Valuing the Environment

DIS Guest Lecture
Environmental Economics and Policy Analysis

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By the end of the session you should have…

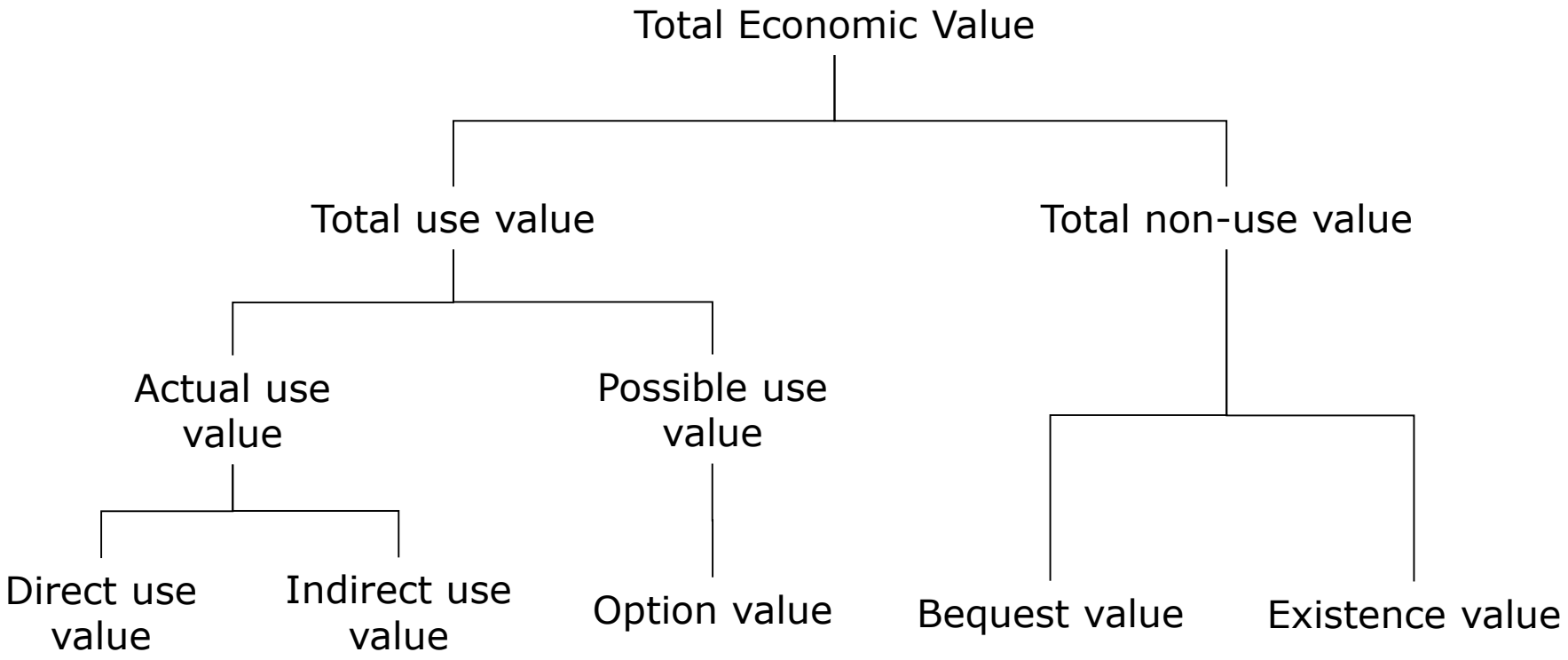
- Familiarised yourself with the basics of Economic Valuation of the environment
    - Particular focus on the so-called Choice Experiment method
- Taken part in group discussions to come up with a design for your own economic valuation survey

Can we place a monetary value on the environment?

Why is it necessary to know nature's value?

- To justify and decide how public spending (tax money) should be distributed on nature protection and/or renovation
  - Also in relation to other uses of public funds
- To take account of peoples' preferences as well as encouraging public participation in and support for environmental projects/policies
- To compare the advantages (benefits) with the disadvantages (costs) of various projects
- To prioritise different projects
- To get the most nature and environment for our money

What are nature values?



But there is no market and hence no price for nature

Does this view have a value? (it is free!)

But does it still have the same value now? (the price is unchanged)

Non-market goods

- Nature and the environment are typically not traded
- Therefore often classified as non-market goods
- Even though it is not traded on a market and does not have a price it still has a value!
- But how can we find this value?
- This is where economic valuation comes in…

Revealed preference methods

- Demand for environmental goods revealed through peoples' demand for market goods

- Markets goods have to be *complementary* to the consumption of the environmental good

  - Travel cost method
  - Hedonic pricing method

But these do not tell us anything about non-use values

Capturing non-use values

- The methods based on revealed preferences are based on observed market behaviour
    - Requires complementarity and *ex-post* project evaluation
- What do we do if there is no complementarity between a market good and an environmental good?
- And what if we are interested in an *ex-ante* project evaluation?

Stated preference methods

- We ask people what value they would place on a hypothetical change in the environmental good
- Two main methods within Stated Preference methods
  - Contingent Valuation Method
  - Choice Modelling Methods
- Our focus today will be on the Choice Modelling Methods, namely the *Choice Experiment* method

Stated preference methods

- Interview conducted with a representative sample of respondents from the relevant population
    - Questionnaire, telephone interview, face-to-face, internet
- We establish a realistic scenario (the hypothetical market)
- Focus is on identifying the respondent's *Willingness-To-Pay* for a well-defined hypothetical change in the environmental good

The Choice Experiment method

- Based on Lancaster's attribute theory: Demand for the environmental good is assumed to be a function of its attributes/characteristics (Lancaster, 1966)
  - A good has no value in itself, rather it is the specific attributes that result in utility for individuals. An example:

The Choice Experiment method

- Each attribute can take different levels
- By varying the levels, one can construct various alternative configurations of the good
    - Alternatives differ by the variations in attribute levels
- If you include a cost or price attribute you can estimate Willingness-To-Pay for each attribute

The Choice Experiment method

- Two or more alternative configurations of the good presented to respondents. This is called a choice set
- The respondent chooses the option in the choice set he/she prefers, such that alternative A is chosen over alternative B if and only if utility(A)>utility(B)
- Each respondent typically answers a series of 4-8 different choice sets

			None of these
	12 kr.	18 kr.	0 kr.
I choose	☒	☐	☒

Choice set example

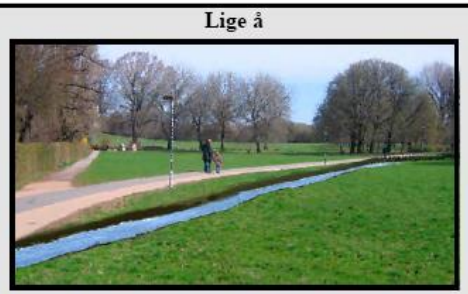
	Option A	Option B	Status Quo
Type	Blackcurrant	Orange	-
Brand	Samsø	Den Gamle Fabrik	-
Calories	100 per portion	50 per portion	-
Organic	No	Yes	-
Price	12 DKK	18 DKK	0 DKK
I choose	❑	❑	❑
	(mark one box only)		

Example – Re-estalishment of the stream Lygte Å

- Possible re-establishment of a water stream, which at the moment is piped through the city
- Cost for the municipality: about 25 million DKK
- Benefits?
- Choice Experiment used to elicit peoples' preferences for a possible re-establishment
- 700 randomly sampled people interviewed

Lygte Å – attributes and attribute levels

Course of stream



Water content

Stream edge/bank

Choice set example for Lygte Å

	Alternative A Re-establishment	**Alternative B Re-establishment**	**Present situation No re-establishment**
Course of stream	Meander	Straight	
Water content	One monthly dry-out (during summer time) per annum	Always with water	
Stream edge/bank	Flagstones	Grass	
Stream profile	Single	Double	
Price	400	200	
Choice (one mark only)	( )	( )	( )

Model results for Lygte Å study

Variable	Coefficient	Standard error	Willingness-To-Pay
Grass	0.76***	0.15	160
Meander	0.71***	0.15	150
Water	0.31**	0.10	65
Double	0.19NS	0.11	*40*
Price	-0.004***	0.0006	-
Constant	-0.063NS	0.13	*-16*

- Total WTP for a ”natural” stream:
  160 + 150 + 65 = 375 DKK/household/year

- Compared to the cost of 25 million DKK

Australian Great Barrier Reef

- 2017 economic valuation report from Deloitte
- Values the "economic, social and icon asset value" of the Reef at $56 billion
- Use values estimated using the Travel Cost Method and Benefit Transfer to be $32 billion
- Non-use values estimated using the Contingent Valuation Method to be $24 billion
- Discount rate of 3.7% over 33 years used to arrive at these numbers (see Appendix F)

Table F.2: Sensitivity analysis

Discount rate	Time period	Total economic, social and icon value
1.5%	33 years	$77 billion
7%	33 years	$37 billion
3.7%	50 years	$67 billion
1.5%	50 years	$104 billion
7%	50 years	$41 billion

Extracting non-use values of the Reef

- Willingness-To-Pay question uses a payment card Contingent Valuation approach

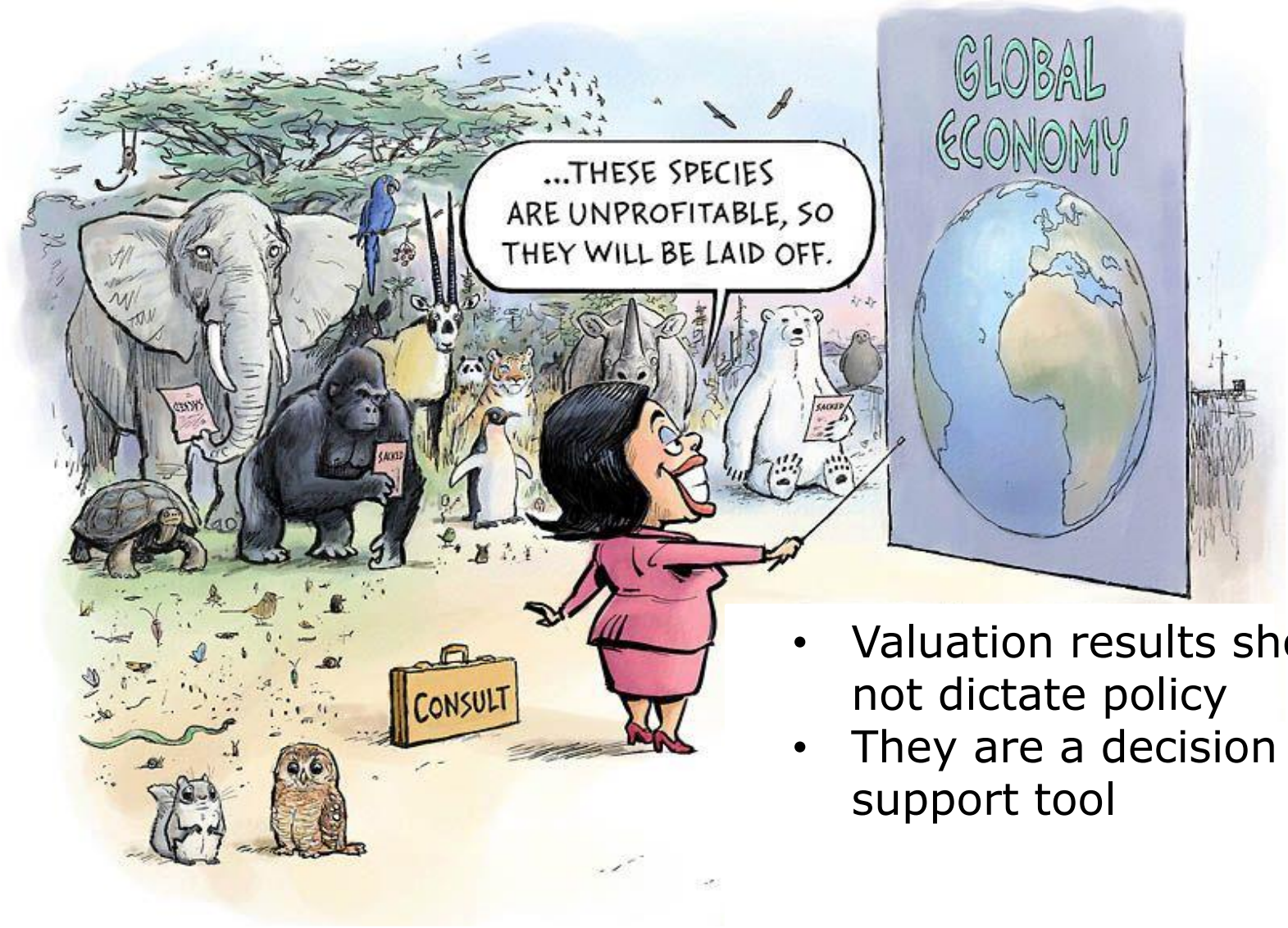
D.3.4 How much are you willing to pay *weekly* to guarantee that the Great Barrier Reef is protected?[10]

	Domestic	Inter-national
$0	42%	27%
$0.44 per week	21%	25%
$1.15 per week	19%	19%
$2.33 per week	6%	8%
$3.58 per week	3%	6%
$4.75 per week	5%	4%
$7.19 per week	1%	3%
$8.40 per week	< 1%	1%
$9.62 per week	< 1%	1%
$10 per week	2%	2%
$15 per week	1%	3%
More than $15 per week	< 1%	1%

- Were the respondents made aware of the 33 year time frame?
- Were they told to disregard use values in their Willingness-To-Pay?
- The report only says:

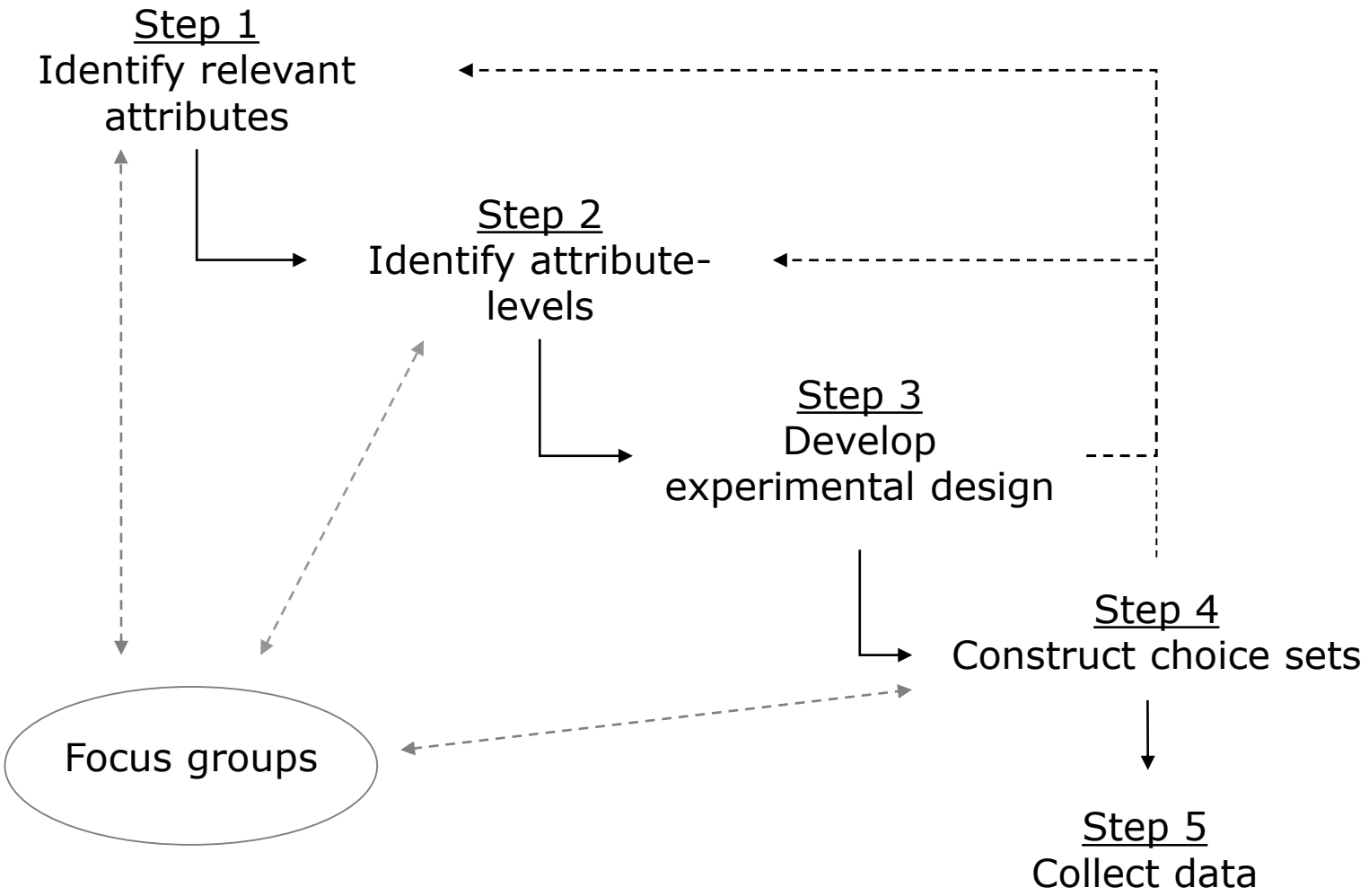
"This question was asked after framing the contingent valuation scenario…The respondent was told that their payment would guarantee that the GBR was protected and would reflect that of the 'take action' scenario, rather than the 'change nothing' scenario"

Are valuation results used in the policy process?



- Valuation results should not dictate policy
- They are a decision support tool

Choice Experiments – The design stage



Step 1: Identify relevant attributes

- Start with a wide range of possible attributes
- Then narrow the range down
- Attributes must…

  …be relevant for peoples' preferences
  …be relevant for the decision-making process
  …provide a realistic and adequate description of the good
  …be described precisely, consistently and intelligibly

- Don't forget the a price attribute so we can calculate WTP!

Step 2: Assignment of attribute levels

- Try to keep the number of levels low
- Choice of levels is case specific
- Include minimum and maximum levels
- Quantitative or qualitative?
- Price levels should reflect the entire relevant bid-range (from close to zero to the choke price)

Exercise in designing a choice experiment

- Your group is an economic unit in a consultancy company working on the AquaMoney project
- You have been hired to design a Choice Experiment to identify use and non-use values associated with reaching a good ecological status now and in the future for Odense River (including effects on the environment and recreation)
- Your group should discuss and determine what attributes to include in your design and what levels these attributes should take
- At the end I will show you the real Choice Experiment design used in the AquaMoney questionnaire
    - How will your design compare?

Choice set examples from AquaMoney

Theme	Present conditions	Alternative 1	Alternative 2
Water quality	Yellow	Green	Blue
Angling	Good	Improved	Improved
Access	Restricted	Good	Good
Surrounding areas	Primary cultivated	Primary uncultivated	Primary uncultivated
Annual payment	0 kr.	650 kr.	1200 kr.
I prefer: (Put a cross in one of the boxes)	☐	☐	☐

Theme	Present conditions	Alternative 1	Alternative 2
Water quality	Yellow	Blue	Yellow
Angling	Good	Improved	Good
Access	Restricted	Good	Restricted
Surrounding areas	Primary cultivated	Primary cultivated	Primary uncultivated
Annual payment	0 kr.	75 kr.	1200 kr.
I prefer: (Put a cross in one of the boxes)	☐	☐	☐