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Have you ever listened coastal inhabitants? Know what they think…

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ABSTRACT

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Coastal dynamics changes, caused by natural or man-made factors, can to give rise serious consequences, namely at urban areas, exposing coastal population at risk. In this context, the understanding of the way people perceive the coastal dynamics and their exposure to risk is essential for the land use management and Integrated Coastal Zone Management.

To get the perception of coastal population, this research was based in a risk map proposed by Water Institute (1999) that classifies the Portuguese territory in three categories of risk: low, mean and high. A questionnaire was applied to the dwellings owners in coastal risk areas of Praia de Esmoriz, Praia de Cortegaça, Furadouro, Torreira, Praia da Barra, Costa Nova do Prado and Praia da Vagueira, during the summer season, in 2006.

The questionnaire has as main objectives: coastal risks social perception; coastal dynamics social perception; identification of territorial and environmental changes in the coastal areas; identification of socio-environmental conflicts. A total of 418 questionnaires were completed which corresponds to 10% of the dwellings at risk in the study area.

Almost all of respondents recognize the shoreline retreat and would accept having their houses relocated if it were confirmed that there home was in fact in danger, however the inquired population confirms to feeling safe near the sea. In other words, there is negligence of the coastal risks. It is necessary to inform the population of the problems that the coastal areas are suffering of and to get everyone involved in coastal issues.

ADITIONAL INDEX WORDS: *Social perception, Coastal dynamics, Coastal risks*

INTRODUCTION

Sea proximity gives to coastal area countless of privileges' and consequently countless of services to society (EEA, 2006). Natural resources richness (either marine, either terrestrial), the possibility of sea use for transport activities, climatic amenity, the landscape beauty and dynamic, shows services availability.

Given the mentioned above, coastal areas are spaces of economical activities polarization and urban concentration, in most part not adjusted to coastal zone particularities and sensitivity, promoting potential conflict of uses and interests. The presence of human societies along history and the presence of environmental changes are proofs to consider that most of coastal areas suffer a historical process of social-environmental changes (TRUJILLO *et al.*, 2003).

On coastal areas the integration and preservation of natural resources with human use of territory is a complex challenge, namely by the conflict of interest uses, intensified by climate change impacts and continuous human intervention on natural ecosystems.

COASTAL DYNAMICS

Coastal areas, interface between ocean and earth, are transition zones, extremely sensitive and vulnerable, where human influence takes place, affecting natural evolution of this complex system (BEATLEY *et al.*, 2002). That dynamic is both characteristic of beaches, cliffs dune areas, lagoons and estuaries.

According with ANDRADE and FREITAS (2001), most part of research done about coastal areas majority deals with pressure factors influence, such has climate change (slow processes with large temporal scales). Nevertheless to coastal zone resilience and vulnerability issues, pressures and local uses has not been given the same importance on this field. However its important take in account all factors that can influence coastal dynamic, considering either different spatial scales or temporal scales. Coastal processes occur at different temporal scales, since millenniums to seconds, given more evidence to constant dynamic change that coast fringe is submitted.

Factors as wind, tides, maritime disturbance, rise of medium sea level and climate change, sand extraction, harbours and hydroelectric infrastructures, coastal protection structures, land use and occupation, territory management, among others, contribute to coastline changes. Human intervention has a prevailing role in the occurrence of several coastal phenomena, instigating or accentuating some coastal processes and by that mean changing the natural dynamic of coastal boundary.

VELOSO GOMES (2007) considers that "*…highly dynamic natural circumstances in zones vulnerable to sea actions that in past times didn't create any type of intervention […] are nowadays embarrassed by land occupation (constructions in spits,*

dunes and beaches) and by the uses (harbour exploitation) actually on place in that areas." Due to the «trouble» coastal dynamics places to the use of coastal zones, land use management should integrate that dynamic feature as well as it's influencing factors, considering either spatial either temporal different scales. (DINIS, 2000; BEATLEY *et al.*, 2002). To speak the truth, use and occupation of coastal areas are the responsible for the rise of coastal dynamic «troubles». In spite of it, it's crucial it's integration in territorial management, as a protection way of both natural resources and population

COASTAL URBANIZATION

Until XIX century the occupation of coastal areas where reduce, because of weather conditions (strong and frequent winds) low vegetation level, difficult access to fresh water, bad agricultural conditions, strong presence of corrosive agents of infra-structures and edifications as salt, exposition to natural events as storms and tsunamis as well as warlike conflicts. (ALVEIRINHO DIAS, 2005).

Since the middle of XVIII century beaches start to be chosen for therapeutically reasons, particularly in England and France, by the society elites (high social classes). The demand for coastal areas involve the generation of conditions to lodging treatment people. With that need starts the appearance of seaside resorts, intensified in the end of XVII and beginning of XX centuries (ALVEIRINHO DIAS, 2005).

In Portugal, it was in the second half of XX century that seaside areas demand, for leisure and social intercourse, starts. People lodging was possible trough the rent of fishermen houses, hotels and second residence constructed meanwhile. The number of second-homes grows significantly since 70's of XX century. This tendency was amplified by the raise of welfare level and urban population need, to have better quality of life. "*As bad consequence, the areas of biggest offer / demand concentration, soon starts to show signs of coastal urban saturation and even of some more general environmental and cultural degradation.*" (UMBELINO and SOUSA,1998).

In this context Portuguese coastal tourism is considered as massive and monothematic tourism. Massive tourism causes high level of pressures to coastal ecosystems, either in Algarve either in west coast.

2001 population census, shows that coastal areas population density was double higher then Portuguese Continental medium rate, 244 inhab./km^2 and 112 inhab./km^2, respectively, (DINIS and TAVARES, 2005).Northwest and central coast presents values much higher then country medium rate. However, population concentration is not continuous along that coastline, neither in each one region or municipality. There are settlements with higher levels of populating and coastal stretches unpopulated.

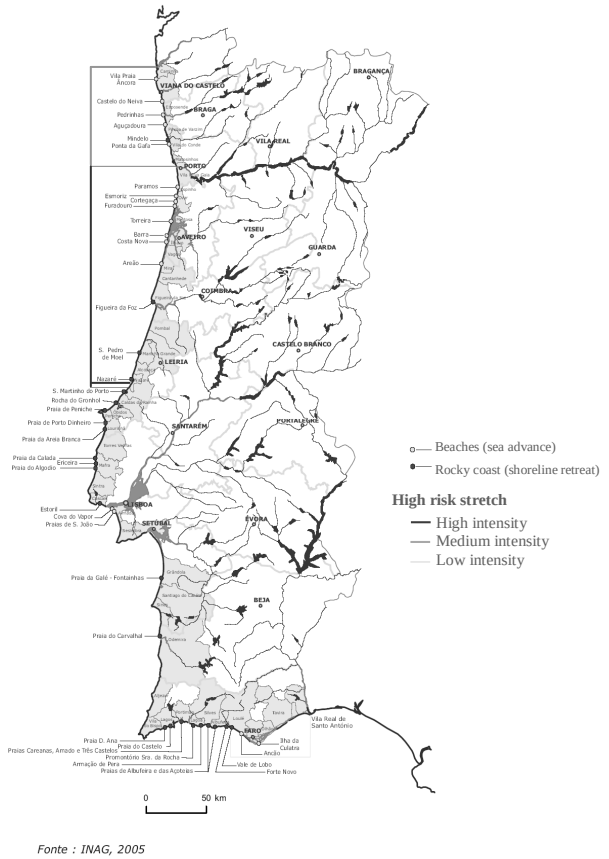
Between 1985 e 2000, in Portugal Continental occurs a 40% increase of artificialised areas. According with EEA (2006) *between 1990 and 2000 the lost of agricultural lands along coastal zones (almost 2000 km^2) was "most pronounced in Portugal, the Netherlands, Belgium, Ireland and Italy.*" Continuous population growth on coastal areas, coastal tourism and consequently urbanisation and infrastructure, as well as the effects of climate change, lead to the destruction of coastal ecosystems, lowering also the capacity of terrestrial protection against sea effects.

COASTAL RISK

The expansion and densification of urbanized seafronts occurred in Portugal Continental can be classified as an urbanistic irresponsibility. It can put people and their properties in risk; due to the transgression Portuguese coastline is suffering during the last 100 years.

That transgression is characterised by pronounced rates of erosion and coastline retreat, as well as sediment accumulation in rivers mouths. According with SANTOS and MIRANDA (2006), huge extensions of coastal areas have been suffering erosion with rates around 1m/year, independently of its morphology, geology and land use. Beside the problematic mentioned above, there are also climate change impacts with principal consequences as change of wave regime and sea level rise. Average sea level raises around 15cm during XX century (1,5mm/ year in average) on Portugal Continental coast, after 2000 years of an inferior rate of annual rise, according with SANTOS and MIRANDA (2006). The same experts assume an average sea level rise, to 2100 temporal horizon, around 1m, considering that elevation rate will be not constant along time (since 2040 is expected an aggravation of it) To those experts, principal impacts of the above mentioned change of average sea level are a raise or intensification of erosion, flood levels and flood areas, sea influence on estuaries and lagoons, besides the change of tide regime and sedimentary balance.

Due to the intensification of human influence on the coast, namely due to excessive occupation of it, several engineering infra-structures has been implemented on Portuguese coast. "… *since the beginning of XX century we saw the multiplication of hard protection infrastructures, most of them constructed in emergency situations – nowadays about 15% of sea coast has interventions.*"(SANTOS and MIRANDA, 2006). Coastal engineering infrastructures where constructed mainly to protect coastal risk areas (DINIS and TAVARES, 2005) (Fig.1).



Fonte : INAG, 2005

Figure 1. Types of coast and coastal risk stretches in Portugal (Source: APA, 2007)

In our society, risk is a concept present in diverse contexts, appearing either by the presence of dangerous situations, or uncertainties on decision making, varying according with society features and information about risk (ALMEIDA, 2004).

Risk concept in the context here presented is intimately related with society and territory. Naturally risks are confined to a certain territory, either more local or more global, having more concentration of risks in more populated areas. "…the appropriation of productive processes, the dynamic of natural processes and social processes tend to create risks to society, related with the socio-spatial dynamic." (CASTRO *et al*, 2005).

Nowadays population, more then ever, needs to be prepare to a huge variety of risks, since natural risks, more common in the past to risks with diverse origins, namely linked with territory artificialisation, man induced changes in ecosystems, social processes, industrial and technological productions, political decisions (AMARO, 2003; CASTRO *et al*, 2005). Due to the presence of risks in our society, risk management emerges as a need to population deal with it (FLYNN and SLOVIC, 2000). Risk management involves a deep knowledge of diverse factors related with risk, such as disaster features, way of disaster occurrence, disaster effects time duration, ways to manage the disaster, characteristics of the affected community and surroundings, potential effects and risks hierarchisation (LOURENÇO, 2003).

According with FLYNN and SLOVIC (2000), "*The limits of risk science, the importance and difficulty to maintain trust and the subjective and contextual influences about risk evaluation, point to the importance of public participation in the structure and in decision making…*".

PUBLIC PERCEPTION RESULTS

According with BARRAGÁN MUÑOZ (2003), public participation and population conscientious are one of the most important elements of coastal planning and management, to be taken in account in all strategic phase. Coastal populations are those most directly dealing with physical space and natural resources, experiencing deeper and "knowing" better the processes occurring there. Living there, the measures proposed in a planning context can interfere and influence their lives, becoming justify their involvement in management process. Participation in the integrated process of coastal management is understood as an interactive process that promotes dialogue and combined work between technical responsible, decisions-makers and citizens interested in coastal issues (Barragán Munoz, 2003).

As advantages of participation we can refer, as well as Barragan Munoz (2003): population possibility to say their one opinion about actions proposed; problems, conflicts, objectives and strategies can be better defined; creation of discussion meetings that make easer workgroup and consensus settlement, contributing to population and managers consciousness; becoming more likely the proposal implementation and encouraging the coordination and cooperation among public institutions, private sector and coastal population.

Inquiry by Questionnaire

A questionnaire was applied to the dwellings owners in coastal risk areas of Praia de Esmoriz (high risk), Praia de Cortegaça (high risk), Furadouro (high risk), Torreira (mean risk), Praia da Barra (high risk), Costa Nova do Prado (high risk) and Praia da Vagueira (high risk) in Aveiro region (see location in Fig. 1) (according with the classification applied on the risk map proposed by Water Institute (1999), That questionnaire has as main objectives the identification of: coastal risks social perception; coastal dynamics social perception; territorial and environmental changes in the coastal areas; socio-environmental conflicts. The questionnaire was divided in five analysis groups (1 – inquiries' and family characterization; 2 – local population and coastal zone relations; 3 – coastal risks social perception; 4 – coastal dynamics social perception; 5 – information, prevention and land use management). Simultaneously, there is a remark group to note building features, namely: typology (one or more families); number of storeys; building conservation conditions and dwellings mail address (location).

The questionnaire was conducted during 2006 summer season, between August 1st and September 8th. A total of 418 questionnaires were completed, which corresponds to about 10% of the dwellings at risk. To reach that percentage, 3 attempts were made to complete the questionnaire, in all dwellings at risk.

Social Characterization of Study Area

According 2001 Census (INE), inhabitants of the above mentioned seven settlements were 10660 inhabitants, corresponding to 3602 classic families.

Also according 2001 Census, there where 5154 buildings on those places, corresponding to a total of 12594 lodgements. Among those, 3483 (28.8% of occupied) were first residences and 8598 (71.2% of occupied) were second homes.

On those seven beaches exists 1813 buildings on risk area (35. 2% of total buildings). Among them 553 (31%) are multifamily type and 1221 (67%) single family type. In total there are 4730 residences at risk on those beaches (37.6% of total lodgement) taking in account INAG's criteria to risk area classification (1999).

Inquiry Results

As mentioned above the sample inquiry was composed by 418 questionnaires. 54% of those questionnaires where applied to single family type buildings and 46% to multifamily buildings, corresponding to 56% of first residences and 44% of second homes.

Inquiries characterization presents the following features: 40,2% male (168) and 59,8% female (250) with age equal or superior to 45 (74.4%); 32,8% has 1st basic education level, 16,5% has an higher education degree and 7,4% of inquiries where illiterate; 43,3% has economical activity, 35,4% where retired, 13,9% where house-wives and 4,8% where unemployed; the most represented profession was fishermen or related activities 7%.

From the answers given by the inquiries, to the 5 different groups of questions we can highlight the following statements.

Relations between Local Population and Coastal Zone and Coastal Risks

In what concerns the relations between local population, coastal zone and coastal risk, when asked about population possibility and capacity to adapt to areas further away from the sea 64.8% stated that would be difficult, around 10% considered the adaptation to be very difficult and 20.6% considered that the adaptation could be easy. Reasons presented to justify that difficulty are: population affective connections with the sea and the economical dependence of the population regarding the sea.

Figure 2 shows the results of responses given to the question about probability of occurrence of certain natural events in their area of residence, namely: shoreline retreat, erosion, swash, floods, tsunamis, and storms; using a scale of analysis of «most likely, likely, less likely and impossible». Shoreline retreat is one of most referred facts.

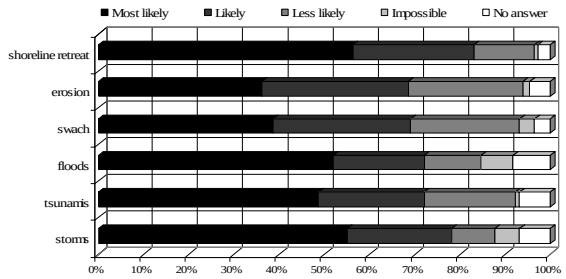


Figure 2. Probability of certain type of events occurrence

Concerning the probability of occurrence of some impacts in the sequence of the above-mentioned events, namely (1) physical damages, (2) moral damages, (3) sand-dunes destruction, (4) rupture of coastal engineering structures, (5) destruction of infrastructures and (6) destruction of buildings, using the same scale of classification, it was found that the last four listed were identified as the most likely to occur.

In all settlements, except Praia da Barra, more than 50% of inquiries reported that they are familiar with some situations of coastal danger that have already taken place, namely damage or destruction of buildings and flooded streets and buildings. The occurrence period reported are very variable, but the period 2000-2003 stands out in Praia da Vagueira, while the 70's of XX century, is more represented in Praia da Barra and Torreira and the 90's of XX century, in Costa Nova do Prado. From the 195 respondents that were present when that happened, only 47.2% assumed that they had a feeling of fear.

Coastal Dynamics

It was also questioned to inquiries if they recognized changes in the shoreline. 91.1% answered affirmatively, exception made to Torreira and Praia da Barra where only 75% of inquiries answered affirmatively. The changes referred where mainly: shoreline retreat (92.1%); shoreline stabilization (3.7%) and shoreline advance (4.2%) The shoreline retreat was less referred in Torreira and Praia da Barra. 79% of the inquiries, who identified shoreline changes, identify a reason for that's to happen. The main reasons given are: climate changes (30.6%), coastal engineering structures along the coast (15%), sea level rise/ just melting (12.6%), tides (7.9%) and lack of coastal defence structures (7.3%).

From those who linked shoreline changes with the existence of coastal engineering structures,18.8% consider that structures stabilize up-drift area but promote down-drift retreats, 17.2% report that structures control shoreline retreat, and 12.5% consider that structures causes down-drift shoreline retreats.

80% of the total inquiries expressed a positive opinion (important/ beneficial/ necessary) about the implementation of coastal protection structures in the coastal place. The remaining inquiries that expressed negative opinion about engineering structures and shoreline retreat, believe that: structures not protect/are not well projected/are not monitored (40%); shoreline retreat in down-drift of the structure put this area at risk (28%); also consider that these structures give a wrong sense of safety (24%) and that against the sea is not worthwhile to fight (16%).

Information, Prevention and Land Use Management

When the inquiries where asked about their feeling of security living in their houses, with their families, facing the sea proximity, 95% answered affirmatively. Only 21 of 418 inquiries considered not being safe, due to the sea level rise and the shoreline retreat.

90% of those inquiries who consider feel protected facing the sea proximity state that they would accept relocation of their dwelling if it was confirmed that they effectively are in a risk area, with possibility of loss of goods, namely their dwelling.

Some of the problems mentioned by the inquiries concerning land use management of these coastal places were incorrect urbanization, excess of buildings, insufficient management of the coastal place, namely nearby the sea, unsustainable growth and many others.

Relating to the importance of local population hearing in the development of land use management tools or in interventions that are being carried out, 84% agreed that it's important and show availability to dedicate a little of their time to contribute to that process. Praia de Esmoriz, Praia da Vagueira and Torreira surpass the others coastal places on showed availability.

In spite of this statement of availability to participate, only 43% knew that there is a Coastal Management Plan established on that area, and only 3.3% participated in the public consultation process of the above-mentioned management tool. The main reason pointed out for not having participated was the ignorance of public participation phase in management process (80.6 %).

CONCLUSIONS

The analysis highlighted the fact that population clearly recognizes shoreline retreat. Despite of that, they feel safe living in their homes. The existence of coastal protection structures in their residence area can explain this apparent contradiction. The existence of these kinds of structures is well accepted as mentioned buy inquiries, because they feel protected. They even suggest the strengthening of those structures. However they are open to move if the reasons for it are well sustain and they clearly can see risk to their life and property.

Despite being recognized, with higher level of evidence, the importance of taken into account public opinion, in plans and projects decision process and implementation, it was very clear the ignorance of existent plan to manage the area (POOC). That fact suggest that the formal public participation phase, include in the process of plan elaboration must be rethinking and adjust to the social features of local communities.

Meanwhile climate change impacts are intensifying and speeding, increasing many areas level of vulnerability, without any actions be taken to strength population skills to adapt to those changes.

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