

Environmental and hazard perception: a case study of a periurban area of Central Portugal

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Abstract

This paper describes an attempt to understand environmental and risk perception in a periurban area. Based on physical characteristics, an analysis of surface processes and the identification of the development of land use, certain environmental vulnerabilities were isolated. The study area corresponds to a small-scale hydrological basin which enabled an inventory of local affinities and common interests to be produced. A survey was undertaken of a sample of 220 local residents in order to assess concerns about natural resources, hydrological, soil and atmospheric contamination, natural and technological hazards, the general quality of life and community needs. The results show that the major concerns focussed on natural resources, especially ground waters, noise and light pollution. Natural hazards do not appear to be relevant concerns, in spite of a long history of flooding. Conservation laws are identified as being important for the development of the local community, as opposed to planning and remediation measures.

Keywords: periurban area, water demands, environmental vulnerabilities, local survey data, local concerns, sustainable management.

1 Introduction

Studying the public's perception of quality of life and the general welfare of the community has become an important issue (Marris et al. [1]; Lima and Castro [2]). Vulnerability analysis, consisting of the identification and evaluation of natural and technological hazards, is nowadays both a concern for planners, politicians and residents and an area of interest for the media (Slovic [3]).



Human activities produce land disturbances which reflect both advanced technology and social concerns. The consequences of these disturbances present varying levels of areal extent, intensity and duration that require trigger impact recognition and mitigation development. The public and decision-makers' perception of environmental parameters and hazardous activities make it easier to adopt and provide institutional support for restrain and reclamation practices (Weston [4]).

These aspects are of particular relevance in periurban areas where changes in land use, different developments in particular areas and alterations and deterioration in the environmental parameters are evident (Tavares and Soares [5]).

The aims of this paper are to characterise the public's perception of environmental parameters and hazard vulnerability and their relevance in a residential community located in Central Portugal in a periurban area of Coimbra (Figure 1).

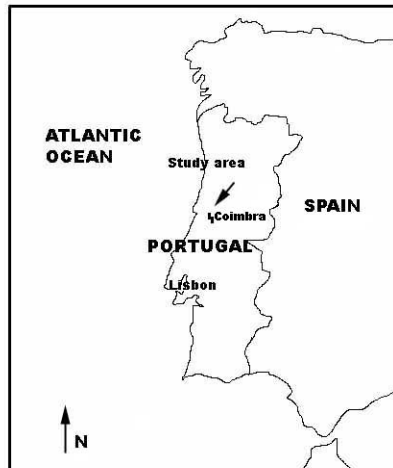


Figure 1: Location of the study area in Central Portugal.

2 General description of the area

The area studied corresponds to a small-scale hydrological basin of about 21.4Km², with a SE-NW orientation that has two inflections (Figures 2 and 3).

The thread physical characteristic is the Ribeira de Frades water shed which flows into the large River Mondego floodplain. The flow regime is perennial in the mainstream and intermittent or ephemeral in the remaining stream network. The water stream has influenced land use and human occupation and is the most relevant environmental parameter in terms of local perceptions.

The hypsometry expresses values ranging from 259 m to 11 m in a sharply widening valley. The upstream slope angles of the basin have values ranging

from 10-15%, and the downstream valley has less than 5%, with a 10-20% side slope.

The upstream valleys are cut into dolomitic and marl limestones Jurassic units, in contrast with the wide downstream valleys which rest on Cretaceous and Tertiary conglomerate, sandstone and mudstone units (Figure 2).

The main water input in the area studied comes from atmospheric precipitation. The annual precipitation (P) is close to 900 mm and about 50% is consumed by evapotranspiration. The remainder goes into infiltration (about 30% of P) and surface runoff.

Within the specific hydrological basin there are several aquifer units, organized into two aquifer systems. The upper and unconfined system lies on the Tertiary and alluvial deposits and has an important hydrodynamic relationship with the perennial stream-flows and discharge into several small springs; the depth of the water table changes from 0.5 m to about 16 m. The lower and confined aquifer system rests on the Cretaceous and Jurassic formations.

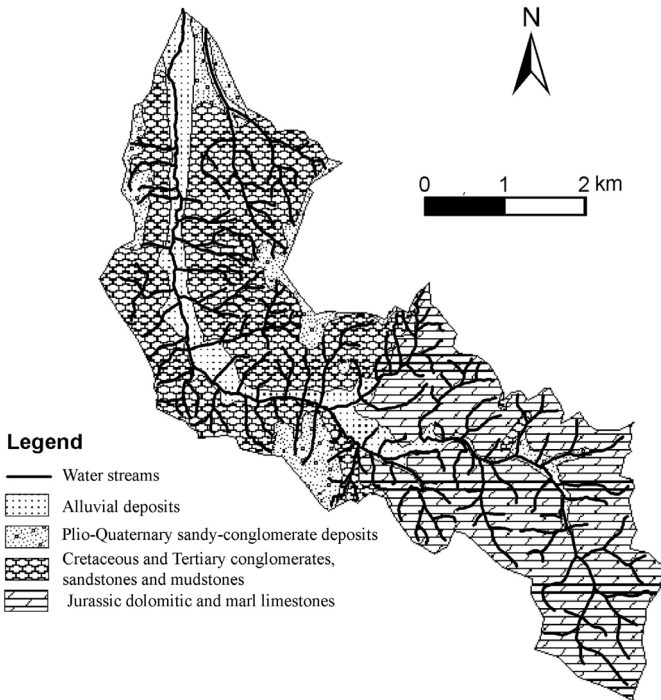


Figure 2: Geological and hydrological characteristics of the study area.

Figure 3 shows five main areas of land use: (1) agricultural areas with a significant share of natural vegetation; (2) forest and semi-open areas; (3) three important road networks and associated areas; (4) urban, with general

discontinuous built-up areas (Assafarge, Palheira-Antanol, Ribeira de Frades; (5) industrial and commercial units close to an airport structure.

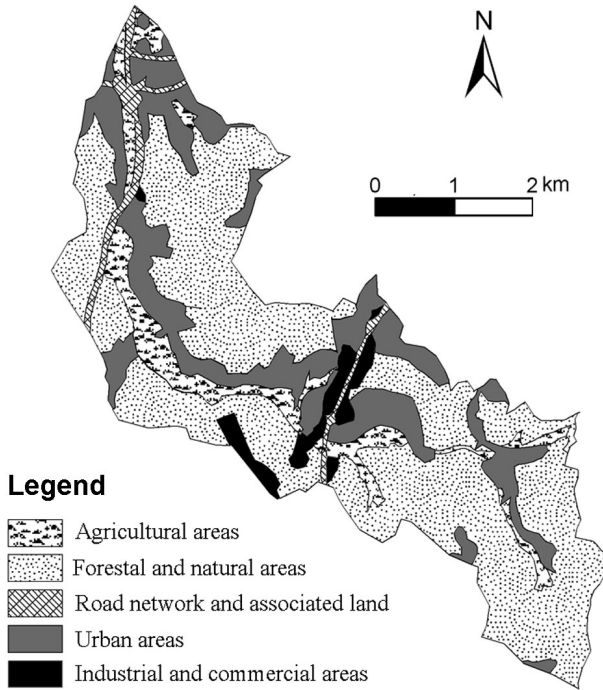


Figure 3: Land use of the study area.

The area has about 10,000 residents with a very asymmetrical distribution. In the upper regions, the population density is close to 123 p/Km² and human activities are concentrated on agglomerations mainly involved in forestry and some agricultural activity. In the middle and lower areas the density is close to 300 p/Km² and the main human activities are in the service sector, with some industry.

Two highways and a national road cross the area and have had environmental impacts that have involved separating local communities and increasing urban pressure.

3 Methods and techniques

Geomorphological, geological, structural and soil occupation approaches were mainly supported by the available bibliography, thematic maps (Tavares [6]), and aerial photography, as well as fieldwork. Detailed physical cartography,

including the surface instability processes, was undertaken on a 1/25000 scale. The hydrological setting was based on the meteorological and hydrographical data for the surrounding region and the geological and hydrological classifications were mainly supported by field observations and measurements.

The inventory of environmental problems and vulnerabilities was based on data from fieldwork collected during the year 2004.

The local survey questionnaire was planned and tested between February and April 2004 and administered in May and July 2004. The sample was divided according to physical and environmental characteristics and the number of residents in the periurban areas. The data was analysed with descriptive statistics, ANOVAs performance and the Statistical Package for the Social Sciences software in October, November and December 2004.

4 Environmental vulnerabilities

On the basis of physical characteristics an assessment of the changes in land use in recent decades, certain environmental vulnerabilities and hazardous activities can be identified:

- The rural features of the area have diminished, particularly due to forestry, the semi-natural reduction and deterioration of areas and a poor understanding of local water resources.

- The growth of continuous built-up areas for residential, industrial or commercial use has created large impermeable areas involving serious changes to the drainage network and infiltration rates.

- There has been a significant increase in water demand over the last two decades. The surface and ground water, as well as the soil, reveal considerable contamination. There are a few localised points that have serious pollution problems related to the excessive use of fertilisers in agriculture or to car repair activities and the packing industry.

- The downstream floodplain area traditionally used for agriculture has been abandoned and replaced by a built-up area, which has increased the future risk of damage and loss.

- The deforestation associated with slope cuts and anthropogenic fill due to road-building and construction activities has produced new evidence of mass movement and an increase in activity and surface erodibility.

- Road and urban land occupation and the growth of agricultural activities and forestry have increased the risk of fire in forests and areas covered with shrubs and herbaceous vegetation.

- The road network and associated areas have divided organised communities, leading to worsening public and social amenities, air pollution, noise and vibration impacts, light pollution, and soil loss.

- There has been a reduction in the quality of building work, involving changes in the types of buildings constructed and the materials used and also new demands on local access to services and community facilities. All of these factors have lead to conflicts in planning projects.



5 Local survey

5.1 Questionnaire organisation and interviews distribution

A structured questionnaire which incorporated elements relating to environmental and risk perception and also to the balance between public needs and planning policies was administered to 220 residents. The methodology involved direct and confidential interviews. Seven per cent of the sample was dropped out because of unreliable answers.

The questionnaire included 49 questions organised into six main sections: (1) definition of the natural resources, (2) forestry and agricultural needs, (3) hydrological and atmospheric contamination problems and their management, (4) perceptions of natural and technological hazards, (5) personal satisfaction with physical infrastructures, namely public sanitation, sports and recreational facilities, access to services, refuse collection, the water supply, proximity to work and public safety, (6) the general quality of life in relation to land use and overall planning.

The questionnaire included mainly closed questions with dominant scaled responses on a Likert or rating scale.

5.2 Survey data

The results show that a large majority of the interviewees (84%) considered that the area had a mixture of urban and rural characteristics, but assumed that local residential areas were rural. The younger groups in the panel generally tended to undervalue these rural characteristics.

Questions about the importance of forest land and related activities showed that about 70% considered this important or very important, as it was connected with commercial clear-cutting or was valued as an energy resource. There was a general understanding that the forest and open areas were well organized and clean.

The agricultural soil and agricultural activities were important or very important for 82% of the population interviewed because of their effect on the family budget, as an essential or supplementary resource. The agricultural roads were good but the fields were only fairly well tended.

The water courses were important to 48% and very important to 26% of the respondents, as they constituted a water supply (for irrigation and domestic use) and for ecological and aesthetic reasons. 47% classified the local water as being of poor quality, 37% stated that the quality was good and 16% did not know what to answer.

Only 10% of the sample considered the groundwater was not important, otherwise 48% of the residents thought it was very important, based on its importance as a supply of water and for environmental reasons. 71% of the sample considered the groundwater to be of good quality.

Figure 4 shows the importance of the specific environmental parameters for the respondents.



When questioned about atmospheric quality in their local area, 24% + 37% of responses stated that it was bad or poor and 39% indicated that the quality was fair. The most relevant factors affecting atmospheric problems were proximity to industrial and commercial areas and the presence of intensive lighting from the road network and associated infrastructures.

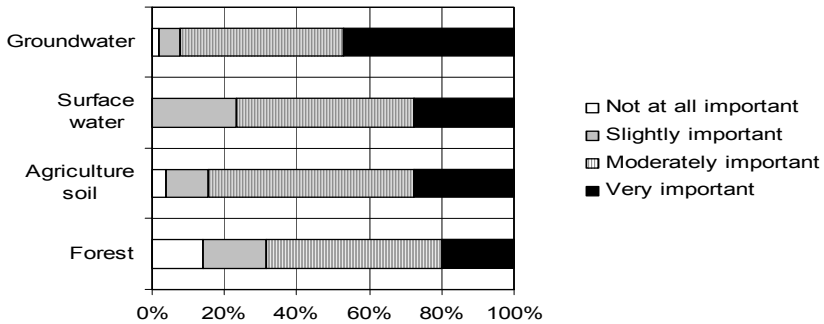


Figure 4: Importance of the specific environmental parameters.

As far as proximity to, and knowledge of, the Ribeira de Frades watershed was concerned, it was clear that there was a better understanding of this in the downstream valley area, although over two thirds of the sample did not recognise the species of flora and fauna.

The welfare factors indicated by the residents are shown in Figure 5. Basic social concerns about the water supply, waste collection and sanitary sewing were indicated by more than 15% of all groups. Good access to health care services and good public order policies were factors selected by 13% of the sample. As observed in Figure 5, land planning and the issue of urban amenities and building projects were not important to local residents, especially the younger group in the sample (15 to 25 years old), who did not cite these in their answers.

Concerning the recycling of waste, only a few residents said that they never separated their waste. Paper and glass were the materials that were usually separated and half of the sample also separated plastic products and batteries from their household waste. Nevertheless the answers show a local lack of concern for recycling (38% rarely; 39% sometimes). Only 25% indicated problems with the refuse collection; the main reasons are related to a lack of information or a lack of effort.

When asked about risk perception, multiple answers were allowed and more than one hundred of the interviewees focussed on forest fires and water and air contamination. The results are shown in Figure 6. Natural (climatic and geological) hazards do not appear to be relevant concerns, despite a long history of flooding. No one reported seismic risk as a local issue and only a quarter of the respondents were concerned about traffic accidents. The sample also reveals a local concern for public safety.

When asked about public concerns that should be discussed or should be the subject of new management policies, several areas were mentioned, as shown in Figure 7. Conservation legislation relating to water, air and forest land was indicated, as were strategies for reducing the risk of floods. Urban planning and ecological conservation were not important for a large number of the population.

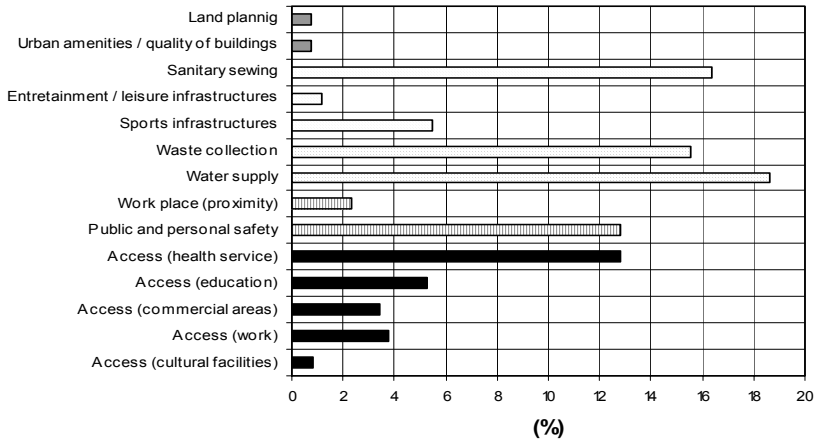


Figure 5: Importance of the welfare factors.

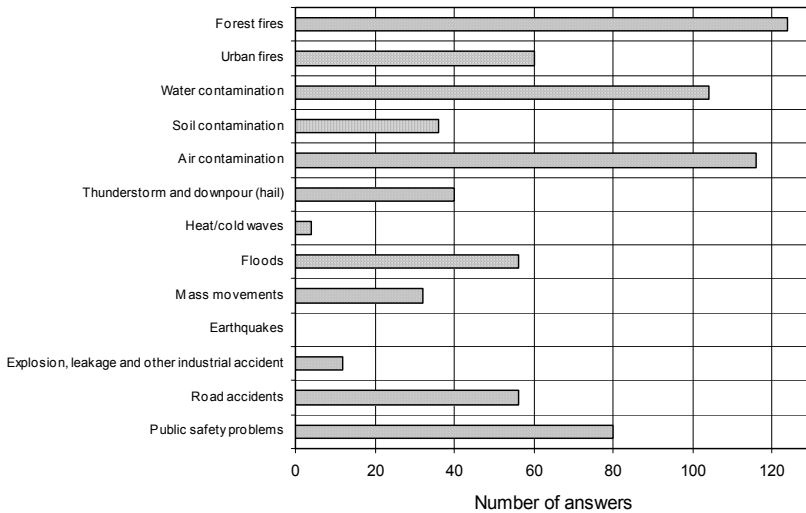


Figure 6: Local evaluation of the hazard targets.

When questioned about the interests of local politicians, access and land planning were mentioned, which suggests a difference of opinions.

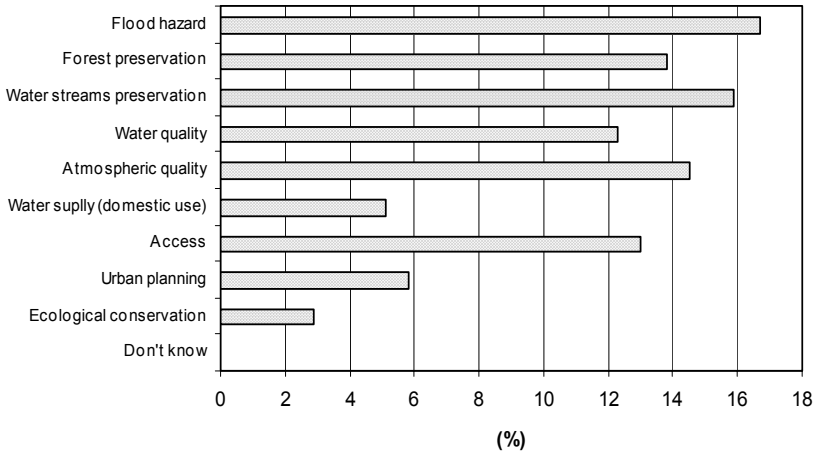


Figure 7: Local environmental and hazardous concerns issues.

6 Conclusions

Recent developments in the study area have led to a significant increase in urban characteristics and new demands for employment, together with a lowered perception of natural parameters. However, a large majority of the residents stated that they liked living in the area and appreciated the rural lifestyle.

The results show a high level of local concern for water quality (streams, aquifers and the domestic supply), according to the environmental vulnerability detected. Atmospheric pollution also worries residents. The agricultural use of land is considered to be more important socially and for economic reasons than forestry. On the other hand, the aesthetic and environmental role of the forest area was also emphasised.

Social and community facilities and infrastructures are considered inadequate. The basic social concerns still focus on the main welfare factors, associated with access to healthcare and public or personal safety.

The recycling of waste has not yet become a habit.

There were marked differences between the major community issues and concerns and the interests of the local politicians and institutions.

General knowledge and perceptions of risk and of the environment allow for sustainable management of the natural parameters and for improvements to be made to the local potential for dealing with vulnerabilities.

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