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BEACH CONCESSION AND CONCESSION FEE IN ITALY Findings from a Meta-Analysis for Recreation Value of Coastal Areas

A. Agnesi *Università Politecnica delle Marche, Facoltà di Economia*

Abstract

Over the past few years, the issue of beach concessions caused several disputes in Italy among public authorities and economic operators. The following paper aims to give a contribution to the ongoing controversy over the management of Italian maritime domain. In particular, concession system governing recreational seaside facilities suffers from inefficiency, with the respective licenses that are allocated in front of extremely reduced fees. A non-market valuation of recreation value is performed for the coastline of Civitanova Marche: such value results to be much high when compared with state revenues coming from the collection of fees paid by concessionaires of seaside facilities over the corresponding area. In this sense, a reform of price mechanism established by law is strongly recommended.

JEL Classification: *D62, H21, H23, Q26, Q58*

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Alessandro Agnesi, Università Politecnica delle Marche, e-mail: a.agnesi@pm.univpm.it

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1 Introduction

Over the past few years, the issue of beach concessions of touristic-recreational type caused several disputes in Italy among public authorities and economic operators. Governments at different levels have faced the problem in many ways but ultimately, in expectation of a comprehensive reform, a series of ex lege extensions beyond the initial term have followed for concession licenses (the last one with the Budget Law for year 2019). Nevertheless, despite being at the centre of political agendas and subject to an extensive debate, the topic has been explored relatively little by economic research making it worthy of further analysis.

With the passing of time, it emerged a dynamic concept of marine state-owned goods that gave more space to considerations on socio-economic opportunity of their use rather than pure defence and conservation of public domain that must realize in accordance with objectives of collective interest. In the given contest, the institute of concession has moved away from its original nature of instrument used only in exceptional situations and has now become habitual in coastal management aiming to constitute an increased benefit for local community, tourism, and economy. Nonetheless, allocation of licences and pricing procedures seem to suffer from an overall inefficiency, especially when coming to touristic-recreational use and recreational seaside facilities. In particular, this legal scenario leads to the formation of concession fees that are unable to reflect the actual value of the considered environmental good which is necessary in the perspective of a rightful enhancement and fair compensation for utilisation and decay of marine state property and that represent a social cost sustained by citizens. Furthermore, the condition of Italy seems even more atypical if we look to other EU member states, where it emerges a situation in which great part of them guarantee a more efficient provision of public beach with greater attention to market competition than in Italy, as already shown by Benetazzo et al. (2017).

The structure of the paper is as follows. Section 2 provides a brief overview on the regulatory framework, the current price mechanism for concession licences and its main deficiencies. Section proposes a methodology of non-market valuation for beach areas: a meta-analytical framework is applied to detect the recreational value of the coastal site of Civitanova Marche that can be later compared to revenues coming from concessions for recreational seaside facilities over the respective area. In Section 4 we discuss outcomes coming from the application of the meta-analysis and the said comparison. Section 5 provides some possible solutions for a revision of price mechanism. Then, Section 6 concludes.

2 Regulatory Framework

Regulation on beach concession consists of three different layers, respectively represented by three different actors: European Union, National State and Regions. On the European level, regulation mainly lies in provisions given by *Directive 2006/123/EC*, better known as *Bolkestein directive*, that applied on the matter of marine state-owned asset concessions to what may concern duration and renewal procedures of concessions. At article 12, the directive provides that whenever the number of authorizations available for a supposed activity would be limited because of scarcity of natural resources or applicable technical capacity, Member States apply a selection procedure within potential candidates that guarantees competition. On those cases, the authorization is released for a limited and adequate duration and cannot provide the automatic renewal process, nor agree other advantages to the outgoing concession holder or to people related to the latter. Over the last decade, Italy was not able to fulfil a complete implementation of the directive (specifically with regards to market accession and competition) causing in this way the opening of an infringement proceeding by European Commission[1].

At today the national context is characterized by a huge fragmentation of the discipline where laws are added one to the other without an adequate reorganization of the whole regulatory framework. With *Legislative Decree 31/03/98 n.112* Italian state has delegated administration tasks to regional authority: complete responsibility to regions was given for the issuance of concessions included goods belonging to maritime domain. In most of the cases, regional authorities delegated administrative duties on maritime domain to municipalities each one competent for its own territory. Therefore, it is duty of competent municipality to release concessions on maritime state-property and each one of them serves as a decision-maker in complete autonomy.

2.1 Concession Fees and Price Mechanism

Low income is generated by tax collection for national government. The current system provides the right to dispose of public beach for an annual fee giving to the concessionaire an almost exclusive use on the assigned stretch. Although, it is likely that such a deprivation of public area is not properly counterbalanced: concession tax result to be inadequate generating extremely low income in relation to the scarce nature of beach along with potential turnover of the linked economic sector.

Concession fees for state-owned assets are established through the annual revaluation of price defined by art. 3 comma 1, b letter of *Decree-Law 400/1993* and modified by comma 251 of art. 1 of *law 296/2006* (Table 1). More in details, fees consider both typology of the considered State area and the belonging of the area to two different categories based on its tourist value (respectively *A typology* – normal touristic

[1] On this respect see European infringement proceeding no. 2008/4908

value - and B *typology* -high touristic value). Then, tariffs per square metre are revalued every year based on the average of the ISTAT index for cost of living and for wholesale market prices. Hence, every amount is simply adapted to inflation for every year. An exception regards amounts for buildings that stay on the state property: in this case, fees are determined by use of the average unitary value for squared metre of the real-estate market for the related business activity, determined by OMI (Osservatorio del Mercato Immobiliare), as indicated in art. 1 comma 251 of *law 296/2006*.

TABLE 1: Concession fee for touristic-recreational purpose.

Anno 2020 - importo per metro quadro / anno

Tipologia	Categoria		Decremento ISTAT rispetto a 2019
	Categoria "A"	Categoria "B"	
Area scoperta	€ 2,62	€ 1,31	-0,75%
Aree e specchi acquei occupati con impianti/opere di facile rimozione	€ 4,37	€ 2,19	-0,75%
Aree e specchi acquei occupati con impianti/opere di difficile rimozione nonché dalle pertinenze demaniali marittime non destinate ad attività commerciali, terziario-direzionali e di produzione di beni e servizi	€ 5,83	€ 3,74	-0,75%
Per ogni metro quadrato di mare territoriale per specchi acquei delimitati da opere che riguardano i porti così come definite dall'articolo 5 del Regio Decreto 3095/1885 e comunque entro 100 metri dalla costa	€ 1,02		-0,75%
Tra 101 e 300 metri dalla battigia	€ 0,73		-0,75%
Oltre i 300 metri dalla battigia	€ 0,58		-0,75%
Specchi acquei utilizzati per il posizionamento di campi boa per l'ancoraggio delle navi al di fuori degli specchi acquei indicati al punto precedente	€ 0,30		-0,75%
Misura minima del canone totale	€ 361,90		-0,75%

Source: Elaboration of Osservatorio CPI on D.M. 06/12/2019, n.226, and art. 3 of d.l. 400/1993 comma 1, letter b and modified by comma 251 of art. 1 of law 296/2006.

According to data of *Ministero delle Infrastrutture e dei Trasporti*[2], there are about 52.500 marine state-owned assets in concession, of which 27.300 are of recreational and touristic purpose. Revenues coming from concessions of maritime domain correspond to € 103 million in 2016 as stated by the Ministry[3]. In this respect, as noted by Osservatorio CPI (2020) [4], data related to the issue are partially provided by public administration and, when it happens, information diffused through different channels frequently results to be in contrast with each other. Data for the following years are not available but it is likely that the volume has remained stable: looking at data before 2016, earnings remained constant around 100 million per annum (98 million of euros in 2011, 102 in 2012, 102 in 2013, 102 in 2014 and 103 in 2015).

2 Data accessible at https://www.mit.gov.it/index.php/comunicazione/news/sistema-informativo-demanio-sid
3 Press statement of 3/05/2017 by *Agenzia del Demanio*: http://www.regioni.it/ambiente-energia/2017/05/03/spiagge-demanio-gettito-103-mlnanno-da-23mila-concessioni-511860/
4 See "Spiagge in Regalo: perché l'attuale sistema di concessioni balneari va riformato?". Osservatorio sui Conti Pubblici Italiani (OCPI, 2020).

Therefore, as estimated by Osservatorio CPI considering annual revenues of approximately 100 million and dividing them for the number of concessions for touristic and recreational purpose we find out that the annual fee for each concession is on average below 4.000 euros.

This figure results to be extremely reduced especially if we consider revenues performed by the industry of beach service and recreational seaside facilities. According to estimates made by Adoc[5], in 2019 the average price for a day spent at the beach was of 26 € per person, while a monthly subscription in August costed on average 697 €, and a seasonal 1.718 €. Within this self-evident disproportion, it also emerges that concession fees and their amounts seem to be almost completely detached from an actual economic valuation of the site given in concession apart from a generic estimate of tourist value.

3 A benefit transfer approach for recreation value assessment

We propose a replicable model for non-market valuation of coastal sites that can be later compared to the respective turnovers produced by touristic-recreational concessions of maritime public domain turned into seaside facilities. In doing this we will make use of a meta-analytical framework for benefit transfer developed by Ghermandi and Nunes (2013), detected by authors to map coastal recreation values on a global level.

With benefit transfer, environmental benefit estimates from earlier and existing empirical studies (i.e., the study sites) are spatially and temporally transferred and their conclusion applied to a new case study (i.e., the policy site) that differs from that of the case study for whom the estimation was originally made. Meta-analysis generally indicates a method that summarize results from studies previously conducted on a given topic that is mainly applied with use of regression-based technique (Ghermandi et al., 2013).

Estimates gathered from primary studies are employed as dependent variables of a linear multi-regression model where characteristics of study sites together with methods used in primary evaluation are classified and served as independent variables of the considered model. Value transfer applications for out-of-sample research can be carried out to infer the unobserved value in the policy site making use of the meta-regression function with the estimated parameters and the variable levels associated with the policy site.

Therefore, it represents a way to value assessment that can distinguish among phenomenon-intrinsic and context-specific factors, such as methodology applied in the primary valuation study (Florax et al., 2002). Starting from the proposed meta-regression model, we aim to define a set of values that will outline the aggregate recreational value of the area expressed as a hectare-based monetary output per year (€/ha/year).

5 Article of 31/05/2019: https://www.adocnazionale.it/spiagge-spesa-media-giornaliera-complessiva-58-euro-famiglia/#:~:text=Secondo%20un'indagine%20dell'Adoc,costo%20sale%20a%2033%20euro

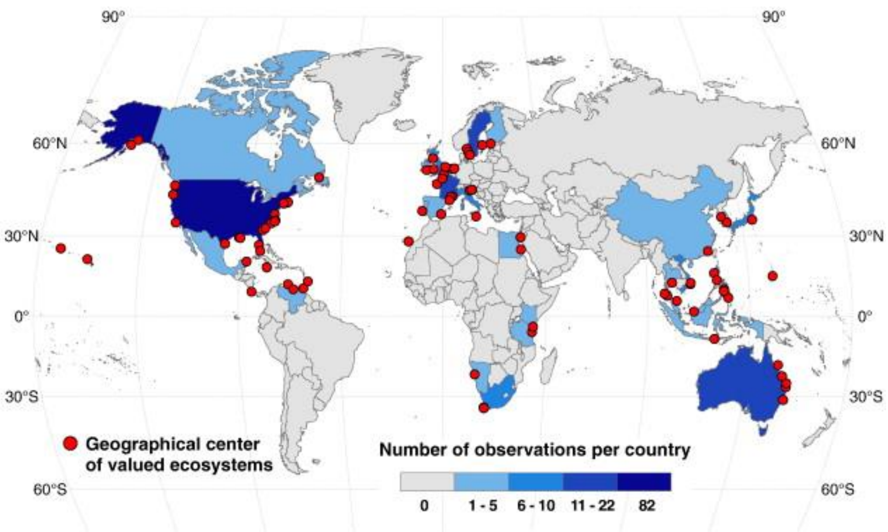
Eventually, we will compare the latter to the current average price of concessions paid by beach establishments over the considered portion of beach in order to see how much the value assigned by mean of *d.l. 400/1993* diverges from the value detected through the model.

3.1 The Meta-Regression Model

The analysis proposed by Ghermandi and Nunes is based on a global dataset of non-market valuations of the recreational benefit given by coastal and estuary ecosystems with 253 distinct values observed from 79 primary valuation studies. As reported in the paper, estimates of non-use values (for instance existence, option and bequest values) or mixed use/non-use values were excluded. Two typologies of recreational use were considered and later distinguished into the meta-analytical framework: extractive usage, represented by fishing, shellfishing and hunting, and non-extractive usage such as swimming, sun-bathing, boating, windsurfing, birdwatching, snorkeling and diving.

Table 2 and Figure 1 are extracted from the paper and provide a summary of characteristics and location for the valued sites. The valued ecosystems contained in the dataset situates in 34 different countries. With regards to climatic conditions, 151 observations of values come from sites located in the North Temperate climate zone (comprised within a latitude that goes from 23.5° N to 66.5° N) standing as the most diffused category among the sample and consistent with our area of interest. Looking at the valuation method, all values were obtained through non-market valuation techniques: stated preference methods were employed in the estimation of 111 elements (93 values were observed through contingent valuation and 18 by means of choice experiments methodology) while the remaining part consist in travel cost (117 observations) and contingent behavior method estimations (25 observations).

FIGURE 1: Geographic distribution of observations.



Source: Ghermandi and Nunes (2013).

TABLE 2: Characteristics of primary studies and sites included in the meta-analysis.

Prevailing ecosystem type	Valuation method	Year of survey	Coastline length, km	Nr. of value estimates
Estuary	Stated preference	2000–2003	12–1540	4
	Travel cost	1995–2003	12–1718	8
	Contingent behavior	1995	1718	1
Beach	Stated preference	1991–2006	3–2268	27
	Travel cost	1992–2003	1–233	22
	Contingent behavior	1986–2003	20–233	12
Coral reef	Stated preference	1996–2007	1–694	33
	Travel cost	1996–2005	15–5618	18
	Contingent behavior	2004–2008	678–5618	2
Marsh/lagoon	Stated preference	1983–2002	2–53	7
	Travel cost	1992–2002	2–53	8
	Contingent behavior	1992	53	1
Mangrove	Stated preference	1997	16	8
	Travel cost	1974	21	3
Other	Stated preference	1994–2007	6–1171	32
	Travel cost	1981–2007	5–8322	58
	Contingent behavior	1995–2007	5–1064	9

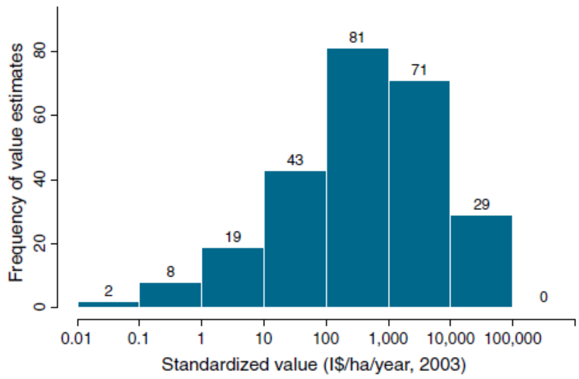
Source: Ghermandi and Nunes (2013).

According to the authors, the great part of the examined papers focused on the welfare impact of a change in the current level of provision of ecosystem services that can be represented by an improvement or deterioration in water quality or beach erosion.

In the categorization of ecosystem typologies, it emerges that sandy beaches are among the most valued types with 61 observations, but a significative number of estimations (consisting in 99 observations) relate to ecosystems that are composed by a mixture of different coastal biomes, classified under the voice "Other" (Table 2).

At this point, data gathered from primary studies were reduced to a common metrics and currency in order to make it comparable: all data are relatable to the common unity of measurement of 2003 international dollars per hectare per year (I$/ha/year). Total estimated value of the analyzed ecosystems was computed before multiplying per person or per-household observed values by the flow of annual recreational users as reported in primary evaluations. In the case of per trip estimates given by travel cost studies, they were similarly multiplied by the annual number of trips of recreational purpose. Net present values were converted to yearly amounts through the discount rate and number of periods reported in the original study. On this basis, a hectare-based metric was defined in relation to the geographical extent of each considered area of valuation.

TABLE 3: Distribution of estimated per-hectare values.



Source: Ghermandi and Nunes (2013).

Values spread out over a wide range with an average value of 4698 I$/ha/year (± 11.283 I$/ha/year) and a median of 453 I$/ha/year and in which 60% of estimates (152 observations) lies between 100 and 10.000 I$/ha/year (Table 3).

The authors classified a set of moderator variables (Table 4) that were divided into three categories: study variables, site variables and context variables. While the first two describe respectively method-specific and site-specific features, the latter refers to the socio-economic and demographic context as well as human development and marine biodiversity by mean of spatially explicit indicators.

TABLE 4: Moderator variables of the meta-analytical model

Group	Variable	Units and measurement	Mean (SD)	*N*
Study variables (X_V)				
Valuation method	Choice experiment	Binary	0.07 (0.26)	18
	CVM – open ended	Binary	0.12 (0.32)	30
	CVM – other elicitation	Binary (omitted)	0.25 (0.43)	63
	TCM – individual and RUM	Binary	0.35 (0.48)	89
	TCM – zonal	Binary	0.11 (0.31)	28
	Contingent behavior	Binary	0.10 (0.30)	25
Marginal/total value	WTP to avoid degradation	Binary	0.15 (0.36)	38
	WTP for improvement	Binary	0.32 (0.47)	82
	Total value at current status	Binary (omitted)	0.53 (0.50)	133
Unpublished		Binary	0.63 (0.48)	159
Year of primary data		Years after first valuation (1974)	23.9 (6.52)	253
Site variables (X_S)				
(Partially) protected area[a]		Binary	0.45 (0.50)	114
Ecosystem type	Beach	Binary	0.24 (0.43)	61
	Reef	Binary	0.21 (0.41)	53
	Mangrove	Binary	0.04 (0.20)	11
	Lagoon or coastal marsh	Binary	0.06 (0.24)	16
	Estuary	Binary	0.05 (0.22)	13
	Other coastal ecosystem	Binary (omitted)	0.39 (0.49)	99
Ecosystem service	Recreational fishing	Binary	0.40 (0.49)	101
	Non-extractive recreation	Binary	0.78 (0.42)	197
Context variables (X_C)				
GDP per capita[b]		2003 US$/year (PPP, ln)	10.0 (0.81)	253
Population density[c,d]		Inhabitants per km^2 (ln)	4.77 (1.75)	253
Anthropogenic pressure[c,e]		Nutrients concentration (ton/km^2/year, ln)	0.41 (2.85)	253
Marine biodiversity[c,f]		Shannon index of biodiversity	3.84 (1.64)	253
Accessibility[g]		Travel time to nearest large city (hours, ln)	4.53 (1.04)	253
Human development	Low development[c,h]	Binary	0.57 (0.50)	143
	Medium development[c,h]	Binary	0.09 (0.29)	23
	High development[c,h]	Binary (omitted)	0.34 (0.48)	87
Political stability[i]		Political stability index	2.92 (0.63)	253
Heating degree months[j]		Degrees Celsius	49.4 (40.3)	253
Max monthly precipitation[k]		mm of precipitation	1270 (634)	253

Source: Ghermandi and Nunes (2013).

The meta-regression model was estimated as follow:

$$ln(y_i) = a + \boldsymbol{Xv_i}\, bv + \boldsymbol{Xs_i}\, bs + \boldsymbol{Xc_i}\, bc + u_i \quad (1)$$

Where $ln(y_i)$ is a Nx1 vector expressed as the natural logarithm of the endogenous variable measured in 2003 I$/ha/year; i is an index for the value observation; a is a constant term; bv, bs and bc are kx1 vectors including the coefficients of the related explanatory variables (with N = number of observations and k = number of regressors). The explanatory variables $\boldsymbol{Xv_i}$ (valuation study characteristics), $\boldsymbol{Xs_i}$ (site characteristics) and $\boldsymbol{Xc_i}$ (context characteristics) are Nxk matrixes and u_i is an error term.

The authors provided four different specifications of the model for benefit transfer: in our analysis, we choose to use the same transfer function used by the authors to make their global mapping of coastal recreational values since it represents the model with the best overall explanatory power and highest consistency with the theoretical and empirical expectations. In this model all variables were tested and then regression coefficients were recalculated embedding only statistically significant variables. The employed model results to be composed as described in Table 5.

TABLE 5: Restricted model for value transfer.

Variable	Coefficient	95% confidence interval		p-Value
Constant	−7.987	−14.510	−1.465	0.017
CV – open ended	−0.944	−1.713	−0.174	0.016
TCM – zonal	1.862	1.089	2.635	0.000
TCM – individual and RUM	0.937	0.377	1.497	0.001
Contingent behavior	−1.639	−2.432	−0.847	0.000
WTP for improvement	0.863	0.326	1.400	0.002
Unpublished	−1.312	−1.870	−0.754	0.000
Year of primary data	0.144	0.106	0.182	0.000
Estuary	1.050	−0.228	2.328	0.107
Beach	1.860	1.087	2.632	0.000
Reef	1.667	0.826	2.507	0.000
Recreational fishing	1.697	0.956	2.439	0.000
Non-extractive recreation	3.387	2.585	4.188	0.000
GDP per capita (ln)	0.470	0.051	0.889	0.028
Population density (ln)	0.454	0.156	0.751	0.003
Low human development	1.972	1.367	2.577	0.000
Anthropogenic pressure (ln)	−0.239	−0.327	−0.150	0.000
Accessibility (ln)	−0.534	−0.984	−0.085	0.020
Marine biodiversity	0.290	0.144	0.437	0.000
Heating degree months	−0.008	−0.016	0.001	0.092

Note: regression with robust standard errors; N = 253; R-square = 0.719; adj. R-square = 0.696; Root MSE = 1.583; Shapiro–Wilk test, p-level = 0.193.

Source: Ghermandi and Nunes. (2013).

All observations are considered, and the regression is performed with robust standard errors. A total of 19 explanatory variables are detected with statistical significance: respectively 7 study variables, 5 site variables and 7 context variables.

3.2 Application of the Analytical Framework to the Policy Site of Civitanova Marche

In the context of this research, we will focus on a specific portion of the Central Adriatic shoreline of Marche Region where several coastal conglomerates have been formed and benefited of long linear beaches able to welcome a huge basin of recreationists every year.

We consider especially the coastal area under control of the municipality of Civitanova Marche that stands as one of the stretches more exposed to exploitation for recreational use and one of the main seaside locations of the region, making it a suitable case study for the scope of the following research as it shows all characteristics of highly exploited coastal areas - where this kind of approach could give the greatest benefit.

Civitanova Marche, situated in the south-central part of the region under the territory of Macerata province, is composed of a beach area of around 50 hectares (Figure 2) with a sea front of approximately 6.500 m that stretch continuously, only interrupted by 590 m of port area that divide the larger North promenade from the South promenade. On the total coastline, about 2.500 m results to be occupied by 45 beach concessions for seaside facilities[6] that cover an area estimated in 16 hectares by local administration. Then, 950 m are intended for public use, 815 m are covered by a protected area of floristic interest situated in the northern portion of coastline close to the border with the municipality of Potenza Picena and a little more of 2 km not accessible for swimming since they fall under fluvial and harbor area. The shoreline is composed by sediments mainly fine to the north of the port (fine sands of 0.125 – 0.25 mm), whereas to the south coarser sediments are present (gravel of 4 – 8 mm) (Acciarri et al., 2017). The southern promenade results to be devoid of coastal defense infrastructures, while the northern one is protected by a series of cliffs of different height.

FIGURE 2: The coastline of Civitanova Marche.

[6] Data available online at *Portale del Mare* by Ministero delle Infrastrutture e dei Trasporti.
See: https://www.mit.gov.it/index.php/comunicazione/news/sistema-informativo-demanio-sid

3.2.1 Defining Explanatory Variables through Sensitivity Analysis

In defining explanatory variables, we want to provide a value range that could be consistent with the policy site as we think that a reliable evaluation can be assessed only in the definition of an interval of values instead of a single point estimate. This is true for two main reasons: first, we assume characteristics of the policy site to be only partially relatable to the dataset of primary studies; second, some of the variables are difficult to determine for a site like the one in analysis and require technical knowledge in some other scientific fields to be computed that we do not possess.

We will lean on information provided by previous studies where it is possible, while, whenever it will not be, we would try to define an estimation based on empirical knowledge of the site.

The methodology we will employ is referrable to the one of sensitivity analysis. Pichery (2014) refers to Sensitivity Analysis (SA) as a method that measures how the impact of uncertainties of one or more input variables can lead to uncertainties on the output variables. SA can improve the power of prediction of the model itself since the expected values of various parameters involved can be used to evaluate the robustness, i.e., sensitivity of the results from these changes. This analysis reduces the uncertainties of parameters of the assessment and then, decisions about the phenomenon under study can be taken. We will define each explanatory variable carefully taking into consideration the three categories detected by the authors in the original study related to methodology used (i.e., *study variables*), site specific features (i.e., *site variables*) and context specific variables (i.e., *context variables*).

3.2.1.1 Study Variables

The chosen model for value transfer (Table 5) detects seven variables of the category to have statistical significance. The unity of measurement for each variable is indicated in Table 4. Table 6 provides an overview on the chosen value for meta-analysis.

In estimating the effect on the output of the given variable group, we should consider how recreation value may vary depending on the employed analytical technique (Bateman and Jones, 2003). If contingent valuations of open-ended valuation format seem to be more exposed to free riding, travel costs methods represent a more appropriate way in valuing outdoor recreational values as widely recognized by the literature. In general, a positive impact of TCM methodologies would have been expected by authors as stressed by plenty of empirical studies that attribute to TCM a higher entity to the valued site (Bateman and Jones, 2003). Therefore, our choice among the method variable would fall in selecting the lower and higher estimated coefficients represented by ***Contingent behavior*** and ***TCM – zonal*** but we can reasonably assume a value closer to TCM methodology to be in line with the purpose of our valuation for the policy site. Besides this, we assign value (1) to ***Wtp for improvement*** while we give no value (0) to the moderator ***Unpublished*** as we do not consider relevant any publication bias for our analysis. Lastly, the variable ***Year of primary data*** (YPD, that stands for the differential in number of years between the considered estimation and the year of the older study proposed in the model) could lead to equivocal results in the value assessment as it makes the dependent variable to increase dramatically. It is difficult to address such a huge distortion just to a simple shift in consumers' preferences or refinement of valuation techniques as referred by the authors, also given the fact that a possible income effect should have been captured by the moderator *GDP per capita*, already present in the model.

In this perspective, even if an effect could be played by the above, it seems more probable that such value explosion is due to an ageing of the meta-analytical framework that make the variable to lose sensibility with passing of years.

The considered regressor emerges as a positive trend with large intensity possibly related to a specific feature of the sample dataset considered by the authors. As regards our analysis, we take 2019 as reference year in order to estimate a pre-pandemic scenario and we assign a value (YPD = 45) that it is almost double to the mean of the primary data sample.

In this sense, we will set up an alternative trial also using the mean value (YPD = 23.9) in order to evaluate the effect of the variable on the final output.

3.2.1.2 Site Variables

Site variables are specified through a set of characteristics regarding the protected status of the area, ecosystem type and then by services provided by the investigated site in term of recreational fishing and non-extractive recreation (i.e., all recreational activities that do not undermine in a substantial manner the stock composition of environmental good). The processed model realized statistical significancy respectively to three ecosystem type and to both service-related variables.

Within the given framework, the policy site of Civitanova Marche is easily attributable to a beach ecosystem. In this respect, we must keep in mind that the proposed category (that includes only study sites with sand sediments) fits partly our case considering the shingled composition of part of the promenade. Nonetheless, the latter constitutes a minority of the whole coastal area and so we can assume the suitability and select the ***Beach ecosystem type*** variable. Coming to the identification of ecosystem services, we know from the authors that the two regressors of ***Non-extractive recreation*** and ***Recreational fishing*** are not mutually exclusive. The policy site results to be equipped with both services. Therefore, we attach value (1) to both variables.

3.2.1.3 Context Variables

Variables that fall under the following category are referred to the specific context in which the site under investigation is located. Seven variables are significant for the considered model.

The ***GDP per capita*** moderator variable is expressed as the natural log of the national income level for the considered year in 2003 International Dollars. We choose 2019 as reference year for our evaluation in order to exclude from the regressor any effect of the recent economic shock of Covid-19 pandemic. Hence, the figure about Italy gross domestic product per capita for year 2019 was extracted from World Bank series at current international dollars and it amounted to 44.248,2 $. Then, the latter was converted into 2003 International Dollars by mean of the Consumer Price Index (CPI) in order to make it comparable with primary data from the meta-analysis. We define it as follow:

(1) $$GDP2003 = GDP2019 / CPI2020 * CPI2003$$

GDP2003 results to be 31.449,8 $. Annual consumer price indexes were calculated by picking values of monthly CPI for the corresponding base years and taking the average.

The explanatory variable ***Population density*** has also a positive effect on the dependent variable and is described as the natural log function of the number of inhabitants per km^2. We can easily define the regressor as the ratio between the current number of citizens and the whole surface occupied by the township. According to official data, the town counts 42.167 dwellers whereas it covers an area of 46,06 km^2: it follows a population density of 915 inhabitants/km^2. If compared with data from the dataset of primary evaluations, we clearly see a divergence from the mean value of approximately 115 inhabitants/km^2 (4,77 in term of log function) also distant from the upper bound of the distribution, witnessing a feature of higher urbanization for the policy area compared to the dataset composition. In this sense, we can soundly attribute zero value (0) to the explanatory variable ***Low human development***.

We compute the value of the ***Accessibility*** regressor following the authors' instructions that describe the variable as the travel time from the nearest city with more than 50.000 inhabitants. Hence, the mean travel time from the policy site to the city of Ancona was considered and evaluated to be forty minutes on average (considering train and car as transport options and excluding coach). The obtained value, as expressed by its log function in Table 11, represent an outlier in the given distribution that, in the context of value transfer, causes the regressor to reverse its impact with a positive effect on the dependent variable.

Heating degree months variable is employed to describe the aspect of climate in the economic valuation. The metrics (HDM) stands for the cumulative deviation of average monthly temperature from an optimal base mean temperature that the authors, following Maddison and Rehdanz (2011), define as below:

(2) $$HDM = POS\ (18.3 - TJAN) + POS\ (18.3 - TFEB) + \ldots + POS\ (18.3 - TDEC)$$

Where Ti represents the mean temperature for each considered month and the function POS returns only positive deviations. A base temperature of 18.3°C is defined as the optimal temperature where householders need neither heating nor cooling to feel comfortable indoors (Maddison and Rehdanz, 2011). Since we are not able to find trustable data specifically addressed to the site of Civitanova Marche, we define the value making use of data related to the meteorological station of Ancona - Falconara[7]. According to the formula, we obtain an estimated value for Heating Degree Month of 67.4 °C.

Eventually, a separate comment must be made for the last two variables of *Marine Biodiversity* and *Anthropogenic Pressure* where detailed metrics for the area of interest were scarce.

In order to assess ***Marine Biodiversity***, the authors made use of the Shannon-Wiener index of biodiversity as calculated within the global mapping framework of Ocean Biogeographic Information System (OBIS).

Due to difficulty in extrapolating significative information for an extremely limited geographic area from OBIS dataset, we will make use of other sources from the literature to detect a measure of marine biodiversity for the area of investigation. In general, we see how marine biologists agree on the fact that a huge depletion of biocenosis of central Adriatic ecosystems is going on especially because of fishing practices (such as bottom trawling) that are widely spread also in the site of Civitanova Marche). Bastari et al. (2017), through local ecological knowledge analysis (LEK) based on response of a sample of surveyed fishermen, supports that at increasing distance from the coast, higher classes of abundance are more likely. Hence, we assume a lower biodiversity for the recreational site that is close to the shore and characterized by shallow backdrops. Several attempts of quantitative measuring are also traceable in the literature: we cite two studies for our analysis respectively conducted by Coccioni and Frontalini (2007) and Lattanzi et al. (2012). Coccioni and Frontalini provided a follow-up activity on Benthic Foraminifera that was based on data gathered by 42 sampling stations distributed along the stretch that goes from Gabicce to Porto Recanati during a time span of three years (2002-2005). The Shannon-Wiener index was estimated to move into a range that vary from 0.4 to 2.1. In a similar way, Lattanzi et al. made an analysis of Amphipod assemblage's presence in the context of an operation of beach nourishment and estimated the Shannon-Wiever index specifically for the coastal zone under the municipality of Civitanova Marche. Value observed in proximity of the coastline for shallow backdrops (2 meters) ranged from a mean value of 1.36 before nourishment and 1.99 after nourishment while deep backdrops (5 meters) values are respectively 2.05 before and 1.90 after nourishment. Although information is not exhaustive for a full assessment and consider only a restricted sample of species, it gives as enough confidence to affirm that the policy site possesses a lower level of marine biodiversity compared to the dataset distribution. We envisage a Shannon-Wiener index that is most likely to be less than or equal to 2. Therefore, we will consider two hypothetical values for the corresponding regressor: the first value will be that of a Shannon-Wiener index equal to 2 ($S = 2$) and the second one equal to 1.38 ($S = 1.38$) that corresponds to the mean minus one and half times the standard deviation of primary observations' distribution.

[7] Data extracted on the basis of medium temperatures of last 30 years as reported by the meteorological station of Ancona – Falconara.
See: https://www.ilmeteo.it/portale/medie-climatiche/Civitanova+Marche

In a similar way, we want to estimate the ***Anthropogenic Pressure*** (AP) variable that is defined by the authors as the nutrient concentration (ton/km2/year) in the surrounds of the investigated site, that negatively impact on the dependent variable. Even if we are not able to determine the requested metrics, we can clearly define the shoreline of Civitanova Marche as a densely anthropized area that is subject to the effect of several environmental stressors that go from the above-mentioned fishing and fish farming practices to sea trade and port activities, besides recreational exploitation. Thus, we tend towards the attribution of a high value for the corresponding moderator variable of the meta-analysis also considering the composition of primary valuation's dataset.

For the purpose of value assessment, we assume a first value equal to the upper bound of the sampling distribution of primary data (ln(AP) = 3.26) and a second value corresponding to the mean plus twice the standard deviation (ln(AP) = 6.11) as we retain high chances to find our site lying between these two ends, also given the logarithmic nature of the regressor.

TABLE 6: Value selected for explanatory variables.

Explanatory Variable	Units	1st Selected Value	2nd Selected Value
Study Variable			
CV - open ended	Binary	0	-
TCM – zonal	Binary	1	0
TCM – individual and RUM	Binary	0	-
Contingent Behavior	Binary	0	1
WTP for improvement	Binary	1	-
Unpublished	Binary	0	-
Year of primary data	Years after first evaluation (1974)	45	23.9
Site Variable			
Estuary	Binary	0	-
Beach	Binary	1	-
Reef	Binary	0	-
Recreational fishing	Binary	1	-
Non – extractive recreation	Binary	1	-
Context Variable			
GDP per capita (ln)	2003 US$/year (PPP, ln)	10.35615	-
Population density (ln)	Inhabitants per km2	6.818924	-
Low human development	Binary	0	-
Anthropogenic pressure (ln)	Nutrients concentration (ton/km2/year, ln)	3.26	6.11
Accessibility (ln)	Travel time to nearest large city (hours, ln)	-0.40547	-
Marine biodiversity	Shannon index of biodiversity	2	1.38
Heating degree months	Degrees Celsius	67.4	-

4 Results of the Analysis

In the making of the analysis, we make use of two different settings of variables: a first setting composed by 8 different combinations of explanatory variables (*Setting A*) and a second one in which we value the impact of the variable *Year of Primary Data* that consists of 16 combinations (*Setting B*). In this way, we obtain two separate layouts of the model that are shown in the Appendix. In Setting A, two values are hypothesized for four explanatory variables (*TCM-zonal/Contingent Behavior*, *Anthropogenic pressure* and *Marine biodiversity*) with the envisaged value running between the two extremes identified. The same happen for Setting B with the addition of the variable *Year of primary data*. Therefore, while Setting A is configured in compliance with the guidelines given by the authors for value transfer approach, the latter gives us a broader perspective useful to evaluate the above specified effect of the considered study variable *Year of primary data* by picking the mean value assumed in primary observations' dataset.

TABLE 7: Value ranges for the site of Civitanova Marche

MODEL SETTING	LOWER BOUNDARY VALUE (€/ha/year)	REFERENCE VALUE (€/ha/year)	UPPER BOUNDARY VALUE (€/ha/year)
SETTING A	71.938	2.384.638	5.640.638
SETTING B	3.447	114.252	5.640.638

By running the model, each corresponding output is detected and exchanged into current euros. Value ranges for the two analyzed scenarios are summarized in Table 7 together with the corresponding reference value for each setting. In Setting A, the emerged monetary value for the considered policy site ranges between 71.938 and 5.640.638 €/ha/year: we expect the economic value of the policy site to amount presumably to 2.384.638 €/ha/year that is the output defined by the combination of variables that estimated the results of a zonal travel cost method analysis (*TCM – zonal* = 1; *Contingent behavior* = 0) by picking the more conservative estimation for Shannon Index (*S* = 1.38) and the value equal to the mean of the sampling distribution of primary dataset plus twice the standard deviation for the logarithmic explanatory of anthropogenic pressure (*ln(AP)* = 6.11). On the other hand, Setting B defines an interval of values between 3.447 and 5.640.638 €/ha/year where we assume a reference value for the estimation of 114.252 €/ha/year: the latter describes the output performed by defining the first four variables in the same manner as the reference value of Setting A (*TCM – zonal* = 1, *Contingent behavior* = 0; *S* = 1.38; *ln(AP)* = 6.11) plus the additional variable of *Year of primary data* defined by taking the mean value of the meta-analysis' sample (YPD = 23.9).

The comparison within the two layouts suggests a huge impact of the variable *Year of primary data* on the dependent variable that moves down the lower bound of the estimate. Moreover, this impact is further emphasized by the huge gap that intervenes among the two reference values of Setting A and Setting B. It seems difficult to interpret it if not as a side effect of some model's obsolescence. In this sense, an update of the model seems to be necessary for further value transfers and it will be useful in the perspective of a model use for policy assessment, given the wide impact exerted by the regressor on the dependent variable that could lead to conflicting results. However, we retain Setting A to reflect a more rigorous use of the meta-analytical framework and we stick to the results obtained by the latter for a benefit transfer approach. Nonetheless, a value range that is slightly lower than what emerged from the calculation may be conceivable.

Coming to our area of interest and according to data provided by the municipality office on maritime domain services of Civitanova Marche, a total of 475.000 € in fees were collected for year 2020 on concessions of marine state-owned assets of which 287.000 € specifically incurred for seaside establishments, a figure that we can assume to be relatively stable over time.

This amount results to be directly referrable to an overall area devoted to bathing facilities of around 16 hectares implying an average cost per hectare of a little less than 18.000 €/ha/year for the concessionaire. If we compare the average cost of concession fee with results of Setting A, the detected recreational value for the corresponding hectares seems to be extensively higher than the total of proceeds. It is remarkable that, even only considering the lower boundary of Setting A's estimate, it emerges a value that is four times bigger than the average amount determined by concession fees. We note especially how the high number of recreational services provided represents a significant source of value for users of the area of Civitanova Marche. This situation results to be also enhanced by the high accessibility to the site as well as by the large population density that guarantee a solid basin of beach users especially during the warmer seasons. In this sense, similar analyses could be carried out for other regional coastal areas such as San Benedetto del Tronto and Porto Recanati that show a compatible beach configurations and preferences of consumption among users and may lead to similar results.

5 Insights for a reform of price mechanism

With the current system of allocation being not based on a public negotiation between concessionaire and the state-owner, effectiveness of the evaluation criteria determined by *d.l. 400/1993* is questioned as it contributes to the formation of a price that is virtually much below the market. On the other hand, quantity given for concessions of coastal areas are extremely high and endorsed by national and regional legislation, setting limitations that are soft or non-existent and, in some cases, do not impose sanctions to violators. At today occupied beaches represent a significant portion of the whole coastal area (about 40%)[8], without considering that it does not exist any national legislation that determines a minimum

[8] See *Rapporto Spiagge 2019. La situazione ed i cambiamenti in corso nelle aree costiere italiane.*

quantity of beach that should be prevented from concession: only 10 coastal regions - out of 15 - have fixed a ratio to comply with, that on average amounts to a minimum threshold of 35.5% of seafront. In this way, the legal framework enhances a situation that tends toward preferences of private disposal with little consideration to consumption preferences of neighboring community and users. Equally, the outcome of the proposed analysis and benefit transfer approach on the policy site of Civitanova Marche seems to confirm this view with a per-hectare value significantly higher than the corresponding concession tax and an area covered by recreational seaside facilities equal to almost one third of the total shoreline surface.

However, as regards the adequacy of fees paid, it can be argued that concessionaires play a role in the enhancement of the stock of environmental good and in this way contribute to the value implementation of the marine state-owned property.

In this way, divergence between paid price and the actual economic value could be justified. Nonetheless, this hypothesis does not seem to reflect completely reality. Recreational seaside facilities have contributed to the overbuilding of coastal areas, involving especially non-removable facilities[9]. Contemporaneously, a constant depletion of the dune environment occurred along national coastline, that passed from 1.200 km in 1955 to 700 km in 2012, with serious implication on coastal erosion and significant loss in term of marine biodiversity. Against this background, it is difficult to outline in general term a clear role played by concessionaires in landscape and environment preservation or enhancement. The need for an adjustment over price mechanism seems to be unquestionable. Two viable options are possible: on the one hand, an increase of the concession fee (possibly through systems that include public tendering procedures) and on the other hand to constrain the concession issuance to more stringent obligations in accordance with principles of a better preservation of coastal environment. In both cases, parameters set out by regulatory framework and *d.l. 400/1993* must be overcome and at least an update of taxation seems necessary. This could happen by a redefinition of parameters set out by the Decree Law but also by exploring new solutions, such as the addition of a tax linked to revenues performed by seaside facilities or by attaching the configuration of price to brand-new procedures of economic value assessment – e.g., meta-analysis - aimed to take consumer preferences into consideration of cost-benefit analysis and help municipalities to take decisions on the awarding of additional concessions.

A growing tendency toward private forms of management has been witnessed in recent years, with beach management sector attracting an ever-increasing number of firms[10]. In this respect, the choice among alternative frameworks to the existing one must therefore take account of an insurmountable constraint linked to the scarcity of the environmental resource necessary to operate in the sector (Benetazzo et al., 2017). Hence, it seems possible to build a comprehensive reform of the sector that

Legambiente (2019). Link: https://www.legambiente.it/wp-content/uploads/Rapporto-Spiagge-2019.pdf.
[9] See the WWF report "Spiagge Italiane: bene pubblico, affare privato"
[10] See the WWF report "Spiagge Italiane: bene pubblico, affare privato"

envisages differentiated solutions according to the nature of state property. In this context, the tendency toward the adoption of outsource solutions is not necessarily detrimental but must be pursued with attention to the long-term scenario bearing in mind the shortage of public beach and the irreversibility of several processes of environmental transformation. To implement a similar approach, mechanisms of pricing that take into consideration the scarcity of good and envisages progressive fee to apply for each incremental stretch of coastline outsourced would represent a possible solution of support to the already adopted regional and municipal planning for Integrated Coastal Zone Management (ICZM).

6 Conclusions

The proposed paper aims to a better understanding of the controversy related to beach concessions of touristic-recreational use turned into seaside facilities and the way through which concession tax are determined. Within the given context the inefficiency of the latter is certainly an anomaly generated by the obsolescence of what is an already fragmented regulatory framework. It results that an excessive quantity of public beach is at disposal of touristic-recreational concessions and price mechanism as determined by disposition of *d.l. 400/1993* generates inadequate turnovers if compared with the scarcity of the good and income earned by the business sector of seaside facilities. In this respect systematic ex lege extensions of licences contributes to make the matter even worst preventing a structural reorganization of the discipline, as well as opposing to the *Directive 2006/123/EC.*

A meta-analysis applied to the coastline of Civitanova Marche gave us meaningful insight on the potential recreation value of the area and the current state of local beach concessions for recreational seaside facilities. In this sense, a scope of this paper is to propose a new field of application for meta-analyses where this methodology can contribute to accomplish a more accurate recognition of recreational value of the site under concession avoiding such divergences between paid price and the actual social cost imposed. Of course, possible limitations could have affected the application of the given framework of meta-analysis to policy sites like the one we tried to analyze. Features of primary valuation dataset such as the high frequency of protected areas and the better quality of marine habitats can discourage from considering it as a valid estimate for the policy site. Nonetheless, if we look at the outcomes of the model, the obtained results strengthen the hypothesis of a poor compensation for the leasing of rights of disposal over public beach, describing an order of magnitude for recreational value that is way bigger than the one determined for concession fees by the legal framework of *d.l. 400/1993*. In view of the obtained results, the given pricing policy becomes difficult to justify and the necessity to act on the allocation of public beach and entity of concession tax seems inevitable.

7 References

Acciarri a., Bisci C., Cantalamessa G., Di Pancrazio G. (2017), *La percezione dell'offerta turistico-balneare delle Marche meridionali: Porto Recanati (MC), Civitanova Marche (MC), Porto Sant'Elpidio (FM) e San Benedetto del Tronto (AP).* Studi Costieri, **25**, 45-56.

Bastari A, Beccacece J., Ferretti F., Micheli F. and Cerrano C. (2017) *Local Ecological Knowledge Indicates Temporal Trends of Benthic Invertebrates Species of the Adriatic Sea.* Front. Mar. Sci. 4:157. doi: 10.3389/fmars.2017.00157.

Bateman, I.J., Jones, A.P. (2003), *Contrasting conventional with multi-level modeling approaches to meta-analysis: expectation consistency in UK woodland recreation values.* Land Economics **79**, 235–258.

Benetazzo C., Gobbato S. (2017), *Italian state beach concessions and Directive 2006/123/EC, in the European context.* European Parliament, Directorate-General for Internal Policies.

Coccioni R., Frontalini F. (2008), *Benthic foraminifera for heavy metal pollution monitoring: a case study from the central Adriatic Sea coast of Italy.* Estuarine, Coastal and Shelf Science – Elsevier.

Florax R.J.G.M., Nijkamp P., Willis K.G., (2002), *Meta-analysis and value transfer: comparative assessment of scientific knowledge.* In: Florax R.J.G.M., Nijkamp P., Willis K.G. (Eds.), Comparative Environmental Economic Assessment. Elgar, Cheltenham, UK.

Ghermandi A., Nunes P. (2013), *A global map of coastal recreation values: Results from a spatially explicit meta-analysis.* Ecological Economics, **86**, 1-15.

Lattanzi L., Targusi M., Nicoletti L. (2013), *Amphipod assemblages before and after beach nourishment in the central Adriatic Sea (Italy).* - Crustaceana - brill.com.

Maddison, D., Rehdanz, K. (2011), *The impact of climate on life satisfaction.* Ecological Economics **70** (12), 2437–2445.

Pichery C. (2014), *Sensitivity Analysis.* Encyclopedia of Toxicology (Third Edition). Academic Press, 236-237.

8 Appendix

TABLE 8: Definition of variables for Benefit Transfer Analysis of Chapter 3

VARIABLE	COEFFICIENT	UNITY OF MEASUREMENT	IP1	IP2	IP3	IP4	IP5	IP6	IP7	IP8	IP9	IP10	IP11	IP12	IP13	IP14	IP15	IP16
Constant	-7,987		-7,987	-7,987	-7,987	-7,987	-7,987	-7,987	-7,987	-7,987	-7,987	-7,987	-7,987	-7,987	-7,987	-7,987	-7,987	-7,987
CV – open ended	-0,944	binary	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TCM – zonal	2	binary	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
TCM – individual and RUM	0,937	binary	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Contingent behavior	-1,639	binary	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
WTP for improvement	0,863	binary	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Unpublished	-1,312	binary	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Year of primary data	0,144	years after first valuation (1974)	45	45	45	45	23,9	23,9	23,9	23,9	45	45	45	45	23,9	23,9	23,9	23,9
Estuary	1	binary	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beach	2	binary	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Reef	2	binary	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Recreational fishing	2	binary	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Non-extractive recreation	3	binary	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
GDP per capita (ln)	0,47	2003 US$/year (ppp, ln)	10,35615	10,35615	10,35615	10,35615	10,35615	10,35615	10,35615	10,35615	10,35615	10,35615	10,35615	10,35615	10,35615	10,35615	10,35615	10,35615
Population density (ln)	0,454	inhabitants per km2 (ln)	6,818924	6,818924	6,818924	6,818924	6,818924	6,818924	6,818924	6,818924	6,818924	6,818924	6,818924	6,818924	6,818924	6,818924	6,818924	6,818924
Low human development	2	binary	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anthropogenic pressure (ln)	-0,239	nutrients concentration (ton/km2/year, ln)	3,26	3,26	6,11	6,11	3,26	3,26	6,11	6,11	3,26	3,26	6,11	6,11	3,26	3,26	6,11	6,11
Accessibility (ln)	-0,534	travel time to nearest large city (hours, ln)	-0,40547	-0,40547	-0,40547	-0,40547	-0,40547	-0,40547	-0,40547	-0,40547	-0,40547	-0,40547	-0,40547	-0,40547	-0,40547	-0,40547	-0,40547	-0,40547
Marine biodiversity	0,29	shannon index of biodiversity	2	1,38	2	1,38	2	1,38	2	1,38	2	1,38	2	1,38	2	1,38	2	1,38
Heating degree months	-0,008	degrees celsius	67,4	67,4	67,4	67,4	67,4	67,4	67,4	67,4	67,4	67,4	67,4	67,4	67,4	67,4	67,4	67,4

TABLE 9: Value computation of Setting A

	OUT1	OUT2	OUT3	OUT4	OUT9	OUT10	OUT11	OUT12
	-7,987	-7,987	-7,987	-7,987	-7,987	-7,987	-7,987	-7,987
	0	0	0	0	0	0	0	0
	1,862	1,862	1,862	1,862	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	-1,639	-1,639	-1,639	-1,639
	0,863	0,863	0,863	0,863	0,863	0,863	0,863	0,863
	0	0	0	0	0	0	0	0
	6,48	6,48	6,48	6,48	6,48	6,48	6,48	6,48
	0	0	0	0	0	0	0	0
	1,86	1,86	1,86	1,86	1,86	1,86	1,86	1,86
	0	0	0	0	0	0	0	0
	1,697	1,697	1,697	1,697	1,697	1,697	1,697	1,697
	3,387	3,387	3,387	3,387	3,387	3,387	3,387	3,387
	4,86739	4,86739	4,86739	4,86739	4,86739	4,86739	4,86739	4,86739
	3,095792	3,095792	3,095792	3,095792	3,095792	3,095792	3,095792	3,095792
	0	0	0	0	0	0	0	0
	-0,77914	-0,77914	-1,46029	-1,46029	-0,77914	-0,77914	-1,46029	-1,46029
	0,216518	0,216518	0,216518	0,216518	0,216518	0,216518	0,216518	0,216518
	0,58	0,4002	0,58	0,4002	0,58	0,4002	0,58	0,4002
	-0,5392	-0,5392	-0,5392	-0,5392	-0,5392	-0,5392	-0,5392	-0,5392
LN(Y)	15,60336	15,42356	14,92221	14,74241	12,10236	11,92256	11,42121	11,24141
Y (2003$)	5976582	4993060	3024358	2526661	180296,8	150626,6	91236,42	76222,3
Y (2020$)	8408731	7024967	4255110	3554877	253667,9	211923,6	128364,8	107240,7
Y (current €)	5640638	4712400	2854359	2384638	170162,3	142159,9	86108,02	71937,85
MIN	71937,85		**REF.VALUE**	2384638				
MAX	5640638							

In Setting A the reference value is defined by Output 4 (OUT4), the lower bound by Output 12 (OUT12) and the upper bound by Output 1 (OUT1).

TABLE 10: Value computation of Setting B

	OUT1	OUT2	OUT3	OUT4	OUT5	OUT6	OUT7	OUT8	OUT9	OUT10	OUT11	OUT12	OUT13	OUT14	OUT15	OUT16
	-7,987	-7,987	-7,987	-7,987	-7,987	-7,987	-7,987	-7,987	-7,987	-7,987	-7,987	-7,987	-7,987	-7,987	-7,987	-7,987
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1,862	1,862	1,862	1,862	1,862	1,862	1,862	1,862	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	-1,639	-1,639	-1,639	-1,639	-1,639	-1,639	-1,639	-1,639
	0,863	0,863	0,863	0,863	0,863	0,863	0,863	0,863	0,863	0,863	0,863	0,863	0,863	0,863	0,863	0,863
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	6,48	6,48	6,48	6,48	3,4416	3,4416	3,4416	3,4416	6,48	6,48	6,48	6,48	3,4416	3,4416	3,4416	3,4416
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1,86	1,86	1,86	1,86	1,86	1,86	1,86	1,86	1,86	1,86	1,86	1,86	1,86	1,86	1,86	1,86
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1,697	1,697	1,697	1,697	1,697	1,697	1,697	1,697	1,697	1,697	1,697	1,697	1,697	1,697	1,697	1,697
	3,387	3,387	3,387	3,387	3,387	3,387	3,387	3,387	3,387	3,387	3,387	3,387	3,387	3,387	3,387	3,387
	4,8673895	4,86739	4,86739	4,86739	4,86739	4,86739	4,86739	4,86739	4,86739	4,86739	4,86739	4,86739	4,86739	4,86739	4,86739	4,86739
	3,0957915	3,095792	3,095792	3,095792	3,095792	3,095792	3,095792	3,095792	3,095792	3,095792	3,095792	3,095792	3,095792	3,095792	3,095792	3,095792
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	-0,77914	-0,77914	-1,46029	-1,46029	-0,77914	-0,77914	-1,46029	-1,46029	-0,77914	-0,77914	-1,46029	-1,46029	-0,77914	-0,77914	-1,46029	-1,46029
	0,2165184	0,216518	0,216518	0,216518	0,216518	0,216518	0,216518	0,216518	0,216518	0,216518	0,216518	0,216518	0,216518	0,216518	0,216518	0,216518
	0,58	0,4002	0,58	0,4002	0,58	0,4002	0,58	0,4002	0,58	0,4002	0,58	0,4002	0,58	0,4002	0,58	0,4002
	-0,5392	-0,5392	-0,5392	-0,5392	-0,5392	-0,5392	-0,5392	-0,5392	-0,5392	-0,5392	-0,5392	-0,5392	-0,5392	-0,5392	-0,5392	-0,5392
LN(Y)	15,603359	15,42356	14,92221	14,74241	12,56496	12,38516	11,88381	11,70401	12,10236	11,92256	11,42121	11,24141	9,063959	8,884159	8,382809	8,203009
Y (2003$)	5976582,1	4993060	3024358	2526661	286346,9	239224,9	144901,5	121056,1	180296,8	150626,6	91236,42	76222,3	8638,286	7216,746	4371,272	3651,924
Y (2020$)	8408730,8	7024967	4255110	3554877	402874,8	336576,6	203868,6	170319,5	253667,9	211923,6	128364,8	107240,7	12153,6	10153,57	6150,146	5138,061
Y (current €	5640638,3	4712400	2854359	2384638	270251,4	225778,1	136756,6	114251,5	170162,3	142159,9	86108,02	71937,85	8152,727	6811,092	4125,563	3446,649
MIN	3446,6492		**REF.VALUE**	114251,5												
MAX	5640638,3															

In Setting B the reference value is defined by Output 8 (OUT8), the lower bound by Output 16 (OUT16) and the upper bound by Output 1 (OUT1).