ATLANTIC AREA
Transnational Programme
INVESTING IN OUR COMMON FUTURE

European Union
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Activity 6

Task 6.2.2: Upgrading Environmental Sensitivity Index – methodology used for socioeconomic index

ARCOPOLplatform

Improving maritime safety and Atlantic Regions' coastal pollution response through technology transfer, training and innovation

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Author:	Rodrigo Fernandes (IST), Miguel Santos, Helena Oliveira, Tiago Torres (CIIMAR)
Responsible partner:	Instituto Superior Técnico

1. Introduction and objectives

The main purpose of this report is to describe the methodology used for updating socioeconomic sensitivity index to oil spills in the Continental Portuguese coast, taking advantage of past experiences from EROCIPS project as well as other research work in the Iberian coast.

This work is integrated in task 6.2.2, which also includes the definition of the ecological index (which was implemented by partner CIIMAR in cooperation with IST)

Although EROCIPS project allowed a very detailed spatial discrimination of the coastline, the methodology adopted for the classification and ranking of the socioeconomic indices was mainly empirical and rather subjective. Thus, this revision will allow a more objective methodology, totally based on statistical information, mostly from official data sources. This new methodology will also permit the possibility of changing the relative weight of the different parameters considered.

The selection of parameters, as well as the definition of their relative weight on the final socioeconomic index was based on previous work developed in the Iberian coast.

2. Methodology

In EROCIPS project, the Portuguese continental coast was divided in more than 1000 segments, with an average segment length of 1230m, and a median length of 435m.

The methodology adopted takes advantage of this spatial discretization, which is in fact used in the other coastline vulnerability indices (environmental sensitivity index and ecological sensitivity index).

The final ranking is defined between 1 and 5 (in absolute values), as it was done in EROCIPS.

Different groups are considered: fisheries and aquaculture, population, tourism, and recreational activities.

The relative weight of each group is based on different references (Leal, 2011; Castanedo et al., 2009); Santos et al., 2013). Based on that, it was assumed that the local population that lives in coastal parishes is the most important factor, with a relative weight of 50% (Santos et al., 2013 uses 60%). The relative weights from the remainder groups (fisheries and aquaculture, tourism, and recreational activities) is mainly based on the work proposed by Castanedo et al., 2009, taking in consideration the impact degree and the recovery time from past accidents as multiplying factors. Although Castanedo et al. 2009, separated the fisheries from the aquaculture, in this revision it was considered as integrative part of fisheries (due to lack of detailed statistical data from aquaculture activities), and therefore the impact degree and recovery time adopted was based on the values obtained from Castanedo et al., 2009 for the fisheries only. Next table reflects the relative weights used in the socioeconomic index.

Table 1 – relative weights from the different groups used in the socioeconomic index

	Tourism	Fisheries / aquaculture	Recreational activities	Population
Impact degree Id (%)	10	100	100	n/a
Recovery time Rt (months)	6	4	0.25	
Weight (Id x Rt)	600	400	25	
Relative weight in socioeconomic index (%)	6.18%	41.24%	2.58%	50%

Each group can be composed by one or more statistical indicators. Since all of them have different units, they are normalized to an identical interval following a min – max approach, therefore converted to a scale between 0 and 1 (Santos et al., 2013):

$$\frac{(x-\min)}{(\max-\min)} \qquad (1)$$

In order to take in account the local importance of different activities like fisheries or tourism, some used indicators are divided by the number of municipal inhabitants (and converted to

/1000 inhabitants unit). This allow to minimize biased values in certain places, simply because the population is too low or too high (e.g. in terms of fisheries vulnerability, without this procedure, a coastal segment in an area with 1000 inhabitants where 50 of them are fishermen, would be significantly less important than a segment from an area with 100 000 inhabitants with 100 fishermen, which is not correct).

Information from municipal inhabitants was obtained by INE in 2014.

Some coastal segments include more than one parish, municipality or region. In those cases, an average is determined for all the indicators.

2.1 Population

This group characterizes the population that lives in coastal parishes (LAU 2 – local administrative unit), as used by Santos et al., 2013. Therefore, only one indicator is considered in this group, and is obtained from INE (gathered in *Censos* 2011).

2.2 Tourism

Tourism is characterized also by a single indicator, which is the number of bed accommodations / 1000 inhabitants, for the associated municipality. The information is obtained by INE in 2014.

2.3 Fisheries and Aquaculture

The determination of fisheries, aquaculture and saliculture vulnerability to oil spills is obtained by the weighted combination of three different indicators:

- Number of fishermen registered in the associated port / 1000 inhabitants (relative weight = 40%)
- Fish captured and unloaded in the port (in €) / 1000 inhabitants in the associated (relative weight = 40%)
- Aquaculture and saliculture production in the associated NUTS 2 region (in €) / 1000 inhabitants (relative weight = 20%)

All information is obtained from INE in 2014.

2.1 Recreational Activities

Two different items are considered (with equal relative weight) for characterizing the vulnerability to recreational activities:

- Number of marina berths / moorings for recreational vessels / 1000 inhabitants in the associated municipality (relative weight = 50%)
- Index of bathing waters importance (relative weight = 50%)

The number of marina berths is obtained from the DGRM website www.portaldomar.pt.

The determination of index of bathing waters importance is obtained from the combination of other three indicators, using an equal proportion for each of them (relative weight = 33.3%):

- existence of blue flag in the coastline segment (0/1)
- existence of beach concession in the coastline segment (0/1)
- aptitude for nautical sports in the coastline segment (0/1)

The information regarding the existence of blue flags attributed in 2015 is obtained from the European Blue Flag Association in the Portuguese website http://abae.pt/.

Beach concession information is obtained from Portuguese Environmental Agency, in their specific bathing water GIS website http://snirh.pt/index.php?idMain=1&idItem=2.1.

The information about nautical sports aptitude in the coastline segments is found in the website www.wannasurf.com , following the approach used by Leal, 2011.

3. Results

The socioeconomic sensitivity index (together with the new ecological sensitivity index and the previously obtained coastal sensitivity index) is published in Google earth format (kml) in link http://arcopol.maretec.org/coastalatlas/netlink.kmz, and the detailed information is also compiled in Excel worksheet.

4. References

Castanedo, S., Juanes, J. A., Medina, R., Puente, A., Fernandez, F., Olabarrieta, M., Pombo, C., 2009. Oil spill vulnerability assessment integrating physical, biological and socio–economical aspects: application to the Cantabrian coast (Bay of Biscay, Spain). Journal of Environmental Management 91, 149–159. doi: 10.1016/j.jenvman.2009.07.013.

Leal, T., 2011. Sensibilidade costeira para planeamento e resposta a emergências de poluição marítima causada por hidrocarbonetos., Dissertação apresentada na Faculdade de Ciências e Tecnologia da Universidade Nova de Lisboa para a obtenção do grau de Mestre em Engenharia do Ambiente, perfil Gestão e Sistemas Ambientais., http://hdl.handle.net/10362/5959

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