



# Climate and environmental change and food security

## *Some conceptual considerations*

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### **Abstract**

For many years issues of climate and environmental change have been mainly seen from a perspective of mitigation : what can we do to prevent climate and environmental change from happening? But the major questions, ever since the scientific community acknowledged that climate change is real, have now changed fundamentally. Today's major concerns are: how can societies adjust, adapt to or at least cope with the impacts arising from climate and environmental change?

Research on climate and environmental change and the impact on food and livelihood security needs to incorporate these changes. This not only has to do with changing perspectives about climate change, biodiversity conservation and environmental research; it also has to acknowledge emerging new paradigms in the field of food and livelihood security research that have been developed over the past 30 years, and that have much relevance for Pacific Island countries.



## Introduction

It has become clear and beyond reasonable doubt that the Earth's atmosphere and oceans are warming. Impacts are felt everywhere. Other serious environmental changes include such phenomena as population increase, habitat degradation, loss of biodiversity, invasive species and extreme events that, in concert with climate change, have made, and continue to make, life and food and productive security increasingly problematic.

The challenge ahead, when looking at climate and environmental change and its impact on food security for the societies of the Pacific Islands, is to embrace a more holistic community-based approach that takes into account the cultural, environmental and economic realities of largely indigenous small island societies and nations that continue to depend on a mixed subsistence and commercial economy.

Long before vulnerability to natural hazards became an object of social science investigation, Bruce Currey (1980) reported evidence of famine in the Pacific. 'This famine vulnerability is because of the prevalence of natural disasters and the limited ability of the different island social systems to adapt to these events' (Currey, 1980:447). The literature on the economic and environmental vulnerability of Small Island Developing States (SIDS) also frequently highlights small islands' exposure to natural hazards and their difficulties in responding adequately to such shocks. Two aspects contradict such an enhanced vulnerability of small island societies and their food security to natural hazards: frequent exposure to risk and shocks actually should enhance coping mechanisms to such events. The more often people are exposed to such shocks the better they learn to cope. It also seems that today Pacific Island societies are not suffering from famine or food crisis or even from under-nutrition to an extent we know it from many parts of Africa and Asia. An enormously high share of Pacific Island populations, indeed, suffers from lifestyle diseases, caused by obesity rather than insufficiency of food supply, though doubtless indicative of malnutrition of a quite different type. This does not necessarily mean that climate change impacts and food security are irrelevant for SIDSs. It surely means that vulnerabilities that emerge are complex and beyond the traditional perception of food crisis, hunger and starvation. Although changes in agricultural production systems are surely important aspects to consider, changes in access to resources, dependency on food imports and changes in international food systems and prices are equally important.

## Changing paradigms in food security research

It seems to be obvious and urgent to analyse how food *production* is affected by climate change and how this affects Pacific Island countries. At the same time, however, it should be noted that food security is very much about *access to food*, about rights over land and marine resources, and about the factors that enable people to grow their own food or disable them from doing so. Food security is about decent incomes enabling people to buy whatever food and other basic items they need. Food insecurity is not only a result of too little food being produced. We even know of situations where people starve right next to supermarkets with all sorts of food available to buy. Hunger is often the result of poverty rather than insufficient food production (Dreze & Sen, 1991; Sen, 1981).

In his book *Poverty and Famines*, the Nobel Prize laureate for Economics in 1998, Amartya K. Sen, challenged the paradigm that hunger, starvation and famine are mainly caused by insufficient food

production (Sen, 1981). His analysis of the Great Bengal Famine of 1943, as well as of famines in Africa and Bangladesh in the 1970s, concluded that often it was not failure of food production so much as other factors that caused famines. In Bengal, for example, food production was not lower in 1943 compared to earlier years. Compared to 1941, a year without a famine, it was in fact higher: the 1943 rice harvest Bengal's farmers brought in was a record high. Despite this, about 3 million people died of starvation in Bengal in the same year. The reason for the Bengal famine was – according to Sen – that the rice price increased in Bengal after 1942. Within about a year it shot up, by up to eightfold in some regions. In Sen's analysis, starvation did not stem from insufficient food production; rather, hunger and famine occurred because many people did not have the change to buy the food that actually was there. Sen calls this a decline in entitlement over food, a Food Entitlement Decline (FED), a decline of people's capabilities to buy food or to produce it (for recent discussions of this approach see Elahi 2009, 2006; Rubin, 2009; Sohlberg, 2006; Yaro, 2004).

Entitlements over food can be secured in various ways, one of which is access to land and the ability to grow one's own food. Others are sufficient financial resources to buy food or eligibility to receive free or subsidised food through government programmes. Decent employment, returning enough so that people are able to satisfy their basic needs, also constitutes an entitlement, as do social security systems that offer support when people, for whatever reason, are unable to satisfy their food and other basic needs.

From Sen's detailed analysis we can learn that hunger and starvation did not hit all groups in society in the same way and to the same extent. When rice prices skyrocketed in Bengal, the farmers and grain merchants did very well. However, artisans, fishermen, landless labourers and other people who did not grow food, but had to buy it, suffered. Their income did not increase enough to compensate for the steep increase in rice prices.

After Sen's analysis had been published, almost no publication on issues of food security was able to ignore his »Entitlement Approach«. It was surely Sen's achievement that he showed to the world that hunger has many sides, and that insufficient food production is only one of these. He directed attention to the whole food system: to the production systems, and to the distribution and consumption of food. He highlighted the hitherto ignored fact that hunger often has much to do with prices and income, with distribution of and access to food and the positions people have in the economic process.

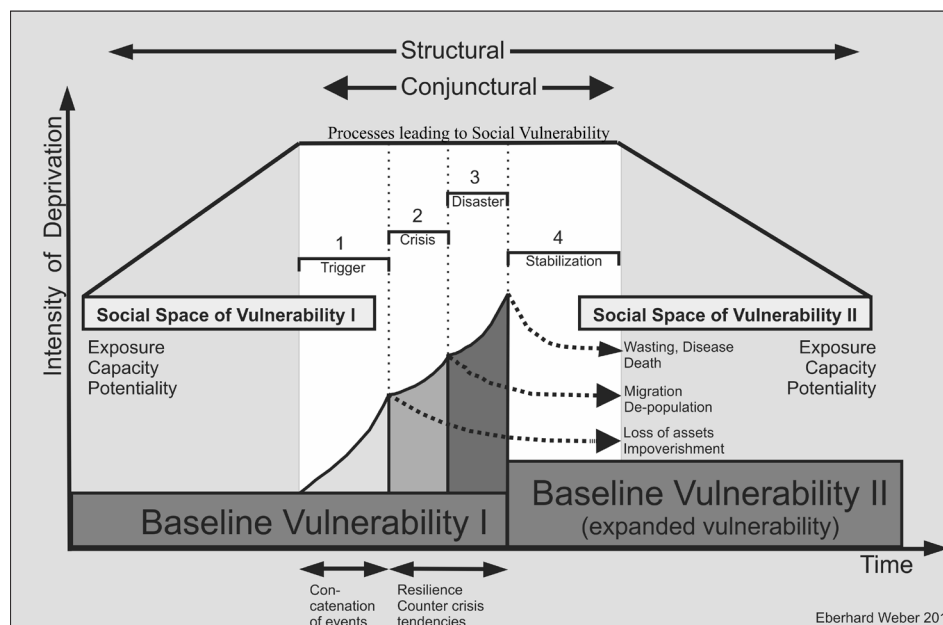
### **The vulnerability of marginal people**

The British social scientist Robert Chambers (1989) highlighted the point that vulnerability to food insecurity and famine has two sides: an external one of risk, stress and pressure individuals and groups are exposed to, and an internal one, which constitutes capabilities, the abilities of people and groups to cope with such external pressures. Vulnerability is much more than the economic status of poverty. It is – beyond an economic dimension – related to access to natural resources, and it covers a wide range of social, cultural and political aspects. Analysing these helps us better to understand which people are most vulnerable and why.

Pastoralists who are frequently exposed to droughts in arid areas of the world might be able to respond to such risks by leaving the drought-prone regions during the dry season and moving to areas, where sufficient water and fodder for their animals are available. However, as soon as these adaptation

strategies to natural risks are compromised by political, economic or social change, then hunger becomes the imminent threat. This happened in Africa, when colonial powers rather arbitrarily drew borders that restricted the movement of pastoralists, or in India, where their movements became restricted as a result of the Green Revolution when pastures were converted into agricultural land.

**Figure 1** The structural dimension of hunger



Source Adapted from Watts & Bohle, 1993b.

The German Geographer Hans Georg Bohle and Michael Watts from the University of California at Berkeley took Chambers's definition of vulnerability and developed a concept producing a better understanding of 'structural dimensions of vulnerability' (Watts & Bohle, 1993a, b). They highlighted the severe consequences when people are not able to recover from past events of deprivation quickly and sufficiently. According to them, social vulnerability to food crisis has a distinct structural dimension, which is created over a long time and which is very difficult to overcome (Figure 1). Inappropriate coping mechanisms might protect people in the short run against all sorts of external stress. Such crises increase what Watts and Bohle (1993a, b) call people's baseline vulnerability and are effective long after a food crisis seems to be resolved. Another important insight is that in most cases a food crisis is the result of the accumulation of several negative events. In most cases a single event, such as a drought, or even climate change, is not enough to trigger such a crisis, but such events affect people, who already have a high-level baseline vulnerability, built up over a long period of time as cumulation or concatenation of a number of adverse events that occur parallel or in quick succession to each other. It then needs just a trigger, which in itself might even be a relatively minor event, to reach the stage where people's coping capacities are no longer sufficient to withstand the external stress. This then is when a catastrophe strikes.

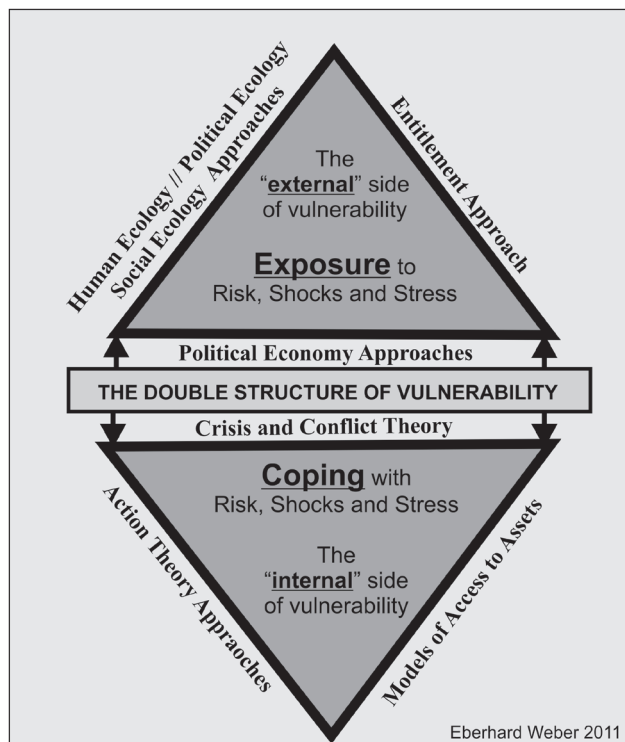
Such baseline vulnerability or susceptibility turns into a food crisis and famine when additional critical events happen that are beyond people's coping capabilities. Such trigger events can be droughts, earthquakes or floods, but also war, civil war and economic crisis. Now, people no longer

have ways to react to the crisis and prevent negative outcomes; food systems can then collapse completely and famine is the result.

It is surely a step in the right direction when social scientists like Sen, Chambers, Bohle and Watts highlight the connection between the way societies organise themselves and vulnerability to hunger. Solutions proposing to end hunger by producing more and more food, but failing to articulate social inequality, unequal distribution of means of production, incomes, wealth and other assets that provide life chances, do not really address the real causes of hunger and malnutrition. It also helps to understand that hunger is a multi-dimensional phenomenon. Looking at climate change, at insufficient food production, at natural hazards or at economic crises on their own is not enough, but it is essential to elaborate how several different trigger events lead to a crisis from which people no longer have a way out. Furthermore, as people weaken through coping, their baseline vulnerability increases. While coping, they lost assets, became impoverished, became sickly, and saw the destruction of social networks through migration and death of family members. Even when the crisis has been overcome, people and communities are weaker than before. Their baseline vulnerability has risen and in future it requires less to trigger the next crisis.

According to Bohle and Watts's 'double structure of vulnerability' the external side of vulnerability, the risks, stresses and shocks people are exposed to, can be analysed using human, political and social ecology approaches, entitlement approaches and as well with political economy approaches (Figure 2).

**Figure 2** The double figure of vulnerability



Source Adapted from Bohle 2001

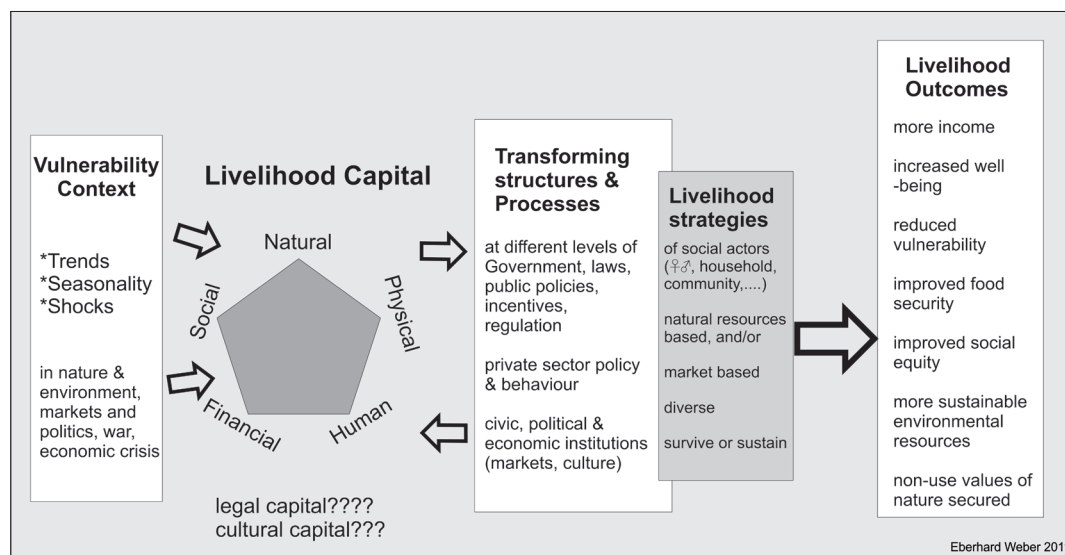
Human ecology approaches refer to the application of ecological concepts to social processes. Human ecology studies the relationship between people and their social and physical environments. For the present context, one may define human ecology as ‘a way to understand both the risk of environment which vulnerable groups confront, and the “quality” of their resource endowment’ (Bohle et al., 1994). In later conceptualisation of the ‘double structure of vulnerability’ Bohle replaced human ecology by political ecology, to highlight that vulnerabilities are the result of power relationships that have impacts on environmental change (Schubert, 2005).

The entitlement approach, as highlighted above, expresses changes in people’s exchange relationships, in particular in changes of process for commodities and people purchasing power. Entitlement decline, however, can also exist in the form of declining access to productive resources (such as land, fishing grounds) and to a decline in transfers from state (e.g. social security) or relatives (e.g. remittances). Sen (together with Dreze) also enlarged the entitlement approach to intra-family entitlements, i.e. structures and processes that govern food distribution within a household (e.g. gender and age-based mechanisms of food distribution).

From a perspective of political economy, exposure to risks, stress and shocks is seen as a result of power structures in society. The perspective of political economy provides the macro-structure in which resource endowments, i.e. the distribution of assets, and patterns of entitlements are embedded. Political economy is concerned with the distribution of power in society. It looks at long-term structural developments, including class processes, conflicts and crises, which cause and perpetuate existing social inequalities, access profiles and processes of marginalisation.

The ‘internal’ side of vulnerability, coping and adaptation can be analysed with the help of approaches that deal with how people reinforce claims, how they can improve their position in society, and how they can get better access to resources and support structures. It is rather coherent that approaches about people’s social vulnerability lead to the Sustainable Livelihood Approaches (Figure 3).

**Figure 3** Sustainable livelihoods



Source Adapted from Carney et al., 1999.

After Sen and Chambers, various sustainable livelihood approaches took up perspectives integrating them into concepts much broader than food security (Bohle, 2009). Many authors highlight the importance of different types of capital that help people to secure sustainable livelihoods (Figure 3). These capital types can be understood as bundles of assets that help people to reduce their vulnerabilities. A mix of various assets (or 'portfolios') can enhance security as it is a suitable measure to spread risk and reduce dependency on a particular capital or asset. Those sustainable livelihood approaches usually identify **natural capital** (access to land, marine and other natural resources and the quality change of these resources), **physical capital** (an asset arising from access to infrastructure and the quality of it), **human capital** (skills, formal qualifications, health, bodily ability), **financial capital** (incomes of all sorts, savings and assets that can be converted into money whenever need arises), and **social capital** (the belonging to formal and informal social networks that provide support, trust and security to overcome difficult situations).

There are good reasons to discuss whether *legal capital* could be another important aspect; it would refer to legally enforceable claims and support mechanisms, such as human rights, but also to social security mechanisms. In addition, there seems to be good justification for understanding *cultural capital* as a cross-cutting asset important enough to constitute a category on its own.

### **Climate Hazard or economic injustice, or why do people go hungry today?**

The complexity of new approaches does not make things easier. At times when hunger and famine were seen as the result of insufficient food production, or caused by natural hazards that destroyed crops in the fields, it was much easier to draft 'solutions' to the problem: of looking for ways to increase food production or to establish effective relief in cases where crops were destroyed in the fields. However, it seems that yesterday's (previous) 'solutions' did not always help; in many cases they even worsened the situation. Just to build some dams to improve irrigation agriculture, to develop new seeds that have higher yields, to train farmers how to make better use of fertilisers and pesticides sounds impressive, but there are plenty of reports that the Green Revolution often caused more damage to the food security of especially the poorest sections of society than it did help them (for different perspectives on the Green Revolution see, among many: Baker & Jewitt, 2007; Brown, 1970; Chakravarti, 1973; Frankel, 1971; Ladejinsky, 1970; Shiva, 1992; Vasavi 2009).

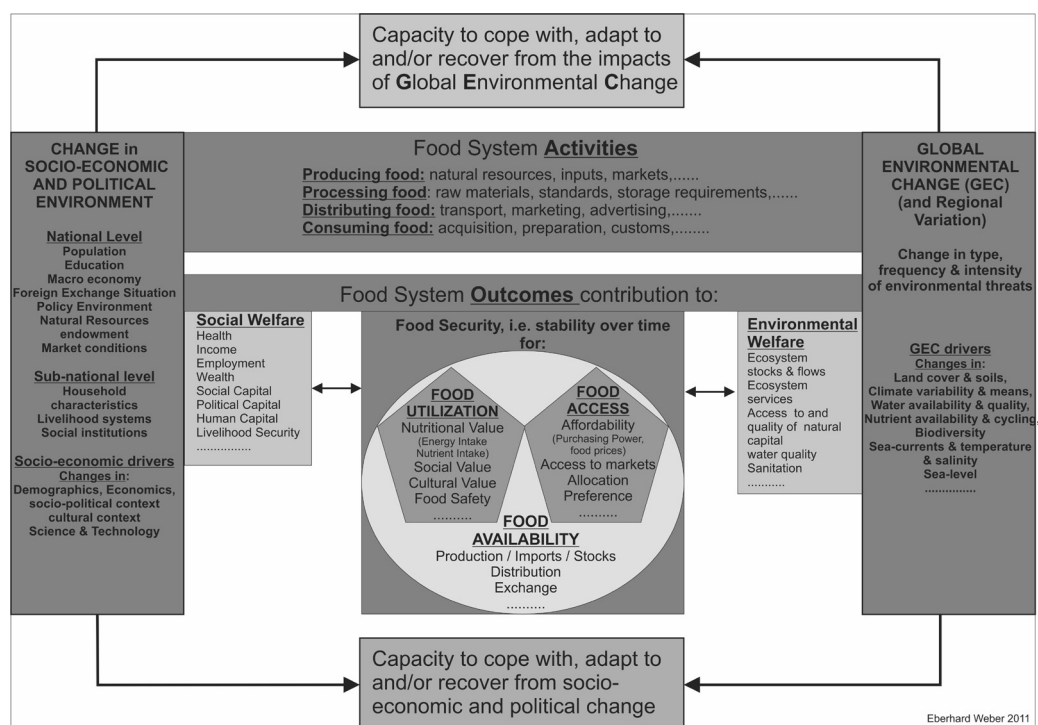
Modernisation or adaptation of food production, even today, is often what first comes to people's minds when it comes to issues of food security and climate change. When impacts of climate change on food security are discussed, usually the major emphasis is given to agricultural production. This seems reasonable as a changing climate foremost has an impact on agricultural production systems. However, it would be many steps backwards if we were to ignore the advances that have been achieved in the past three decades in the fields of food security research. These major achievements include realisation that a) economic, social and cultural access to food is at least equally as important as the sheer (physical) availability of food; b) not everybody is vulnerable in the same way and to the same extent to hunger and food insecurity; c) a food crisis is the cumulation of a number of events that increase vulnerability step by step, sometimes over a long time; d) a small trigger event can be sufficient to cause a food crisis; and e) even when societies and individual people have recovered from an acute crisis, their baseline vulnerability is usually much higher than it was before the crisis. It does not need much to trigger another crisis in future. It is therefore essential to analyse the entire food system, from

production through distribution to consumption, when analysing climate change impacts on food security.

A food system approach as presented in Figure 4 has the supply of food (availability) as well as demand side (access to food, establishing control over food) in its centre. It also looks at food consumption and utilisation, which includes nutritional, social and cultural aspects of the food system as well as food safety. A food system has strong impacts on social as well as environmental welfare and at the same time is influenced by both.

This food system is exposed to external factors that pose potential threats, risk and pressures on people to become food insecure. These factors have an impact on how well people can cope with, adapt to and recover from the impacts of environmental change as well as to socio-economic and political change. These external factors can best be described as changes in the social–economic and political environment as well as global environmental change and its regional variations. Instrumental are socioeconomic as well as environmental change drivers, i.e. those factors that alter the external side of people’s vulnerability. The system looks at capacities of economies and individuals to cope with adverse events, to adapt to changing social, economic and physical environments and to become even stronger, even more resilient to external threats and risks.

**Figure 4** Food system to research food insecurity arising from climate change



When looking at food security issues related to climate change, we need to reflect on a range of matters: how climate change impinges on people’s access to food, who are the most vulnerable groups exposed to these threats, what are the mechanisms and processes that constitute vulnerability, how will exposure to the impacts of climate change increase people’s baseline vulnerabilities, and what might be potential triggers that can lead to a food crisis. In the analysis of various factors,



multi-level approaches seem to be crucial, that is approaches that also look at food dependencies, especially in the case of countries or regions that are heavily dependent on food imports.

Only if we have a wide range of information will it be possible to make reliable statements on the impact of climate change on people's food security. A farmer in Viti Levu might be able to adapt to climate change by using improved seeds that are better adapted to changing climatic conditions. Here, agricultural research along with extension and training might meet the needs of the situation.

However, for people living in low-lying, flood-prone squatter settlements that need, because of environmental change, to be resettled to the outskirts of cities far away from people's sources of livelihood, agricultural modernisation achieves little. It might even be instrumental in food price increases as a result of higher production costs. Many societies in the Pacific Islands depend to a large extent on food imports. Here, not (only) own agricultural and fisheries production is what constitutes food security, but secure supply of food at low import prices as well as favourable balance of payment situations are equally (or even more) important. Import substitution as a mean to reduce external dependency might show a possible direction, but might turn out to be more costly in the long run than continuing food imports.

Important questions are also how societies in the Pacific can cope with extreme (weather) events, with tropical storms, drought and other hazards. How easily can people cope with the destruction of their crops? What support can they get from their own families, governments and NGOs when major, widespread disasters strike? How resilient are they and what is it exactly that constitutes resilience?

Tropical cyclones, king tides, storm surges, droughts, earthquakes and tsunami and other natural hazards are nothing new for people of the Pacific Islands. Probably since the first settlers arrived in this part of the world some 3,500 years ago, the islanders were, again and again, exposed to such extreme events. They 'invented' mechanisms that helped them to cope and also to adapt to changing environments: climates, sea levels, biodiversity. Looking at future challenges requires bringing together knowledge of the past that is, unfortunately, in the process of being lost; knowledge that has the potential to make people more resilient and less susceptible to the impacts of climate change; applied knowledge of the people that links with knowledge of modern science and technology.

### **Where to go from here in the Pacific Islands**

Societies in the Pacific Islands have undergone extremely rapid change in the past one-hundred years. Individualisation, commercialisation and urbanisation have weakened those coping mechanisms that were based on community solidarity, subsistence production and exchange in rural, small communities. People were living in big family networks, and obligations that arose were not so much individual decisions as ritualistic enforced network outcomes. However, already then as well as today people were agents of their destinies. People are not victims of natural hazards, nor of social structures. Social structure is both the medium and the outcome of social action, of group action. It therefore makes much sense to analyse past and present support systems to see how they have changed in modern times.

To obtain a better picture of how ancient knowledge can contribute to solutions of present and future challenges, a review of such indigenous knowledge systems stands right at the beginning of

any scientific effort. After having gathered a rough overview of ethnographic material, it is already possible to say that there is a wealth of such material, but little systematic work on whether such knowledge is still applied and how relevant it is today. Many of the references today call this latter aspect 'ideological reception of the past' by people who have experienced rapid changes in Pacific Island societies over an extended period of time. They are people who are critical of these changes, for very good reasons, and who would love to arrest time. This is by no means intended as a negative statement. To the contrary: if these people were not collecting evidence of knowledge of the past, the knowledge of this knowledge would have been even more erased than it is anyway. However, the material, which is often rather descriptive than analytical, rather anecdotal than systematic, can be only the starting point of an enormous effort to bring together systematically whatever is left of such knowledge, look at it from an analytical and even more from a conceptual perspective to determine how this can still be useful today and what is needed to make this enormous knowledge still available and able to contribute to solution of our present and future challenges.

One of the most comprehensive attempts to bring this knowledge together in a systematic and conceptual way is surely Campbell's report on traditional disaster reduction in Pacific Island communities (Campbell, 2006). The report is on the one hand an excellent review of existing material, bringing together a huge number of relevant publications. More than that, it also provides a structure for what to look at when investigating traditional ways to cope with and adapt to adverse events, such as natural hazards. Food security and various aspects that contribute to it stand at the beginning. The production of surpluses in societies that were mainly subsistence orientated suggests that such surpluses had other functions than to provide cash incomes: they were there to help people to bridge critical times. This strategy goes hand in hand with knowledge about food preservation and storage. What Campbell calls 'Agricultural Resilience' (Campbell, 2006:15) follows increases in crop and location diversity to minimise or to spread risk, a principle many subsistence economies and even small commercial agricultural systems know and where livelihood security is more important than profit maximisation. Mutual help was a strong feature and the belonging to social as well as spatial networks was constantly re-inforced through rituals that strengthened reciprocal relationships. Thaman (e.g. 1982a and b, 1979) stresses in a number of publications the need to preserve the 'time-tested, socially and environmentally suited Pacific Island food systems' (Thaman, 1982a:109). Societies were almost entirely self-sufficient and often described as being in a state of subsistence affluence (ibid.:109). Local communities are described as highly resilient to natural hazards and external intervention (e.g. in the form of inappropriate disaster relief) would weaken this resilience, leading to changes in nutritional preferences and undermining community solidarity (or in today's development language, people's 'social capital') (Thaman, 1982b).

Causes for change of nutritional preferences, loss of traditional practices and knowledge are often not fully investigated and assumptions reflect the critique of authors in a modern, capitalistic mode of production rather than empirical investigation. Here, systematic research about change is required to understand how and in particular why societies are changing, and why systems that provide protection against risks and stress are undermined. One would assume that traditional knowledge, skills and practices have their place in people's lives as long as they are beneficial. Something that has real value for people is not just given up for no reason. It seems, however, that systems that provide protection are indeed weakening and disappearing, without the emergence of adequate modern institutions that would provide similar functions. Here is the area where more research into the causes and direction of social change and their implications for people's security is needed.

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