%	51	—
Increase in fish populations		
+ 5%	51	46
+ 10%	53	52
Increase in turtle populations		
+ 5%	8	—
+ 10%	19	—
Increase in whale shark population		
+ 2%	27	—
+ 5%	28	—
Increase in seagrass populations		
+ 5%	—	24
+ 10%	—	39
Increase in abalone populations		
+ 5%	—	13
+ 10%	—	27
Decrease in whale collisions		
- 25%	—	23
- 50%	—	55

Source: McCartney (2009)

# Comparing costs and benefits

A positive NPV = Net benefits after discounting  
 A Benefit : Cost ratio > 1 = positive return

<b>Net Present Value (PV Cost – PV benefits) at 3.5% Dr</b>	<b>\$144 million</b>
<b>Benefit : Cost ratio</b>	<b>2.45</b>

Year	1	2	3	4	5	6	7	8	9	10	TOTAL
Benefits	29,400,000	29,400,000	29,400,000	29,400,000	29,400,000	29,400,000	29,400,000	29,400,000	29,400,000	29,400,000	294,000,000
Financial costs	3,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	21,000,000
Non-financial costs	12,000,000	12,000,000	12,000,000	12,000,000	12,000,000	12,000,000	12,000,000	12,000,000	12,000,000	12,000,000	120,000,000
Total costs	15,000,000	14,000,000	14,000,000	14,000,000	14,000,000	14,000,000	14,000,000	14,000,000	14,000,000	14,000,000	141,000,000

## Assessing the analysis

- What are its strengths?
- What are its weaknesses?
- Which issues have been left out of the equation? (materiality check)
- Which methodological steps are followed appropriately and which ones are not? Are results sensitive to assumptions?
- What conclusions can we draw out of this study?

## Bottom line (1)

- ❑ Despite the existence and development of other tools and methodological approaches, CBA and its variants (e.g. SROI) remain pre-eminent.
- ❑ This is a result of the often simplistic nature of tools such as CEA...
- ❑ ...because it is a widely embraced methodology by the mainstream...
- ❑ ...because it is politically powerful (the strength of the \$ figure) ...
- ❑ ...and finally because it is grounded in Welfare Economics theory (academic legitimacy)

## Bottom line (2)

- ❑ However, a key debate when applying CBA is in terms of **which costs and which benefits** should be included in the equation.
- ❑ Further, if we are to include the environment into the equation of a CBA (either in form of benefits or costs), then this means that nature/ecosystem services need to be *monetized* (i.e. expressed in \$ terms).
- ❑ A key thing to remember is that **ALL** this type of analyses embody assumptions. The questions are: Are these assumptions made transparent? Are they sensible or extravagant?

# Discussion and Q&A

## CBA and Impact Assessments


<b>Title: Designation of Marine Conservation Zones in English Inshore waters and English and Welsh Offshore waters</b>			<b>Impact Assessment (IA)</b>		
<b>IA No:</b> Defra 1475			<b>Date:</b> 13/12/2012		
<b>Lead department or agency:</b> Defra			<b>Stage:</b> Consultation		
<b>Other departments or agencies:</b>			<b>Source of intervention:</b> Domestic		
			<b>Type of measure:</b> Other		
			<b>Contact for enquiries:</b> Mansi Konar (mansi.konar@defra.gsi.gov.uk) 0207 238 1046		
<b>Summary: Intervention and Options</b>			<b>RPC Opinion:</b> RED		
<b>Cost of Preferred (or more likely) Option</b>					
<b>Total Net Present Value</b> N/A	<b>Business Net Present Value</b> N/A	<b>Net cost to business per year (EANCB on 2010 prices)</b> £0.5m	<b>In scope of One-In, One-Out?</b> No	<b>Measure qualifies as One-Out?</b> NA	
<b>What is the problem under consideration? Why is government intervention necessary?</b> A biologically diverse marine environment is of high value to society. Human activities affect many seabed habitats, and although many human activities are regulated, management does not necessarily aim to conserve habitats and species. People may not be aware of the full negative environmental impacts that their activities have, and there's no existing mechanism to ensure that the full costs of activities are taken into account. The resulting depletion of marine habitats and species negatively affects society as a whole. Government intervention is required to address these market failures. By protecting marine habitats and species, the value of the marine environment to society can be maintained.					
<b>What are the policy objectives and the intended effects?</b> The Government aims to have 'clean, healthy, safe, productive and biologically diverse oceans and seas'. An ecologically coherent network of Marine Protected Areas (MPAs) is an essential part of this strategy. The network of MPAs will contribute to meeting the UK's commitments to international agreements, obligations and the requirements of the Marine Strategy Framework Directive. Marine Conservation Zones (MCZs - a type of MPA) are an essential component of this and Government has a duty to designate MCZs under the Marine and Coastal Access Act 2009. The procedure to identify MCZs will help to deliver the Government's aim of a well-managed network of MPAs that is understood and supported by stakeholders.					
<b>What policy options have been considered, including any alternatives to regulation? Please justify preferred option (further details in Evidence Base)</b> Two options available: 1) designating all MCZs in 2013 as recommended by 4 stakeholder led Regional Projects; 2) designating in 2013 a first tranche of 31 MCZs (preferred option) where designation decisions are made on robust evidence. The MCZs not included are considered to be unsuitable for immediate designation due to: i) Lack of certainty on presence, extent and conservation objective of features in MCZs'. ii) Uncertainty of economic impacts – making it difficult to assess whether the ecological advantages outweigh the socio-economic costs.					

[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/82721/mcz-designate-ia-20121213.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/82721/mcz-designate-ia-20121213.pdf)



# Discussion and Q&A

## The RPC

	OPINION	
<b>Impact Assessment (IA)</b>	Designation of Marine Conservation Zones in English Inshore Waters and English and Welsh Offshore Waters	
Lead Department/Agency	Department for Environment, Food and Rural Affairs	
Stage	Consultation	
Origin	Domestic	
IA Number	Defra 1475	
Date submitted to RPC	09/10/2012	
RPC Opinion date and reference	03/12/2012	RPC12-DEFRA-1604
<b>Overall Assessment</b>	<b>RED</b>	
<p>The IA is not fit for purpose. The IA says that the proposal is out of scope of 'One-in, Out-out' (OIOO), but this is not consistent with the current OIOO Methodology. The IA needs to amend its OIOO classification prior to publication for consultation to be correctly recorded as an 'IN'. The estimated cost to business (EANCB) will have to be strengthened significantly prior to validation at final stage.</p>		
<p>Identification of costs and benefits, and the impacts on small firms, public and third sector organisations, individuals and community groups and reflection of these in the choice of options</p>		
<p>Presentation. The length of the IA means that it is not accessible or easy to understand. In order to facilitate a more effective consultation the IA would benefit from being more concise to ensure consultees can understand the proposals and potential impacts.</p>		
<p>Estimating the impacts of restricting activity from designation. The IA says that the proposal will restrict a number of activities, including for example, fishing. The IA says that the value of that activity will not always be lost as some activity may be displaced rather than lost (paragraph 3.2.42) and estimates that 75% of the value from, for example, fishing will be recovered from fishing elsewhere. The consultation will have to be used to test this assumption and to determine the extent to which alternatives are meaningful substitutes for restricted activity because losses in consumer and producer welfare from restrictions are not fully offset by the take-up of alternatives activities. Furthermore, the IA acknowledges that there are potential costs of displacement (for example, a reduction in fishing efficiency) that have not yet been taken into consideration.</p>		
<p>Use of current stakeholder estimates. There are examples of significant costs raised by stakeholders which do not appear to have been included in the estimated Net Present Value (NPV). The IA needs to provide a much clearer justification as to why it is considered inappropriate to test these estimated impacts in consultation.</p>		

<http://regulatorypolicycommittee.independent.gov.uk/wp-content/uploads/2010/02/2012-12-03-RPC12-DEFRA-1604-Designation-of-Marine-Conservation-Zones-final.pdf>