

# Misperceptions of climate-change risk as barriers to climate-change adaptation: a case study from the Rewa Delta, Fiji

Shalini Lata · Patrick Nunn

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**Abstract** While increasing research is focusing on the effective adaptation to climate change in richer (developed) countries, comparatively little has focused specifically on this subject in poorer (developing) countries such as most in the Pacific Islands region. A significant barrier to the development of effective and sustainable adaptive strategies for climate change in such places is the gap between risk and perceived risk. This study looks at a vulnerable location in Fiji—the densely populated Rewa River Delta where environmental changes resulting from shoreline retreat and floods are expected to increase over the next few decades and entail profound societal disruption. The numbers of people living in the Rewa Delta who know of climate change and could correctly identify its contributory causes are few although many rank its current manifestations (floods, riverbank erosion, groundwater salinization) as among their most serious environmental challenges. While lack of awareness is a barrier to adaptation, there are also cultural impediments to this such as short-term planning perspectives, spiritual beliefs, traditional governance structures. One way forward is to empower community leaders in places like the Rewa Delta to make appropriate decisions and for regional governments to continue working together to find solutions that acknowledge the variation in sub-regional trans-national vulnerability to climate change.

## 1 Introduction

Research into the disparities between climate-change challenges and responses has been increasing within frameworks of risk and risk perception. There is a growing

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S. Lata  
University of the South Pacific, Suva, Fiji

P. Nunn (✉)  
University of New England, Armidale NSW 2351, Australia  
e-mail: pnunn3@une.edu.au

debate around how policy can be designed to overcome the barriers to effective adaptation that exist in many parts of the world. Key to this is understanding the perceptions of current and future climate-change risk held by decisionmakers and how these perceptions might be adjusted to better align with the most probable risk scenarios (Weber 2006; Paeth and Otto 2009).

It is widely acknowledged that people's perception of environmental risk determines both the nature and degree of their response (Adams 1995). Strategies for eliciting optimal responses to such risk emphasize effective communication grounded in an appropriate sociocultural context (Lindell and Perry 2004; Leiserowitz 2006). Within the context of climate-change adaptation, attention has focused on awareness-raising intended to engage communities and individual stakeholders with national (or sub-national) adaptation planning (Etkin and Ho 2007). Yet this approach has worked best to date in richer (developed) countries where individuals are generally better-educated and more aware of global issues than in poorer (developing) countries. In addition, top-down approaches to community action are common in developed countries as solutions to issues of national concern, such as water shortages or disease awareness, whereas in developing countries top-down communication is often ineffective, both because of the inabilities of governments to disseminate messages of concern and because communities are often unreceptive to such messages (Patt and Schröter 2008; Nunn 2009).

While much effort has gone into mapping pathways for optimal adaptation to climate change in developed countries, typically through a combination of top-down and bottom-up approaches, comparatively little attention has been paid to understanding how climate-change adaptation might be best achieved in many developing countries (Lane and McDonald 2005; Matakaki et al. 2007). This situation is regrettable as most authorities agree that livelihoods of the (poorer) inhabitants of developing countries are likely to be affected more by twenty-first century climate change than their counterparts in developed countries (Parks and Roberts 2006; Mertz et al. 2009).

Notwithstanding progress in developing countries concerning the engagement of communities in processes of adaptation to global change, the degree of this appears too slow to effectively meet the associated challenges, especially those of climate change. To this end, there is interest in understanding the nature of disparity between climate-change risk and perceived risk in vulnerable situations in the developing world in order to develop appropriate solutions for reducing disparity and enabling appropriate adaptive responses (Vedwan and Rhoades 2001; West et al. 2008).

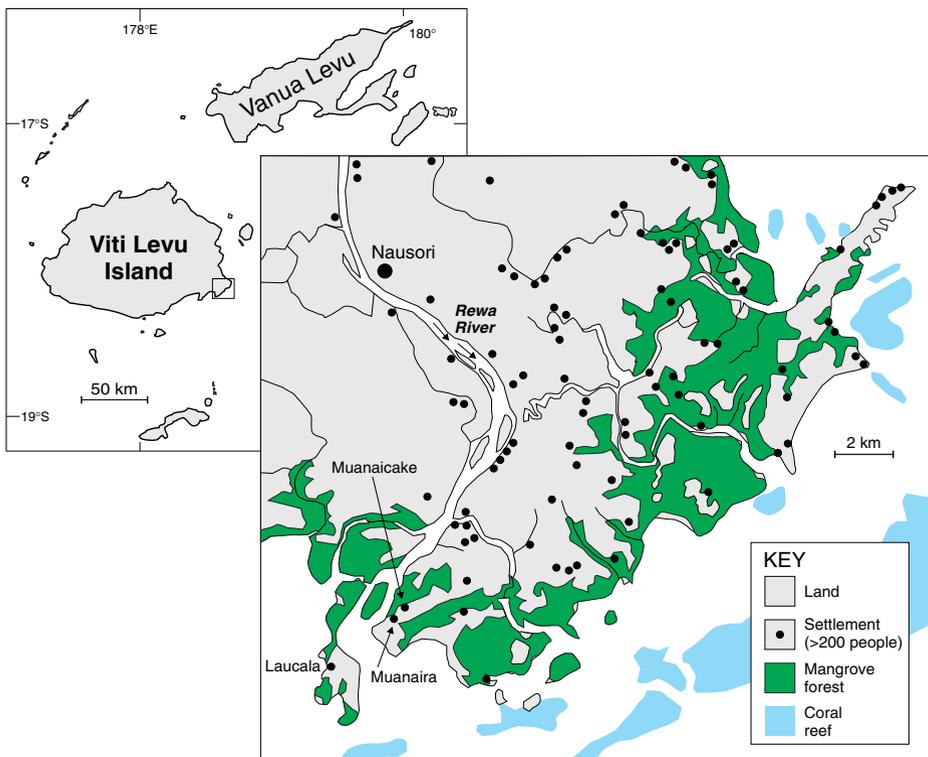
The present study looks at two contrasting communities in the Rewa River Delta, the largest in the Fiji Islands group (Southwest Pacific Ocean), with a view to both understanding their perceptions of climate change and measuring how effective their planned responses will be. While this study contributes to the growing field of climate-change risk perception, it also reports from uncommonly vulnerable communities (island, delta) in the developing world which make the findings of wide interest.

## 2 Environmental and human context

Popularly perceived as being on the “frontline” of climate change, the Pacific Islands are in reality somewhat diverse in both their vulnerability and resilience to climate

change. While sea-level rise is a major and widespread concern in this region, as in any island region, there are also significant climate-related stressors around groundwater salinization, shoreline erosion, and food security (Hay et al. 2003; Nunn and Mimura 2007; Barnett and Campbell 2010). Much attention has focused on the most iconic vulnerable locations—atoll islands—but hardly any attention has been given to Pacific Island deltas, many of which are as densely populated as the large deltas of South and East Asia (and elsewhere) where there is a better understanding of the threats posed by future climate change (Wassmann et al. 2004; Woodroffe et al. 2006).

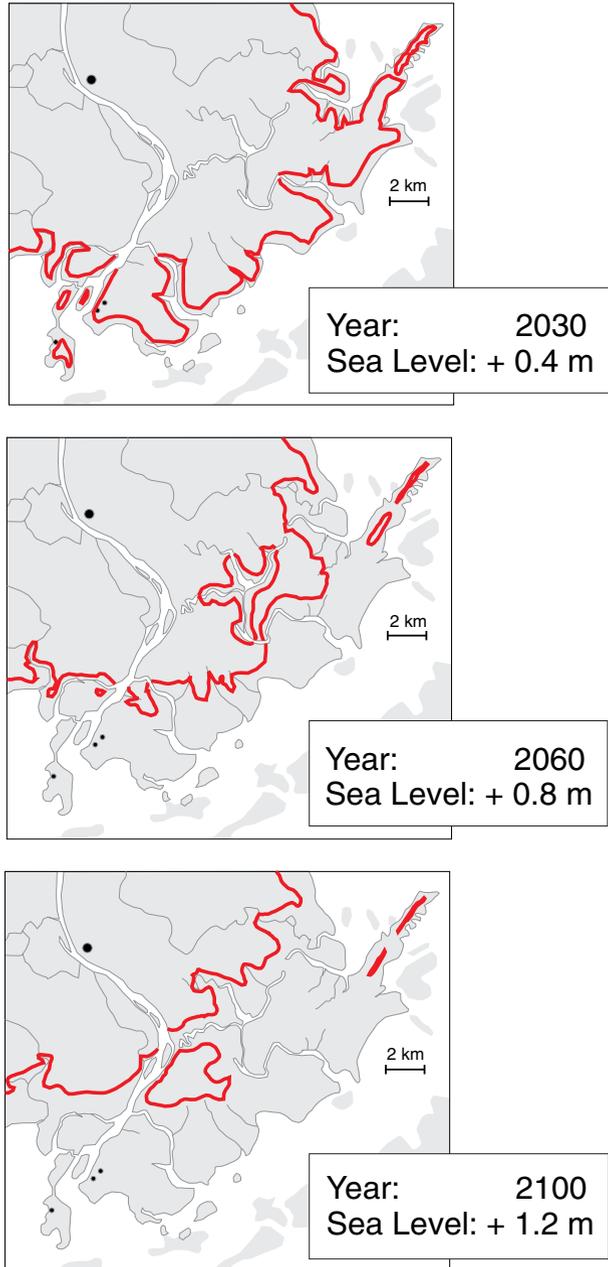
One of the largest deltas in the Pacific Islands is the Rewa Delta (240 km<sup>2</sup>) in the southeast part of Viti Levu Island in Fiji, which is home to some 70,000 people, about half of whom live in traditional communities along river banks (Fig. 1). Much of the delta is intertidal and occupied by mangrove forests (5130 ha) while coral reefs exist off some of its margins (Feresi et al. 2000). Most inhabitants subsist from food grown in the fertile well-drained delta soils supplemented by seafood from river and reef-lagoon ecosystems. There are presently three main groups of environmental stressors amongst the communities of the Rewa Delta: (1) the increased frequency of flooding, often linked to bank/shoreline erosion, (2) groundwater salinization in agricultural areas, and (3) reduced availability of seafood.



**Fig. 1** The Rewa Delta (*large map*) and its location within the Fiji group (*small map*). Study sites within the delta are shown; Nausori is the only town while Muanaicake, Muanaira and Laucala villages comprise the traditional community of Vutia

To understand climate-change risk in the Rewa Delta, sea-level rise projections were developed based on the IPCC AR4 figures upgraded with more recent work (IPCC 2007; Rahmstorf et al. 2007; Vermeer and Rahmstorf 2009; Nicholls et al.

**Fig. 2** Threats to the Rewa Delta from sea-level rise calculated on the basis of present-day topography, shoreline defined by mean low-water spring tide level (Fiji Datum), and realistic sea-level rise scenarios based on Vermeer and Rahmstorf (2009). Full details in Lata (2010). Maps are based on a Digital Elevation Model (DEM) of Viti Levu Island obtained from the Fiji Land and Information System with a cell size of  $50 \times 50$  m. Using Global Mapper (version 11.01) with input of several key elevation readings from the rear of the Rewa Delta, a series of sea-level rise scenarios was configured using interpolation. These maps were re-drawn from computer-generated ones following minor adjustments for groundtruthing throughout the Delta



2011) and applied to the area (Fig. 2). The amount of direct inundation represented by the landward movement of the shoreline underestimates risk because it cannot show risk from the river flooding that routinely affects the lowest parts of the delta and which is likely to worsen in future decades as a result of both local-area and regional influences, particularly a sustained high frequency of tropical cyclones (Leslie et al. 2007; Mimura et al. 2007). A study of the Rewa River basin suggested that there will probably be an increase in the magnitude of floods here over the next few decades as result of increasing river-channel sedimentation (Terry et al. 2002), the effects of which will be amplified by a likely increase in intense tropical cyclones (Knutson et al. 2010).

Floods in the Rewa Delta have increased in frequency and magnitude over the past few decades (Kostaschuk et al. 2001) at the same time as its population has grown and its economic importance as a supplier of food to the expanding Greater Suva area, the largest urban centre in the Pacific Islands, has increased (Walsh 2006). Concerns around the future habitability and productivity of the Rewa Delta have been voiced among some key stakeholders but none of this has been translated into either long-term adaptive planning or sustained community-level awareness.

This study examined two contrasting delta communities (shown on Figs. 1 and 2). The first is the main urban centre—Nausori Town—which is the market and commercial hub for the delta as well as hosting the airport serving the capital, Suva. The second is a representative rural community named Vutia, comprising the three villages of Muanaicake, Muanaira and Laucala. Over a period of several months, key and representative individuals in these communities were approached and asked a series of questions intended to capture their perceptions and understanding of climate-change risk. Dialogue was conducted in appropriate vernacular languages.

Nausori is a multiethnic community (around 25,000 people growing at 7.1% annually) governed as a municipality with a mayor and elected councillors. While agriculture drives the town's economy, the retail and industrial sectors also generate a significant amount of revenue. Nausori is connected by road to all major centres on Viti Levu Island as well as many rural communities. Decisionmaking in Nausori is top-down with generally only little consultation of stakeholders, something that has become embedded recently with the dismissal (as for all of Fiji's municipalities) of the mayor and councillors and their replacement by a government-appointed administrator.

Vutia is populated exclusively by indigenous Fijians (estimated 900 individuals) living in generally less solidly constructed houses than most in Nausori with comparatively few opportunities for cash-income earning. As with most Rewa Delta communities, there is no road connecting Vutia to other places, the people depending on small boats. Unlike Nausori, which has had a water supply and a reticulated sewage system for decades, Vutia has had piped water only since 2008 and has no solid-waste disposal system. Vutia has its own primary school, church, health station and community hall. Its people adhere to a hierarchical system of decisionmaking of a kind which has its origins in pre-literate Fiji society. This type of decisionmaking, while exclusive and dominated by males and hereditary chiefs, is widely acknowledged as having provided a degree of stability and sustainability for many such communities although it often struggles to cope with the contemporary challenges of rapid population growth, resource depletion, and the manifestations of climate change (Aalbersberg et al. 2005; Nunn 2009).

### 3 Methodology

For Nausori, there is considerable diversity of population that could not be completely captured through sampling. The first requirement was that interviewees had been continuously resident in Nausori for at least 30 years. Second-stage sampling was done by ethnicity (Fijian, Indian, other) and on the basis of age category (30–50 or >50) and gender for individual interview. No sampling targeted occupation (such as farming and commercial) because many Nausori families do both.

For Vutia, all inhabitants fall into *mataqali* (extended family groups), two of which are characterized as *vulagi* (literally foreigners, but meaning recent arrivals in the community) and two as *gone* (literally children [of the land in Vutia]). Being comparatively recent arrivals, it was assumed that members of the former *mataqali* would have shorter-term memory of environmental change in Vutia, so they were not surveyed. The latter two *mataqali* also included family groups (known as *tokatoka*) that had migrated to Vutia from elsewhere, typically within the past 20–30 years, so these were excluded from survey for the same reason. The remaining people comprised 31 *tokatoka* (an estimated 127 residents). Of this number, 14 *tokatoka* were excluded because they had been resident outside Vutia at various times for more than 5 years, usually while the principals (typically the eldest male) were employed elsewhere; the assumption is that members of these *tokatoka* might lack the continuity of knowledge of environmental change in Vutia. This left 17 *tokatoka* (approximately 69 individuals) from each of which two adults were selected on the basis of age category (30–50 or >50) and gender for individual interview.

No informants were paid. In all cases, individual interviews were carried out with just the interviewee, the interviewer and translator where necessary. Yet it was impossible to exclude other persons from interviews although interjections were discouraged.

Although the specific data analysed later in this paper were obtained from individual interviews, these were supplemented by focus-group discussions in appropriate cultural situations for the purposes of understanding both the broader context and canvassing group views. The latter was especially important in Vutia where communal groups develop and apply decisions on a range of issues.

### 4 Risk perception

The risk to the Rewa Delta from future sea-level rise is profound. It is likely that the increased frequency/magnitude of flooding which has been experienced here in the past few decades as well as the observed shoreline/riverbank erosion and groundwater salinization are manifestations of sea-level rise (Fig. 3), which is currently occurring in this part of the Pacific at a rate of some 1.4 mm/year (Church et al. 2006), perhaps even faster (Cheng et al. 2008). In order for adaptation to long-term climate risk to be effective in such places, it is essential that communities buy in to appropriate and sustainable adaptive solutions which in turn requires that communities perceive the threats from climate change clearly (Shackley and

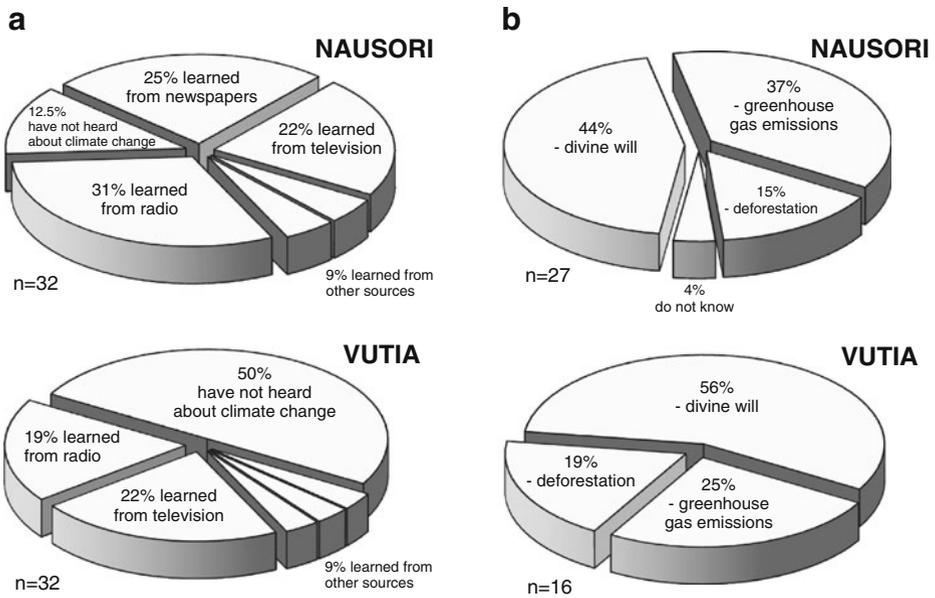
**Fig. 3** Environmental problems in the Rewa Delta (photos by Shalini Lata). *Upper*—The Rewa River in flood at Nausori in December 2009. *Lower*—Local response to riverbank erosion at Muanaira Village (Vutia) consists of a line of stakes in the river backfilled with refuse



Deanwood 2002; van Aalst et al. 2008). To this end, the three sets of questions asked referred to

1. the understanding of climate change and its causes, intended to ascertain the degree of awareness upon which an appreciation of risk and appropriate adaptation needs to be built,
2. the rank of climate change among other sources of risk to livelihood sustainability, intended to gauge appreciation of climate-change risk, and
3. the perceived nature of future environmental changes in the Rewa Delta and their human consequences.

The results of each of these three sets of questions are discussed in the following sub-sections.



**Fig. 4 a, b** Results of questions about the awareness of climate change and its causes

#### 4.1 Understanding of risk

In the two delta communities studied, several questions were asked to measure people's awareness of climate change and its causes. The results in Fig. 4a show in Nausori, the well-connected urban centre, just 12.5% of people had not heard about climate change, most having learned about it from the media. In contrast, 50% of people in the Vutia community knew nothing about climate change. When those who had heard about climate change were questioned about its proximal causes, the vast majority ascribed it to the will of a divinity (Fig. 4b). 46% of people in Nausori knew something of the causes of climate change while the equivalent figure in Vutia was 22%.

These results reflect a predictable disparity in awareness and understanding between urban and rural communities. The fact that half the people questioned in Vutia had not heard about climate change was less expected, given that they live comparatively close to an urban centre and have regular access to information that their counterparts on outer islands in the Fiji group do not have. Studies of Fijian communities on Moturiki Island, 15 km off the east coast of Viti Levu Island, showed that there was a much lower degree of awareness about climate change than in Vutia (Kumar 2007).

The attribution of climate change and other such phenomena to the will of a divinity has been recognized as a barrier to climate-change adaptation in the Pacific Islands region and elsewhere where religious beliefs are deeply engrained (Mortreux and Barnett 2009; Barnett and Campbell 2010). To judge from responses in the Rewa Delta, the problem is specifically that if you believe a phenomenon to have a divine cause then not only is it pointless to try and alter it but it is also an

affront to the divinity to contemplate doing so. In addition, it was clear from this survey that older people were more inclined to attribute change to divine will rather than younger people. This is more of a concern in traditional hierarchical societies such as those in the rural parts of Pacific Island nations than elsewhere because decisionmaking is dominated by older people, although there are signs of changes being forced by climate-change imperatives in some island communities (Nunn 2008).

The very low level of community-level stakeholder belief in future climate change amongst the people of the Rewa Delta is no surprise. Recent surveys in the United Kingdom and United States suggest that in these countries, where the population is both more exposed to the science of climate change and better equipped to assess its veracity, only 26% and 57% respectively believe that it is happening and is human-caused (Campbell-Lendrum and Bertollini 2010). By contrast, in most parts of the developing world, where people have had minimal exposure to climate-change issues and generally lack the critical sense to evaluate these, no-one interviewed in the Rewa Delta linked the ubiquitously observed changes occurring there to climate change. Some of this may be attributable to denial but most is testament to the conspicuous failure of international initiatives for aiding Pacific Island governments to raise awareness about climate change and future adaptive responses amongst the peoples of the Pacific Islands (Nunn 2009).

#### 4.2 Ranking risk

Each interviewee (group) was asked to identify their five greatest environmental concerns. Results are shown in Table 1. Answers came from all individual interviews as well as from persons in focus-group meetings who elected to name five concerns. Since answers were given in various vernacular languages, the results shown in Table 1 have been translated into English before being grouped into the thematic groups shown. It is acknowledged that this process is subjective but, because of the inability of most interviewees to converse fluently in English and to articulate their concerns in the language of science, there is no alternative to this method. Such an approach is justified on the grounds that the data produced are understood to be qualitative and generalized, and therefore unable to be rigorously interrogated.

The fact that no-one identified climate change as a risk *per se* demonstrates that, while many have heard about climate change, it is perceived as a phenomenon unrelated to daily life. Part of the reason for this is thought to be that such communities which do not speak English as their first language perceive issues such as climate change as alien and remote because of the language in which information about it is presented (Nunn 2009). Yet many of the risks identified as high priority by interviewees are (largely) climate-change risks; four of the seven risks identified by people in Nausori are of this kind, as are the top five identified by people in Vutia (see Table 1).

The fact that Nausori people placed pollution at the top of their list reflects the problems associated with the rapid growth of such urban centres in developing countries, and the attendant problems of waste disposal (Shisanya and Khayesi 2007). But then come a series of concerns around flooding, the threat this poses to economic development, even to the land itself. The combination of flooding and pollution is responsible for the concerns around sickness which is not a concern at Vutia where

**Table 1** Ranking of environmental and associated concerns by residents of the two study sites

	<b>Nausori (n=61)</b>	<b>Vutia (n=81)</b>
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin-bottom: 5px;">Highest concern</div> <div style="text-align: center; margin: 5px 0;">  </div> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin-top: 5px;">Lowest concern</div>	Pollution (solid and liquid)	Riverbank erosion
	Vulnerability of riverbank developments	Inundation (of formerly used lands)
	Riverbank erosion	Irregular potable water supply
	Social issues (population increase, poverty)	Change in rainfall (affecting agriculture)
	Flooding (from river)	Flooding (from river)
	Irregular potable water supply	Unsustainable resource use (by others)
	Sickness and disease (especially waterborne)	Deforestation (especially mangrove forest)
		Pollution (solid and liquid)
		Social issues (population increase, poverty)

Climate-change associated risks are in shaded boxes

pollution is less serious. Also in Nausori, there is concern about water supply but because this is supplied from a reservoir inland, it is not considered a climate-change risk, although it might one day become one.

Being lower, closer to the ocean fringe of the delta, and lacking the protective infrastructure of Nausori, it is understandable that most of the top risks identified by the people of Vutia would be linked to climate change. Most of these are to do with flooding and/or sea-level rise, the change in rainfall affecting agriculture probably more to do with groundwater salinization, signs of which are observable in the villages' food gardens. Water supply in Vutia is from Nausori but less reliable as pipes often break or become clogged during floods and heavy rain, for which reason this risk is linked to climate change.

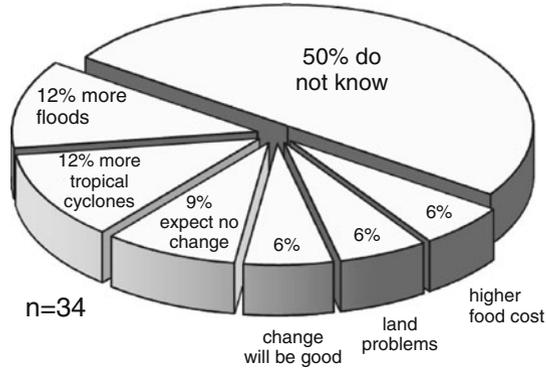
What this part of the survey also implies is that climate change is already impacting the lives of people in the Rewa Delta although they do not perceive this as so. Interviewees had many suggestions for reducing environmental risks, principally the construction of artificial levees and the dredging of river channels. Such solutions are common among delta communities worldwide but in the case of the Rewa Delta are only short-term solutions to a problem that will eventually require a more far-sighted and profound response.

#### 4.3 Future risk

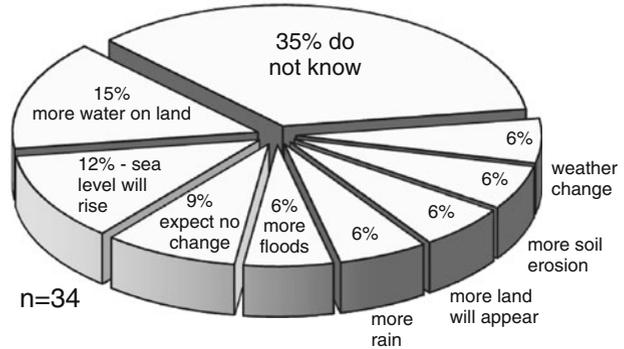
The final set of questions asked interviewees to state how environmental risk might change in the future, the intention being to have them marry their understanding

**Fig. 5** Results of questions about future environmental risk

**NAUSORI**



**VUTIA**



of climate change with their ranking of risk (Fig. 5). Given that large numbers of interviewees have little or no knowledge of climate change, it is unsurprising that none identify resettlement (outside the delta) as part of any future adaptive strategy. Yet this observation also speaks to the short-term outlook of many people in this area, as in other developing countries, particularly in subsistence communities. This is explainable by the fact that people in developing centres like Nausori are understandably focused on activities that fuel economic growth, something that is explicitly supported by government. In subsistence communities like Vutia, the situation is different yet has the same end result given that short-term needs, ranging from daily food provision to a periodic need for cash, generally far outweigh any longer-term issues around environmental or livelihood sustainability.

Large numbers of interviewees at both study sites did not know what might happen in the future (see Fig. 5). Of the remainder, more predictions were to do with flood risk although it is interesting that more than one interviewee in both locations expected no change to occur. This might be interpreted as a sign that climate risk is perceived as intrinsically short-term, an expression of climate variability rather than change. Such a belief probably underpins many other responses around predictions of future risk in this survey.

## 5 Discussion

Many issues arising from this study echo those found in others, particularly those concerned with the perceptions of people in developing countries about environmental risks and the ways in which appropriate responses to these can be developed and sustained. To demonstrate these connectivities and to frame appropriate solutions for similar situations, the Rewa Delta in particular, five issues arising from this study are discussed below.

### 5.1 Lack of awareness of climate change and its causes

Climate change is a term that is well known in the Pacific Islands, particularly to younger better-educated people, but as a call to action it is widely ignored (Barnett and Campbell 2010), being perceived as an alien concept, partly because all the information about it is available only in a foreign language and partly because—for most people in the Pacific Islands—the examples of climate change effects to which they are exposed are from elsewhere. This “elsewhere” may be Africa or Australia or even elsewhere within the Pacific Islands region; many people questioned in the Rewa Delta regarded atoll island communities in Kiribati and Tuvalu as falling “victim” to climate change not their own. This disconnect in the minds of stakeholders between global/elsewhere and local issues has been cited as the principal reason for the failure of environmental policies to influence residents’ interactions with the environment in Andalusia, Spain (Moyano et al. 2009) and in California (Moser and Tribbia 2006).

The lack of awareness of climate-change issues in Pacific Island nations is not shared by many government decisionmakers. In Fiji, as elsewhere in this region, there is a conspicuous gap between government policy (and stated policy direction) for climate-change adaptation and the views of community-level stakeholders (Mataki et al. 2007; Lata 2010). This has been identified as a barrier to adaptation in other developing countries (Patt and Schröter 2008) and indigenous communities (Petheram et al. 2010).

The fact that climate change is a cross-sectoral issue which does not therefore fall neatly within the portfolio of any government department in the Pacific Islands is also a significant issue that may account for the general lack of awareness among the people of the Rewa Delta, and most other rural communities in this region (Turnbull 2004; Nunn 2009). Thus some Pacific governments house climate change within national meteorological offices, others within environment departments concerned more with issues ranging from biodiversity conservation to water management. In addition, the fact that climate-change projections are commonly expressed in decades contributes to their lack of perceived immediacy and provides some justification for focus by rural dwellers on shorter-term, more immediate goals. Such factors contribute to the lack of clear messages about climate-change risk being given to Pacific Island communities, something that has been observed elsewhere (Seacrest et al. 2000).

This problem is exacerbated when communications about climate change are not in vernacular languages and employ words and concepts that are perceived as foreign and therefore serve still further to alienate community decisionmakers in developing countries (van Aalst et al. 2008). Community ownership of climate-

change adaptation is essential in rural Pacific Island situations (and their equivalents elsewhere in the developing world) for it is unlikely that governments will ever be able to reach down to all of these and give them the information they need to develop and sustain appropriate adaptive solutions. In fact, the problem of dependency on external assistance (especially funding) needs to be overcome if climate-change adaptation is to be successfully mainstreamed in archipelagic island nations like Fiji (Nunn 2009).

### 5.2 Confusion of climate change and climate variability

Long-term interannual climate change is an alien concept for many people in the developing world, especially those (like most in the Rewa Delta) who routinely subsist from the land and sea in time-honoured ways that they expect to sustain them into the future. Such people are accustomed to short-term variations in climate, such as drought and tropical cyclones, which temporarily impact particular resources but they also believe that these will eventually return to full productivity. Such beliefs are ingrained in many Pacific Island (and similar) cultures (Vedwan and Rhoades 2001; Speranza et al. 2010). To therefore convince such people that it is not simply (reversible) climate variability but rather (irreversible) climate change that is affecting their environments requires a fundamental change to their perceptions. This has been achieved elsewhere by explaining the degree of divergence of current climate from perceived norms (Vedwan and Rhoades 2001) and by the exposure of stakeholders to extreme scenarios that create alarm (Poumadère et al. 2008).

That said, even though many subsistence dwellers in the Rewa Delta and elsewhere in the Pacific Islands region admit that they have noted changes in rainfall (amount and seasonality), temperature, tropical-cyclone frequency, and droughts over the past few decades, they are nonetheless reluctant to accept this as representing evidence for climate change. Rather they see it either as a climate variability, in which an eventual return to “normality” is implicit, or that over the past 30–50 years normality has been redefined, as in subsistence communities elsewhere (West et al. 2008).

### 5.3 Short-term outlook and short-term responses

Most environmental decisionmaking at the community level (in both Nausori and Vutia) is short-term in both the way that challenges are contextualized (outlook) and answered (responses). This is typical of much sub-national environmental decision-making in developing countries and is readily explainable by (a) the lack of resources and expertise to develop more sustainable solutions and (b) the aspirations of decisionmakers and the communities they represent to achieve short-term economic goals and reap the benefits of these (Mertz et al. 2009).

A good example of such short-termism in Vutia is around short-term impacts of climate change (cf. Table 1) which are similar to those of agriculturalists in other developing countries where climate change is perceived as a remote threat to be considered only after more immediate concerns around day-to-day food production are solved (Burton and Lim 2005; Mertz et al. 2009).

Many of the interviewees in the Rewa Delta explained that environmental decisions were almost always taken retroactively (not proactively) and were event-driven

in the sense that a response would be made only if something had disrupted the normal condition of a particular production system. The best examples are to do with floods which, although occurring more frequently than they did a decade and more ago, are still regarded as temporary disruptions to normal life, a view that is being increasingly enforced by unprecedented solutions like river dredging and levee construction. While understandable, especially in a developing country context, event-driven adaptation of this kind is likely to become an unnecessarily costly option in the future as perceived normal conditions become increasingly fragmented (Reenberg et al. 2008; Bridges and McClatchey 2009; Lasco et al. 2009).

Many Pacific Island governments (including Fiji) state that they are committed to long-term and sustainable solutions to the environmental challenges of the future (including those from climate change) and yet appear preoccupied with short-term, reactive, and commonly event-driven responses. In common with other studies of rural environmental decisionmaking in the Pacific Islands region (Turnbull 2004; Nunn 2008), this study also found that community leaders in the Rewa Delta are often ignorant of their government's position on long-term environmental stressors like climate change. In contrast, such people have high expectations of government assistance following natural disasters.

#### 5.4 Traditional decisionmaking

While decisionmaking for Nausori follows a top-down yet consultative model that obtains in urban centres in many parts of the world, decisionmaking in Vutia—as in most rural communities in the Pacific Islands region—is traditional in the sense of being hereditary and hierarchical, non-democratic and exclusive, and often unsuited to coping with long-term environmental challenges. The failures of such traditional processes are easy to understand, particularly given that they now operate in a different societal context to that for which they were originally developed. Today, such rural dwellers are often better educated, less able to be coerced into actions they dispute, and adhere to a set of religious beliefs that sometimes conflict with cultural mores. And yet, because issues around environmental sustainability (which include climate change) are perceived as secular and beyond the understanding of many in communities like Vutia, the onus for associated decisions often lies with the traditional apparatus.

In the case of Vutia, this means that practical environmental decisionmaking, such as that to do with floods and riverbank erosion, crop failures and other food-resource depletion, often comes back to the traditional chief and his elderly advisers to pronounce upon. This effectively guarantees that such decisions will be short-term, and uninformed by either government policy or science; at best, based on the emulation of solutions in familiar situations, usually nearby.

The respect for traditional decisionmaking processes in Vutia and other Pacific Island communities can change from being a barrier to effective adaptation to enabling it, if traditional decisionmakers are empowered to make appropriate decisions about their environments (Mercer et al. 2007; Nunn 2009). Other approaches to environmental issues in comparable situations have used participatory learning and action (PLA) effectively (Terry and Khatri 2009; McKinnon 2010).

## 5.5 Divine will as a barrier to adaptation

Most of the people living in the Rewa Delta have spiritual beliefs that pervade their everyday activities and are commonly used to rationalize various incidents and observations. This explains why such large proportions of interviewees ascribed climate change to the unalterable will of a deity, something that explains why they would not contemplate adaptive action, something that is a defining characteristic of many traditional societies (Glacken 1967). A comparable example comes from the Pacific Island nation of Tuvalu where one group of people interviewed were taking no action against the threat of rising sea levels because they trust that God will not break a promise never to flood the Earth again (Mortreux and Barnett 2009).

It is clear that in the Pacific Islands, as in similar societies (e.g. Byg and Salick 2009), any effective adaptive strategy for climate change should acknowledge people's spiritual beliefs and, where possible, harness them to help initiate and sustain appropriate action. The Christian churches in the Pacific Islands have an unrivalled outreach to communities, are generally better-respected than governments and NGOs, and can provide a conduit for communicating key information about both the imperatives for adaptive action and the optimal ways of doing it in this region (Takesy 2004; Nunn 2009). The ecumenical Pacific Conference of Churches has declared its intention to engage the communities they serve for the purposes of effective climate-change adaptation. Its 2009 Moana Declaration is centred around the need for resettlement of vulnerable coastal communities ([www.oikoumene.org](http://www.oikoumene.org)).

## 6 Conclusion

Two major statements by Pacific Island leaders in recent years have identified climate change as the leading concern for the Pacific Islands region. The first of these, which is regarded as a guiding principle for the future development of the region, is the Pacific Plan ([www.forumsec.org](http://www.forumsec.org)). The other is the Pacific Leaders' Call to Action on Climate Change issued on 6 August 2009 ([www.pif2009.org.au](http://www.pif2009.org.au)). Both statements acknowledge the huge challenges to livelihood sustainability in the Pacific islands region posed by future climate change and call for effective action. Yet given the results of the study reported in this paper, there is clearly a misfit between leaders' views and grassroots awareness and action.

Several ways forward to achieving a goal of effective and sustainable adaptive action throughout this region have been suggested above. Principal among these is empowering community decisionmakers to direct *appropriate* action. The emphasis is on providing community decisionmakers, be they traditional chiefs, elected spokespeople, or other persons of influence (e.g. religious leaders, others having above-average educational attainment) with the tools they need to make decisions about the environment that are effective and sustainable, and acknowledge the long-term effects of climate change. In addition, given variations in vulnerability between particular island nations, it is essential that regional discussions should remain centrestage for populations will inevitably need to be re-located from one country to another as this century progresses.

That said, community awareness of climate risk in highly vulnerable places like the Rewa Delta lags well behind the understanding of that risk by scientists and government decisionmakers. It is likely that over the next decade or so, this gap in perception will be closed not by an increase in the kinds of anticipatory actions described here but by a highly disruptive event (like a sustained deep flood) that will affect livelihoods so profoundly that it will result in the widespread acceptance of the need for long-term adaptive action like resettlement.

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