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Natural hazards and climate changes in mountains areas: perceptions of local elected officials

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ABSTRACT (EN)
This communication aims at presenting findings from a research program, RiTTA (risks and territorial transformations in Aquitaine), funded by the Aquitaine Region. It will focus on the analysis of the perceptions that local elected officials of Pyrenean mountain areas have of CC and natural hazards. We assume that perceptions issues at local level are essential to understand vulnerability drivers, obstacles and potential levers for local society's adaptation and mitigation of climate changes. The method developed to analyze these perceptions has been based on semi-structured interviews with the mayors of the Pyrenean Ossau valley. The paper will focus on three main issues: knowledge of CC and its effects on mountain areas; relationship established (or not) between climate change and natural hazards; and measures taken to adapt or mitigate climate change at the local level.

Keywords
Climate change; perception; knowledge; natural hazard; local elected official; mountain; Pyrenees

RESUME (FR)
Cette communication vise à présenter une partie des résultats du programme de recherche RiTTA (Risques et Transformations Territoriales en Aquitaine), financé par la région Aquitaine. Elle se centrera sur l'analyse de la perception du changement climatique et des risques naturels par les élus locaux des zones de montagne pyrénéennes. Nous formulons l'hypothèse que les questions de perception, à l'échelle locale, sont essentielles pour comprendre les facteurs de vulnérabilité, les freins, mais aussi les possibles leviers pour l'atténuation du changement climatique et l'adaptation des sociétés montagnardes. La méthode retenue pour saisir ces perceptions repose sur une enquête qualitative sur la base d'entretiens auprès des élus de de vallée d'Ossau. Trois thèmes principaux sont abordés dans cette communication : la connaissance du risque et de ses effets sur les zones de montagne ; la relation établie (ou pas) entre changement climatique et risques naturels ; et les mesures d'adaptation ou d'atténuation du changement climatique adoptées à l'échelle locale.

Mots clés
Changement climatique; perception; savoirs locaux; risque naturel; élu local; montagne; Pyrénées

RESUMEN (ES)
Esta comunicación pretende presentar parte de los resultados de un programa de investigación, RiTTA (Riesgos y Transformaciones Territoriales en Aquitania), financiado por la Región Aquitania. Se centrará en el análisis de la percepción que los representantes políticos locales de zonas de montaña pirenaicas tienen del cambio climático y de los riesgos naturales. Formulamos la hipótesis de que las cuestiones de percepción a nivel local son esenciales para comprender los factores de vulnerabilidad, los obstáculos, y los posibles impulsos para la adaptación de la sociedad local y la mitigación de los cambios climáticos. El método desarrollado para aproximarse a estas percepciones se ha basado en una encuesta cualitativa en forma de entrevistas a los alcaldes del valle de Ossau. En esta comunicación se abordan tres temas principales: el conocimiento del cambio climático y de sus efectos en las zonas de montaña; la relación establecida (o no) entre cambio climático y riesgos naturales; y las medidas de adaptación o mitigación del cambio climático adoptadas a nivel local.

Palabras clave
Cambio climático; percepción; conocimiento; riesgo natural; representantes políticos locales; montaña; Pirineos

1. INTRODUCTION
This communication aims at providing a better understanding of social perceptions of climate change (CC) in mountain areas. In particular, mountain areas are particularly vulnerable to multiple natural hazards, address how CC modifies natural processes and social vulnerability is a very important challenge. We assume that perceptions issues at local level are essential to understand vulnerability drivers, obstacles and potential levers for local society's adaptation and mitigation of CC.

A qualitative survey based on semi-structured interviews (one hour in average) was carried out: 50 inhabitants, elected officials of Pyrenean Ossau and Aspe valleys and other local representatives of public authorities were interviewed. In the context of this article we will focus in particular on the viewpoint of the 15 elected officials (out of 18) we have interviewed in Ossau valley. As they are supposed to be key actors in local adaptation and mitigation policies, a lexical analysis of the interviews was

carried out in order to understand their views and knowledge of CC.

Three main issues will be highlighted. First, we will analyze mayors' knowledge and experience of CC. Secondly, we will discuss the way they connect or not CC issues and natural hazards. Finally, we will analyze the viewpoint of the local elected officials on CC adaptation and mitigation measures.

2. CLIMATE AND ENVIRONMENTAL CHANGES OBSERVATION

The position of elected representatives on CC reflects contradictory debates in society. The interviewees form 4 groups with very different discourses. Just under half (6/15) say they are sure to observe CC indices. They are extremely convinced, they use categorical qualifiers for them: "tangible", "certain", "measured", *etc.* The second group, almost as important (5/15), is convinced that there is something going on globally, but not locally. This group often asserts that mountain allows or will allow to protect them*: "Great changes..., not yet here, I think. We're in an area, in a privileged area."* (I 6). The third group (3/15) asserts that they don't know if CC does exist and question the possibility that it may be only inter-annual variability inherent in climate processes. Nevertheless, only one interviewee claims to be totally climate-sceptic.

To the question "What does CC mean to you?", first, the interviewees talk about alleged local indices of temperature and precipitation changes (see figure 1). But while many mention the increase in temperatures (7 mentions), it is the weakness of snowfall that is most often cited (9 mentions) showing the weight of the local environment in the perception of CC. Generally speaking, CC is associated with less marked seasons (9 mentions), shifted in time (specifically in winter). The general lack of rainfall is also highlighted (droughts, dry water sources and reduced river flows). The rise in the rain/snow altitude limit is also mentioned as well as an increase in the daily thermal amplitude.

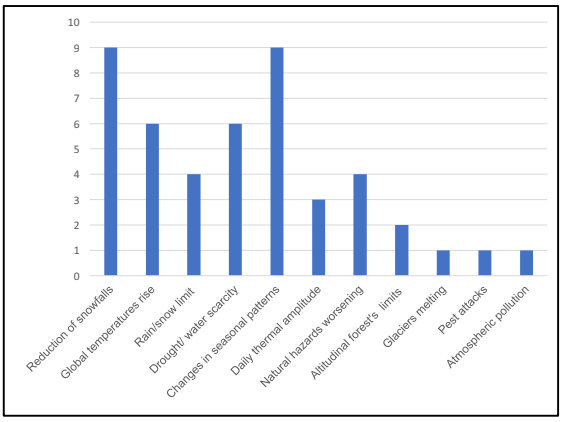


Fig 1: General ideas linked to CC by the interviewees (number of quotes)

Apart from all these climatic considerations, the interviewees mention, however, to a lesser extent, clues concerning the environmental consequences of CC (forest, pest attacks and the exacerbation of natural hazard phenomena). All these observations are very often associated with a personal discourse that highlights the very humble position of the interviewees who insist that they are not specialists in the subject.

To the question "How do you see the consequences of CC on your future living environment?", 5/15 don't see what the changes could be, either because they don't believe in CC or because they have no idea. The others give a wide range of answers: 3 main attitudes emerge, all linked to the way the interviewees define their living environment (see figure 2). The impact on the mountain economy is the most emphasized. Particularly, winter tourism and agriculture which are the two crucial pillars of the local economy. A second group addresses the issue through its environmental dimension: possible droughts and water shortages are the second most discussed theme.

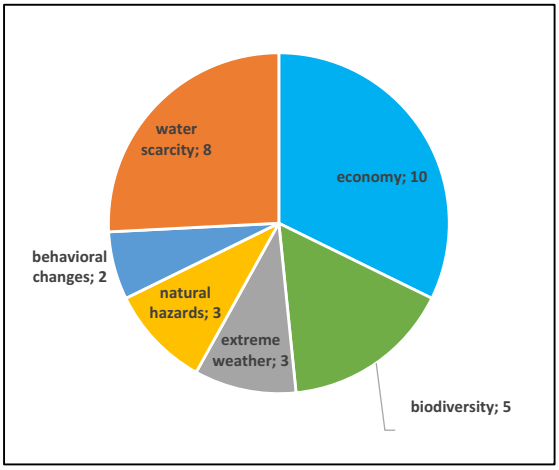


Fig 2: Expected evolutions in the living environment according to the interviewees (number of quotes)

Besides water scarcity problems, 5 respondents also make spontaneously the link with extreme weather or natural hazards. Finally, a few, less numerous, insist more on the shifts in practices and behaviors that CC will require.
Indeed, even if the term "risk" was not deliberately present in the question, the future impact of CC is perceived as representing risks of different kinds in a very anthropocentric perspective: environmental impacts are far less mentioned than consequences for humans.

3. NATURAL HAZARDS: INCERTAINTY FOR THE FUTURE

Indeed, hazards are likely to be affected by CC if the latest models of climate projections on the French mountain are taken into account, even if the predictions of evolution appear to be imprecise both spatially (large local disparities) and temporally (seasonal and inter-annual variabilities) [1]. Climate and environmental changes, while they combine global dynamics, are also due to very local factors, particularly complex in the case of mountains where risks are multiple and processes are interdependent [2].

The perceptions the interviewees have of the future effects of CC on hazards are often contradictory and reflect the scientific uncertainty. When asked explicitly

about natural hazards, only the 3 climate sceptics state that they do not believe or know if CC can have an impact on mountain natural hazards. The list of hazards mentioned by the other 12 is broader than for the previous question (see figure 3).

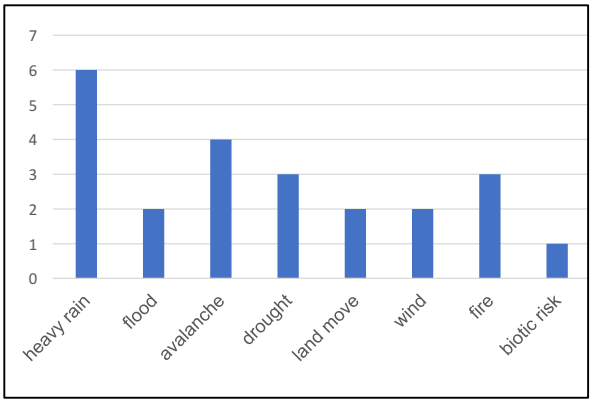


Fig 3: risks that may evolve as a result of CC according to the interviewees (number of quotes)

Heavy rainfall, floods and landslides are still mentioned but new risks are also identified such as wildfires, usually connected to the use of fire in traditional agricultural clearing practices: CC *"can also modify what is much more peculiar, that is, the forest, for example, we have seen forest fires…about fifteen years or twenty years ago we had never heard of that here*" (I 1). It should be noted, that for this interviewee, this risk is already present. But most interviewees point out that they think that hazards are going to get worse, but they don't know how bad.

While some people think that the worsening is already observable, others try to reassure themselves by saying that they will not see the impacts. 3 out of 15 wonder about the reality of risks increase. In particular, they refer to the vernacular knowledge of the elders to state that risks have always existed and are cyclical.
One of the risks that leaves the interviewees puzzled is avalanches, because for some, the behavior of the snow seems more erratic, less predictable than in the past. Two of them clearly consider that local knowledge of avalanche risk is no longer valid with avalanches in new places and new behavior of snow.

The answers, which generally only mention one or two kinds of hazard, show that it's not a concern that most of the interviewees are used to thinking about. Their knowledge of risks linked to CC is generally incomplete and for most of them, limited to their personal experience and what they learn by themselves [3]. It reflects both the scientific uncertainties and their difficulties in addressing technically complex issues, whereas public risk management policies are not a competence of municipalities in France.

4. LIMITED ADAPTATION AND MITIGATION MEASURES IMPOSED BY NATIONAL REGULATIONS

While mayors are sensitive, as a whole, to CC perceptible at different scales, they are more divided on the factors that cause these changes and on the actions to be taken to prevent or mitigate them. 3 out of 15 elected officials are unable to answer the question "In your opinion, are there concrete measures that could limit the effects of the CC?". Another one, fatalistic, considers that it's too late to act:" *It's catastrophic, it's terrible, I'm disgusted because (...) it's not now, it was long before that question had to be asked* "(I 4). This person believes that change is inevitable and must be accepted with resignation: "*We will have to endure this CC*" (I 4). This idea is accompanied by the feeling that the fight against CC must be carried out at a different level (national or international).

Some elected officials, however, mention some measures that, if adopted locally, could help to mitigate the effects of CC, for example: *the orientation towards "softer (...) less energy-intensive agriculture*" (I 13), the development of eco-mobility practices or renewable energies. Nevertheless, these ideas remain very general. When asked whether they have taken or plan to take concrete action in their local communities to limit the effects of CC, 6/15 admit that they have not implemented any of them, with the exception of those corresponding to a legal requirement such as the abandonment of the use of pesticides in public spaces imposed by the law). The others refer mainly to actions in the energy field, which are also encouraged by national legislation, such as improving the thermal insulation of municipal buildings, encouraging carpooling, reducing the energy consumption of street lighting or developing renewable energy: "*We can't afford everything because we are a small village, but we rent our roofs to energy producers using solar panels. We are part of an approach… nowadays, it is almost imposed by law, but we had planned to do so before* "(I 5). Indeed, the most easily implemented measures are those which make it possible to hope for co-benefits [4][5]in the short or medium term.

The role of the Pyrenees National Park in supporting the implementation of these measures is sometimes evoked: "*in public lighting, therefore, we are moving towards solar energy, assisted by the National Park*" (I 4);"*With the Park we join in an energy climate plan*"(I 3) and "*for the abandonment of pesticides (...) we were helped by the Park.*" (I 1). For some of these rural elected officials, who are poorly informed, with limited human, technical and financial resources, the Park is recognized as a valuable aid in the fight against CC, even if, in this valley, due to old antagonisms, many municipalities remain hostile to this public institution [6].

5. CONCLUSION

Elected officials confirm the idea that local appropriation of CC issues is difficult because it requires a long-term strategic vision. However, in small communities, communal management is more a matter of managing and solving concrete everyday problems. Since the mid-2000s, in the absence of municipal technical services, the private sector has been responsible for providing expertise and public engineering services, formerly provided by the State. These changes have an impact on the policy options of small communities, on their ability to integrate the many legislative and regulatory changes, and on their ability to appropriate and operationalize new and complex issues such as CC and hazards evolutions.

Moreover, as observed in other areas, there are many barriers that limit CC mitigation and adaptation [7]. Often, action in the field of CC gives way to other priorities [8] even if most of elected officials the we interviewed are aware of changes in their living environment, the issue seems too distant temporally and spatially (involving the future and other levels of decision-making) while they already have to deal with other, more immediate problems of demographic and economic vitality.

6. ACKNOWLEDGMENT

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