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Climate Change and Vulnerability in Local Areas: Attitudes to Evolving Risks and Adaptation in Two Pyrenean Valleys

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- ¹ Drawing on our findings in the Western Pyrenees, this article aims to bring a better understanding of attitudes to climate change among local players in mountain areas, mainly elected representatives, but also residents¹. We started from the assumption that the difficulties in grasping current and future changes adds to the vulnerability of local areas to climate change. Vulnerability is a concept much used in studies on natural risks and, more recently, in research on climate change, sometimes with different meanings (Adger *et al.*, 2005; Adger, 2006). With regard to risks, it generally refers to the likelihood of a key area of concern (human, material, etc.) sustaining damage because of the existence and occurrence of a hazard (Blaikie, *et al.*, 2004; Cutter, 1996; Thouret *et d'Ercole*, 1996). When used in the context of climate change, the concept refers instead to the extent to which a system (in this case, a local area) is liable to be adversely affected by the effects of climate change, including climate variability and extreme phenomena (IPCC 2001 and 2014). In the operational sphere, the French Agency for Energy and Environment (ADEME), drawing on IPCC findings, analyses local area vulnerability to climate change into three indicators: degree of exposure (nature, scale and rate of change), sensitivity (consequences of change for the safety of people, their activities and the environment) and capacity for adaptation (organisational aspects and governance systems) (ADEME, 2012). This was the matrix used by the Pyrenees National Park for its Climate Plan diagnosis to assess vulnerability in the area comprising the two valleys we studied. In practice, this definition establishes a close link between vulnerability and change. As changes are inherent to socio-ecological systems, ignoring or resisting them is likely to increase vulnerability (Walker and Salt, 2004). As underlined by Magnan *et al.* (2012), vulnerability also

evolves, and assessing it necessarily involves the time factor (Adger, 2006), because understanding the factors of vulnerability of a local area implies taking both historical depth and future trends into account.

- 2 We therefore investigated the ways in which local players, especially elected officials, perceive the vulnerability of their local area to climate change. Our investigations placed climate change in the context of past, present and future changes and made every effort to understand the different points of view. Particular attention was given to the interactions between climate change and extreme events, as the areas we studied are identified at the *département* level as highly exposed to natural risks (*Préfecture 64*, 2018). Intensifying natural hazards and changes in snowfall (and the resulting threats to winter tourism) are considered to be two major consequences of climate change for mountain areas in France (Bertrand *et al.* 2007; Richard *et al.*, 2010), especially in the Pyrenees (Le Treut, 2013 and 2018). How those on the ground perceive the way these hazards are evolving with climate change can affect the way they are understood and managed.
- 3 While the actions of local authorities as institutions are frequently brought under scrutiny, the personal attitudes of elected officials, especially in small municipalities, have rarely been addressed (Wachinger *et al.*, 2010), even though the local level has increasing regulatory responsibilities in coping with climate change (French Act on the energy transition for green growth, 2015), and in applying risk management policies (transfer of flood prevention responsibilities to the inter-municipal level in 2018). A qualitative survey based on semi-directive one-to-one interviews (lasting one hour on average) was undertaken in the spring of 2017, with 20 elected officials from the 30 Pyrenees in municipalities of the Ossau and Aspe valleys. Their views were supplemented by a similar number of interviews with residents in zones considered as risk-prone in the PPR plans (for the prevention of foreseeable natural risks), and in natural risk maps produced for information purposes. Finally, about a dozen interviews with representatives of local organisations (Council for the *département*, agency for the restoration of mountain terrain, etc.) were conducted to place the question of vulnerability in context. The interviews were designed to address 5 main topics: 1- quality of life and how it might change; 2- knowledge of climate change (signs observed, future impacts); 3- knowledge of risks and hazards (phenomena remembered, preventive measures); 4- climate change, evolving risks and local area vulnerability; 5- personal sources of information on the subject. A lexical analysis was made (using Tams Analyser software) of the transcribed interviews: definition of units of meaning in the responses, coding and quantification of occurrences to understand how the interviewees perceive changes to the environment and in their local area, how they assess the vulnerability of their local area and the links they make between climate change and extreme phenomena.
- 4 The surveys produced three main results. First, although the interviewees identified various environmental changes, they believed that their local area was vulnerable above all to socio-economic changes. We will show below that although they often link the question of climate change with risks, their knowledge of both topics is very limited and their ideas on the future are highly uncertain. Finally, the difficulty they have in projecting themselves into the future and the technical nature of the topics at issue both limit their capacity for adaptation and cause them to consider that action has to be taken at scales in time and space other than their own.

Attitudes to local area vulnerability: from recurrent anxiety over changes in society to minimising the importance of environmental changes

- 5 The first series of questions was designed for the interviewees to first describe the area they live in and then address the kinds of change they may have observed since they had lived there. The last question, which was deliberately open, showed to what extent all of the interviewees were worried above all by the socio-economic changes affecting their area and likely to increase its vulnerability: changes in the economy, lifestyles and local area management were more often mentioned than environmental and especially climatic changes. The great majority of the interviewees stressed economic and demographic changes above all. Rural desertification was indicated as a major and long-term trend, some seeing it as beginning in the 19th century and others evoking the constant battle to maintain the population and public services since the mid-20th century. Changes in the landscape were also emphasised, especially the closing of landscapes with the decline in farming and especially livestock grazing. Their explanations of change therefore focus on local human factors and not on global environmental and/or climatic causes. While the opinions of residents and elected officials were highly convergent, the latter also brought in another topic, the transfer of administrative competences (Fig. 1) under the current reorganisation of administrative divisions and especially the NOTRe Act (2015), which could positively or negatively affect the area's capacities for adaptation.

Fig. 1: The different types of changes addressed by elected officials (number of times mentioned)

Source : authors, 2018.

- 6 The elected officials experienced and explained all these types of changes in more negative than positive terms. Their comments on changes in lifestyle were sometimes particularly sombre. The decline of the population and the few job opportunities in the area were mentioned with rather depressing evocations of village dynamics. Nevertheless, a more positive albeit minority view emerged in 12 comments as against 23, with a universal appreciation of the social life and solidarity of the rural lifestyle.

Similarly, while the elected officials deplored the loss of jobs in local industry (Arudy basin), the ageing population, the decline in the number of farmers and the difficulty of maintaining high-quality services, they also felt that these trends are levelling off and mentioned some modest progress towards diversification with the development of short distribution channels, crafts and services to individuals. Another change generally addressed in negative terms is the administrative reorganisation. The elected officials commented on the loss of competences and autonomy for urban planning and infrastructure, although some saw a few advantages, such as on-demand transport funded by the inter-municipal authority, school clusters or the preservation of authentic architecture. Views on landscape change varied from negative comments on increasingly abandoned farmlands to very positive statements about the modernisation of public infrastructure and especially the high environmental quality of the valleys: the mountain landscape is unanimously appreciated. Pessimistic and optimistic views on the future of these mountain areas were almost equally balanced.

- 7 While none of the elected officials spontaneously mentioned the climate among the changes observed across the area, many - when the question was explicitly asked - were able to talk about it and mention "tangible" signs. A series of targeted questions on climate change then enabled them to be more specific in giving their points of view. When questioned as to what climate change meant to them, the elected officials rarely referred to the global scale: for example, only four (out of 20) mentioned global temperature rise and the international undertaking to limit global warming to +2°C. Their grasp of climate change is therefore based on the local scale and sometimes, but rarely, on the scale of the Pyrenees as a whole. The positions they expressed reflect the contradictory debates in the media, scientific expertise or political stances at State level. Although they often expressed their humility as laymen in the field when giving their points of view, four groups emerged with distinctly different positions. A little less than half said they were sure of having observed indications of climate change. They expressed great conviction, using categorical terms such as "indisputable", "tangible", "sure", "certain", "observed" or "measured". The second group, with almost the same number, was sure that something was happening globally, but did not address the local scale: "I don't know, I'm not a specialist, you're the specialist. I think it's true something's happening, so it must be global" (E5). This group often asserted that the valley is, or would be, protected by its geographical position: "Big changes, well..., I think there are..., not here yet. We are in an area, a privileged zone" (E6). The third group admitted their ignorance and wondered whether these changes, which they did not deny, are in fact a matter of interannual variability inherent to climatic processes: "there are cycles, here at medium altitude, there are cycles. But me, I don't know enough about it" (E15). Finally, one single interviewee asserted total scepticism about climate change.
- 8 The elected officials had the most to say about possible signs of climate change. They first mentioned variations in temperature and precipitation, and especially declining snowfall (11 times). The ski resorts in the area (Gourette, Artouste, La Pierre-Saint-Martin) are particularly sensitive to climate change and the local elected officials are particularly attentive to this, because of their importance to the local economy. In general, the perception is that the seasons are less distinctly marked and have shifted over the year. Winter in particular is considered to be "disrupted", with less frequent snowfalls. The overall lack of precipitation is also emphasised in comments on drought

(9 mentions, often relating to agriculture) and water scarcity: climate change evokes "drier summers and so less and less water in rivers, which are drying out up the mountain, so yes, that's what it brings to my mind. Winters with no snow as well, I think: when I first came here, the snow lasted for two months here in the village" (E13). The higher elevation of the snowline is also mentioned, as is the increasing amplitude of daily temperatures. Besides these climatic considerations, a smaller proportion of the interviewees also spontaneously mentioned signs of environmental consequences of climate change for plant cover (higher tree line) and the prevalence of pests, but especially, the exacerbation of natural hazards (7 times).

Present and future risks and climate change: technical subjects that are not fully understood

- 9 Although the term "risk" was deliberately not included in the first questions to the interviewees about changes induced by climate change, its future impacts are widely perceived, from a highly anthropocentric point of view, as representing different kinds of risks: impacts on biodiversity or the environment as a whole are much less frequently mentioned than consequences for people. When asked what they think about future trends rather than about what they observe, most of the residents had very little to say. The elected officials, while underlining their limited knowledge, mainly mentioned socio-economic consequences and environmental changes likely to significantly affect the population and local activities, such as declining water resources and links with natural hazards.
- 10 The opinions of local elected officials on the future impacts of climate change on hazards were often contradictory and reflected scientific uncertainty. When explicitly asked about natural risks, only four officials stated that they did not know whether climate change could alter the nature of hazards or did not believe this was the case. They referred to traditional vernacular knowledge to state that risks have always existed and are cyclical phenomena with alternating periods of crisis and respite: "climate change is blamed for everything but it doesn't always have to be that. I mean, there have been periods of heavy rainfall in the past. I think there are, like, cycles that come and go, and well, there you are" (E16). The point here was to underline both scientific uncertainty and the lack of hindsight, which they thought would be needed to show the existence of a link between observed phenomena and climate change. There were recurrent references to local vernacular knowledge that contradicts scientific and media discourse on climate change: "there are old people here, 92 or 93 years old, 7 or 8 of them in every village, and they all say the same thing: that they've known cycles; still, it's weird all the same" (E7).
- 11 Nevertheless, this point of view is very much in the minority. As in surveys on the national scale showing that climatic disruption (storms, flooding, etc.) is increasingly attributed to the greenhouse effect (CGDD², 2018: 13), most of the interviewees thought that the risks will get worse. But, like the scientists, they said they did not know how much worse. The list of phenomena mentioned is quite broad, mainly heavy rainfall, flooding, landslips and avalanches. New risks are also identified, such as those arising from the use of fire in traditional agriculture: "we've had forest fires... 15 or 20 years ago they were unheard of here" (E1). It is interesting to note that the tense used by this person shows that the problem has already become real. Although the question was

explicitly about the future, many elected officials responded by talking about changes they have already observed, including some of those who had answered the previous questions by stating that climate change impacts were not very spectacular in the mountains or who did not spontaneously mention hazards in talking about observed and potential changes. On the timescale of changes in risks, opinions fell into three types: the first two groups referred to changes already under way, either implicitly by responding in the present tense to a question about the future, or more explicitly when underscoring the reality of changes that are already observable. The third group tried to find some reassurance in the idea that things would only change in the distant future: "we'll be long gone when it all happens" (E 15).

- 12 Besides the question of worsening risks, several elected officials mentioned changes in risk patterns, for example in their spatial distribution: "there are some places that maybe won't get flooded any more, or avalanches maybe, and even places where there weren't any avalanches before and now they might come back. Anyway, things... things could change" (E17). On this point, the most puzzling risk for the interviewees are avalanches, because to some, snow patterns seem to have become more erratic and less predictable than in the past. Three of them clearly said that local knowledge of avalanche risks had become obsolete: "last winter, we had one avalanche, well, personally, I'd never seen that before (...). And when you know that in the old days, when people built a house or something, it was never in a place where there were risks of an avalanche" (E17).
- 13 The fact that avalanches occur in new places is accounted for by different snowfall patterns due to climate change: "personally, I think there's less snow than before, (...) the snowfalls are heavy and they aren't regular (...) It's milder in the winter, there's less snow in the village, but on the other hand, there's as much snow or maybe more higher up" (E18). Snow cover is seen as changing more quickly: "before, we could be sure that when it snowed, it would be powdery. But now, it turns from powder to compact snow in a couple of hours" (E12). These comments thus underline that observable changes already exist. However, they were made by a minority (4) of the elected officials who were clearly better informed about risks than the average as they were from municipalities where the risks of avalanches are high.
- 14 Nevertheless, in most cases, the responses about changing risks were by no means precise or exhaustive: only one or two types of risks were mentioned, with a great many interjections of "I don't know", and showed that most of the people interviewed were not in the habit of thinking about changing risks in their everyday lives. The knowledge that elected officials have of risks in general is therefore often vague and non-technical, even though all the municipalities are exposed to at least one type of risk and three quarters have a risk prevention plan (PPR). This is even more true on the more advanced topic of the correlation between climate change and changing patterns in extreme phenomena. In most cases, their knowledge is limited to personal experience and to what they learn about the subject themselves, especially through the mainstream media (Loubat, 2017; Malfondet, 2017), and reflects both the scientific uncertainties inherent to the subject and their own difficulties in addressing technically complex questions.
- 15 This observation for the elected officials is even more obvious for the residents. Two thirds of the latter replied that they did not know whether climate change could have an impact on risk patterns, in responses that differed widely according to levels of

education, socio-professional categories and personal experience: not surprisingly, the best informed people were from the intellectual professions or had had experience of risk management through their professional activities (former elected officials, mountain guides, livestock farmers). Overall, residents in the upper valley, where the risks are more numerous and diverse, had more knowledge and experience than those living further down, who were mostly affected only by flooding. Unlike the elected officials, the least informed residents sometimes made no bones about having little interest in the subject, if any, even though some had said at the start of the interview that they had observed signs of climate change. As for many other types of subject, the question of the future is not necessarily of central importance to these people. They explain their indifference as a matter of age or personal difficulties: "maybe we're a bit selfish, we're thinking about our own lives, well that's how it is. Because we've got so many problems now, personal problems, so ..." (H4).

- 16 Consequently, the majority of the residents interviewed had little concern for future risks and adopted a passive attitude to present-day risks that were perceived as a fact of daily life: "sometimes the *gave*³ goes into spate and then we hear the boulders and the pebbles crashing into the banks, but, well, I just think "right, they're playing *pétanque*", but we're used to it, it doesn't worry us any more" (H11). Underestimating danger, as also observed in Alpine areas (Scolobig *et al.*, 2010), also involves distancing - in time and/or space - as in the case of a resident in the Gourette ski resort: "they aren't big risks ... there's less danger to me here than lower down in the valley, at least in the summer" (H10). Distancing of this kind often goes together with a kind of slightly fatalistic resignation: "I don't see how you can go against forces of nature: you can't do anything about them, that's obvious to me! (...) You just have to live with it, right, know that people, if they go and live in a risk-prone area, something might hit them at any time" (H13). Consequently, only few of the interviewees (4) said they had taken any precautions to protect themselves.

Adaptation measures to reduce local vulnerability to climate change

- 17 While the elected officials were generally well aware of living and working in an area exposed to multiple risks and were sensitive to perceptible climatic disruptions at different scales, they were more divided over what should be done to prevent or mitigate these risks. This is due to the fact that they do not all assess their area's vulnerability to risks and climate change in the same way. Like the residents, the elected officials feel relatively immune to climate change risks: "we're safe where we are, anyway" (E2). To the question "in your opinion, could there be practical measures to limit the effects of climate change?", six elected officials could not answer or made suggestions that seemed quite wide of the mark. One doubted that effective measures could be implemented at all: "I'm doubtful. For example, we turn off the street lighting after dark ... Because, well, that saves energy and so on, but really it's just tinkering, we don't believe it solves anything" (E1). Another believes fatalistically that it's too late: "we should have been raising the issue a long time ago (...) we're just going to have to live with climate change now" (E4). This admission of powerlessness goes together with the sense that the battle has to be waged at a different scale: "we're too small here to make any difference" (E7).

- 18 Nevertheless, the majority of the elected officials mentioned measures that, if adopted locally, could help to mitigate the effects of climate change: developing renewable energy, thermal renovation of buildings, moving towards "more environmentally friendly agriculture (...) that uses less energy" (E13). However, these ideas are very general and, in most cases correspond to a change in the regulations. When asked if, in practice in their municipality, they have introduced, or considered introducing, measures to limit the effects of climate change, nine elected officials admitted that they had never done so, except for measures under national measures and incentives to ban the use of phytosanitary products for the maintenance of public spaces.
- 19 These measures are modest and there are various obstacles to their widespread implementation, mainly the lack of financial and human means and of technical support. The elected officials emphasised that the municipalities in the Aspe and Ossau valleys are all rural, small in size and with limited budgets that have been severely constrained by cuts in State funding: "in three years, I've lost 10 000 euros (...) so I'll have to be cutting back on something" (E20). The merging, starting in 2007, of local government departments under the general public policy reform (RGPP) profoundly disrupted the organisation of State services in mountain valleys, where capacities for mobilising and applying regional engineering tools and competences are limited and where municipalities feel at a loss as to how they can take charge, on their own, of the competences transferred to them by decentralisation: "the mayors need support, they need proposals as well, because we can't just invent everything from scratch, we can't, er, there's such a huge field of action we have to cover" (E16).
- 20 They are not totally without support, however, because the State is still on hand, although more discreetly now, through its agencies. One elected official referred to the long-term action undertaken with the water agency for the Gave d'Ossau floodplain: "the water agency buys land to give the river more space, because (...) It can be quite violent when it goes into spate, so it needs more room (...). In built-up places, well, it's built up, but we give the river more room to move where we can, at the intermunicipal level" (E3).
- 21 However, neither of the two valleys we studied has adopted a climate change adaptation strategy at the intermunicipal level (as yet, they have no legal obligation to do so as they have fewer than 50,000 inhabitants). In both valleys, the reference organisation is a national institution, the Pyrenees National Park (PNP), which introduced a climate plan for the two *départements* of the Hautes-Pyrénées and Pyrénées-Atlantiques in June 2012. Some rural elected officials recognise that the Park provides valuable support for action against climate change, even though many municipalities in these valleys, where long-term environmental conflict goes deep (opposition to the National Park and to the reintroduction of bears in particular), are hostile to the Park as a public institution (Clarimont, 2013).
- 22 The climate plan aims to implement an adaptation strategy that will protect people and property, avoid socially unequal exposure to risks and preserve the natural heritage (PNP, 2013: 5). It is based on a diagnosis of current and foreseeable vulnerability to both natural and anthropic risks. Vulnerability is assessed through a review of current knowledge and "a seminar with the players concerned" (PNP, 2013: 5), although the list of participants is not specified. The summary produced at the end of the diagnosis, for example, attributes high to average vulnerability to the area as regards biodiversity but low vulnerability to natural risks, because it considers that "the area already has

natural risks well in hand" (PNP, 2013: 39) thanks to the broad coverage of its risk prevention plan (PPR) and its capacities for crisis management. The assessment implicitly weights the three vulnerability indicators selected, giving more weight to the governance aspect than to the degree of exposure, but without explicitly stating whether "having risks well in hand" is an indicator of sensitivity of the area or of its capacity for adaptation. In doing so, the document takes little account of the time factor, as if successful risk management in the past were necessarily synonymous with low sensitivity or capacities for future adaptation. Moreover, the diagnosis itself underlines significant weaknesses in the understanding of risks among local institutions: "a wait-and-see attitude; poor spatial management; lack of control over urbanisation and, overall, unsatisfactory appropriation of the issues by local government" (PNP, 2013: 39). On the other hand, it does not mention, at least on the subject of risks, the increasingly fragile existence of rural municipalities and the increasing scarcity of public services, although these points are heavily underlined by the elected officials. Furthermore, although the climate plan is now in the implementation phase, it is rarely mentioned by the elected officials concerned, only one of whom mentioned it explicitly.

- 23 Consequently, the measures implemented to deal with climate change in the two Pyrenean valleys we studied are modest, dispersed and not particularly innovative. More often than not, they are simply a response to a legal obligation. The "barriers to adaptation" (Adger *et al.*, 2009; Dupuis *et al.*, 2011; Gifford, 2011) are therefore quite varied: lack of human and financial means available to local government in rural areas, persistence of inherited practices, limited grasp of the effects of climate change at the local scale, etc. To the local elected officials, the vulnerability of their area is above all economic and social rather than climatic: the valley "is vulnerable (...) but not necessarily because of the climate; it's linked to the desertification or use of farmland. If fields are left fallow, they become vulnerable to wildfires (...). Those are the problems we might fear but they're not directly linked to the climate, they're linked to sociology and the way human beings are evolving." (E12).

Conclusion

- 24 Analysing the attitudes and discourse of local elected officials and residents to address the vulnerability of mountain areas to climate change confirms the usefulness of investigating social and cultural representations when considering change (Billig, 2004). While scientific syntheses on climate change in Aquitaine have underlined its already observable impacts on mountain environments (Le Treut, 2013 and 2018), most of our interviewees believe that their valley is relatively immune to climate change and do not feel there is any need for urgent action locally. To use the ADEME terminology, they acknowledge that their area is exposed but do not believe it to be particularly sensitive. Nor do they feel they have the capacities to apply adaptation policies at the municipal level. The climate problem is thus considered by the majority as a distant matter compared to their current priorities (Dubar, 2014). The fact that other changes and other sources of vulnerability in their area exist is given as a reason for their low level of response to the issue of climate change specifically. This can be interpreted positively, as a sign that the interviewees do perceive systemic links, at least in part, between the different issues at stake in their area (for example between climate,

abandon of farmland and intensified hazards), but also negatively as a convenient way of legitimising inaction by using the complexity and global nature of the problems to shield themselves from responsibility.

- 25 The example studied thus shows the difficulties that arise in assessing the vulnerability of a given area, depending on the type of vulnerability in question (vulnerable to what?), the attention given to the different potential indicators and the passage of time under consideration. Failure to address changes or to anticipate future trends associated with changes in the environment and the local area can quickly cause local knowledge and public policies that were considered relevant at a time T to become obsolete (Mercer, 2010), which significantly increases vulnerability on the scale of the whole area. In this respect, the rapid rate of environmental change is generally considered to be a major factor of vulnerability, because it tends to be considered implicitly that hazards have an essential role in the creation of risks, especially in mountain areas (Hewitt & Mehta, 2012). But here, only a few interviewees had noted that these changes were already undermining local knowledge, whether vernacular or technical, on some hazards such as avalanches. Which would mean that what limits the inclination to act is gradual and not particularly spectacular environmental change, rather than the reverse.

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NOTES

1. This study was conducted under a 2015-2018 research programme on "risks and local area transformations in Aquitaine" (RiTTA), financed by the Regional Council of Aquitaine.
2. *Commissariat Général au Développement Durable*: department of the Commissioner-General for Sustainable Development
3. Local word for a mountain stream.

ABSTRACTS

Drawing on our findings in the Western Pyrenees, this article aims to bring a better understanding of attitudes among local players, mainly elected representatives but also residents, to change - especially climate change - and how these changes are likely to affect the vulnerability to risks of mountain areas in the shorter or longer term. Vulnerability depends not only on the nature, scale and intensity of the changes to which a territorial system is exposed, but also on its sensitivity and capacity for adaptation (IPCC, 2001 and 2014). It is also exacerbated by scientific uncertainties as to how the climate is evolving and over the risks that arise, which are particularly evident at the local level. We show that difficulties in grasping current and future changes add to the vulnerability of the areas investigated.

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