

Scuba diving in the Oosterschelde: Combining travel cost estimates with stated choice experiments

Sandra Rousseau and Anthony Tejerizo Fuertes

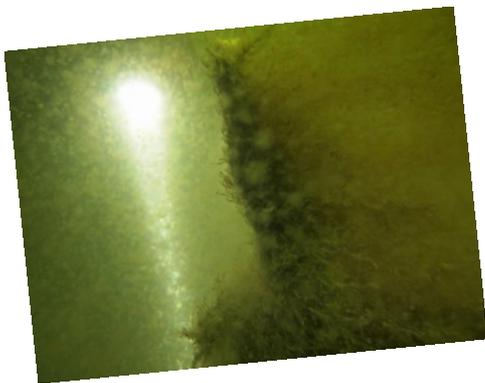
CEDON – Faculty of Business and Economics

ENVECON, London, 9 March 2018





Scuba diving in the Oosterschelde may be cold and muddy, it is also valuable
(estimated at over 20 million euro per year)



Motivation

- Tourism and investments in recreation-related infrastructure poses the second largest threat to the sustain provision of ecosystem services in coastal habitats (MEA)
- Yet, coastal visitors typically value healthy natural environments and a rich biodiversity
- Challenge: [develop policies for a sustainable governance of coastal ecosystems balancing recreation and biodiversity protection](#)
- Valuation studies are necessary for policy evaluation and policy design but relatively scarce
 - We did not find any valuation study for scuba diving in Europe



Rich in biodiversity

- Legal protection
 - Protected conservation area of exceptional value (2002)
 - Natura 2000 protected area
- Tidal area, mixing sea and freshwater
 - Home to seal and porpoise populations
 - Different North Sea species come to this area to reproduce
 - cuttlefish in spring and summer
 - sea horses in summer and autumn
- Very popular diving destination in the Netherlands as well as Belgium
 - More than 100 000 diving trips per year

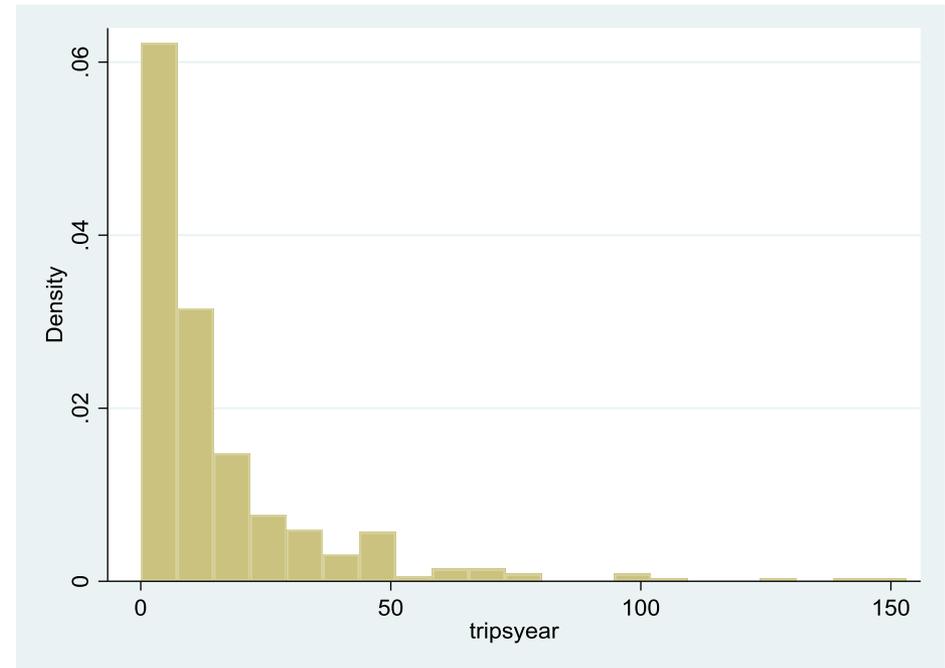


Valuing scuba diving

- Based on actual behavior
 - Travel cost method (TCM)
 - If someone makes the effort to go to the Oosterschelde for scuba diving, it must be worth at least that effort
- Based on stated behavior
 - Discrete choice experiments (DCE)
 - A diving experience can be seen as a bundle of characteristics with each a different value. How does the overall value of diving trips change with changes in each of these characteristics?

Sample

- Online survey (begin 2017)
- Distributed through Flemish and Dutch diving associations
- Sample size
 - 828 started survey
 - 486 completed survey
- 74% Belgians, 26% Dutch
- Average age: 46
- 18% female
- On average 15 diving visits per year (25% more than 25 trips)
- Visits (mostly by car)
 - 77% driver and 22.5% passenger
 - 30% company car



Step 1: TCM estimates

- Demand function: (ln)number of yearly trips as function of
 - Travel costs (TC)
 - Monetary transportation costs (fuel, wear & tear, toll...)
 - Time costs
 - Additional trip costs:
 - Non-diving costs (parking, picnic, pub visit...)
 - Diving costs (diving map, filling diving cylinders...)
 - Weighted for multipurpose trips (0 – 100 stated importance of diving in trip)
 - Respondents characteristics
 - Diving experience
 - Proxy for available substitutes
 - Nationality, education,...



Step 1: TCM results

surplus (€ per trip)	All trips			Only daytrips		
	All (N=479)	Belgian (N=356)	Dutch (N=123)	All (N=394)	Belgian (N=307)	Dutch (N=87)
TC1	156	186	125	180	223	116
TC2	154	177	127	168	204	113
TC3	615	1073	172	162	197	108

Highest adjusted R²

	Number of diving trips per year	Surplus per trip	Total value (euro per year)
Belgian	81 902	197	16 134 694
Dutch	51 443	108	5 555 844
Total	133 345		21 690 538

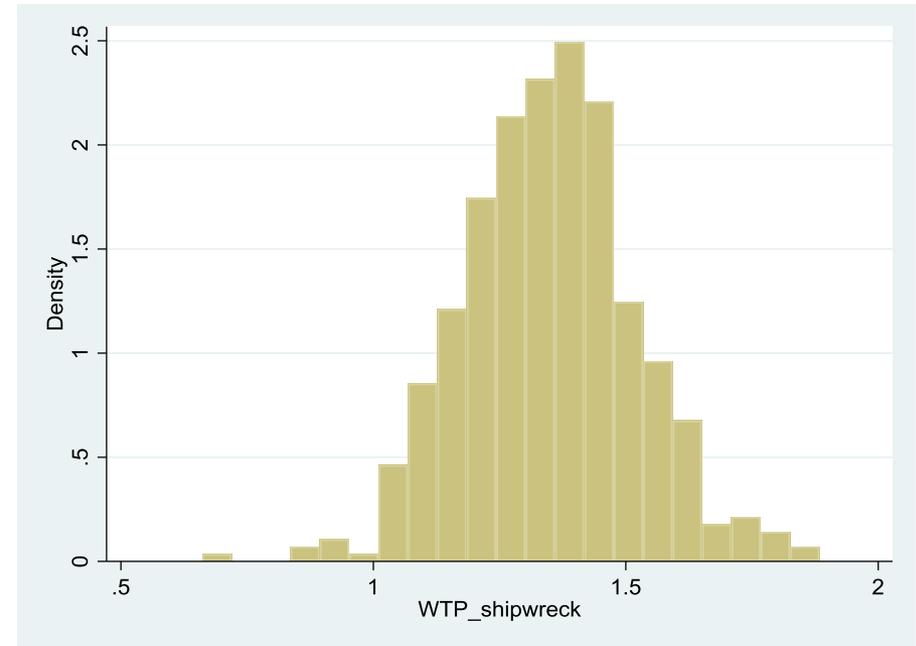
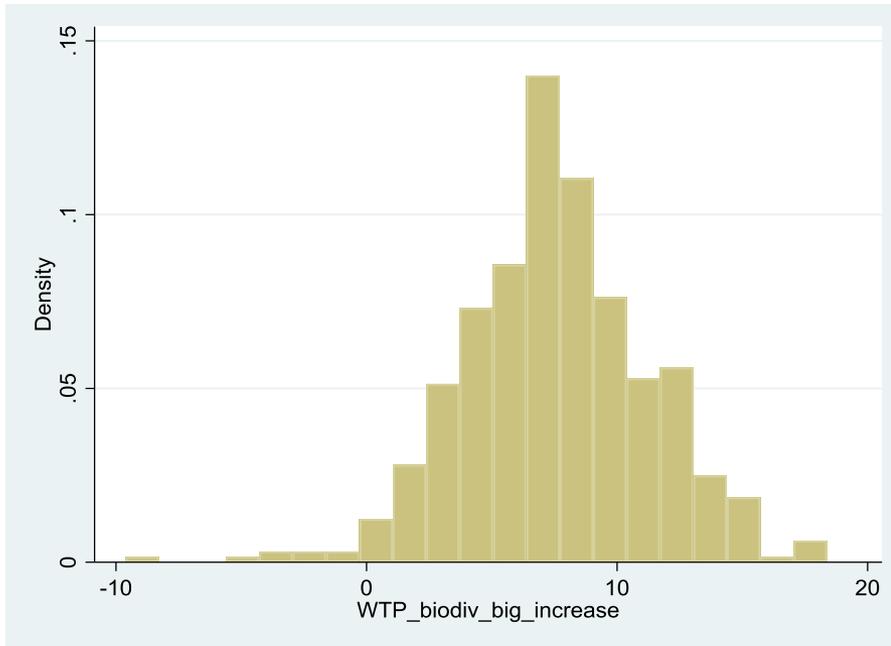
Step 2: DCE estimate

- Which of the following three dives would you prefer?
 - Dive A / Dive B / Dive C
 - None of these
- **Payment vehicle: contribution for diving one day**
 - Payment scheme used in the past: Zeelandvergunning abolished in 2002
 - In 2015/2016 the Dutch Underwater Sport Association (NOB) considered re-installing this system
 - Payment enforced through mobile inspectors
 - Different payment options available (online vs on site; per day vs per year)
 - Payments collected in a fund dedicated
 - to support a sustainable management of the Oosterschelde
 - to improve diving infrastructure.
 - We reminded respondents of their budget constraint and stressed that they could also opt not to dive.

Step 2: DCE estimate (MXL-in-WTP)

	Mean (euro per dive)	Standard deviation (preference heterogeneity)
Biodiversity decrease (prob. of seeing 4 species)	-7.146 ***	***
Biodiversity increase	2.867 ***	
Biodiversity big increase	7.356 ***	***
Visibility (in m)	2.713 ***	***
Sunny	5.459 ***	
Cloudy	3.385 ***	
Water temperature (in °C)	0.219 ***	***
Presence of shipwreck	1.349 ***	
Infrastructure: stairs and pontoon	1.117 **	
Infrastructure: stairs, pontoon & changing rooms	1.446 ***	
Pub nearby	1.017 **	
Easy dive	4.980 ***	***
Opt out (no dive)	-6.251 ***	***
Contribution (euro per dive)	-2.183 ***	

Step 2: DCE estimates – WTP scores



Step 3: Explaining individual WTP-scores

- This series of estimations shows that the **willingness to pay (WTP)** revealed through the stated choice experiment is **virtually unrelated** to the respondent's **travel cost**.
- Respondents with **higher travel costs** seem
 - **less** willing to pay for a **substantial increase in biodiversity** (TC1, TC2)
 - **more** willing to pay for diving in the **vicinity of a shipwreck** (TC1, TC2)

Step 3: Explaining individual WTP-scores

- Patterns based on other respondent's characteristics
 - Respondents with **higher incomes** seem to care more about biodiversity changes
 - **Diving experience** matters
 - For instance, the least experienced divers have a higher WTP for substantial improvements in biodiversity and for an easy dive
 - (Past) members of a **nature protection organization** are
 - more willing to pay for substantial improvements in biodiversity
 - less willing to pay for improved visibility under water
 - **Belgian** divers (compared to **Dutch** divers)
 - For instance, Belgians have a lower WTP for a small improvement in biodiversity, but a higher WTP for a substantial improvement
 - **No gender** effects

Discussion

- As the Oosterschelde is a very attractive and popular destination for Belgian divers, one can question whether it is fair that the costs and efforts of protecting and managing this national park are faced completely by the Dutch authorities.
- One way of sharing this burden is to require divers (and maybe other visitors) to pay a small contribution when visiting the Oosterschelde.

	All	Dutch divers	Belgian divers
	%	%	%
Yes, certainly	0.21	0.18	0.22
Yes, maybe	0.49	0.41	0.52
No, probably not	0.19	0.25	0.17
No, certainly not	0.11	0.17	0.09
Total	482	125	357

Discussion

- Support for contribution
 - Willingness to help **protect nature and biodiversity**
 - Desire to help maintain and improve **diving infrastructure**
- Opposition
 - Diving is already considered to be an **expensive** hobby
 - It is felt to be **unfair** to pay for access to natural resources that should be **publicly available**, especially by focusing on **one type of recreation** and not including other recreational activities in a payment scheme.
 - Skepticism related to the **efficient use of the collected funds** by the authorities.
 - Several respondents refer to the **past contribution** ('zeelandvergunning') and how it was abolished because it was too costly to monitor and enforce.

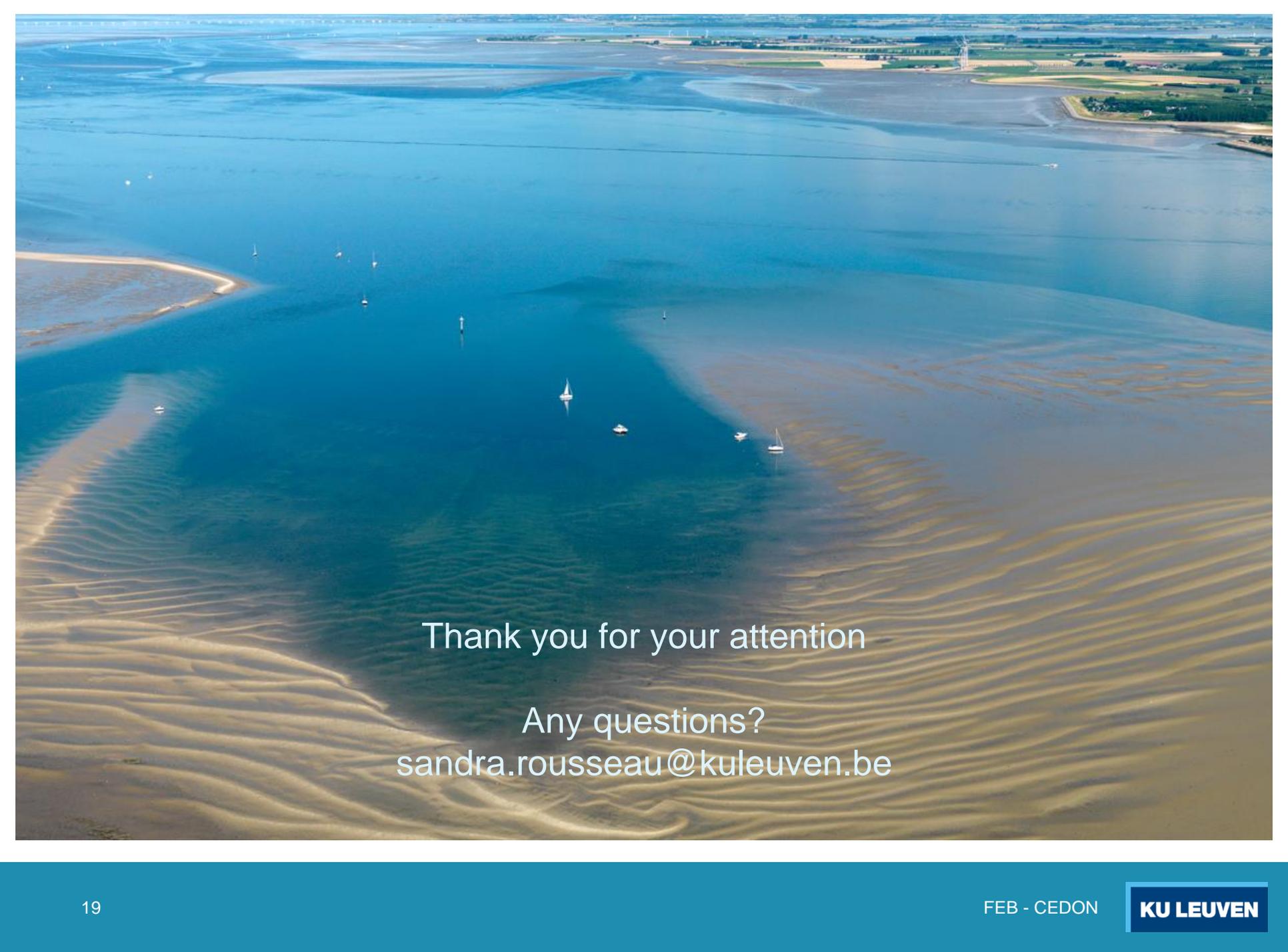
Discussion

- Larger willingness to contribute among Belgian than among Dutch divers (74% vs 59%)
 - Dutch respondents mention that they already pay **local and national taxes**
 - Many pay an **annual contribution** of 42.5 euro to the Dutch Underwater Sports Association NOB which includes 'support to the preservation and improvement of diving locations'

'Diving for the Dutch should be free, foreigners should pay for protecting the Oosterschelde'

Conclusion

- This is one of the first valuation studies for scuba diving in a European estuary and can thus be a more relevant starting point for benefit transfer than previous studies for tropical waters.
- The results of this case study show that diving is a valuable recreational activity even in a setting that does not include sunny beaches, coral reefs and tropical waters.
- Different valuation methods seem to capture different aspects of value.
 - While the travel cost method reveals a rather high willingness to pay to go diving in the Oosterschelde in general,
 - the stated choice experiments show which dive characteristics are valued most by the respondents (i.e. biodiversity).
- Cross-border dimension of coastal resources as the Oosterschelde is an additional challenge to policy makers

An aerial photograph of a vast, shallow body of water, likely a coastal lagoon or estuary. The water is a deep blue, and the seabed is visible through the clear water, showing intricate patterns of sandbars and channels. Several small sailboats are scattered across the water. In the distance, a coastline with green fields and some buildings is visible under a clear sky.

Thank you for your attention

Any questions?
sandra.rousseau@kuleuven.be