REPORT

Livelihood Security, Vulnerability and Resilience: A Historical Analysis of Chibuene, Southern Mozambique

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Abstract A sustainable livelihood framework is used to analyse livelihood security, vulnerability and resilience in the village of Chibuene, Vilanculos, southern Mozambique from a historical and contemporary perspective. Interviews, assessments, archaeology, palaeoecology and written sources are used to address tangible and intangible aspects of livelihood security. The analysis shows that livelihood strategies for building resilience, diversification of resource use, social networks and trade, have long historical continuities. Vulnerability is contingent on historical processes as long-term socio-environmental insecurity and resultant biodiversity loss. These contingencies affect the social capacity to cope with vulnerability in the present. The study concludes that contingency and the extent and strength of social networks should be added as a factor in livelihood assessments. Furthermore, policies for mitigating vulnerability must build on the reality of environmental insecurity, and strengthen local structures that diversify and spread risk.

Keywords Livelihood security · Vulnerability · Resilience · History · Archaeology · Palaeoecology

INTRODUCTION

Planning for secure livelihoods and mitigating environmental insecurity require analytical tools and methods for assessing vulnerability, resilience and local sustainability (Chambers and Conway 1992; UNDP 2005; Cutter et al. 2008). The majority of these assessments are based on contemporary and short-term studies that fail to acknowledge that conditions of vulnerability and sustainability can be historically constituted. Furthermore vulnerability and sustainability are terms that need to be qualified in a

temporal perspective. This article analyses the tangible and intangible aspects of livelihood security from both a historical and a contemporary perspective focusing on the coastal village Chibuene, Southern Mozambique (Fig. 1). It is situated in an area constituted by high vulnerability even though it has experienced continuous occupation since at least 700 AD. The many different sources available from Chibuene and the longevity of settlement provide the opportunity to study long-term vulnerability and resilience. The questions addressed in this article include:

- (1) Is vulnerability a new feature in this landscape?
- (2) What are the strategies for reducing vulnerability?
- (3) Do historical contingencies exist that serve to increase or decrease vulnerability?
- (4) What can we learn from history when it comes to mitigating vulnerability and building resilience?

Area Background: The Historical and Geographical Setting

Chibuene, situated 7 km south of the town Vilanculos, is a commune of more than 250 residents administrated by the Vilanculos municipality (Fig. 1). The annual and seasonal variability in rainfall is very high. Average rainfall is 832 mm/per year, mostly occurring between December and February (FAO 1984), but the summer rainfall region usually experiences near decadal cycles of wet and dry phases. The ENSO phenomena add a near inter-annual variability (Holmgren et al. 2003). A dunal system forms an aquifer that is independent from the interior and is mainly recharged from rainfall; this means that freshwater availability can be irregular (Ekblom 2004). As a result, the Vilanculos region has an estimated 50 % likelihood of crop failure (UNDP 2005).

Fig. 1 Location of Chibuene (*left*) and detail of the Chibuene area (*right*), showing the location of Lakes Xiroche and Nhaucati (Fig. 5) and the extension of archaeological cultural layers (*grey*)

Geologically, the area is constituted of Pleistocene dunal sands that are weakly developed and low in nutrients (Luvic Arenosols in FAO 1988). These soils are unstable and when vegetation cover is removed they are highly susceptible to erosion. Vegetation in the Vilanculos region is at present dominated by miombo savanna woodland. This is constituted of species such as *Brachystegia spiciformis* and *Julbernardia globiflora*, but *Brachystegia* is rare in areas of intense agriculture (Telford and de Castro 2001).

Chibuene represents a long continuity of settlement from 700 AD until today. There is no space here to review the history of the area in detail but a short summary will be given as background for the reader unfamiliar with the region. Farmers have probably been present in the region since the first centuries AD, and undated Late Stone Age

lithics are found in the Bazaruto archipelago. Between 700 and 1000 AD Chibuene was a centre of trade that connected the southern African interior and the Indian Ocean (Sinclair 1987; Ekblom 2004). From 1000 AD the role of Chibuene changed, probably owing to a change in trade routes on the Indian Ocean. A roughly 200-year break in occupation has been suggested at this time (Sinclair 1987), but palaeo-ecological analyses suggest that agricultural production expanded in this period (Ekblom unpublished). From c. 1200 AD the area was under the influence of the centre of Manyikeni, situated 50 km inland. Population movements of the Tsonga in the eighteenth century, which originated south of Maputo, caused a cultural integration resulting in the establishment of the Xitswa language. Many villagers associate their ancestors with the Tsonga. After the Nguni expansions in the nineteenth century, the state of Gaza

imposed a tributary rule over southern Mozambique. In 1895, the Gaza state collapsed and Mozambique became a Portuguese colony. A labour code and hut tax were imposed in southern Mozambique (Newitt 1995). After years of struggle Mozambique became independent in 1975 but internal strife and regional politics caused the outbreak of a long and devastating civil war between 1977 and 1992, during which many of the Chibuene villagers were displaced. From 2000 the large-scale development of holiday resorts and private estates have obliged families to move inland.

MATERIALS AND METHODS

I have based this analysis on a sustainable livelihood framework that includes tangible aspects (for instance resource production, income and employment) and intangible factors (such as capabilities, claims, access and social capital) related to livelihood security (Chambers and Conway 1992; Scoones 1998). In this case vulnerability and resilience will be assessed at a community level but covering many temporal scales. Vulnerability is defined as the degree to which a society or a socio-environmental system is unable to cope with adverse effects (Adger 2006; Cutter et al. 2008). Resilience is referred to here as the capacity of society or a socio-environmental system to respond to and recover from adverse conditions, to counter the effects of inherent environmental insecurity (for instance seasonality), and to reorganise society to meet new conditions (Folke et al. 2002; Berkes et al. 2003; Cutter et al. 2008).

Parallels will be drawn with the wider region of southern Africa, summarising numerous historical analyses and written sources on southern Africa which were reviewed in detail by Ekblom (2004). Archaeological surveys have been carried out in the area since 1977 (Sinclair 1987; Ekblom 2004). Data on climate variability and vegetation history is available through pollen and diatom analyses from Lake Nhaucati and Lake Xiroche (Ekblom and Stabell 2008; Ekblom 2008). The analysis is also based on interviews that were carried out in 2000–2001 with 16 Chibuene elders on local histories. A semi-structured interview method was chosen to allow the interviewees to redirect the focus according to their interests. Interviews were carried out in Xitswa with the assistance of students from Eduardo Mondlane University. An assessment of resource utilisation carried out by Berger (2004) will also be used. In this assessment, household representatives were asked to group resources and to class them based on how often the food resource was used over the year.

RESULTS

Is Vulnerability a New Feature in this Landscape?

The resource use assessment suggests a high vulnerability both seasonally and between years. Farming rarely produces a surplus. Between March and July locally produced grain is scarce. During this period income from local fisheries is used to buy maize from the shops. Cultivated crops represent an estimated half of total consumption (Fig. 2). The most common crops are maize, groundnut, cassava (both leaves and tubers) and millet. Sorghum is consumed in the dry season but is not very common. Coconut is consumed throughout the year while cashew nuts, an important source of income in the past, are consumed seasonally. Cattle are not kept in the area; villagers report that this is due to the presence of tse-tse (*Trypanosomiasis*) and the unsuitability of grass for grazing. However, the absence of cattle may also have historical roots (see below). Sheep, goat and poultry are not commonly eaten. Marine resources are seasonally scarce in May–September (Berger 2004). Illicit industrial fishing, in combination with imposed fishing regulations (following the proclamation of Bazaruto Island as a National Park), have reduced the profits from local fisheries. Meanwhile, local opportunities for wage labour are few, though this is perhaps changing at present with the tourist development in the area.

Households in Chibuene have been engaged in a farming and fishing economy since 700 AD. Marine resources represent c. 20–30% of the archaeological bone assemblage over time and cattle and sheep/goat in the bone assemblage (domestic bone) represented 30–50% of the bone assemblage historically (Fig. 2). Regional meteorological and paleoclimatic data suggest recurring periods of drought over the last 1200 years, followed by irregularities in seasonal rainfall (Holmgren et al. 2003). Written sources report several droughts from the sixteenth century onwards (Ekblom and Stabell 2008) with severe droughts occurring in the eighteenth and nineteenth centuries. Sources from other parts of Mozambique describe how people *fell dead of weakness* and how *the whole vegetable kingdom had died* (in Newitt 1995, p. 255). The droughts in the eighteenth century were particularly severe and may have resulted in the drying out of the freshwater lakes in the Chibuene area (Ekblom and Stabell 2008).

The embeddedness of environmental insecurity in the Chibuene landscape created a flexible social and political system that was potentially adaptable to crises. From the archaeological material we know that Chibuene was entangled in the power politics of other entities in the larger region. Sixteenth century documents report how rulers in the interior states, such as Quiteve and

Resource utilisation over time in Chibuene

Fig. 2 A comparison of resource utilisation over time based on the bone assemblage from the archaeological site (700–1700 AD) and the resource use assessment (Berger 2004)

Monomotapa (Fig. 3) provided personal guarantees for the regularity of rains (Dos Santos 1609[1964]; Huffman 2009), but crises may have led to political fragmentation and population dispersal. In the coastal communities chiefs did not have the same political (and environmental) control as the larger centres. Rainmakers counteracted the authority of the chiefs and chiefdoms were segmentary political entities that easily broke up into smaller units (Newitt 1995). Muslim leaders in coastal trading centres, such as Sofala (Fig. 3), may have had analogous roles to those of rulers in interior centres (Dos Santos 1609[1964]). Similarly, Portuguese estate holders in the Zambezi Valley were sometimes regarded as spirit mediums and rainmakers (Newitt 1995). An association between politics and rain has been continuously reinvented in history. A number of new cults and spirit possession rites appeared during the famines and social unrest at the turn of the twentieth century (Young 1977). In Chibuene rainmaking ceremonies were carried out in the past, but there is disagreement whether they are still being carried out (Ekblom 2004).

What are the Strategies for Reducing Vulnerability?

Here, I will focus on livelihood strategies for building resilience. These include a wide use of resources, local and extra-local social networks, the possibility of working for

food or food entitlements (Sen 1981) and investment in long-distance trade networks (see summary in Fig. 4).

Diversified Use of Resources

The diversified use of resources should be seen as a constitutive part of the farming economy of Chibuene over time and in itself a source of adaptability (see Fig. 4). In Chibuene today wild plant resources are used throughout the year as a complement to daily diets (Fig. 2) and are particularly important in the months of scarcity (October–November and February–March) (Berger 2004). Shellfish harvesting is a household subsidiary and the many shell middens on the archaeological site attest to its importance historically. The bone and shell assemblages from the archaeological site show that people practiced a broad subsistence economy including the rearing of domestic animals, such as sheep, goat and cattle, and broad utilisation of marine fauna, including various types of fish, shark, dugong, turtle and crab (Badenhorst et al. 2011). Historically, cattle may have been an important means of risk buffering (i.e. stores, Fig. 4), since in times of need cattle could be traded, however, at present cattle are not kept in the area. Alongside cultigens such as sorghum and millet, wild plant resources were important in both farming communities and larger centres as suggested by

Fig. 3 Trade and exchange routes 1700–1900 based on Liesegang (1895) with additions. Trade in slaves occurred until the 1870s, but a clandestine slave trade continued into the twentieth century (Harries

1981). Migrant labour was common from the 1870s onwards. Note that the routes for migrant labour are not shown on the map

archaeological data (Jonsson 1998) as well as written sources (Dos Santos 1609[1964]; Young 1977). Many interviewees related how in the past, Chibuené villagers were able to live mainly on wild resources. One elder also stated that in the past most of the agricultural products were sold to the shops and household subsistence consisted mainly of wild resources (Ekblom 2004).

Local and Extra-Local Social Networks

Household sharing is an important way of risk buffering in the local economy in Mozambique (i.e. claims and access, Fig. 4). Feliciano (1989) has shown the importance of domestic exchange, based on kinship and marriage alliances, that occurs both between households within villages

Fig. 4 A conceptual representation of assets and capabilities in Chibuene over time based on Chambers and Conway (1992)

and across larger entities. Such exchange can be said to have been institutionalised in the traditional economy and are equivalent to social capital (Scoones 1998). Kinship-based social and economic assistance continues to be important, together with other non-family forms such as community participation, church relations or formal inter-household exchange. Social networks in Mozambique are crucial as state-organised social services are not in place (Gallego and Mendola 2011). In a recent survey in Mabote, c. 50 km inland from Chibuene, household representatives reported that they both gave and received food and money from other households (Hahn et al. 2009). Although this issue was not directly pursued in our interviews, one elder stated that household assistance was common in the past, but rarely possible today.

The longevity of local and extra-local social networks is suggested by both archaeology and written sources. Erskine (1875), who travelled the Vilanculos region in 1871–1872, remarked that the coastal populations were dependent on the area around the Govuro for their supplies. Close contact between the interior and the coast is also archaeologically confirmed in links between Chibuene and

Manyikeni, 50 km inland (Barker 1978; Sinclair 1987). This network of exchange was mentioned in the interviews: when ships came to Chibuene, villagers went to the interior to obtain animal skins for exchange. This network now appears have faltered—wild game constitutes a very small part of the diet in Chibuene today (Fig. 2) and marine resources are rare in Manyikeni (Berger 2004). Meanwhile, exchange trade networks between Chibuene and the archipelago have been and remain important; one woman stated that Chibuene villagers and the people in Bazaruto “are the same”, which suggest that social bonds between the households on the island and the coastal mainland are very strong.

Investment in Long-Distance Trade Networks

In 700–1000 AD, Chibuene was a point of connection between the interior of southern Africa and coastal centres further north. These trade networks connected Chibuene with the Indian Ocean trade (Sinclair 1987; Wood 2012) (Fig. 3). Glass beads and other goods were exchanged for ivory, animal skins and slaves, as listed in written

documents (Wood 2012). However, trade probably also included movement of labour, natural resources, cattle, marriage alliances and food resources (i.e. convertible assets, Fig. 4). The base for this argument is that, as surplus production could not be stored over a long period, it was invested in the building and confirmation of regionally extended social networks that could be invigorated during times of scarcity (again relating to access and claims, Fig. 4). The trade in resources was a vital part of the farming economy, not only in times of stress, but as an integrated part of everyday strategies for livelihood security (Duarte 1995; Ekblom 2004).

The trade in exotic trade goods diminished after 1000 AD, probably as the result of a breakdown in the trading routes of the Indian Ocean (Wood 2012). However, the long-distance social networks and trade of natural resources to and from the Chibuenne area continued. Settlements on Bazaruto Island traded shellfish to merchants and supplied the mainland with trade goods in the sixteenth century (Barbosa 1516[1964]). In the nineteenth century, shellfish from Bazaruto Island was exported directly to India. During a famine, in exchange for grain, a large batch of shellfish from Bazaruto was traded with India resulting in considerable profit for the Indian market (Rita-Ferreira 1999).

Another indication of the importance of trade for the local economy has been the readiness of local farmers, from the sixteenth century onwards, to experiment with new crops and to take advantage of new demands (Dos Santos 1609[1964]; Beach 1994; Newitt 1995). Maize was grown in large quantities in the Limpopo Valley already by 1650 AD and it has been suggested that cultivation of maize there was orientated towards trade (Ekblom et al. 2011). Cashew nuts were introduced gradually from the sixteenth century onwards. In the 1860s, Inhambane was exporting rice, maize, cassava, millet, groundnuts and cashews on a large scale to foreign merchants (First 1983).

Labour Migration and Working for Food or Food Entitlements

Labour migration has been an important part of household economies since the late nineteenth century (First 1983; Harries 1994; Newitt 1995). Industrial growth in South Africa provided new opportunities for salaried labour and was promoted by the colonial administration. Migration for access to resources or exchange networks was not a new phenomenon, however. Written sources from the Zambezi Valley relate how people contracted themselves to service with chiefs (Newitt 1995). Typically farmers and hunters paid tribute to chiefs in the form of resources and produce, and there was a practice of tribute labour on fields belonging to chiefs (Dos Santos 1609[1964]; Junod 1927).

In bad times the stores of the chiefs could go some way to provide for a population in need (Dos Santos 1609[1964]; Huffman 2009). Thus, working for or paying tribute to a chief was investing in food entitlements.

Most households in Chibuenne have male members who worked in the mines in southern Africa. In local tradition, in the past, men went to the mines to obtain money for bride wealth. The number of Chibuenne households that receive remittances from family members working abroad today is unknown, but in the Mabote survey 62% of households had family members working elsewhere (Hahn et al. 2009).

As farming rarely produces surpluses, salaried labour becomes crucial for household expenses. For example, in the Mabote survey only 12.1% of households stated that they were solely dependent on farming as a source of money, while 87% of households relied solely on family farming for food (Hahn et al. 2009). This has been a reality for Chibuenne households since colonial days, when a monetary hut tax was imposed (Newitt 1995). In Chibuenne, fisheries provide additional income and shellfish collecting (i.e. convertible asset, Fig. 4) was important as a source of income in the past. Revenues from the sale of both maize and cashew nuts were important earlier in the twentieth century but today villagers report that there is rarely any agricultural surplus to sell. Profits from cashew growing have decreased due to disease affecting the trees (Ekblom 2004) along with a dwindling market for cashews after the civil war (Azam-Ali and Judge 2004).

DISCUSSION

Long-Term Effects of Socio-Environmental Change

Socio-Environmental Insecurity

The repeated droughts, many of them severe particularly around 1700 AD, resulted in the reduction of forest vegetation in Chibuenne from 1400 to 1600 AD onwards (Fig. 5). Coastal forests are now non-existent in the area but were common before 1400–1600 AD, when vegetation consisted of a mosaic of coastal forest interspersed with miombo savanna. The reduction of forests was most likely a natural response to climatic variability, made irreversible through the unstable soils (Ekblom 2008). Droughts and environmental deterioration co-occurred with warfare and social unrest. In the eighteenth century the northward migration of the Tsonga caused considerable turmoil. This continued with the military expansion of the Nguni in the nineteenth century and the subsequent internal struggles of succession in the Gaza state (Liesegang 1895; Newitt 1995; Ekblom 2004).

Vegetation history: pollen and charcoal

Fig. 5 Pollen diagrams from Lake Nhaucati (*left*) and Lake Xiroche (*right*). The decline in forest (riparian) taxa from 1400 to 1600 AD onwards is shown in both diagrams. The differences in the diagrams can be explained as that Lake Xiroche, being smaller than Lake Nhaucati, represents local vegetation, while Lake Nhaucati displays changes over a larger area. *Brachystegia spiciformis* is included in the savanna group. Explanation of the diagram: *vertical axes* (from *left to right*) depth (cm from surface), estimated age depth (age AD) and the

lithology with legend below. *Horizontal axes* The percentage distribution of the main pollen groups, arboreal pollen (AP) (*dark grey*), grass (*grey*), herbs (*white*) and ungrouped (*black*). *Black silhouettes* Representation of riparian (forest), savanna (miombo) and generalist taxa in percentages. Concentration of total pollen and cereal pollen is shown in the middle and microscopic charcoal (*black bars*) to the right. For methodology, see Ekblom (2008)

There are many possible explanations for this socio-political instability and they should probably be seen as converging. The expansion of the ivory trade from 1750 may have been a response to insecurity but was also driven by demands from the global market. The ivory trade itself is thought to have destabilised power relations, agricultural production and the domestic economy in southern Africa (Eldredge 1995; Newitt 1995). Socio-political unrest increased the supply of slaves from Delagoa Bay from the end of the seventeenth century, but this was also in response to the global slave market (Eldredge 1995). The slave trade, in turn, affected local production and socio-politics. The many periods of social and political unrest also resulted in a gradual breakdown of regional exchange networks. According to some Chibuene elders the coastal network broke down during the Nguni expansion when traders stopped coming to the area. The interior networks also seem to have weakened in the beginning of the

twentieth century. In the nineteenth century domestic stock became severely diminished in the Vilanculos region due to repeated raids by the Nguni (Erskine 1875; Ekblom 2004). At the same time rinderpest, which spread in the region at the end of the 1890s, is estimated to have killed about 80% of the cattle population (Young 1977). As discussed earlier, cattle are rarely seen in the area today.

Socio-environmental instability led to an intensified outtake of natural resources and a diversification of livelihoods. Colonial hut taxes and labour codes imposed at the end of the nineteenth century resulted in increased labour migration. However, labour migration may also have been a response to environmental insecurity. In the twentieth century peaks in labour migration corresponded to drought years (First 1983). Commercial hunting, not only for ivory but also for meat and skins, intensified in southern Africa at the end of the nineteenth century (Carruthers et al. 2008). Young (1977) argues that commercial hunting was a

response to socio-environmental instability. The export of shellfish from the Vilanculos region in the nineteenth century is another example of intensification: shell middens in Chibuenne show that oysters gradually became smaller and had to be fished from deeper depths, possibly suggesting the overexploitation of shellfish (Ekblom 2004).

Biodiversity Loss

The gradual reduction of coastal forests in 1400–1600 AD probably reduced the living range of wildlife populations. All elders we interviewed stated that Chibuenne used to be forested and that there was more wildlife in the past (referring to pre-colonial or colonial times). Wildlife populations are generally assumed to have diminished in the course of the nineteenth and twentieth century owing to commercial hunting, but there is little information about population numbers in the past. Ivory was probably the main export item from Chibuenne in 800–1000 AD. In the nineteenth century, the Bazaruto Archipelago is known to have exported large amounts of ivory that originated on the mainland (Pélissier 1984). However, in living memory wildlife has been abundant only in the interior (see above) and has represented a very small part of diets in Chibuenne over time (Fig. 2).

The breakdown in trade routes, loss of domestic livestock and decrease in biodiversity has created a higher dependence on local agriculture. At the same time socio-environmental instability may have caused an aggregation of populations in the coastal areas. One elder stated that the population has increased in the area in his lifetime (Ekblom 2004), but there are no numbers to qualify this. The increased dependency on local agricultural production may explain the absence of *B. spiciformis* in the area today (Massinga in Ekblom 2004). This species is resilient to droughts and fire, as it reproduces vegetatively. It was probably cleared in connection with an intensification of agricultural activities. As there were no techniques for irrigation or manuring, a higher dependency on local agriculture could only be met by extensification (Scoones 1998), i.e. more fields in a larger area and a diversification of crops. This may explain the increased popularity of New World crops such as cassava and maize, as well as cashew nuts in course of the nineteenth century. Cashew expansion may have been specifically orientated for market sale (Newitt 1995). Cassava is a drought-resistant crop whose expansion today is usually explained as a response to famine and drought (Carter and Jones 2003; Hillocks 2002). Maize, unlike sorghum, millet and cassava, can be eaten when still immature; it is easier to store and can be sold to the shops for money or exchanged for other food. One elder from Chibuenne related that in the past, to counteract seasonal availability of food resources, surplus

maize was sold to the shops and bought back again when food was scarce (Ekblom 2004). Although maize cultivation may have been a successful way to counter vulnerability, it is an environmentally exhaustive crop. If farmers do not manage to store surpluses of grain for the coming year farmers have no choice but to plant maize the next year. This means that a short-term response to temporary vulnerability in a household can easily lead to a systemic vulnerability (see Crais 2003).

CONCLUSION

Mitigating Vulnerability and Building Resilience: Learning from the Past

Many assessments of vulnerability focus on household subsistence and agriculture. An estimated 90% of the active Mozambique population are employed in the informal sector and the majority of these are assumed to be employed in domestic agriculture (UNDP 2005). However, the historical analyses presented here suggest that this assumption may be partly incorrect. In southern Mozambique, most households have been dependent on migrant labour or other sources of income since the beginning of the twentieth century. Migrant labour is not just a response to temporary vulnerability, but should be seen as an ever present complementary strategy for livelihood security (Walker et al. 2004, p. 49; Macamo Raimundo 2009; Gallego and Mendola 2011). Such approaches need to be more clearly addressed in livelihood analyses, and the reliability and geographical extent of social networks (i.e. migrant labourers, family ties in other regions etc.) should also be explored.

The commercialisation of natural resources has been part of local economies since the beginning of the twentieth century (or longer, depending on the definition of the term). The importance of commercialisation in reducing vulnerability was stressed in the interviews in connection with maize. Shellfish harvesting is another example of the importance of trade through channels uncontrolled by authorities. A further example is the cultivation of cashew nuts, which began as a local initiative by local farmers (Newitt 1995). These small-scale enterprises should be encouraged, as informal economies and trade/exchange outside official markets are important means of risk buffering. As these do not appear in official statistics or quantitative analyses, they may be overlooked as possible solutions (see also Chambers and Conway 1992; Reardon 1997; White 2002).

At present the local labour market is expanding as the tourist industry is growing. In 2001, many Chibuenne villagers (although having experienced the negative effects of

this development) had great hopes of a more secure future in that they expected that local opportunities for employment would increase. However, the tourism industry is also highly sensitive to environmental insecurity. Thus, revenues or salaries from employment based on tourism may not be sufficient as a means of risk buffering unless they can be saved or invested in anticipation of bad years.

The long-term analyses presented here highlight the interplay between natural and social disturbances on several temporal and geographical scales. The causes and solutions to present-day vulnerability reside in a complex set of relationships, so-called contingencies, many of which are historically rooted. Vulnerability is a long-term feature in this landscape and livelihood strategies for reducing vulnerability are institutionalised in society as both tradition and practice. These strategies are examples of the social capacity for building resilience (cf Berkes et al. 2003). The long-term effects of environmental and social insecurity and the resultant biodiversity loss should be viewed as negative contingencies with effects that are still being played out today. Sensitivity to such historical contingencies is required both for understanding and for alleviating vulnerability. This study also emphasizes that while strategies for reducing vulnerability can be effective in the short term, they can inhibit the capacity to build resilience over the long term, thus underlining the importance of including a historical time depth in assessments of livelihood security, resilience and sustainability.

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