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The Nautical Quality Index (NaQi): Methodology and Application to the Case of Italy[1]

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Abstract: The present work aims at setting up an index to rank different coastal territories. The objective is to provide insights for future developing paths: a tool in the service of public decision-makers who govern the territories and optimize the local resources for the purpose of economic development, with the industry of boating involved. This paper offers indexes based on relevant indicators, all of which are available in advanced countries. The construction of the Nautical Quality Index (NaQi) follows a process that strictly adheres to the most reliable method of calculation: starting from 18 variables selected *ad hoc*, which are grouped into six synthetic indicators. The overall indicator is obtained as the sum of each partial indicator, appropriately re-standardized and weighted for the vector of dimensional weighting. The resulting NaQi is therefore a general classification, obtained from the sum of six synthetic indices.

Keywords: Nautical Quality Index, Composite indicator, Tourism, Weighted synthesis

JEL Classifications: C18, R41, R12, J19

1. The value of the land at the service of boating

As is known, the industry of boating and nautical tourism is particularly complex and involves very different components (Ivaldi 2013a). Paradoxically, the sea, and also internal waters, are not the only important element: the surrounding territory is of increasing strategic importance for the development of the sector.

This finding has led to confront and engage in the difficult challenge of creating a tool for measuring the "nautical quality" of the territory, and summarise precisely the value of the territory in relation to the ability to receive and develop nautical tourism. Despite having access to a plurality of proprietary databases[2], there was a lack of an overall assessment that combined the sectoral aspects of boating with the necessary context of each local area (ONN 2013).

[1] All the paper is common, however, sections 1 and 2 are to be attributed to Gian Marco Ugolini and sections 3, 4, 5 are to be attributed to Enrico Ivaldi.

[2] The authors are scientific advisors to the National Nautical Observatory, which has been operating for more than a decade on a national scale and draws up an annual report - Rapporto sul Turismo

The first step was to define the concept of "nautical quality" of a territory: it is not an easy task because it is a qualitative concept. The concept used was that of the "nautical vocation" of an area, as experienced and perceived by the typical user who, in our case, is precisely the pleasure boater or anybody who wants to practice sports and activities that involve a phase of navigation (Ugolini 2010). This vocation is realized in the presence of all general infrastructures and facilities and in the provision of goods and services across the territory in support of the activities of the nautical tourist (Ugolini 2013).

The second preliminary step was to identify the territorial scale (Fraudenberg 2003, Giovannini 2004) on which to measure the nautical quality. We decided to consider the provincial scale, referring of course to the sea provinces (62). The third step was to decide how to use the data considered. In the literature there are mainly two methods to study data related to contexts that can only be described by considering more areas or domains (Saltelli 2007, Brandolini 2008, Decancq and Lugo 2008): one method is aggregative, the other is not aggregative. In this case we chose the former method, through the construction of a composite indicator. A composite indicator (or Index) is a quantitative or a qualitative measure derived from a series of observed facts that can reveal relative positions (e.g.: of a country) in a given area. When evaluated at regular intervals, an indicator can point out the direction of change across different units and through time (Nardo et al., 2005a).

Composite indicators are increasingly used by statistical offices and national or international organizations to convey information on the status of countries in fields such as the environment, economy, society or technological development. Composite indicators are calculated by combining well-chosen sub-indicators into a single index, on the basis of an underlying model of the policy domain that one wishes to measure. Composite indicators provide comparisons of countries in complex and sometimes elusive policy issues (Saisana et al. 2005, Cherchye et al. 2008). These measures are increasingly recognised as a tool for policy-making, and especially public communications on the relative performance of countries in wide ranging fields such as environment, economy or technological development (see Griliches 1990, Cox et al. 1992, Färe et al. 1994, Knox Lovell et al. 1995, Guerard 2001, Osberg and Sharpe 2002, Huggins 2003, Somarriba and Pena 2009, Ivaldi and Testi 2011, Ivaldi 2013b among others)

It is much easier to interpret composite indicators than to try and find a common trend in many separate indicators. Such indicators have proven to be useful in ranking countries in benchmarking exercises (Nardo et al., 2005b). Moreover, such a synthetic statistic can indeed capture reality and be meaningful, in that stressing the bottom line is extremely useful in garnering media interest and hence the attention of policy makers (Sharpe 2004). Therefore, its ability to synthesise the different facets of a phenomenon, led to consider this tool as the most useful and immediate instrument to support economic and social policies.

2. The construction of the index

The planning phase of the construction of the Nautical Quality Index (NaQi) was rather complex and posed the necessity of continuous choices to mediate between the needs for scientific correctness, performance objectives and data availability.

The very concept of measurability imposed to rely as much as possible on objective data (Nardo et al. 2005a, Maggino 2006), integrating them, however, with the subjective judgement of satisfaction of the *stakeholders*, that is, of the boaters.

Following the definition given by Cummins et al. (1998) and Maggino and Ruviglioni (2008), the distinction between objective and subjective components appears sufficiently clear: (1) *Objective component at micro level*, referring to conditions that can be taken back to widely accepted criteria and can be referred to context indicators. Its specificity is in the possibility to define and recognize an external reference; (2) *Objective component at macro level*, referring to social and economic contexts; (3) *Subjective component*, referring to the way in which each individual evaluates the situations in different specific contexts. It is assessed by individuals' or groups' responses to questions about satisfaction, utility, or benefit. Contrary to the objective measures at micro level, no explicit standard is defined and no external reference can be defined.

In a policy perspective, the need for subjective indicators arises during (i) the assessment of policy results and (ii) the selection of policy objectives (Veenhoven 2002); in fact, they provide a direct judgment about the quality of specific services or about the need for clear interventions, regardless of the objective values.

Therefore, the preferred approach in this article is to consider both indicators of objective variables and subjective indicators in the construction of NaQi: the simultaneous use of these two types of indicators provides a better outcome with regard to the final evaluation and judgment of a particular service (Diener and Suh 1997, Goosens et al. 2007, Michalos 2008).

In order to define which parameters to use to measure the quality of the territory for nautical fruition, we identified domains or macro categories (or synthetic indicators - SI) that grouped a series of basic indicators (EI), which would allow the evaluation.

Based on the experience gained[3] we identified the following six composite indicators:

1. Territorial offer of ports and berths
2. Availability of port services
3. Presence of other sea tourisms
4. Accessibility of the area and theoretical availability of berths
5. Environmental quality of the sea and coastal land
6. Hospitality and tourist resources of the territory

The first two (ports - berths and services) refer to the unavoidable presence of the land-sea interface, i.e. those infrastructure (port and/or similar) that allow navigation. It is clear that there can be no satisfaction of the pleasure boater if an area is not equipped with the above facilities and if the services (for pleasure boats and pleasure boaters) are not available and lack quality.

The third indicator marks the presence of other forms of use of the sea, in some way disconnected from the fact of owning a boat and that allow anyway the practice of pleasure boating or other activities related to the sea. The fourth aspect takes into account accessibility to the locations where port facilities are based, referring to the road conditions and area accessibility, with

[3] In the five years of activity in the National Nautical Observatory dozens of surveys were carried out at port facilities and trade associations, among boaters and industry professionals, etc.. that have allowed to determine which factors are taken into greater account in the qualitative judgment and for the "nautical satisfaction" of Italian and foreign yachters sailing our waters.

the addition of the degree of saturation of the potential demand for berths compared to the effective supply. The fifth indicator is designed to verify the presence of what may be called the true "motivating matter" of pleasure boating: the environmental quality of the sea and the coast and the presence of particular navigable areas of value. Finally, the sixth indicator takes into account the tourist context that the boat owner can enjoy on land: besides navigation, leisure activities are in fact increasingly in demand by those who are resident in or transiting through a port during the cruise.

Already at this stage the availability of basic indicators to be included within each synthetic indicator was taken into account, but their precise choice required a series of further steps. In particular, we followed commonly used criteria such as:

- choose the indicators more consistent with the objectives of the measurement;
- define the method of calculation and the unit of measurement of the indicators;
- explain the source of the data and its public accessibility;
- represent the detection mode also in relation to the periodicity of detection.

Certainly, once the indicators had been chosen, it was helpful to test them to evaluate the effectiveness of the set thus identified. Drawing on considerations made in the field of business and management we can mention, among others (Neely et al.2002):

- truth check, that answers the question: are we really measuring what we want to measure?
- focus check: are we measuring only what we want to measure?
- significance check: is it a correct measure of the element that we want to monitor?
- clarity check: is there or can there be ambiguity in the interpretation of the results?
- check of "and now ...?": is it possible to act on the basis of the data collected?

The value of an index thus constructed is particularly useful for comparing the nautical quality of different territories: it is evident that, while the indicator point at relative strengths and weaknesses, each consequent action for improvement must take into account the individual territories in order to plan interventions that are actually useful to obtain the planned result. Selective target marketing represents a feasible complement to current management practices which focus on tourists who may not necessarily be interested in protecting the local environment or promoting local development (Dolnicar & Leisch, 2008).

3. The basic indicators

In order to provide a quantitative assessment of the quality of services in the Italian sea provinces, given the many variables involved, it is difficult to derive robust conclusions from a single measurement, since it could be affected by various environmental and social factors. These considerations suggest to measure this inequality through a set of variables or partial indicators to better reflect their multidimensional nature (Atkinson 2002).

The choice of indicators is one of the most fundamentally important step, where judgement is required. In practice, composites are often either opportunistic and incomplete (measuring aspects of performance that are captured in existing data), or are based on highly questionable sources of data. Either weakness can cause serious damage to the credibility of the composite (Smith 2002).

One of the problems in constructing a composite indicator is the lack of relevant data; some statistics may be unavailable and cannot be measured or no one has attempted to measure it. On the other hand available data only exist for a few countries or may not be comparable across different countries (Freudenberg 2003).

Table 1. The variables included in the NaQi

(All the indicators are on a yearly basis of frequency)

Indicator	**Primary data source**	**Survey**
Density of infrastructures along the coast;	Pagine Azzurre / ISPRA (Institute for Protection and Environmental Research)	2012
Berths per 1,000 inhabitants;	Pagine Azzurre	2012
Percentage of facilities that can accommodate yachts out of the total provincial structures;	Pagine Azzurre	2012
Percentage of marinas out of the total number of ports in the province;	Pagine Azzurre	2012
Index of presence of services (on a set of 12 services offered by the port);	Pagine Azzurre	2012
Number of companies involved in refitting activities per km of coastline;	UCINA - La Nautica in cifre 2012	2012
Number of diving centres per km of coastline;	ONN	2010
Number of sports clubs associated with FIV per km of coastline;	IVF	2010
Number of nautical bases used by charter companies compared to km of coast.	ONN	2012
Presence of airport infrastructures within the provincial borders;	ENAC	2012
Number of municipalities along the coast, belonging to the province, which has at least one highway or freeway exit;	Soc. Autostrade / ANAS	2012
Pressure index expressed in berths per 1,000 potential boaters who gravitate in that territory;	ONN	2012
Number of hectares of AMP protected marine area per km of coastline;	Ministry of the Environment	2012
Degree of cleanliness of the sea and beaches, crowding of the shoreline and security services;	Lega Ambiente	2012
State of conservation of the territory and the landscape;	Lega Ambiente	2012
Quality of hospitality and tourism sustainability; presence of typical products and quality of shops, restaurant and public services;	Lega Ambiente	2012
Presence of places of historical and cultural interest, quality craftsmanship, museums and archaeological sites;	Lega Ambiente	2012
Initiatives for the sustainable management of the waste cycle and mobility, of water and energy saving, of local production of energy from renewable sources.	Lega Ambiente	2012

The construction of composite indicators of country performance generally involves trade-offs between broad country coverage and lower quality data, so the selection of indicators is most often constrained by data availability; a different set of indicators will produce a different composite indicator and hence a different set of rankings, although it is not known how different. (Jacobs et al. 2004).

Given the previous considerations, it is therefore appropriate to construct an index on the basis of data currently available and that do not require *ad hoc* investigations based on explicit satisfaction of the pleasure boater, with the dual result of avoiding the occurrence of additional costs and being able to update the indexes in a simple and continuous way, basing decisions on objective and transparent data (Jarman 1983, Gordon et Pantazis 1997, Burlando et Ivaldi, 2012). In this case, after eliminating the variables that resulted incomplete or manifestly unreliable, we decided to consider 18 indicators at the provincial level - implemented with proprietary data of the National Nautical Observatory (ONN) or otherwise suitably adapted[4] and weighed (the methodology is discussed in the following paragraphs).

In order to proceed with the construction of the index, we need to decide how to combine the selected indicators. The way by far most used in literature (Jarman 1983, Towsend et al. 1988, Carstair et Morris 1991, Forrest et Gordon 1993, Muldur 2001) provides an additive index consisting of the summation, either weighted or not, of the partial indicators (Jarman 1983, Townsend et al. 1988; Carstairs et Morris 1991; Carstairs 2000; DETR 2000, Fagerberg 2001, Testi et Ivaldi 2009, Ivaldi e Testi 2012). This method is therefore based on ordinal information and its advantages are simplicity and the independence from outliers.

When the variables are expressed in different units of measurement, as in this case, before making the sum it is necessary to proceed to a standardization in order to avoid that some have greater weight than others (Jarman 1983, Townsend et al 1988, Carstairs et Morris 1991, WEF 1996, Morton 2003, Testi et Ivaldi, 2009, Ivaldi et Testi 2010). Standardization is the most commonly used method because it converts all indicators to a common scale with an average of zero and standard deviation of one. The average of zero means that it avoids introducing aggregation distortions stemming from differences in indicators. The scaling factor is the standard deviation of the indicator across the countries. Thus, an indicator with extreme values will have intrinsically a greater effect on the composite indicator. (Salzman 2003, Nardo et al. 2005a).

$$S_n = \frac{v_n - \mu_{v_n}}{\sigma_{v_n}};$$

Once the variables were suitably standardized, these were grouped in the first six dimensions described above (synthetic indicators) that take into account:

1. Territorial offer of ports and berths: density of infrastructures along the coast; berths per 1,000 inhabitants; percentage of facilities that can accommodate yachts out of the total provincial structures;

2. Quality of port services: percentage of marinas out of the total provincial ports, index of the actual presence of services (on a set of 12 services potentially offered by the port), number of companies involved in refitting activities per km of coastline;

[4] Several of the basic indicators used refer to the investigations carried out by Legambiente of 305 Italian seaside resorts in collaboration with the Italian Touring Club (Guida Blu 2012 - Touring Editore).

3. presence of other kinds of sea tourism: number of diving centres per km of coastline, number of sports clubs associated with IVF, number of nautical bases used by charter companies. All three indicators are processed by comparing the consistency to their respective km of coastline;

4. Accessibility of the area and theoretical availability of berths: presence of airport infrastructures within the provincial borders; municipalities along the coast, belonging to the province, which have at least one highway or freeway exit; pressure index expressed in berths per 1,000 potential boaters who gravitate in that territory;

5. Environmental quality of the sea and coastal area: number of hectares of AMP protected marine area weighed against km of coastline, cleanliness of sea and beaches, crowding and security services; state of conservation of the territory and the landscape;

6. Hospitality and tourism resources of the territory: quality of hospitality and tourism sustainability; presence of typical products and quality of shops, restaurants and public services; presence of places of historical and cultural interest, quality craftsmanship, museums and archaeological sites; initiatives for the sustainable management of the waste cycle and mobility, of water and energy savings, of the local production of energy from renewable sources.

Each dimension was then obtained by adding the contributions and calculating the corresponding *z-scores* (Ivaldi et Testi 2010).

$$x_i = \sum_{n=1}^{m} (s_n)$$

In the absence or less of dominance of one dimension over all others, some combination or aggregation is necessary in order to make the phenomenon inter-individually comparable. There is a unanimous agreement that the listing as well as the indexing (weighting) of the relevant domains is a crucial, but very complicating matter in this type of research. If we suppose that not all the measured indicators (sub-score) necessarily contribute with the same importance to the measurement and evaluation of the total variable (synthetic score), a weighting system needs to be defined in order to assign a weight to each indicator, before proceeding to the aggregation of the indicators. So the first decision that needs to be made and that will influence strongly the final results is between equal and different weighting. (Maggino and Ruviglioni 2008). Weights are essentially value judgements about the relative importance of different performance indicators and about the relative cost of achieving those performance measures (Jacobs et al. 2004). The usual discussion concerning the methodology applied in order to determine and assign weights to the indicators composing the synthesis always asserts that the choice of weights should be derived from objective principles (Nardo et al. 2005b; Maggino 2009). However, since developing and defining weights can be always interpreted in terms of value judgments, the procedure should include and involve individuals' contributions in attributing importance to different domains (Saisana and Tarantola 2002, Maggino 2009, Maggino and Ruviglioni 2008).

Thus, the commonly used method is the assignment of weights to sub-indicators based on personal judgment (participatory method), through a careful and pondered choice based on the experience of sector's operators. In this way, partial contributions were then appropriately weighted by the vector of dimensional weighting that associates a different weight to the six dimensions,

$\boldsymbol{\omega} = \begin{pmatrix} \omega_1 \\ \omega_2 \\ \omega_3 \\ \omega_4 \\ \omega_5 \\ \omega_6 \end{pmatrix}$, where the specific weights w_i correspond to 40%, 25%,15%,5%,10%, and 5%, respectively.

The index is then calculated in an additive way, by summing up the contributions by calculating the corresponding *z-scores*.

$z_1 = \frac{x_1 - \mu_{X_1}}{\sigma_{X_1}}$; $z_2 = \frac{x_2 - \mu_{X_2}}{\sigma_{X_2}}$; $z_3 = \frac{x_3 - \mu_{X_3}}{\sigma_{X_3}}$; $z_4 = \frac{x_4 - \mu_{X_4}}{\sigma_{X_4}}$; $z_5 = \frac{x_5 - \mu_{X_5}}{\sigma_{X_5}}$; $z_6 = \frac{x_6 - \mu_{X_6}}{\sigma_{X_6}}$ and

$$NaQi = \sum_{i=1}^{6} (z_i \omega_i)$$

The indicators were then grouped together in 6 dimensions (synthetic indicators) obtained from the sum of the respective *z-scores.* The sum of each partial indicator, appropriately re-standardized and weighed for the vector of dimensional weighting, resulted in the NaQi indicator, in turn converted to the hundredth part to highlight the results more clearly.

To locate a subdivision into groups of provinces it is possible to resort to "homogeneous groupings", providing a limited number of classes that identify increasing levels of the index to which one can assign each reference unit for which the index has been calculated (Carstairs 2000). In order to identify the classes and discriminate between different levels of inequality, the literature suggests to divide the distribution of the indices based on its parameters (Carstairs et Morris 1991, Soliani et al 2012a,b, Ivaldi 2013b), or by using quintiles of population (Jarman 1983, Townsend et al.1988; Cadum et al.1999). In this case it appears more appropriate to use the first method that allows to maintain the discriminatory features of the distribution (Carstairs 2000), using the values of $\pm$ and $\pm 1/2$ as a *cut-off* of the six classes: class I identifies the provinces with a higher indicator, the following classes, instead, include the provinces characterized by a gradually lower coefficient of the indicator. The results of these elaborations are presented in section 5.

4. Results

The results of applying the method explained above are summarized in the Nautical Quality Index for the first and the last 10 position[5], resulting precisely from the six synthetic indicators (Table 2 on the next page).

[5] Complete data available upon request

Table 2. Synthetic indicators of the NaQi, 2012

Index & rank / Provinces	**NaQi 2012**		***Ports and berths***	***Quality of port services***	***Other sea tourisms***	***Accessibiliy & saturation***	***Environ-mental Quality***	***Tourism Quality and Sustainability***
Provinces	Index	Rank	*rank*	*rank*	*rank*	*rank*	*rank*	*rank*
Olbia Tempio	100.00	1	*1*	*22*	*25*	*8*	*7*	*1*
Lucca	96.6	2	*13*	*1*	*3*	*42*	*33*	*44*
Genoa	89.62	3	*8*	*4*	*5*	*23*	*21*	*10*
Matera	89.52	4	*5*	*2*	*19*	*32*	*47*	*2*
Pescara	84.71	5	*4*	*5*	*2*	*59*	*58*	*20*
La Spezia	84.12	6	*2*	*47*	*6*	*6*	*5*	*37*
Livorno	83.55	7	*10*	*34*	*9*	*1*	*4*	*4*
Grosseto	82.49	8	*3*	*13*	*15*	*9*	*2*	*15*
Fermo	78.43	9	*15*	*3*	*27*	*47*	*42*	*39*
Imperia	77.95	10	*7*	*11*	*7*	*17*	*28*	*33*
Rome	77.5	11	*26*	*14*	*1*	*39*	*37*	*5*
….	…	…	…	…	…	…	…	…
Crotone	48.07	53	*55*	*39*	*52*	*11*	*17*	*29*
Reggio Calabria	47.69	54	*59*	*49*	*39*	*5*	*6*	*7*
Chieti	47.18	55	*50*	*45*	*45*	*35*	*36*	*34*
Bari	45.36	56	*52*	*59*	*38*	*28*	*19*	*11*
Nuoro	44.62	57	*57*	*41*	*44*	*7*	*14*	*48*
Cosenza	43.05	58	*54*	*46*	*59*	*26*	*15*	*53*
Caltanissetta	34.39	59	*58*	*50*	*48*	*61*	*62*	*59*
Viterbo	29.24	60	*60*	*61*	*36*	*41*	*39*	*61*
Catanzaro	22.82	61	*61*	*37*	*46*	*24*	*34*	*27*
Medio Campidano	0.00	62	*62*	*62*	*62*	*45*	*48*	*62*

Note: For the detailed results of the 41 provinces ranked middle, please contact the authors.

The first thing that catches the eye is the presence in the list of cities that do not have a direct view of the sea and whose image is therefore not in any way related to yachting, for example, Lucca, Matera, Fermo, etc.. We need to have a quick think and connect the provincial capital to the reality of its coast: we can then associate Lucca to the ports of Viareggio; Matera to Marina di Policoro and the port of Argonauti Maratea; Fermo to Porto San Giorgio; Forli-Cesena to the the three structures of Cesenatico.

The second fact that draws attention is how even a strong "penalty" in one synthetic indicator (eg Lucca) does not preclude the top positions because, in this case, the two indicators (saturation and quality of tourism) have only a total weight of 10%.

With these elementary precautions of interpretation, the NaQi provides a precise answer about the state of "nautical" health on the overall situation and on the six synthetic indicators (which in turn are the result of the sum of eighteen simple indicators) for all 62 sea provinces. It is interesting to examine the *TOP TEN*, which includes, respectively, the provinces of Olbia Tempio, Lucca, Genoa, Matera, Pescara, La Spezia, Livorno, Grosseto, Fermo, Imperia as well as those at the bottom, from Medio Campidano (without marinas) going up to Catanzaro, Viterbo, Caltanissetta, Cosenza, Nuoro, Bari, Chieti, Reggio Calabria, Crotone.

With regard to the six partial indicators, there are some significant differences in the top five:

1. local supply of ports and berths: first place to Olbia Tempio, followed by La Spezia, Grosseto, Pescara, Matera
2. quality of port services: first place to Lucca, then Matera, Fermo, Genoa, Pescara
3. presence of other kinds of sea tourism: the ranking is Rome, Pescara, Lucca, Forl ìCesena, Genoa
4. accessibility of the area and theoretical availability of berths: with Livorno first, followed by Lecce, Trapani, Salerno, Reggio Calabria
5. environmental quality of the sea and the coastal territory, the top five places are occupied by Lecce, Grosseto, Salerno, Livorno, La Spezia
6. hospitality and tourism resources of the territory: with Olbia Tempio, Matera, Messina, Livorno, Rome near the top.

5. A geographical interpretation

The objective of the NaQi is certainly also to provide information to improve the nautical quality of a territory by proposing a comparison between different realities: a tool at the service of public decision-makers who have the burden to govern the territories and optimize the allocation of resources for the purposes of economic development (Stigliz et al, 2009), also available to the whole world of boating. All this is based on an index which by its nature is intended precisely to create a ranking and, in some way, even a hierarchical order in relation to the nautical suitability of the Italian sea provinces.

It is therefore relevant to analyse in detail the individual positions, let alone through considering the results of individual synthetic indicators. However, the NaQi lends itself very well to develop a more general analysis when moving to a national scale or at least large areas. In order to have elements more easily combined at a national scale it is necessary to carry out a passage that somehow allows the re-aggregation of values. Therefore we chose to try and create "homogeneous groupings" of values of the NaQi, providing a limited number of classes that identify increasing

levels of the index to which one can assign each reference unit for which the index has been calculated.

Therefore, the index distribution has been divided into six classes (Table 3): class I identifies the provinces with a higher indicator, the following classes, instead, include the provinces characterized by a gradually lower coefficient of the indicator.. These classes identify different levels of "technical" quality, which in turn identify different areas of functionality of the "nautical vocation" of the sea provinces.

Table 3. Breakdown of the indicator in classes

Class	Number of provinces	Provinces	Population share of the class out of the total population
I	4	Olbia Tempio, Lucca, Genoa, Matera	4.97%
II	9	Savona, Rimini, Pescara, La Spezia, Livorno, Grosseto, Fermo , Imperia, Rome	19.20%
III	20	Naples, Udine, Gorizia, Forl ìCesena, Ancona, Cagliari, Venezia, Ascoli Piceno, Messina , Ogliastra, Sassari, Vibo Valentia, Lecce, Pisa, Salerno, Pesaro Urbino, Trieste, Trapani, Catania, Ravenna	37.51%
IV	12	Palermo, Carbonia Iglesias, Oristano, Campobasso, Latina, Barletta-Andria-Trani, Potenza, Brindisi, Foggia, Ragusa, Siracusa, Massa Carrara	15.41%
V	13	Agrigento, Macerata, Rovigo, Ferrara, Caserta, Taranto, Teramo, Crotone, Reggio Calabria, Chieti, Bari, Nuoro, Cosenza	19.69%
VI	4	Caltanisetta, Viterbo, Catanzaro, Medio Campidano	3.22%

As it can be noted, each of the six classes does not identify a grouping on a geographical basis. However, by transforming this classification into a territorial and thematic representation, very significant outcomes show up (figure 1, on the next page). Beyond the very specific provincial classification obtained, which is essential for territorial policies concerning boating at this scale, one can detect aggregations of "colour" that give a good representation of the situation at the level of the entire national coastal development.

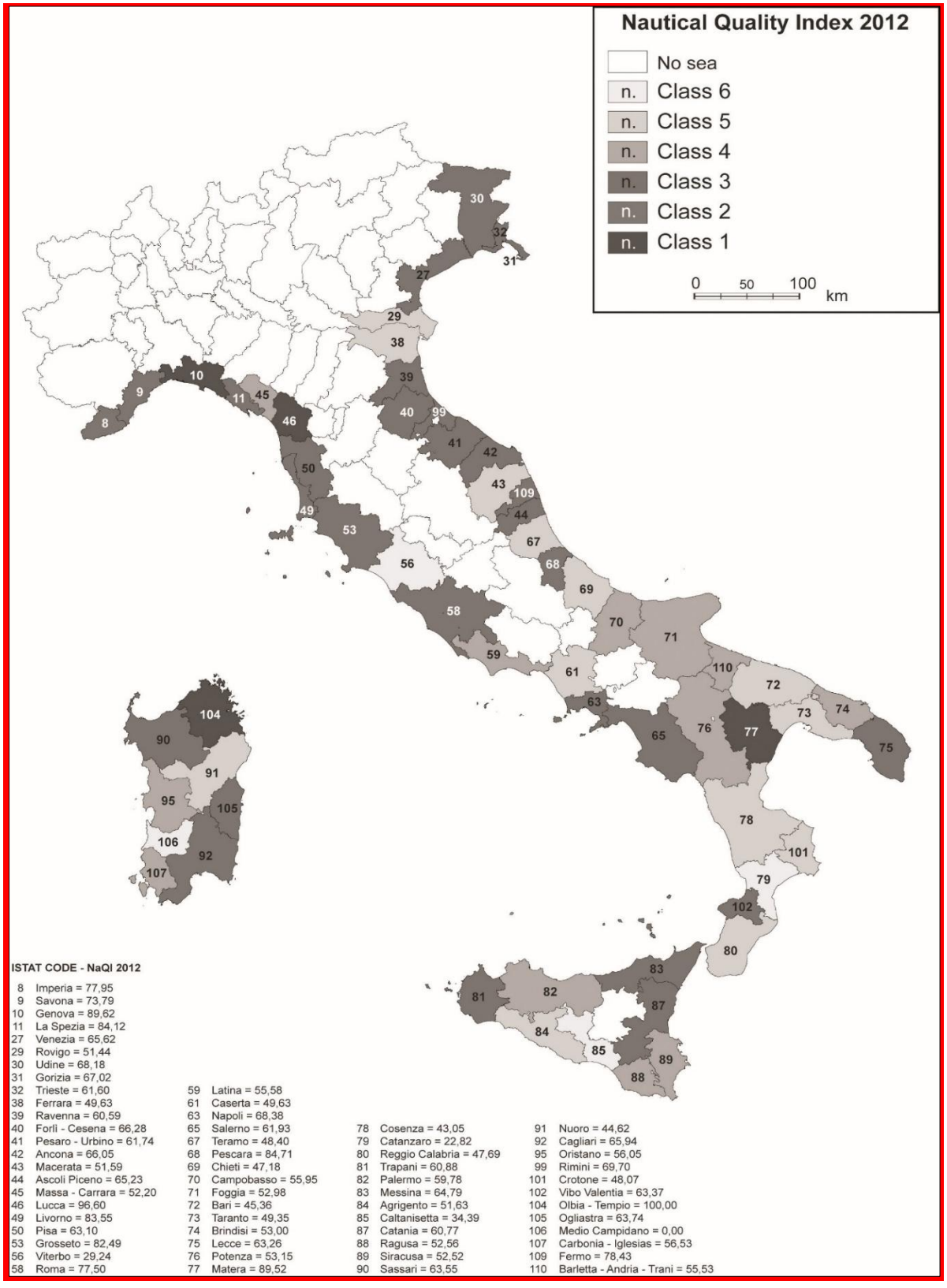

Figure 1. The Nautical Quality Index

Considering the first three classes and starting from the north of the country, it clearly appears how all the two coastal areas belong in the first three classes of merit: starting from Imperia down to Rome, with the sole exception of Massa Carrara and Viterbo.

In the Adriatic from Trieste down to Pescara with the exception of Rovigo, Ferrara, Macerata and Teramo. In the rest of Italy there are only four "islands" belonging to the macro-group of the first three classes: Olbia - Tempio and Matera in the first; finally, in the third class there are three pairs of provinces that form small groups including the stretch of Amalfi Coast, with Naples and Salerno, the south-eastern coast of Sardinia with Cagliari and Ogliastra and the north-east of the other larger island, Sicily with Messina and Catania.

It is obvious then, that it is precisely southern Italy to present the situations of greatest deficiency in relation to the nautical quality of the coast: in particular, Puglia and Calabria are the areas that probably need large and geographically widespread intervention to enhance their "nautical quality".

6. Conclusions

The NaQi index provides an overall idea of the phenomenon. It takes into account different aspects, giving each of them a different weight. The construction of the NaQi index and its subsequent application to the case of the Italian regions shows how it is possible to classify and identify which are the most appropriate areas to the yachting activity, both in terms of service to the boat and the boat owner strictly within the port context, and in a broader context that involves the activities and services intended to satisfy the needs of tourism. The innovation in the scientific approach lies primarily in considering elements and variables that were not normally taken into account, at least from the point of view of their measurability, in decisions about the location for the construction of new marinas. The picture that emerges from the application to the Italian case, clearly shows that the most successful marinas are those in areas also equipped with elements of natural beauty, of tourist and accommodation facilities and that allow activities related to both other types of sea tourism and to cultural and identity elements, including material culture.

As well as in the case of alternative decisions in relation to regional or specific policies about the location of new marinas, the NaQi also provides valuable guidance to port management. The six individual synthetic indicators and, even more, the eighteen basic indicators allow to identify, at least in a comparative logic, the strengths and weaknesses of a port structure and show what the possible margins of improvement are and how large.

The index is designed to be a tool to guide territorial policy. The case of the attractiveness for boating of an area (coast + hinterland) is particularly delicate: in fact, an increase of the infrastructure leads to an impoverishment of the landscape and an overcrowding of boats leads to an increase in pollution. Improving the "boating quality" and the attractiveness of the area could lead to irreversible changes in the natural and man-made landscape, for example by giving rise,, in the long run, to a decline in the "boating quality" itself. The NaQi indicator takes this point into account. Firstly, because its compilation includes different variables related to both boating receptivity, natural amenities and quality of life. Secondly, because the different variables have weights set exogenously by the researcher. It is obvious that this is a challenge to the management of the ports which, today and increasingly in the future, will have to expand its limits of intervention and seek, where appropriate, contacts and synergies with those who govern the surrounding areas, offering boaters, in addition to boat services, an articulated and varied “touristic offer”. The failure to take into account the indicators of NaQi indicating a lack of competitiveness, at least within the same area of navigation, can determine the success or the decline of its marinas.

It is possible to think, in a later and more refined version of the NaQi indicator, to allocate decreasing weights to increasing elements, such as infrastructures, to reflect both their decreasing marginal effectiveness to determine the boating attractiveness and the fact that, beyond a certain threshold, the diseconomies and negative externalities generated may be greater than the benefit to which they give rise.

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