

The Blue Economy of coasts in Italy. Econometric models for assessing the risk of beach erosion¹

Marco Pini, Si.Camera-Unioncamere

Introduction

How economically important is the sea? The sea represents an important lever for the economic system, as underlined by the European Union too. In recent years in the EU the awareness of the direct link between blue economy and economic growth has increased². According to Unioncamere data³, the blue economy produced in 2015 an added value of 42.6 billion euros in Italy, corresponding to 3% of the total economy with over 800 thousand persons employed which represents 3.5% of total employment value of the country. So, the coastal protection topic involves both environment and economy. In fact, for example, more than one third of the total added value produced in Italy by the blue economy is related to coastal tourism referring to specific activities like "Accommodation and Food and beverage service" and "Sports and amusement and recreation activities" placed in coastal municipalities: 15.3 billion euros produced in 2015; almost 380 thousand persons employed with an increment by 2% in respect to 370 thousand in 2011; 105.8 thousand of enterprises, incremented by 10% from 2011, corresponding to 10 thousand units more.

Added value and employment of the Blue Economy: the details - Year 2015 (absolute value and percentage)

Settori	Added Value		Employed persons	
	a.v. (mln euros)	Composition %	a.v. (000 units)	Composition %
Fisheries	3,151.9	7.4	102.0	12.2
Offshore oil and gas	2,362.2	5.5	6.0	0.7
Shipbuilding chain	6,596.2	15.5	129.2	15.5
Maritime transportation	7,699.0	18.1	99.1	11.9
Marine tourism	15,324.0	36.0	378.3	45.3
<i>of which: Accommodation and Food and beverage service activities</i>	12,849.2	30.2	310.6	37.2
<i>Sport and recreative activities</i>	2,474.8	5.8	67.7	8.1
Research, regulation and environmental protection	7,456.1	17.5	120.4	14.4
Total Blue Economy	42,589.3	100.0	835.1	100.0
Total economy	1,434,362.2		23,961.9	
Percentage Blue Economy on the total economy (%)	3.0		3.5	

Source: Unioncamere-Si.Camera, V Rapporto sull'Economia del Mare

¹ This work is the result of a more wide analysis on economic impact assessment methodology realized by Statistical and Economic department of Si.Camera-Unioncamere, scientifically shared with Alessandro Rinaldi and realized with the operative support of Enrica Tozzi.

² European Commission (2013), *Blue Growth. Opportunities for marine sustainable growth*, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Brussels, 13 September; ECORYS, Deltares, Oceanic Développement (2012), *Blue Growth. Scenarios and Drivers for Sustainable Growth from the Oceans, Seas and Coasts*, (for the European Commission), Rotterdam/Brussels, 13 July.

³ Unioncamere-Si.Camera, V Rapporto sull'economia del mare; Pini M., The blue economy contribution to economic growth of the country, «Review of Economics and Statistics for Regional Studies» n.2, 2013, Franco Angeli, Milan, pp. 87-97.

These figures explain the determinant role of the “sea” to sustain the economic system of a specific area. Indeed, the activities linked to coastal tourism show a wide multiplier effect: for each one euro produced by coastal tourism activities, 2 euros are generated on the rest of the economy.

Blue and green economy

Blue economy and green economy, a tight relationship? One of the new paradigms underlying the early 2000s development is the green economy, a topic considered no longer as a “cost” with a mere ethic nature, but as an opportunity. A factor which improves productivity, economic growth and, consequently, also the occupation increase⁴. Clearly, the environmental sustainability acquires more importance in our case because the item of pollution reduction are strongly related to the territorial safeguard (e.g. the beaches).

The Unioncamere data show a significant green investments propensity (with regards to firms with at least one employee) of the blue economy firms⁵, considering that those which have already invested during the triennium 2013-15 in green field represent the 17.3% of the total. Moreover, the 11.1% expect to invest in 2016. Regarding the firms which have already invested, the investments are aimed mainly at consumption reduction⁶ (85,1%) in respect to production process (15,6%) and to product (10,3%). Moreover, from territorial point of view, the green investments are widespread in all macro-areas without particular gap: the percentage of firms which have already realized green investments corresponds to 20.4% in the North-West, 18.9% in the North-Est, 16.5% in the Center and 16.9% in the South.

The background: the production activity of the territory

What do we have to measure? This is the first step to take on if we want to study the economic impact of the beach erosion. When we face the “economic impact” it’s necessary to base the analysis on the main economic activity indicator: the added value. We specify that we consider the added value such as macroeconomic indicator defined by the National Accounts methodology⁷, so it allows us to estimate the economic impact on Gross Domestic Product (GDP) for a given territory. In fact, as is well known, the GDP is the result of the sum of the added values produced by single economic activities, plus a residual term related to indirect taxes net of subsidies.

Hence, with this approach we are in the macroeconomic field, even if the analysis could begin from enterprises’ data at microeconomic level. Moreover, the choice to focus on the added value permits us to estimate the potential impact not only in structural terms but also in the dynamics ones with reference to economic cycle at a local level too. Finally, thanks to the choice of the added value as activity indicator, we can evaluate the total impact of beach erosion on the GDP at national level.

⁴ Positive link between green economy and productivity is clearly stated and shared by a wide literature starting with the famous Porter’s studies, from which origins the “Porter Hypotesys” (cfr. Porter E.M., *America’s Green Strategy*, Scientific American, vol. 264, n.4, 1991 e Porter M.E., van der Linde C., *Toward a New Conception of the Environment-Competitiveness Relationship*, Journal of Economic Perspectives, vol.9, n. 4, 1995). To have an overview cfr. Koźluk T., Zipper V., *Environmental policies and productivity growth: a critical review of empirical findings*, OECD Working Papers No 1096, Paris, 2013. Referring to the Italian experiences, cfr. Fondazione Symbola–Unioncamere, *GreenItaly*, annual editions; Pini M., The Green jobs demand on the basis of the Italian System of Chamber of Commerce analysis, «Review of Economics and Statistics for Regional Studies», n.3, 2013, Franco Angeli, Milan pp.95-112.

⁵ Still referring to the sectors identified in the *V Rapporto sull’economia del mare* realized by Unioncamere-Si.Camera.

⁶ Data in brackets are referred to a question with multiple-choice answer, so the percentage could be more than 100%.

⁷ Istat, *Methodology for estimate of national accounting aggregate at running price*, Italy – Inventory SEC 95, «Methodology and Rules» n.21, 2004. More recently, Eurostat-European Commission, *European System of accounts ESA-2010*, European Union, 2013.

Fig.1 – From added value to GDP focusing on economic sectors of activity

Sector 1	Production	-	Intermediate Consumption	=	Added Value +
Sector 2	Producton	-	Intermediate Consumption	=	Added Value +
				=	Added Value +
Sector					Added Value =
					Total Added value +
					Indirect taxes net of subsidies
					Gross Domestic Product (GDP)

We want to specify that this approach analyzes the economic impact from the supply side, focusing therefore on the productive capacity rather than the demand side, which consists of final consumptions (residents, non resident tourists, etc.), investments and foreign demand⁸; as well as it isn't related to other evaluations out of National accounts, such as the expected damages⁹. Clearly, the supply approach is directly linked to GDP because, as we have just seen, the GDP is the sum of added values produced by each activity sector. While the demand side calculation involves estimates about economic impact of beach erosion on the GDP with regards to more aggregates: we remember that the GDP is equal (from the demand side) to *the sum of every demand components. This involves the need to take into account the effect of the beach erosion not only seeing consumptions (first of all the touristic ones) but also other demand components (investments, etc.) which are however related to the phenomenon analyzed.*

The approach chosen requires a deep work of estimation of the added value at territorial level – referring to a specific recent year – with a municipal and sub-municipal detail, to obtain the economic framework on which calculate the economic impact (in structural and dynamic terms) of the beach erosion. Unfortunately, the maximum territorial level of the added value data provided by Istat (National Institute of Statistics) is provincial, the most recent year is 2013 and the data show are not detailed as it would be necessary¹⁰. Indeed, the analysis of this study requires data with the highest detailed level both territorial and sectorial (fifth digit of the Classification of the Economic Activities - Ateco, Istat¹¹).

Moreover, to estimate the total productive capacity (added value and GDP) by territorial levels allows also to know the economic weight of a specific marina area within the corresponding municipality, province or region.

Which is the value of the economy generated by the beach? Once estimated the territory's productive capacity it is necessary to know the value depending directly (or generated) on the beach. In this direction we have to use some indicators based on the localisation of the enterprises through geo referencing instruments, Area Code, localities, census size, focusing on coastal areas.

The need of the maximum territorial detail, up to local level, is explained by the existence of several geographic realities where the municipalities may expand for a large part also in the internal areas (quite far from the coast). However, the relationship with the beach, referring to productive capacity, doesn't involve necessarily only a localisation close to the coast. For instance, a bar placed on the beach shows a beach dependence around by 100%, but, at the same time, with refers to other activities placed a little far from the beach this quota can be lower but still positive (referring to dependence to beach).

⁸ Study from Marche Region on demand side focused on tourism demand (Regione Marche, *Costruzione di un modello replicabile di analisi economica dei tratti di litorale*, agosto 2013).

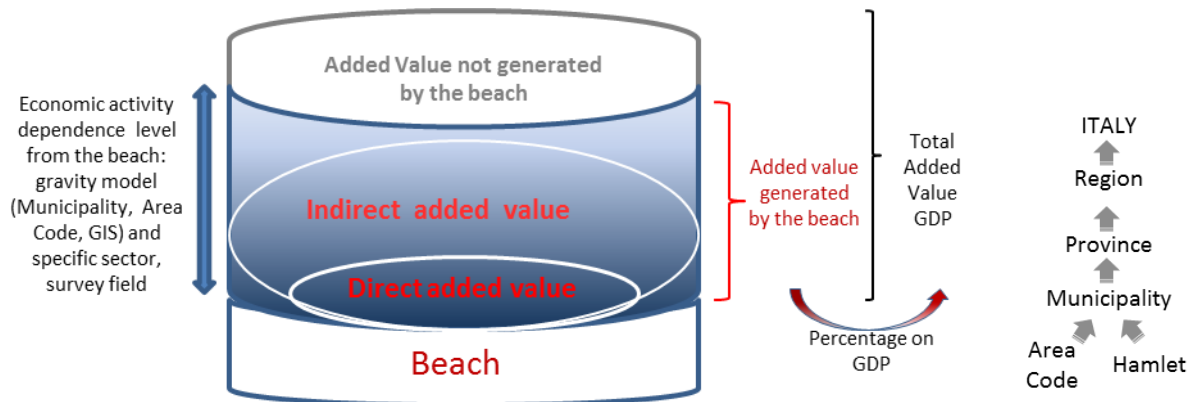
⁹ Cfr. Studio PESETA Joint Research Center IPCT of Siviglia (2009).

¹⁰ <http://dati.istat.it/>.

¹¹ Istat, *Classificazione delle attività economiche Ateco 2007*, «Metodologie e Norme» n.40, 2009.

For this reason the methodology to build up should consider more indicators related e.g to the distance from the coast, to the economic activity sector and should be integrated with an *ad hoc* enterprise survey. At this aim it will be identified a significant statistically firms' sample referring first of all to sector and size able, to gather direct indication about the dependence of their activity from the Coast/ beach.

Fig.2 – Productivity capacity of an area related to the Coast and the Beach



We want to point out that this calculation methodology is based on added value and even if declined at territorial level (from national to area code level), however it respects the main rules of the National accounts methodology, ensuring hence an appropriate use both at national and local level. It would give therefore the opportunities to calculate the economic impact of the coast erosion at national level.

Measurement of the beach erosion effect on the territorial economy

The beach: how much and which? Once calculated the economic value linked to the beach, we have to analyze the beach as single area. Starting from the available data about the surface of the total beach area, the first thing to consider is the distinction between “free/public” beach and “equipped/private” beach (beach resort) to analyze the maximum potential of the beach in terms of people’s presence, using specific parameters related to the physic space per head.

How much is it the worth of a square meter of beach? After having estimated the economic value linked to the beach on the one hand and the surface of the beach on the other hand, it’s possible to calculate the added value per square meter of beach. This operation permit us to estimate, for one year or in terms of mean referred e.g. to a three-year period, the economic value “produced” by a square meter of the beach considering the real people’s presence.

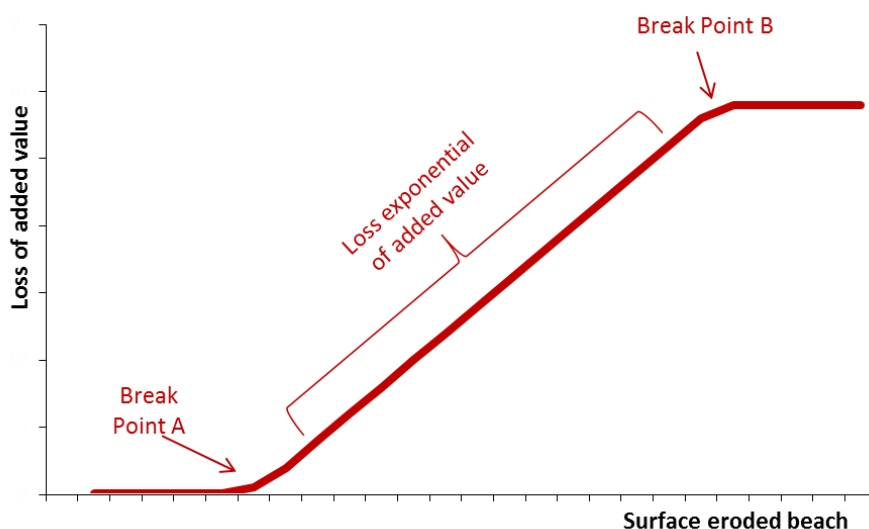
In theory, we could estimate also the potential added value that we can call “of full use” (with refers to the people’s presence on the beach) supposing the full use of the beach by people during the summer season. But, at the same time, this approach wouldn’t allow the exact economic value of the beach which must reflect also the attractiveness potential of the beach.

Erosion effect: how measure it? The evaluation of the economic impact of the beach erosion involves a very analytical calculation because we have to find the mathematical function which represents the relationship between beach erosion and added value decrement with the highest significance level. Clearly, knowing the phenomenon in general we can suppose that this relationship is not following a linear trend, more probably it may be represented by a logistic function. More specifically, there would be a first phase of beach erosion where the economic activity is not too much involved succeeding in finding a new

equilibrium which guarantees the same production level. Whereas the erosion beach should continue, there would be “the second phase” where the erosion effect raises, explained by an exponential pace of the added value lost which starts from the “break point A” (see Fig.3): in this phase there is a negative circle characterized by the decrement of people on the beach, declined of firms’ added value unto close down. The beach resorts of course could be the first activities to suffer, showing the highest likelihood to close down. We should consider, in according to Unioncamere-Infocamere data from “Business Register”, 6,300 firms as beach resorts in Italy at the end of June 2016. Finally, there would be the third phase (it starts from “break point B”, see Fig.3) characterized by the end of the beach erosion (the erosion will be completed substantially) and so the economic activity will stabilize on minimum level without displaying additional decrements¹².

Hence, a single calculation about the economic lost per square meter of beach eroded seems too simplistic and not representative, because it’s more useful to know after how many meters of beach eroded it starts the exponential phase (from break point A to break point B). This analysis needs to be sustained by a survey useful to understand more analytically, at microeconomic level, this relationship between beach erosion and added value decline.

Fig.3 –The beach erosion and the economic impact on decreasing of added value: which links



If we want to estimate the complete economic dimension of the erosion effect we should take into account even the “inter-sectorial” relationships between the economic activities, because the production of a sector generates an economic activation also in other sectors along the productive chain: we can think, for instance, to sectors which provide good and services as intermediate consumptions of another sector or the services activated like consultancy, transports, etc. For this reason it is important to evaluate also the part of economy indirectly activated by the beach: so we can arrive to the total economic value linked to the beach, both in direct and in indirect way. Consequently, we can estimate the total negative effect produced by the beach erosion. This kind of analysis requires the use of input-output table provided by Istat¹³ although only at national level. So, this table will be also estimated at territorial level through some desk indicators in addition to the field ones provided by the specific enterprise survey above mentioned.

¹² The hipotesys is built up in a framework *ceteris paribus*, it means that during the beach erosion no other new economic activity or reclassification should be considered.

¹³ For a methodologic description of tables input-output, cfr. Eurostat, *Input-output Manual*, 2001; Istat, *Le tavole delle risorse e degli impieghi e la loro trasformazione in tavole simmetriche. Methodologic Note*, October 2006. More recently <http://www.istat.it/it/archivio/178233>.

The survey will allow us to understand also the localisation of the indirect activities (within municipality, province, region or elsewhere) in order to focus more strictly the economic impact on the territory.

Output results

So, the results of the econometric analysis will in part concern the economic impact of the beach erosion according to a nonlinear function. It will be defined: the amount of the added value (absolute and relative) lost in a territory because of the increment of the beach erosion, evaluating hence the impact on territorial GDP; the specific features of this economic decrease by type of activities (direct and indirect), underlining the most damaged sectors; finally, the differentials of the economic growth rate.

In other words, from policy maker point of view, the results allows to estimate how many euros it will be generated to sustain the GDP, in both structural and dynamics terms, per each euro invested in beach protection.

Work steps

We show below the work steps from technical point of view through the participation of institutional actors.

Fig.4 – Work steps, involvement of the institutional actors and output results

