METHODOLOGICAL PROPOSALS FOR RESEARCH ON RISK AND ADAPTATION: EXPERIENCES IN BRAZIL AND AUSTRALIA[1]

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Introduction

The widened debate on public participation in decision-making processes involving risk situations is the result of a range of empirical experiences. Such experiences have shown the need to consider individual and collective perceptions of the risks to which individuals are potentially exposed and to incorporate both local and technical-scientific knowledge so as to extend the dialogue on policy formulation to include all those affected by a given issue (Freitas, 2000; Funtowicz, Ravetz, 1997; Renn, 2008; Di Giulio, 2012; Di Giulio *et al*., 2012).

Two methodological instruments were tested in two studies carried out between 2011 and 2013 to understand perceptions of and behaviours toward the potential risks associated with extreme events as well as climate and environmental change and to foster a debate on the necessary action for mitigation and adaptation at the local level.

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These instruments included focus groups concentrating on the northern São Paulo coast (Brazil) and scenario planning involving a community in Far North Queensland (Australia).

Although they were carried out independently, the studies involved similar objectives and strategies. Specifically, qualitative and participative methods were used in both cases to enable the participation of stakeholders (local civic managers and leaders) and researchers to gauge perceptions, identify demands, discuss proposals and solutions, and to foster participation in producing data and addressing risks. Working towards promoting participative research, the studies sought to dialogue with the paradigm of post-normal science, given that critical assessments of environmental problems cannot solely be addressed by a limited body of specialists; rather dialogue and policy formulation should include all those affected by the issue under consideration - an extended peer community (Funtowicz and Ravetz, 1997).

This paper aims to contribute to the current theoretical and methodological debate on research instruments in studies on risk. Drawing on the findings from the two studies, the intention is to highlight both the potential and limitations of adopting these qualitative methods.

Context of the research undertaken

The vulnerability of coastal regions to extreme events and environmental change has been highlighted as an important issue for national and international research and policy agendas.

In Brazil, where 26.6% of the population live in municipalities in coastal areas (IBGE, 2010), studies have shown the possible impacts related to the occurrence of extreme events in these regions. Impacts include coastal erosion, damage to coastal defences, sanitation and urbanization works, structural or operational damage to ports and terminals, and exposure to buried pipelines or structural damage to exposed pipelines (Neves and Muehe, 2008).

Some of these impacts can be seen already in coastal areas of São Paulo State, which has 16 municipalities and a population of 1,996,007 inhabitants (IGBE, 2010). In particular, the northern coast formed by the municipalities of São Sebastião, Ilhabela, Caraguatatuba and Ubatuba has an estimated 745 km^2 of areas at risk of landslides and flooding (Ferreira *et al.*, 2012). Additionally, a number of projects being undertaken in the port and oil sectors have great potential to bring change to the local economy and environment (Viglio, 2012).

Similarly to the process of urbanisation in Brazil and elsewhere in the world, roughly half the population in Australia live less than seven kilometres from the coast, and around 30% of this population live less than two kilometres from the sea (Chen and McAneney, 2006). Considering the increasing urban development of the Australian coastline, it is expected that many of these urban centres will be highly vulnerable to the effects of climate and environmental change such as rising sea levels, more intense cyclones and coastal flooding (Hennessy *et al.*, 2007).

One example of these urban centres is the coastal town of Cardwell, located in the state of Queensland, in north-eastern Australia, with an area of 4.9 km^2 and a population of 1,176 (Australian Bureau of Statistics, 2011). In the summer of 2010/2011, the La Niña pattern caused intense flooding in more than 70% of the total area of the state of Queensland. At the same time, in February 2011, the coastal town of Cardwell was severely affected by category 4/5 tropical cyclone Yasi (The World Bank and QRA, 2011).

On the basis of these similarities in terms of the socio-environmental vulnerabilities to extreme events and climate change and the dialogue between researchers involved in two research projects conducted in these two locations[i], this article explores the use of two qualitative methods in research on risk and aims to highlight their potential and their limitations.

Focus groups and scenario planning – research and engagement instruments

Focus groups and scenario planning were used in the studies to maximise participatory research based on adapting the principles of action research and intervention research.

Action research involves generating practical knowledge that may be useful to people in their daily lives and on the understanding that, based on this research, individuals and communities themselves can improve their wellbeing and develop a more sustainable relationship with the environment in which they live (Reason and Bradbury, 2006).

Intervention research, which is a variant of action research, is based on a view of integrated knowledge production which takes into account both the implications for the way research is conducted and for practice so as to promote changes in the studied reality (Rothman and Thomas, 1994). Avenier and Nourry (1999) maintain that intervention research involves a process of ongoing interaction between researchers and stakeholders. This process of interaction starts in the negotiation phase between the research project led by researchers and the project (or in other words, the demands) of the stakeholders. The second step is called cross-fertilisation because it involves the possibility of synergies between the projects and the demands identified, thus resulting in the (re)drafting of a final project that should prove mutually beneficial for both the research team and the interested parties. It is also worth noting that the means in which the researchers and stakeholders interact during the research should target collective learning and knowledge production through information-sharing. This generated knowledge includes local knowledge which refers to understanding stakeholders' capacity to address their focal problems; meta-knowledge, which refers to the knowledge gained through conducting the research on stakeholders and the groups they represent, including knowledge of local social practices and dynamics, experiences, perceptions of the issues and questions discussed, elements that interfere with perceptions, possibilities of dialogue between social groups; and publishable knowledge, referring to the knowledge produced by researchers from their research objectives.

These types of research, as defended by this article, can be most useful in studies on adapting to extreme events and environmental and climate change because they identify the demands and options for local communities to adapt to these phenomena and how

these choices can diminish social vulnerability. Additionally, research based on the way in which researchers and stakeholders interact, which is aimed at collective learning and knowledge production, may enable stakeholders to use generated knowledge. This is because stakeholders and researchers work together from the identification of the problem through to the analysis of proposed recommendations and strategies based on the information collected.

In this respect, in the Brazilian case, the study of the north-eastern coast of São Paulo concentrated on conducting focus groups, a qualitative research instrument based on group interviews, whose main objective is to provide an understanding of how perceptions, opinions and attitudes surrounding facts, products or services are formed and vary. Bearing in mind that perceptions, opinions and attitudes are social constructs, the focus group method enables researchers to more easily extract the views of individual participants. This is because, in the interaction process, the comments voiced by those involved can stimulate and generate the opinions of other participants about the matter under discussion (Krueger, 1994).

Morgan (1988) carried out an in-depth review of focus groups and argued that from a social sciences point of view, this method offers many benefits. It is useful in obtaining the participants' interpretations of the matter under discussion and connections to the topic in a broader context, in generating hypotheses based on the information provided by the participants, in developing later surveys, in addition to collecting the individual participants' perception of the matter under discussion and to identify their experiences and perspectives.

The number of participants in a focus group varies. The average is between six and ten. Smaller groups are interesting when the researcher wants strong involvement – a clear sense of reaction – from each participant on the topic under discussion. In general, these participants are highly involved with the topic. Participants are usually specialists or know a great deal about the matter under discussion, which, almost invariably, is controversial and/or complex. Bigger groups with more than ten participants are convened when individuals show low levels of involvement with the topic under discussion and the objective is merely to hear a number of suggestions on a topic (for example, a brainstorming session).

In all focus groups, participants should have something to say on the topic in question and should feel comfortable making their comments in front of others - for this reason major social differences or lifestyles should be avoided when selecting participants. As Morgan (1998) maintains, the objective is for homogeneity amongst the participants and non-homogeneous outlooks.

When discussing this method, Krueger (1994) offers important tips for focus groups to achieve the desired outcomes. The place chosen for the meeting needs to be easily accessible and the environment neutral and propitious for visual contact between the participants who should be seated in a circle. A team of at least three people is recommended to enable focus groups meetings to run smoothly: the moderator, who leads the discussion between the participants, explores and gauges questions of interest for the research undertaken, explains the purpose and the format of the discussion and

encourages everyone to participate; the report writer, who should take notes on the main points of the debate, including observations on the participants' non-verbal attitudes (facial expressions and gestures, for example) and highlight on a visible board the key words from the discussion, with the objective of closing the debate; and the cameraman/ woman who should film the meeting.

It is worth recalling that in a focus group, the moderator does not seek to convince, teach, organize or censure participants; his/ her objective is to create an opportunity for the others to speak and for him/ her to listen (Morgan, 1998). In this way, it is the moderator's responsibility to propose questions to foster and spice up the discussion and reassure participants that they can flesh out their own comments and back up their own arguments. In this regard, the moderator can use: (i) initial questions to identify common characteristics among the participants; (ii) introductory questions to introduce the general topic of the debate and to provide participants the opportunity to reflect on their own experiences and links to the topic under discussion; (iii) transition questions to aid participants in viewing the topic in a broader context; (iv) key questions which steer a course towards the objectives of the study; and (v) concluding questions which should close the discussion and help participants to draw a critical analysis of the content of the debate (Krueger, 1994).

However, as with other methods used in qualitative research, there are some limitations. For example, Gondim (2003) notes that the sample size may compromise the representativeness of a focus group and its application to the population being researched; there is a lack of control over the moderator's performance; there is a limitation in the level of response to be considered for the purpose of analysis in focus groups, as forming opinions stems from social interactions; and that limitations should be expected when comparing results obtained in focus groups with other research techniques.

In the Australian case, the study was based on the use of scenario planning, a strategic/forward-thinking instrument employed to develop decision-making structures based on scientific knowledge in order to address the uncertainty caused by the lack of more precise information and/or situations where there is a low margin of control (Peterson *et al*., 2003). This type of instrument allows for the generation of a systemic focus for developing and evaluating plans, strategies and public policies that address uncertain situations and circumstances through the creation of plausible futures in which they can be tested (O'Brien, no date). Scenario planning enables the creation of plausible futures to inform the decision-making process in the present.

By being a future-orientated instrument, scenario planning requires a systemic structure through which a series of plausible futures can be explored (Cork *et al.*, 2005). In this context, the stages involved in scenario planning include: (i) identification of a focal issue or subject; (ii) evaluation of certain and uncertain drivers that influence this issue or subject over a given period; (iii) development of options based on these drivers – the creation of scenarios that are plausible and consistent with ideas about plausible futures; (iv) the development of narratives to describe the transition from the present to plausible futures (including a journey for each scenario, as well as signs that could indicate whether one future would likely to be more real than the other); and (v) testing of plans, strategies and policies against these plausible futures.

Scenario planning's potential is related to the possibility of generating a context in which a decision on a given matter or issue can be taken now, even though its consequences may only be felt in a future that still remains uncertain (O'Brien, no date). This is made possible by systemic description and exploration of the ways in which uncertainty can manifest itself in the future beyond the impacts it could cause to the decision in question.

Scenario planning can vary in its qualitative or quantitative focus. However, it is important to stress that this method, which is based on generating descriptions of plausible futures, involves a high degree of uncertainty and does not yield any forecasts about any future specifically (O'Brian, no date).

In the field – northern São Paulo coast

In the case of the northern Brazilian coastline which includes the municipalities of São Sebastião, Caraguatatuba and Ubatuba, eight focus groups were held, each with an average of 6-7 participants[ii]: one with researchers representing the Thematic Project funded by FAPESP[iii], to which this study was related; three with managers and technical staff who work directly and indirectly on evaluating and managing risk in the three municipalities involved in the project; two with neighbourhood leaders in areas deemed to be at risk in the municipalities of São Sebastião and Caraguatatuba; and one with young people aged 12 to 17 who were students and residents in a neighbourhood considered to be both a risk and an environmental protection area belonging to Caraguatatuba municipality[iv]. All participants signed an agreement stating they gave their free and informed consent to participate as volunteers in the project.

Before the focus groups were organized, it was crucial that meetings were held with the heads of Civil Defence of the three municipalities, based on the premise that the research undertaken would be participative. Although the initial intention was not to follow the stages proposed in a piece of intervention research (as described previously), parallels can be drawn with the proposed objectives in this type of research, based on the idea of ongoing interaction between stakeholders and researchers.

In this case, the interaction process in the negotiation phase involved meetings with the heads of Civil Defence where the research was presented. For their part, the technical staff in addition to providing information on the existing risk areas in these locations and the action, communication and prevention strategies adopted, voiced their research demands (highlighting the importance of studies focussing on perceptions and strategies for communicating and dealing with issues) and the need for closer dialogue between those producing scientific knowledge and those using this knowledge for decision-making. It was agreed, albeit informally, that the heads of Civil Defence would help the researchers identify possible participants for the focus groups and the most suitable locations for holding the meetings, as well as participating in the focus groups to be held with local managers and technical staff. In turn, the researchers would seek to work towards the necessary improved dialogue and contacts with local technical staff and managers.

It was established, again albeit informally, in the early stages of the cross-fertilization phase between projects that these technical staff would indicate possible participants for

the focus groups and would share information on risk areas. Another point raised was that stakeholders and the community would be involved in the research project through meetings and workshops.

With regard to the three types of knowledge that can be generated by intervention research (cf. Avenier and Nourry, 1999), the study contributed towards generating:

(i) Local knowledge, especially by convening focus groups which, to some extent, led the participants to reflect on the problems of the places in which they live and work, the risks associated to climate change and potential cooperation;

(ii) Meta-knowledge, as it was possible to generate knowledge about stakeholders and the groups they represent which included identifying possible ways of improving dialogue between social groups; in addition, it was possible to test and confirm that convening focus groups as a participative method for researching risk situations was an appropriate method;

(iii) Publishable knowledge, as the results and analyses herein attest.

With the focus groups in particular, the participants showed themselves to be comfortable deconstructing and reconstructing concepts, bringing to the debate personal experiences, accessed information (either through official sources, from the media or conversations with family members, neighbours and friends), possibilities for relating and connecting the topics discussed with other questions that emerged naturally over the course of the meetings, and seeking answers to their worries and concerns.

Together, by debating environmental change and focussing on climate change in particular, participants listed potential threats related to this phenomenon such as floods, landslides, changes to the landscape and rising sea levels. They also indicated potential causes such as deforestation, vehicle pollution, CO_2 and greenhouse gas emissions and showed that there is no consensus in this area. They also highlighted potential difficulties in confronting risks and threats at the local level such as the contradictions and controversies surrounding weather forecasting and scientific studies carried out, the lack of dialogue between those producing scientific knowledge and those who should have access to this knowledge to use it in their daily decisions, and social, economic and emotional conditions to bring about change when living in areas deemed to be at risk.

Participants' perceptions on the risks linked to climate change reflect the way in which they process what their senses observe (the so-called physical signals; in this case the changes observed in the place they live) and the information they receive (such as the news conveyed by the media and public bodies such as the local authorities and civil defence bodies; information shared between neighbours and family members; and access to the results of completed studies). In addition, perceptions also reflect how participants' judgments are formed, including their experiences, the contextual variables, values, trust in the organisations and institutions involved, and uncertainties.

Studies on risk perception and environmental change have shown that individuals' perceptions are constructed amidst a process of association and emotion, based on the

information they have, the attention they pay to the subject and their confidence in the data provided (Weber, 2010).

In this regard, it is worth recalling, for instance, participants' comments on controversial data on weather forecasts (lack of reliability); on the lack of access to the results of studies carried out in the region, including research on climate change (lack of information); and on the media coverage of the topic, characterized in general by a more alarmist focus.

The collected narratives revealed that the trust between the social players in the arena was continuously called into question. On the one hand, current managers and technical staff blamed the lack of control and the lack of action on the part of previous management, which allowed or facilitated unregulated urban sprawl in risk areas. On the other hand, residents recognized this lack of enforcement on the part of the previous and current managers (especially with regard to high-value buildings on hillsides), the lack of concern and action by public municipal administrations, and called for greater involvement of those affected in the decisions taken.

The narratives collected involving the Thematic Project researchers showed efforts to achieve closer dialogue with other social groups, including direct communication regarding the studies conducted, participation in public hearings and seminars, interviews to the media and technical visits to public agencies and bodies. Nevertheless, the narratives collected from the focus groups involving managers, technical staff and residents show the absence of information on studies conducted in the region and the lack of any greater links and closer dialogue with producers of scientific knowledge. Comments like "it's as if we were inside a glass bubble with people observing us", "what is missing is us knowing the reason for all this research, what the focus is" and "people are tired of diagnostics" show that this truncated dialogue between social groups can lead to the impression that the research undertaken benefits some, but not everyone.

In relation to the ability to protect, adapt and react to risks associated with extreme events and environmental change and attributing responsibilities, the narratives indicate that public authorities shoulder part of the responsibility for people continuing to occupy areas at potential risk due to changes in climate and extreme events (such as riverside and hillside areas). However, some of the responsibility also lies with the residents themselves. Although residents are aware of the risks to which they are exposed, they would still live in these areas, citing financial, psychological, emotional and social reasons and doggedly believing the idea that the danger will not materialize.

It is also worth stressing another relevant aspect in perceptions regarding the threats posed by environmental change: the religious component. Schipper (2008) recognizes that religion can also have a negative influence in the case of climate change-related risks in that events can be understood as being caused by a divine or supernatural force and, therefore, they comprise punishments meted out on mankind by a superior being. In this regard, it is worth recalling one leader's comment: "People today are really protected by the hill at Ilhabela, and also by God", revealing that residents also feel protected from potential environmental risks through divine action.

While the public authorities and residents themselves are highlighted by participants as being responsible for occupying areas at risk, they are also singled out as being jointly responsible in confronting the risks associated with climate change mitigation and adaptation actions.

When analyzing the narratives, one might think that the risks associated with extreme events, environmental and climate change still appear to be a relatively low priority when compared to other issues discussed during the focus groups. This low priority confirms the analysis by Leiserowitz (2007/2008) on public opinion research on climate change conducted in a number of countries. However, the potential conflicts and problems created by new large infrastructure projects being set up in the region seem to be viewed with greater concern. Specifically, the narratives show that the issues that currently cause the greatest concern are:

(i) city infrastructure and planning in order to receive tourists and new residents;

(ii) occupation of environmentally-protected areas and risk areas – which could worsen climate change-related risks and threats as more residents might be exposed to landslides and flooding; and

(iii) the potential technological risks stemming from exploration, transport and storage of oil and gas.

In the field - Queensland coastal area

In the case of the study of the north-eastern Australian coast, a collaborative planning approach (Healey, 2006 and 2008) was adopted to direct the work between researchers and members of the community of the town of Cardwell. The research started immediately after the region was hit by tropical cyclone Yasi in February 2011 and involved members of local community groups and residents in general.

A combination of qualitative methods was used for data collection, including workshops, semi-structured interviews and participant observation. A total of seven workshops focussing on scenario planning were held involving members of the community between March 2011 and November 2012. With each one averaging 15 participants, the objective of the workshops was to collaboratively develop a strategic action plan to strengthen Cardwell's ability to deal with recurring natural hazards that affect the region such as cyclones[v].

The negotiation and participation process involved in this research was initiated by the Cardwell Chamber of Commerce which contacted the university researchers. At that point in time, the representatives of the Chamber of Commerce were interested in launching an initiative to revitalize and strengthen economic activity in the town which had been hit hard by Yasi. Additionally, there was a desire to position the town as a focal point to attract both tourists and new residents as a necessary measure to make commercial activities viable and to strengthen the community.

The researchers' project thus focussed on examining the attributes that characterize communities that empower themselves to deal with the consequences caused by disasters.

As a result of the negotiations between the Chamber of Commerce and the researchers, it was agreed that a series of workshops focussing on scenario planning would be held to develop future options for Cardwell, which were compiled in a strategic action plan that was finalized at the end of 2012.

In terms of cross-fertilization between the two projects, it was agreed that the researchers would help with the process of generating the strategic action plan in return for having members of the community take part in the research activities. Although this agreement was struck during the first round of negotiations between the researchers and community members, further rounds of negotiations were needed throughout the process of preparing the action plan, particularly to enable the inclusion of other community representatives to increase the legitimacy of the process. This ongoing negotiation characterized the means through which the researchers and community participants interacted.

It is worth stressing that during the initial contacts there was a great deal of resistance on the part of the community members involved in the research towards understanding and accepting the risks related to climate change, even though there was considerable consensus on the fact that the area could easily be hit by other cyclones in the future. This is shown by the narratives collected during the interviews: "You know, we had Larry; five years later we got Yasi. Now we live on this road (connecting the city with the north of the state) and now we cannot say, 'the next time the cyclone is going to hit Townsville'. We don't know which places will be affected. There are no forecasts on how cyclones will behave…" (English original).

In relation to the three types of knowledge that can be generated through intervention research, the following contributions toward increasing stakeholders' ability to deal with the ongoing risk posed by cyclones were observed:

(i) local knowledge enabled the risks and ways to deal with them to be identified through the development of the action plan. This led to the inclusion of self-empowerment actions for topics relevant to the town's future as well as ideas on how to improve emergency management related aspects;

(ii) the creation of meta-knowledge focussing on the advantages of establishing collaborative planning exercises aided by the use of scenario planning that enable the identification and discussion of issues that affect the local community as well as improving communication between the community and the local authorities;

(iii) the publishable knowledge is discussed below.

Given that the discussions during the workshops and engagement activities with the community should not have concentrated on the debate about the existence of climate change, the researchers and participants focussed the discussions on the risk of future natural hazards and subsequent socio-environmental impacts that could affect the region.

The debates conducted showed that, despite a broad understanding of the risks that the residents face every year and the existence of institutional mechanisms to deal with this risk, there were shortcomings and problems both in terms of the response and the recovery process associated with Yasi.

The narratives collected through the interviews stressed the problem surrounding how the risk was communicated before and after Yasi by the authorities: (*Before*) "There was no safety for us. There was no place that was safe. On the one hand, we were told to 'stay in your homes, that's the safest place there is' and, then, the local authorities said 'get out of your houses, evacuate because the storm tide is going to be intense'"; (*After*) "The saddest thing was that some people told me 'don't drink tap water'. I didn't know that. The first official report that came out said 'now you can drink tap water'". (English original)

When dealing with the issue of how the population of Cardwell could improve the way in which it deals with the risks related to natural hazards, the use of scenario planning has proven to be very effective. Considering that one of the main projections related to climate change relevant for this town is the intensification of cyclones (Abbs, 2012), the final strategic action plan included a number of strategies that can be deemed adequate for the town to deal with this issue, such as:

(i) the construction of a cyclone shelter away from the shoreline and at a higher altitude;

(ii) the voluntary relocation of the urban part of the town, also to a higher area;

(iii) a survey of the skills of members of the community who might be able to help in the collective response to these extreme events;

(iv) the preparation of a local and specific plan for managing disasters so as to improve the process of evaluating and communicating risk.

These strategies, in the opinion of the participants and researchers, have also proved to be advantageous in indirectly dealing with the risks linked to climate change.

Considering that reaching a collective consensus is one of the main difficulties for collaborative planning processes (Healey, 2006 and 2008), it is worth stressing that in this specific case the use of scenario planning enabled participants to become more tolerant of the aspirations and interests of other individuals and to share the intent that they all wanted a similar, more resilient future for the region. As a result, power relations, at that point in time, could be appeased as participants recognized their common interests in solving local problems, including economic stagnation and the exodus of residents.

In addition, the study also helped to identify two social characteristics that were deemed to assist when recovering from disasters: strong social ties and an attachment to their place (Colten *et al.*, 2008). These characteristics were in evidence during workshops when participants were able to reaffirm how they valued their quality of life and lifestyle because of the characteristics of their natural environment. Additionally, participants also valued the fact that many members of their community are volunteers and involved in matters of collective interest.

Inferences about the methods used and the results obtained

While the narratives collected in the two studies enabled us to identify and analyse how participants think about and perceive their ability to protect themselves, adapt

and react in the face of risks tied to extreme event and environmental change, they also allowed us to reflect on the possibilities and challenges in terms of the dialogue between different social groups and the participation of stakeholders, particularly the affected parties, in facing these risks and in the decision-making process associated with these risks.

In the Brazilian case specifically, the narratives seem to confirm that the process of facing risks in Brazil is, in general, one of late or no institutional action; the public's lack of confidence in the agencies and bodies responsible for regulating and managing risk; the absence of a plan to engage the public in the decision-making process (public involvement is still limited to access to information and participation in some consultation exercises); and an excessively centralized decision-making process (Di Giulio *et al*., 2012; Di Giulio, 2012).

In the Australian case, despite the consolidated existence of procedures involving emergency services in dealing with risk and disaster situations, the narratives point toward a lack of co-ordination regarding communication of these risks to affected communities. This holds true both for communication before the disaster struck, which in this case was centred around preparatory measures for facing the cyclone, and for the messages after the event which were intended to guarantee the well-being and safety of the people affected by the cyclone. Furthermore, there was limited involvement of the community in the decisions that followed this extreme event, particularly during the post-disaster reconstruction period.

The narratives also underscore two important limitations that individuals, both at the institutional and collective level, face when acting and taking decisions in risk situations. In both situations, an absence of technical and scientific information on climate change and risk and the difficulty of using available information in decisions could be observed. This difficulty is related, in particular, to the controversies and uncertainties linked to the causes and effects of environmental changes and of climate change, which makes it more difficult to adopt and support environmental measures and policies. As one of the participants in the São Sebastião focus groups for managers and technical staff asks: "the question is how you plan for the future with uncertainty?"

Besides the uncertainty, another difficulty in using scientific knowledge in decisions is related to the way in which information is disseminated. The use of elaborate scientific language can make it difficult to achieve one of the objectives of communicating science: to create knowledge that will serve as a basis to change attitudes and practices and to exert influence on the adoption of public policies orientated towards promoting individuals' wellbeing.

These observations establish a link with the findings of Patt and Dessai (2005) who argue that the dissemination of scientific knowledge about environmental changes could provide an opportunity for decision makers in making their choices, which could impact on individuals' current and future quality of life. Hence, by having access to and understanding of the information conveyed, those in power could decide to mitigate the effects of environmental change and stakeholders (both governmental and non-governmental) could choose to adapt their daily lives, investing in consumption patterns and habits centred on the changes already underway.

However, at this juncture, it is worth recalling that there is not necessarily a linear relationship between science and politics. Thus, the existence and availability of a technical and scientific basis do not necessarily lead to rational and correct political decisions (Pielke Jr, 2007).

In the Brazilian case, on the basis of the dynamic used in the focus groups, this experiment met the proposed objectives by answering the initial research questions and can be seen to have promoted closer ties between the social stakeholders involved in the risk arena and enabled knowledge to be exchanged.

In the Australian case, due to its interactive and participatory nature, the instrument used has the potential to be used in initiatives that seek to develop adaptation to environmental change, particularly due to its capacity to deal with uncertainties (Peterson *et al*., 2003). In the study, the stakeholders had the opportunity to investigate plausible future scenarios for their location despite the uncertainties associated with future impacts of environmental change. Moreover, they had the opportunity to become more involved and take part both in the proposals for actions in the action plan for the future of the town of Cardwell and in implementing these actions themselves, which bestowed greater legitimacy on the process.

Final considerations

The studies examined in this article showed that one of the major challenges science faces against this backdrop of uncertainties, controversies and complexity, which are the hallmarks of environmental change and extreme events, seems to be that of reflecting on the most effective ways of acting in the risk arena and involving other social stakeholders in the production, validation and use of scientific knowledge.

By adopting participatory research approaches such as focus groups and scenario planning, methodological possibilities are offered to gauge perceptions, research strategies for communicating and addressing risk and to enable exchanging experience and knowledge. They are also conducive to exploring how those who are potentially exposed and those who need to provide an urgent response to risk situations perceive risk and their ability to protect, adapt and react.

The discussed results confirm that the methodological instruments explored met the proposed objectives and contributed in particular to closer dialogue and links between scientists and stakeholders.

Nevertheless, more wide-ranging reflection on the challenges regarding participative management of risk situations related to environmental change and extreme events suggests there are limitations and shortcomings that need to be analysed themselves.

On the one hand, there is still a dearth of actions to forge closer dialogue and links between researchers and stakeholders to produce knowledge that is more participative and better distributed socially. On the other, there is a blatant need to make headway with attempts to involve the public in the decision making process.

The way to overcome these challenges and meet these demands is to understand the subjective and objective dimensions involved in defining, constructing and negotia-

ting the risks and the possibilities, like those explored in this article, for producing more participative knowledge in which science is open to debate, barriers between specialists and laypeople are reduced and the legitimacy of the decisions taken stems from holding an open debate.

Nores

i In the case of Brazil, the Thematic Project Urban Growth, Vulnerability and Adaptation: social and ecological dimensions of climate change on the Coast of São Paulo was conducted, with funding from the FAPESP. Meanwhile, in the Australian case, the Project refers to the South East Queensland Climate Adaptation Research Initiative (SEQCARI). The dialogue between the researchers involved in these two projects, the authors of this article, began with the 1st International Cooperation Workshop on climate change in coastal areas in the State of São Paulo (Brazil) and South East Queensland (Australia) in July 2011.

ii In addition to the focus groups, 15 interviews were held over the period with residents of areas deemed to be at risk in the three municipalities being studied, three interviews were conducted with the Civil Defence bosses of these municipalities, two interviews with geologists working in public research institutes who have conducted studies in the region; together with workshops.

iii FAPESP – State of São Paulo Research Foundation.

iv Given that sociological and cultural studies on risk perception focus on the social and cultural stimuli that evoke certain specific patterns or attributes associated with different types of risk (Renn, 2008), it was suggested that a focus group be instituted with young people aged 12 to 17, targeting ways of identifying and confronting similarities and differences to the narratives obtained from the other groups.

v In addition, 36 interviews were conducted with members of the community to obtain information on the preparation, response and recovery process after disasters strike.

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METHODOLOGICAL PROPOSALS FOR RESEARCH ON RISK AND ADAPTATION: EXPERIENCES IN BRAZIL AND AUSTRALIA

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***Abstract*:** In this article the authors introduce a debate about focus groups and scenarios planning with stakeholders and researchers as methodological tools for qualitative studies on risks aimed to investigate perceptions and needs, to debate proposals and solutions, as well as to promote the participation of the extended peer community in producing knowledge and dealing with risks associated to extreme events and environmental change. Considering this theoretical and methodological approach the paper focuses on two research projects undertaken in urbanizes coastal areas in Brazil (North Coast of São Paulo) and in Australia (Nort Cost of Queensland), between 2011 and 2013. The findings highlight that both methods achieved the proposed goals and improved the dialogue and articulation between scientists and stakeholders.

***Keywords*:** Qualitative methods; Knowledge articulation; Environmental change; Brazil; Australia.

***Resumo*:** Neste artigo, os autores discutem a utilização de grupos focais e de planejamento com cenários envolvendo *stakeholders* e pesquisadores como instrumentos metodológicos em estudos qualitativos sobre risco, tanto para aferir percepções, identificar demandas, discutir propostas e soluções, como para promover a participação de uma comunidade ampliada de pares na produção de dados e no enfrentamento dos riscos associados a eventos extremos e mudanças ambientais. A partir deste recorte temático e metodológico os autores apresentam e analisam resultados de dois estudos realizados no Litoral Norte paulista (Brasil) e na parte Norte da costa de Queensland (Austrália), entre 2011 e 2013. Tais estudos apontam que os instrumentos metodológicos explorados alcançaram os objetivos propostos, contribuindo, em particular, para estreitar o diálogo e articulação entre cientistas e *stakeholders*.

***Palavras-chave*:** Métodos qualitativos; Integração de conhecimentos; Mudanças ambientais; Brasil; Austrália.

Resumen: En este artículo, los autores discuten la utilización de grupos focales y de planificación con escenarios con stakeholders e investigadores como instrumentos metodológicos sobre riesgo, tanto para comparar percepciones, identificar demandas, discutir propuestas y soluciones, como para promover la participación de una comunidad ampliada de pares en la producción de datos y en el enfrentamiento de los riesgos asociados a eventos extremos e cambios ambientales. A partir de esta propuesta temática y metodológica los autores presentan y analizan los resultados de dos estudios realizados en el Litoral Norte del estado de Sao Paulo (Brasil) y en la zona Norte de la costa de Queensland (Austrália), entre 2011 y 2013. Los estudios apuntan que los instrumentos metodológicos explorados alcanzaron los objetivos propuestos, contribuyendo, en particular, para estrechar el diálogo y la articulación entre científicos y stakeholders.

Palabras clave: Métodos cualitativos; Articulación de conocimentos; Cambios ambientales; Brasil; Australia.