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THE WILDLAND-URBAN INTERFACE: A NEW RISK PRONE AREA IN SPAIN

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I. DEFINITION, DEMARCATION AND CHARACTERISATION OF THE PROBLEM

One of the elements which are contributing to increase vulnerability of territories to wildland fires in Spain the most is the development of situations which could have an impact on buildings and urban areas. This spreading of the threat to goods and people prompts, aside from a risk increase, a rising complexity of prevention, and above all extinction duties.

1. The appearance and development of the concept of wildland-urban interface

Wildland-urban interface (WUI) is to be understood as the zone in which forest land meets built-up areas. Despite the fact that building in zones populated by natural vegetation means an environmental challenge in the broadest sense (Radeloff *et al*., 2005), this term is most preferably used from the viewpoint of wildland fires.

Longer than twenty years ago, this concept started to spread from the United States (California), where it appeared for the first time, gradually reaching other spheres (Australia, Canada, Western Europe). This is a concept linked to the phenomenon of scattered urban development and also to the urban pressure made on forest lands (Avalapati, Carter and Newman, 2005).

2. Scientific approach to wildland-urban interface

In the last twenty years, research on this new reality has developed strongly, not only in the USA, Australia or Canada but also in Europe. This all results in the concept of interface being deeply rooted, especially within the scientific community devoted to wildland fires.

1. Methods for demarcation and characterisation

The first efforts to identify and map this phenomenon were made in the USA, framed within wildland fires planning. Pursuing the aim of identifying the communities which

inhabited interface areas, the Federal Register officially defined this reality and set a methodology for its representation (USDA & USDI, 2001). Together with those small-scale cartographies, methods to accurately demarcate these situations at larger scales have been developed (Lampin-Maillet *et al*., 2010).

2. Risk management in the wildland urban interface

The other great issue is risk management in the WUI, which includes awareness of the residents of these spaces and also further consideration of this risk situation when planning (both spatial and civil defence planning) (Walt, 1988).

The identified key factors on which preventive measures should be taken in order to reduce threat are fire intensity and the kind of structures, as well as their flammability.

Many works were focused on assessing the effectiveness of fuel treatments in WUI to cut fire intensity (Reinhardt *et al*., 2008; Safford, 2009; Ager *et al*., 2010). Modelling the behaviour of wildland fires, assessing fire spreading in the vicinity of buildings, and ignition of these, make up a sizeable proportion of the work of many research projects. However, references to the problems related to extinction duties are less abundant (Castellnou, Rodríguez and Miralles, 2005).

II. DISTRIBUTION OF WILDLAND INTERFACES IN SPAIN AND EPISODES OF FIRE

The rising presence of WUI on the territory results in an increase in number of episodes of wildland-urban fire in Spain. This increase of vulnerability is determined by a dynamics of vegetation progression and a noticeable scattering trend of urbanisation processes.

1. Evolution of interface territories

WUI are particularly dense in Galicia, Asturias or The Canaries, regions marked by their highly scattered system of rural settlements. This situation especially affects those areas with the highest levels of urbanisation too. That is the case of the metropolitan rings of Madrid, Barcelona and, to a lesser extent, Valencia; also noticeable are the concentrations present at the Mediterranean coast, an area of higher intensity of touristic uses.

1. The rising territory urbanisation, main reason of the advance of interfaces

The spreading of interface situations is mainly related to urbanisation processes and the spatial patterns adopted in those processes. The intense growth of urban areas can be considered a general trend nationwide but it has been particularly intense in certain zones (metropolitan areas and, in general, urban agglomerations and coastal zones) and regarding particular residential configurations (low density housing development).

2. The progression of natural vegetation

The other element which contributes to the spreading of interfaces is the progression of natural vegetation against farmlands. Statistical data on the evolution of land use in wildland areas (CORINE, IFN) are slightly contradictory. In general, wildland has stabilised or slightly increased in Spain. Which seems to be more indisputable is the advance of wildland densification. These are qualitative changes of particular significance which also affect the increase of continuity of forest uses in especially sensitive areas like town farmlands or city outskirts and coastal areas.

2. The problem in Spain: recent episodes of widland urban fire

The fire regime in Spain entails a higher and higher relative importance of large wildfires, which, under extreme weather conditions, are beyond extinction capacity. One of the elements which come together with this general evolution of fires is the appearance and progressive significance of wildland-urban fires.

This is the reflection of higher territorial vulnerability, linked to the increasing importance of scattered estates on the Spanish territory, but also has to do with the progression of natural vegetation and looser management in many rural villages' surroundings.

III. THE MANAGEMENT OF THE WILDLAND-URBAN INTERFACE

The necessity of managing WUI arises from several viewpoints, which include the stages of emergency prevention and extinction as well, and which have to do with the actions involved in different public interventions (spatial planning, forest and fire policies, civil defence).

1. The responsibility of spatial planning for the increase of territorial vulnerability

Spatial planning is responsible for the spreading of interfaces. The main contribution to this issue would be stopping its progression by adopting a more sensible territorial model, able to include the relations between decisions regarding land uses and the existing fire regimes in a specific territory (Pincetl *et al*., 2008). However, to do that, certain problems must be deal with first.

1. The scarce consideration of risk as an element associated to scattered urbanisation

The negative perception of low-density urbanisation processes as one of the components of territorial unsustainability doesn't include the fact that they also contribute to increase vulnerability of large territories to the risk of wildland fires.

2. The necessary sectoral approach to the problem

The definition of risk territories must be supported by sectoral planning (forest, wildland fires). However, these maps are drawn with different purposes (fire prevention and extinction) which don't meet the requirements of spatial planning.

3. The technical difficulties involving management and the necessity of new approaches

Territorial management from zoning must lean on the consideration of territorial dynamics (scattered urbanisation, progression of natural vegetation) key to define risk territories. Thus, planning must also advance towards the adoption of a strategic viewpoint, directed to detection and regulation of the most relevant and innovative processes with spatial incidence.

2. Sectoral planning (forest and wildland fire policies): a recent and insufficient incorporation of the concept to laws and practices

The specific approach to the problem of interfaces in Spain takes place framed within the law on civil defence (1993). In turn, forest legislation finally includes the concept of WUI, although in a wide, imprecise manner, linking it to the problem of wildland fires.

From this general framework, some Autonomous Communities have gone into the specific approach of the problem in depth. Advances took two main paths: on one hand, specific planning and management of these spaces; on the other, assessment of territorial vulnerability prompted by urbanisation processes in forest land.

1. The management of interface areas

The obligation of protective perimeter strip of variable width aiming at reducing fire intensity, together with other complementary actions, is the most usual approach to the management of these spaces.

Catalonia has pioneered it. The importance that urbanisation processes in forest land gets in this region and the rising importance of wildland-urban fire explain the interests of Catalonian authorities in developing an efficient management system (legal support and subsidies) (Terés *et al*. 2007).

2. The incorporation of the variable population vulnerability into risk maps

The changes that are starting to occur in some Autonomous Communities regarding the drawing of those risk maps are particularly relevant. On one hand, the inclusion of new vulnerability parameters linked to the presence of villages and goods potentially threatened by fires; on the other hand, the expressed will to declare spaces which should remain apart from urbanisation processes.

3. Planning for emergencies

The special circumstances in which interface fires take place make this kind of fire be a rising worry for extinction systems, which have to devote more and more time and means to fight these eventualities. In this context, the main work lines of emergency planning are the increase of effectiveness of extinction task forces and the raise of awareness of the inhabitants of this kind of spaces.

1. Awareness and self-protection of WUI residents

Very few Autonomous Communities have carried out awareness campaigns (Catalonia, the Canaries). Besides awareness of living in a risk territory itself, these campaigns intend to encourage behaviours of adaptation to risk on owner's part, aiming at reducing vulnerability of structures. The other great objective is informing about the most adequate way to act in case of fire.

2. The management of a new wildland fire scenario

The analysis of fires that occurred in campaigns with severe problems of wildland-urban fires makes advisable performing changes in tactics and training of extinction teams to adapt to a new reality characterised by simultaneousness of emergency situations (Castellnou *et al*., 2007). Particularly delicate are the decisions on evacuation or confinement. There is no different strategies previously defined in Spain but evacuation is clearly chosen as the preferential solution.

IV. THE PROBLEM OF THE WUI: BETWEEN UNSUSTAINABILITY OF URBAN DISPERSION AND AGRICULTURAL ABANDONMENT

The advances in knowledge of this reality in Spain haven't resulted up to now in a widespread social attitude which considered wildland-urban interfaces a territory at risk. People don't see the increase in number of episodes which more and more frequently affect inhabited areas is directly related to certain territorial dynamics which increase vulnerability of the territory. In particular to the increase of disperse urbanisation in rural spaces, both in metropolitan areas as well as in zones linked to touristic development, and to processes of abandonment of agricultural land in particularly sensitive areas (towns' surroundings).

The widespread opinion on the unsustainability of the rising dispersion of settlements doesn't incorporate its contribution to the increase of risk situations linked to wildland fires. Much less are people aware of how processes of abandonment and changes in agricultural practices in the surroundings of villages are substantially modifying wildland fires spread patterns.

In conclusion, despite the interest and notoriety that this reality has progressively acquired, the necessary, sufficient conditions for an adequate consideration of this new risk territory don't occur yet.