



Final conference

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Socio-economic analysis

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Eutrophication and society

- Generally, **runoff** from agricultural, sewage water treatment and surface can lead to significant off-site economic impacts
- The role of the web based information server (WIS) of ISECA is to allow for **better exchange of information** related to:
 - **Social and economic** aspects of eutrophication
 - Relevant actors and targeted publics
 - Predictable causes and effects
 - Effective mitigation strategies
- This presentation provides **one** approach to look at socio economic aspects of eutrophication.

Solent study area





Economic analysis of eutrophication

- A basic assumption of Economics is that restrictions on economic activity are likely to reduce societal welfare, for example, eutrophication.
- For eutrophication – a big challenge is to quantify ecological and **non-use benefits** alongside fishing & other priced outputs.
- **Environmental valuation techniques**, notably stated preference technique – Choice Experiments (CE) – provide a measure of **willingness to pay** (WTP).
- The **application of choice experiments** also opens opportunities to explore **policy** alternatives to guide planning and management of eutrophication.



What is WTP?

- In economics, the WTP is the maximum amount a person would be **willing to pay, sacrifice or exchange** in order **to receive** a good or **to avoid** something undesired, such as eutrophication.
- For this, we have to ask general public their preferences using **surveys**.
- In CE questionnaire, we present respondents some **options** consisting of multiple **attributes** with different **levels**.



Attributes and accompanying target levels

- **UPSTW – Upgrade sewage treatment works:**
 - **STATUS QUO** (maintain current levels),
 - **GOOD** (more treatment work to improve water to good level),
 - **EXCELLENT** (cost more but water at excellent level)
- **REDAGNUT – Reduce nutrient inputs from agriculture to rivers and estuaries discharging to Solent water :**
 - **STATUS QUO** (maintain current levels),
 - **GOOD** (25% more investment to introduce nitrate vulnerable zones, (NVZ)),
 - **EXCELLENT** (50% more investments in NVZs and catchment sensitive farming projects)
- **COST – management and monitoring cost (this payment would be an additional yearly tax contribution per person):**
 - **€0** – no additional tax
 - **€10** – additional yearly tax
 - **€25** – additional yearly tax

SECTION 1. Please TICK the box (only one) next to your preferred option

1.	UPSTW: IMPROVING 	REDAGNUT STATUS QUO 	COST £10	THIS IS MY PREFERRED OPTION <input type="checkbox"/>
2.	UPSTW: IMPROVING 	REDAGNUT FULL COMP 	COST £25	THIS IS MY PREFERRED OPTION <input type="checkbox"/>
3.	UPSTW: SIG IMPROVING 	REDAGNUT STATUS QUO 	COST £25	THIS IS MY PREFERRED OPTION <input type="checkbox"/>
4.	UPSTW: IMPROVING 	REDAGNUT IMP COMP 	COST £0	THIS IS MY PREFERRED OPTION <input type="checkbox"/>
5.	UPSTW: SIG IMPROVING 	REDAGNUT IMP COMP 	COST £10	THIS IS MY PREFERRED OPTION <input type="checkbox"/>
6.	UPSTW: STATUS QUO 	REDAGNUT IMP COMP 	COST £25	THIS IS MY PREFERRED OPTION <input type="checkbox"/>
7.	UPSTW: SIG IMPROVING 	REDAGNUT FULL COMP 	COST £0	THIS IS MY PREFERRED OPTION <input type="checkbox"/>
8.	UPSTW: STATUS QUO 	REDAGNUT STATUS QUO 	COST £0	THIS IS MY PREFERRED OPTION <input type="checkbox"/>
	UPSTW: STATUS QUO 	REDAGNUT FULL COMP 	COST	

The options as presented

Can present all or a subset to each respondent.

In survey all were presented to each respondent, who made a single choice

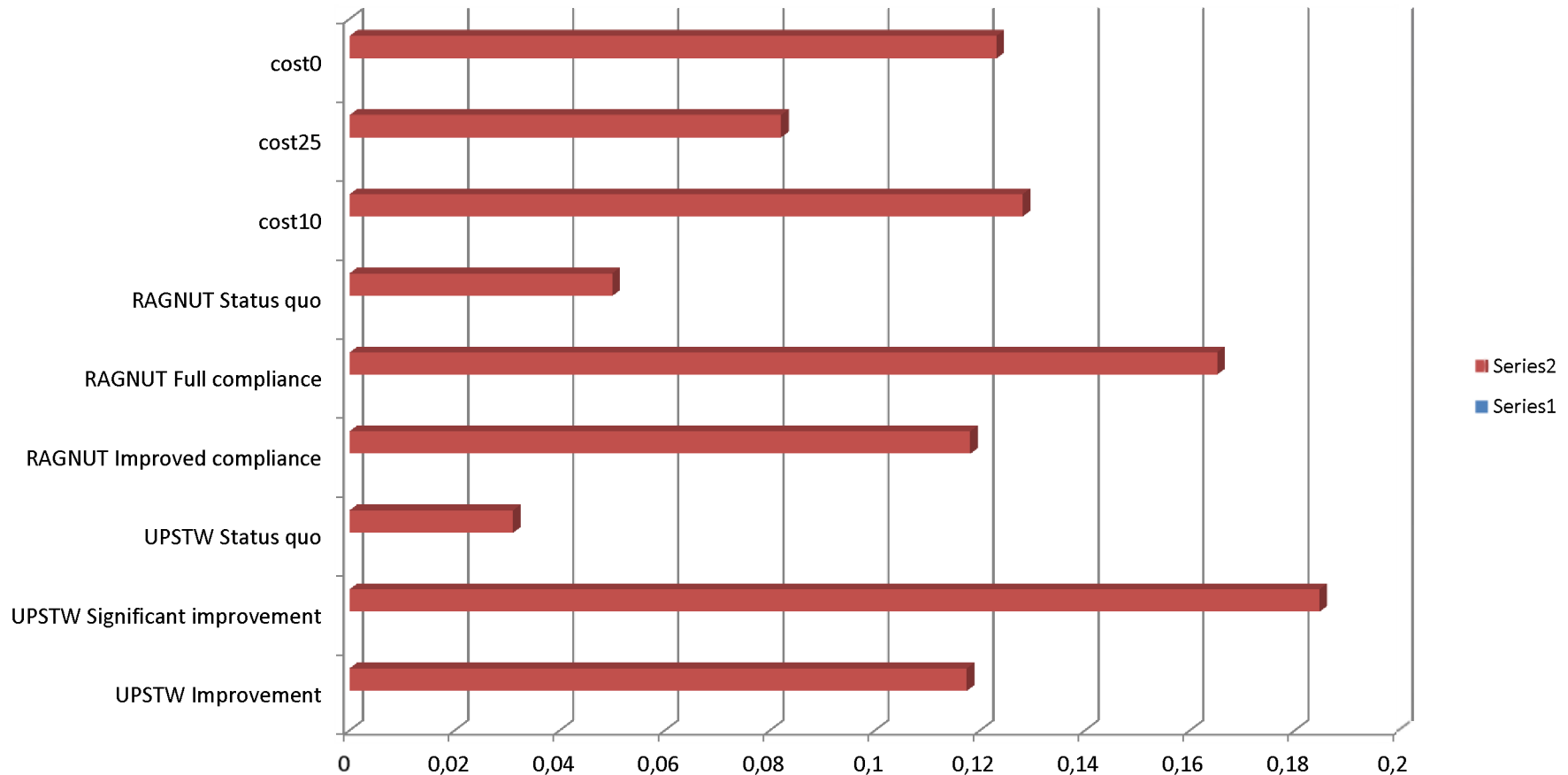
Results: model parameters by attribute levels

<i>Parameter Variable</i>	<i>Parameter Estimate</i>	<i>S.E.</i>	χ^2	$Pr > \chi^2$
<i>UPSTW</i>				
Improvement	1.32881	0.24956	28.3513	<0.0001
Significant Improvement	1.78112	0.23037	59.7778	<0.0001
Status quo	0	.	.	.
<i>RAGNUT</i>				
Improved compliance	0.85997	0.20952	16.8472	<0.0001
Full compliance	1.19491	0.20921	32.6218	<0.0001
Status quo	0	.	.	.
<i>COST</i>				
Ten GBP	0.03931	0.16867	0.0543	0.8157
Twenty five GBP	-0.40528	0.18112	5.0069	0.0252
Zero GBP	0	.	.	.

Preferences for each activity - Probability of Choices

UPSTW	UPSTW Improvement				0.117506
	UPSTW Significant improvement				0.184712
	UPSTW Status quo				0.031115
RAGNUT	RAGNUT Improved compliance				0.11816
	RAGNUT Full compliance				0.165171
	RAGNUT Status quo				0.050002
COST	cost10				0.12808
	cost25				0.08211
	cost0				0.123143
					1

Estimation of the degree of importance attached to each attribute from the model (derived from the full set of 27 alternatives)





Most preferred options individually..

- Ranking of attributes and levels suggests that **the top 2 preferences for WQ improvement are to:**
 - **UPSTW significant improvement and**
 - **RAGNUT full compliance.**
- **Next in the order of ranking comes:**
 - **a cost of 10 GBP**
 - cost 0 GBP of, followed closely by
 - RAGNUT improved compliance and UPSTW improvement.

Implicit Prices (WTP)

Marginal values for WTP £25	GOOD	EXCELLENT	Total values
UPSTW	3.279	4.395	7.674
RAGNUT	2.123	2.949	5.072
TOTAL	5.402	7.344	12.746
TOTAL £ for SOLENT	3202592	4354485	7557777

- Implicit prices show the marginal WTP for a particular change in each attribute valued independently of all other attributes.
- Population in Solent is 593,000
- Additional tax contribution is £7.5 million
- More for sewage treatment than agricultural runoff.

Welfare losses from algae bloom along the Belgian coast – June 2014

Leo De Nocker, Jean-Luc De Kok (Vito), Carolien Knockaert, Annelies Goffin
(VLIZ), Elise Chiroutre (Nausica), Premachandra Wattage (CEMARE)

Indicator	N° respondents	%
Willing to pay' at least (1)		
20 € - 35 €	162	85%
+ 35 €	138	39%
No WTP (2)	55	15%
Subtotal of which info on WTP (6)	355	100 %
Protest answer (3)	117	
Students (4)	48	
Total number of respondents (5)	520	

Indicator	Willingness To Pay
Mean WTP (€/household.year)(1)	23
WTP per beach visit	
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frequent visitors(2)	0,47
average estimate (3)	0,79
non-frequent visitors (4)	1,9

(1) Based on WTP for full sample of respondents

(2) Based on average number of beach visits for all respondents (49 visits/year)

(3) Based on average number of beach visits/respondent for all respondents, excluding respondents that visit beach each day (6 % of respondents) (29/visits year)

(4) Based on average for respondents that visit beach once a month

Total damage (€/year) = WTP (€/household.year) x number of households affected

Households affected	N° households (1)	Total damage
	Millions	Million €/year
Coastal area (West-Flanders)	0,5	12
Flanders	2,65	61
Belgium	4,70	108
Belgium + foreign tourists	5,14	118



Observations for discussion

- CE have proven a **robust** state of the art tool for the evaluation of **un-priced non-use** coastal resources modified by eutrophication.
- The results confirm the importance attached by the **Solent public** to WQ improvement in the Solent areas and demonstrate their preferences.
- The method is flexible to the needs of particular areas and for similar sites in relative proximity there is also the potential (albeit limited given current methodologies) for “**benefit transfer**” between sites.
- The quantified outputs can be incorporated into **CBA**
- The outputs provide **tangible, quantified** support for **sustainable coastal area policy** planning and management.