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Risk landscapes. Conceptual aspects, didactic potentiality in the classroom and practical utility in spatial planning

I. INTRODUCTION. RISK, AN ESSENTIALLY GEOGRAPHICAL CONCEPT

Risk is about probability, uncertainty and the possibility that something could happen and could affect human beings. It is one of the concepts that best represents the purpose of Geography as a scientific discipline: knowledge of the relationships between the physical environment and human action that occur in geographic space. And it is, at the same time, an object of study that has gained great prominence in geographic research in the last two decades (DAUPHINÉ, 2003).

The geographical space reaches its superior state with the creation of landscapes. Landscape is the visual manifestation of the degree of civilisation of a society. The geographic space integrates human action in a physical environment that allows the construction of territories that integrate significant geographic elements that give it character (PISÓN, 2009). This perspective, as in the case of risk mentioned above, connects with the very *raison d'être* of Geography, integrating physical and human facts (GÓMEZ MENDOZA, 2003). Sometimes, that character is granted by a feature of the natural environment; in others, due to the human activity conducted in that space, which may manifest beliefs or guidelines of their cultural tradition. And all of this is “imprinted” in the geographical space in a visual way (ZUBELZU and ALLENDE, 2015). The study of landscape is one of the most identifying legacies of Geography since its consolidation as a scientific discipline (ORTEGA CANTERO, 2010). And as has happened in the last two decades with other geographi-

cal elements that form a fundamental part of the territory (e.g. water, risks, mobility, heritage), the landscape has become the object of political action —planning— where the geographical discipline has a prominent role in the development of analysis, diagnoses and proposals for applied intervention (FROLOVA, 2009).

In this second category (intense transformation of the physical environment) of creating landscapes in the geographical space, the “risk landscapes” that are dealt with in this work are integrated. These are environments whose condition is given by improper actions by human beings on media that behave, sometimes, in an extreme way. As Martínez de Pisón indicates “the landscape is the configured (and sometimes disfigured) place” (MARTÍNEZ DE PISÓN, 2017). In this way, geographical spaces are generated whose characteristic element is a risk condition that manifests itself in a high vulnerability to natural hazards. These areas can be mapped but, above all, they can be identified visually. They are the “risk landscapes”, a unique category within the typology of landscapes that make up a geographical space, where the human component prevails over the physical aspects of the environment, at the time of their characterisation (OLCINA CANTOS, 2014). In this way, “landscape” and “risk”, two categories of geographic analysis, are presented in an integrated manner with a dual purpose: the teaching of risk through the landscape, as indicated by the legislation and the educational curriculum in our country and the use of this landscape unit in spatial planning processes, as indicated by landscape regulations and land use planning.

The scientific study of natural risk was born in Geography and it is within this discipline that it has acquired a more complete conceptual and methodological development (AYALA and OLCINA, 2002; ESPEJO and CALVO, 2003; OLCINA CANTOS, 2014); without forgetting that the approach to risk analysis has been academically highlighted from other disciplines related to the physical environment, social behaviour and data processing (geology, environment, engineering, sociology, economics, mathematics, computer science, health).

Little by little, the theoretical and methodological corpus of “risk geography” is being consolidated within the geographic discipline, which will gradually incorporate analysis tools and techniques to improve results (CALVO, 1984, 2000, 2014; RIBAS and SAURI, 2006). The development of some extraordinary events, of natural or technological causes, since 1980, will give scientific and social prominence to this geographical branch that will begin to share the object of study with other disciplines (geology, land engineering, sociology, economics) (BECK, 2000, 2002).

To this will be added the development of regulations (water, environmental impact, land use, spatial planning) by some Western countries, which begin to incorporate the consideration of risk or any of its components as a determining criterion when establishing activities, infrastructures, or facilities in the geographical space. In this sense, risk mapping acquires a fundamental role as an essential scientific-technical tool for the delimitation and assessment of risk areas in the territory, until it becomes a legal risk accreditation document. Indeed, an important advance that has occurred in the three decades has to do with the improvement in work methods and cartographic representation (OLCINA and DíEZ, 2017). The use of computer tools, with greater capacity over the years, for data processing has made it possible to specify the analysis phase in risk studies. A final phase, starting in 2010, has been the incorporation of big data and artificial intelligence tools and with the preparation of risk maps, thanks to the use of geographic information systems and the incorporation of satellite images that have been incorporated as an *ex officio* procedure in research or work applied to natural risks (PÉREZ MORALES et al., 2022).

An important link in the evolution of natural risk studies occurs in the current context of climate change due to the anthropogenic greenhouse effect. Since the publication of the 4th Report of the IPCC (2007), the relationship between the process of warming of the atmosphere and alterations in atmospheric circulation that can lead to the genesis of extreme weather events with catastrophic ef-

fects has been clear. This relationship has been highlighted in successive reports from this international organisation (2018) until the last one published in 2021 (IPCC, 2021). In general, a warmer troposphere causes more frequent and energetic movements of air masses in the search for equilibrium in the planetary energy balance, something that is not obtained because the imbalance caused by the emission of greenhouse gases is, now, constant.

With geographical criteria, the risk is the territorial expression of human actions conducted improperly in areas with natural danger. And the risk analysis pursues the precise delimitation of the territories at risk and the determination of the degree of risk existing in each one of them. All this gives, as a result, the elaboration of a risk map (natural or technological). In short, conceptual, and methodological aspects of Geography. Theoretical geography with the purpose of applying their knowledge to society. That is the virtue of the geography of risk.

The present work proposes the use of the risk landscape as a unit of study of the natural risk existing in geographical space in the diverse levels of education, from ESO to university, from the elaboration of files or atlases of risk landscapes of the nearby living area. The work makes a commitment to the image—panoramic photography, aerial photography, satellite image—, compared to the risk map as a geographic work tool that is especially suitable for the study of the existing risk in a territory and for its practical application in spatial planning processes.

II. THE VISUAL CONFORMATION OF RISK IN THE TERRITORY: RISK LANDSCAPES

There are territories where the natural risk acquires the category of a significant geographic element; that is, they have in the risk an element that characterizes that place by the frequency of development of events of extraordinary range or by the magnitude that they reach (GIL and OLCINA, 2021). In one case and another, there is always an element that determines the significance of the geographical fact, and it is the affection for the human being (CANO, 1985). The territory of risk becomes a landscape of risk by visually reflecting in the geographical space the anthropic actions that have not considered the dynamics of the natural environment. A dynamic that sometimes manifests itself in an extreme way. A risk landscape is an area where human actions that have been conducted and that have not caused a high degree of exposure to the sometimes-extreme behaviour of the environment are captured visually.

The human factor is key to characterizing a risk landscape. In the classification of landscapes that a geographic space can accommodate, there are areas with a lesser or greater imprint of human activity on the physical environment. The degree of human intervention is usually the main criterion in the elaboration of landscape types. In the case of risk landscapes, human intervention in their gestation is an essential piece. There are no risk landscapes without human action because the risk is a condition given to the environment by human action.

The risk landscape can be identified in the territory before or after the genesis of an extreme event. The process of creating a risk landscape is related to two elements: the existence of a high degree of danger in the face of a natural event and human action that ignores this high danger and implements uses. The more stable and with the higher level of human occupation this use has, the greater the degree of risk of the generated landscape.

The identification of risk landscapes and their social explanation, especially in teaching, has characteristics that make it an especially suitable activity for the subsequent development of risk reduction practices. As they are clearly identifiable places with the naked eye or from photographic, aerial or satellite images, they are presented as examples of malpractice to be avoided in future actions on the territory.

Risk landscape has two important qualities for the understanding and management of geographic space. On the one hand, its identification from an image facilitates its presentation in the classroom against the risk map, which is more complex to study. On the other hand, the landscape at risk is one more unit of the landscape, with its own characteristics, within the landscape catalogues that must be incorporated into the spatial planning processes, as reflected in the land and landscape planning regulations of the autonomous communities in our country.

III. RISK LANDSCAPE IN CLASSROOM: PROPOSAL

The teaching of risk landscapes in the classroom has the purpose of identifying bad practices on the territory with the effects of future repair. Risky landscapes, within landscape classroom teaching, deserve special treatment in the classroom, especially in those territories that present a high degree of danger concerning natural (or anthropic) phenomena that can reach extreme range.

The approval of climate change laws —State and Autonomous Communities— and educational reform in

our country, where specific sections on “Education and training against climate change” are included, opens new possibilities for teaching risk landscapes at different educational levels.

An interesting alternative for the teaching of risk landscapes is the preparation of identification cards of the same, where geographical causes of their formation, historical aspects, related cartographic representations, or risk reduction proposals are included, together with the visual aspects of these territorial units. The degree of detail of these files will depend on the educational level and the training competencies contemplated for each one of them. At non-university levels, the explanation of risk landscapes must be based on the image. The teaching of natural risk, with a didactic purpose, has in the risk landscape a very useful resource for understanding the processes of danger, vulnerability and exposure that occur in the geographical space. The risk map is a resource of great interest, but difficult to understand by students unfamiliar with geographic tools and methods; On the contrary, the landscape of risk, as a visual representation of existing actions in the territory, is a didactic resource that students will recognize immediately, especially if they live in a high-risk area. Field work is presented as an ideal ally for the characterisation of landscapes in a territory (CAMPARI, 2020), very suitable for identifying risk landscapes.

IV. RISK LANDSCAPES IN SPATIAL PLANNING

The risk and its territorial manifestation have had a slow consideration in spatial planning processes. In Spain, there is a before and after, after the disaster of the Biescas camping in August 1996, a notable example of a risk area, after the authorisation to install this recreational activity in an alluvial valley (OLCINA, 2010). Without forgetting the antecedents of the 1985 Water Law and its 1986 Public Hydraulic Domain regulations, and civil protection regulations, in particular the appearance of the 1995 Basic Flood Directive, which for the first time indicates the need to prepare flood maps. As a result of the dramatic effects that occurred in that episode, the Land Law of 1998 was modified, incorporating an article that indicated the obligation to classify as “non-developable” those spaces with “accredited” natural risk. That law had no effect on natural risk reduction because the accreditation procedure was never clarified. A decade later, the new land law of 2008 would point to the map of natural risks as a technical-scientific document for the accredita-

tion of natural irrigation in territorial actions. Curiously, in the decade that passed between the approval of both regulations, the most important real estate growth of the democratic stage occurred in our country and the greatest increase in the areas of natural risk, mainly flooding, was generated by this process of radical transformation of the physical environment. So, the creation of risk landscapes experienced a period of expansion from the mid-1990s until 2008, with the outbreak of the economic crisis, rooted in real estate sector.

It must be remembered that with the approval of the European Territorial Strategy (1999) and the European Landscape Convention (2000), the principle of sustainability in territorial processes has permeated the regulations and practices of urban and territorial planning in our country.

In terms of landscape, it has been integrated into the regulations of the autonomous communities, either exclusively or as part of land laws and land planning. The landscape counts as a work unit in spatial planning processes. Therefore, it is necessary to incorporate the cartography of landscape units as a determining element when assigning future land uses. A division of the landscape should be the landscape of risk, in those sectors that meet the characteristics indicated for the definition and delimitation of these areas.

A further step is the integration of the landscape units, that is, the different classes of landscapes defined in a geographical space, in the “green infrastructure” tool that some autonomous communities have incorporated into the planning of the territory, as a superior structure of the physical-cultural characteristics of a geographical space object of planning (BEREZI and OLCINA, 2021).

A risk landscape unit identifies areas that must be acted upon from urban action to reduce risk and to avoid the repetition of improper territorial practices in other parts of the space subject to urban intervention. The risk landscape (image) shows what has been done wrong in the past and is evident in the present. The risk map, with the future modelling of scenarios, makes it possible to avoid the repetition of those territorial malpractices that have given rise to a landscape of risk.

A new process must be incorporated into spatial planning processes that will affect the very delimitation of risk landscapes. This is the current climate warming that is directly related to the genesis of extreme range atmospheric events (MUÑOZ et al., 2020; IPCC, 2021). The green infrastructure tool is especially suitable for incorporating this issue when preparing climate projection cartographies of atmospheric or environmental elements that must be considered when assigning new land uses.

V. CONCLUSIONS

Landscape is a concept and a work object typical of Geography, as is risk analysis. Other disciplines also study landscape, but it is within Geography that landscape and risk have found a more complete epistemological and methodological development. The characterisation of landscapes is a scientific task that pursues a critical reading of the territory (AGE, 2017), with an ethical objective, to highlight the aesthetic values of the geographical space, but also the bad practices of occupation of the territory that can generate situations of risk.

Risk landscape combines the elements that make up the interest of geography (physical environment and human action). In this category, the second takes on a leading role, since the condition of risk is only reached by the development of human actions that contravene the natural functioning, sometimes extreme, of an environment.

The study and explanation of risk landscapes in the classroom has the fundamental value of the image, as an identifying element of a territorial condition. This makes it a particularly suitable tool for understanding the degree of risk presented by geographic space, over and above the risk map itself, which is an excessively technical document.

In addition, risk landscape, as a unique unit of landscape in a territory, is very useful in spatial planning processes, since it identifies areas that must be acted upon from urban action to reduce risk and to avoid repeating this type of improper action. in other parts of the space subject to urban intervention.