Urban vulnerabilities to climate change: a case study from Bolivia

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Background

Pooling concepts and data to achieve a single objective is the key to interdisciplinarity, involving dialogue and the flow of information between scientists from different disciplines and social stakeholders. For this dialogue to be useful for policy-making, the work must be carried out at a level that is appropriate for territorial management, one where decision-making is possible and that is close to concrete action. In addition, the whole research process must be transferable to the management team, so that it can be understood and reproduced at other sites. A research-action programme is tackling these issues in two Bolivian cities where climate change is an emerging challenge.

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Further reading
https://scioteca.caf.com/handle/123456789/1811

Content of the research project

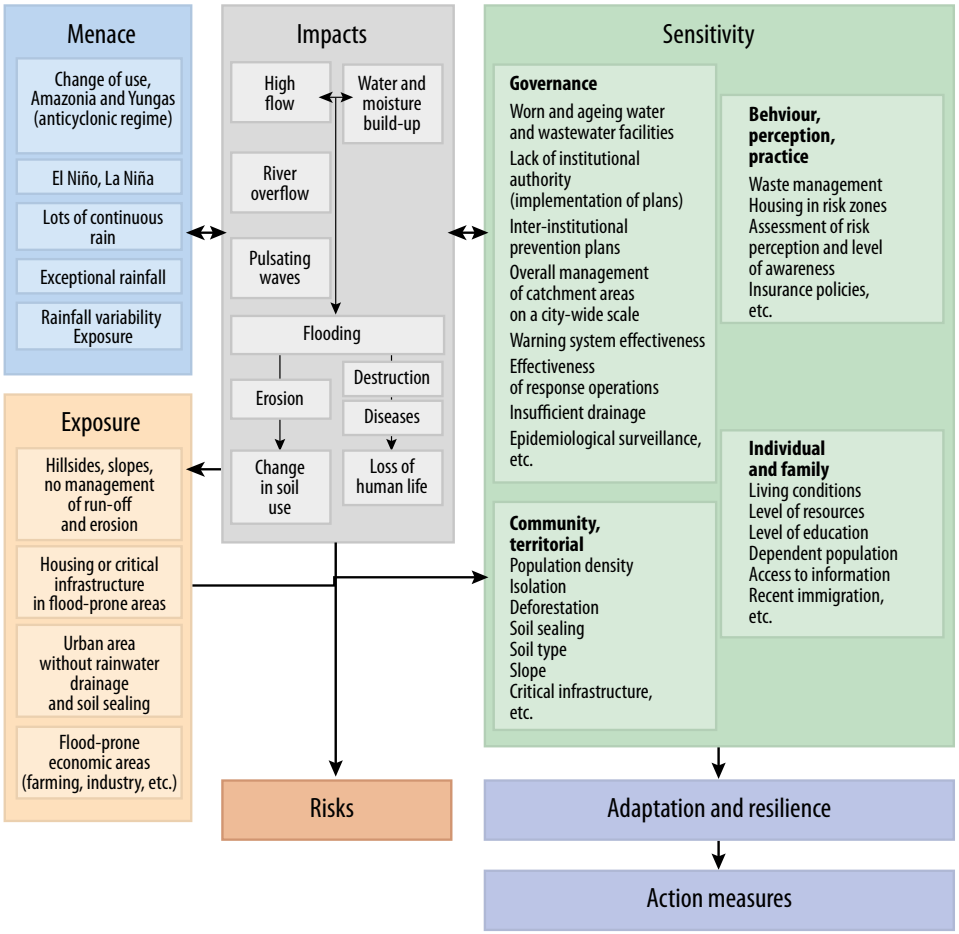
A large number of Andean towns, particularly in Bolivia, are extremely diverse in terms of their physical and environmental characteristics (altitude, climate, type of soil, system of basins and slopes), social and economic features (inequalities between neighbourhoods, varying degrees of identity) and urban planning (high levels of concentration, areas of individual housing or areas of densification and expansion, presence of unconsolidated housing). This heterogeneity creates a variety of impacts and responses to climate change, requiring a cross-sectoral and interdisciplinary approach. As part of a programme[1] designed to strengthen the capabilities of key stakeholders in two Bolivian cities, La Paz and Tarija, the environmental department of the municipalities concerned, two research centres and two NGOs worked closely together to tackle the new challenges of climate change. The programme focused on four areas of study. Firstly, hydro-climatic modelling at a highly detailed scale (1:50,000 for 10, 30 and 70 years) showed: 1) stable rainfall, but an increase in extreme events; 2) a significant increase in temperature differences of up to 7°C; and 3) the importance of the Zongo valley, situated between the tropical zone and the Altiplano, in regulating the climate of the cities of La Paz and El Alto. This modelling, together with workshops with city stakeholders,[2] was used to rank the threats and define the physical, social, economic and political vulnerability of the cities. This programme resulted in the development of integrated risk diagrams (known as "risk chains") – through participatory workshops at which all the variables associated with the threat, exposure, impact and vulnerability are listed, along with the linkages between these four components – for four prioritised threats: flooding, landslides, dwindling water resources and heat waves. Then, using these diagrams as a basis, a series of indicators for diagnosing and monitoring vulnerability to climate change and a detailed mapping of these indicators (at the level of the 649 basic territorial organisations, each of which is the minimum management unit) were developed. Lastly, an adaptation plan was drawn up, including 10 priority projects and 100 or so measures designed to strengthen the resilience of towns and cities, together with the funding for these projects.

A methodology combining scientific rigour and stakeholder priority

From a methodological point of view, the added value of this programme is the constant connection that has been established between the modelling carried out by hydro-climatologists, the design of risk chains by geographers, the work carried out by sociologists on risk indicators and perceptions, the financial evaluations carried out by economists, and finally the search

1 · The programme is entitled "Index of vulnerability to climate change in the cities of La Paz and Tarija" (2019-2022) and is funded by the European Union's Latin America Investment Facility (LAIF) programme, the French Development Agency and the Andean Development Corporation (Corporación Andina de Fomento).

2 · Nearly 30 institutions involved in studying or managing the city took part in the workshops: university laboratories, international bodies, NGOs, public institutions such as town hall departments and certain ministries, private bodies such as chambers of industry and commerce or the engineers' association, and neighbourhood associations.



**Example of how to build a risk chain for "flooding" events.
A few examples of variables are listed here.
The method then attempts to connect these variables, both qualitatively and quantitatively, to assess risk priorities and possible courses of action.**

for projects prioritised by the social stakeholders, which are likely to become the basis of a resilience policy created by the town hall management team. A constant flow of information back and forth between these various stakeholders, in particular the neighbourhood associations who know the terrain best, proved to be fundamental to achieving consistent results

as part of an integrated approach. From a scientific point of view, this study highlighted the importance of the impacts of climate variability in cities with extreme conditions (altitude and drought), combined with geographical and social variability that need to be understood on a detailed scale if targeted actions relevant to municipal management are to be proposed. The inclusion of management stakeholders in the scientific programme from the outset ensured that the proposals for action were validated in the field and consistent across six areas: "green, high-altitude town", "integral conservation of Zongo's ecological heritage", "conservation of fragile high-altitude Andean ecosystems", "urban drainage", "development of a new water culture" and "creation of a climate change resilience centre".

Limits of operational application

A programme of this kind also challenges the limits of scientists' involvement in controlling climate change through programmes whose implementation is often the responsibility of development cooperation agencies or NGOs. Even if this project resulted in a realistic adaptation plan, what guarantee do we have that the plan will be properly implemented? To what extent do scientists have a responsibility in this implementation phase? Should the dogmatic approach of sustainability science not also consider scientists participating in and overseeing the implementation of their findings and recommendations? If so, how might this be done? Methodological frameworks such as theories of change could help to assess these limits.

KEY POINTS

Current data and forecasts on climate change suggest that the impacts will be more intense and specific in urban areas, but also less discernible to the general public and politicians. Working with the risk chain methodology proved to be educational as it enabled the participative construction of summarised diagrams, the elements of which were then prioritised by the local people or experts. This makes it easier to define the actions to be taken and their cost. However, there is still one aspect that scientists do not control: the implementation of research results. This depends on political will and institutions, which are often too unstable in the most vulnerable countries. Solutions to combat climate change are long-term endeavours, which go beyond political visions that are often more short-term.

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