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Indigenous Knowledge for Climate Change Assessment and Adaptation: Introduction

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Over the last decades, climate variability and, more specifically, global climate change have entered the mainstream of international discourse, reflection and concern. One recent outcome of this global preoccupation with climate has been a growing interest in how weather, climate variability and climate change might be experienced, understood and interpreted by societies and cultures around the world, including those of indigenous peoples. In these diverse ecological, social and cultural settings, what changes are people observing and what responses might be the most appropriate and effective? This in turn raises the issue of what policies and what actions are required to guide adjustments to actual or expected future climate and its effects (IPCC, 2014: 5). To ensure that climate change decision-making recognizes and supports local priorities and needs, it is critical to be aware of what is already being experienced on the ground. Without this understanding, decisions may not only fail to provide assistance to those most in need, but may inadvertently undermine local resilience and increase vulnerability.

This volume presents a selection of case studies that illustrate how knowledge and practice rooted in indigenous communities may inform our understandings of climate change processes, and how indigenous coping strategies provide a crucial foundation for community-based adaptation. It also confronts some recurrent but misleading assertions about climate change impacts and responses with actual accounts from indigenous communities around the globe. It therefore contributes to a newly emerging field that builds synergies among a wide range of disciplines, from both the natural and social sciences, to address climate change assessment and adaptation in accordance with the observations, practices, knowledge and priorities of indigenous peoples.

The Emergence of Indigenous Knowledge in the Global Climate Change Arena

Global climate change was identified in the 1980s as one of humanity's most daunting challenges (see early history in UNFCCC, 1992; Maslin, 2014: 16–19). This recognition led to the establishment of the Intergovernmental Panel on Climate Change (IPCC) in 1988, and the United Nations Conference on Environment and Development in 1992 (Earth Summit, Rio de Janeiro, Brazil) that established the United Nations Framework

Convention on Climate Change (UNFCCC). Since that time, world attention roused by the global climate change debate has largely concentrated on particular areas of the planet – low-lying tropical islands and coastlines, high-altitude zones, tropical forests and the polar regions (Orlove et al., 2014). It so happens that most of these areas, except ice-covered Antarctica, are home to indigenous peoples. Despite the world's growing interest in indigenous peoples and their homelands as harbingers of the impacts of planetary climate change, much work needs to be done to understand their concerns and appreciate their knowledge (see Box 1.1).

Interest in the perspectives and knowledge of indigenous peoples (see Box 1.2) first emerged in certain world regions and on certain themes. In the Arctic, the Earth's northern polar region, indigenous voices were heard loud and clear already by the year 2000, perhaps because the shift in its climate regime has been one of the most dramatic and pronounced on the planet (see Larsen et al., 2014). Owing to these and other factors, polar peoples' observations and concerns about transitions triggered by the changing climate and weather were rapidly reported and were widely circulated in scholarly and political circles (McDonald et al., 1997; Weller et al., 1999; IISD, 2000; Huntington, 2000; Krupnik and Jolly, 2002; Herlander and Mustonen, 2004; Nickels, 2005).

In addition, since 1996, the Arctic has a unique political body called the Arctic Council. It includes eight Arctic nation states as its founding members, several 'observers' (both other states and organizations) and also six 'permanent participants' representing polar indigenous peoples – the Inuit, Sami, Aleut, Gwich'in, other Dene/Athabaskan groups and indigenous nations of northern Russia. The Arctic Council has been very active on issues related to environmental change and it has historically welcomed indigenous peoples' interests and voices, as seen in its seminal *Arctic Climate Impact Assessment* (ACIA, 2005) and several other studies it initiated. The Arctic may be a rare example where a strong consensus has developed among scientists, indigenous peoples, politicians and local governments about the threats brought by the changing environment *and* the need to engage polar residents in common actions – observation, research, assessment, adaptation and mitigation.

A similar combination of local factors favoured a more proactive response in another area critically affected by rapid climate change, low-lying tropical islands (Lazrus, 2012; Orlove et al., 2014). Here the push for local people's voices and knowledge in climate change assessment had the additional advantage of a direct state presence in intergovernmental forums. Small island developing states (SIDS), whether from the Caribbean or the Atlantic, Indian or Pacific Oceans, are United Nations Member States and are themselves Parties to the UNFCCC. In the Pacific, SIDS are 'indigenous states' with majority populations of indigenous peoples with their distinctive languages, institutions, cultures and histories. The New York-based intergovernmental Alliance of Small Island States also provided a platform to mobilize shared concerns and demands. From the early 2000s, island voices could be heard directly in global arenas and through networks of non-governmental players, anthropological and other scientific studies, independent environmentalists and filmmakers (see Lazrus, 2012; Rudiak-Gould, 2013).

Box 1.1 Basic Concepts and Definitions: Understanding Indigenous Knowledge

Recognition of indigenous knowledge is a recent development in the climate sciences in general and in the understanding of global climate change in particular. For this reason, it may be useful to introduce some basic concepts and definitions for readers whose encounter with indigenous knowledge may be relatively recent.

The term ‘indigenous knowledge’ makes reference to knowledge and know-how that have been accumulated across generations and which guide human societies in their innumerable interactions with their surrounding environment. Such traditional ecological knowledge is defined as: ‘a cumulative body of knowledge, practice and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment’ (Berkes, 2012: 7).

These knowledge systems are transmitted and renewed by each succeeding generation. They ensure the well-being of people around the globe by providing food security from hunting, fishing, gathering, pastoralism or small-scale agriculture, as well as health care, clothing, shelter and strategies for coping with environmental fluctuations and external forces of change (Warren et al., 1995; Nakashima and Roué, 2002; Sillitoe et al., 2002; Sillitoe, 2007).

An abundance of labels for this knowledge coexist in the literature. Common terms include but are not limited to indigenous knowledge, traditional knowledge, traditional ecological knowledge, local knowledge, farmers’ knowledge, folk knowledge and indigenous science. Although each term may have somewhat different connotations and reference groups, they often share sufficient meaning to be utilized interchangeably (Nakashima and Roué, 2002). In this publication, the term indigenous knowledge will be used most frequently, as many of the examples put forward relate to knowledge developed and maintained by indigenous peoples. However, it should be recalled that important sets of local knowledge of relevance for climate change assessment and adaptation is also held by non-indigenous rural societies (Grabherr, 2009; Lawrence, 2009).

It is also important to keep in mind that much indigenous knowledge is gendered (Berkes, 2012). While men and women share a great deal of knowledge, they also hold distinct knowledge sets relating to differing and complementary roles that they may fulfil in society and in production. Rocheleau (1991) comments that ‘half or more of indigenous ecological science has been obscured by the prevailing “invisibility” of women, their work, their interests and especially their knowledge’.

In this publication, the term ‘knowledge’ is used in its broadest sense. Though knowledge (in particular scientific knowledge) is often opposed to practice (science vs technology) and the rational is distinguished from the spiritual (science vs religion), in indigenous worldviews these diverse elements are often combined. In a holistic understanding of human interactions with their surrounding milieu, indigenous knowledge encompasses not only empirical understandings and deductive thought, but also community know-how, practices and technology; social organization and institutions; and spirituality, rituals, rites and cosmologies (Nakashima and Roué, 2002).

Box 1.2 Basic Concepts and Definitions: Identifying Indigenous Peoples

Indigenous peoples live in all regions of the world and own, occupy or use up to 22 per cent of the world's land, which in turn harbours 80 per cent of the world's biological diversity (UNDP, 2011: 54). They are estimated to number at least 370 million, and represent the greater part of the world's cultural diversity (UNPFII, n.d.), including the major share of the world's almost 7,000 languages (Harrison, 2007).

In view of the enormous cultural diversity of indigenous peoples, their many histories of contact and interaction with other societies, and the broad spectrum of political contexts in which they live, there is no single universally accepted definition of 'indigenous peoples'. Most operational definitions converge around a set of core criteria that generally include:

- maintenance of social and cultural traits distinct from those of mainstream or dominant society (which may include distinct languages, production systems, social organization, political and legal systems, spirituality and worldviews)
- unique ties to ancestral territories and to the natural resources of these places
- self-identification and recognition by others as being part of a distinct cultural group (Cobo, 1986)
- in many instances, a historical or continuing experience with subjugation, dispossession and marginalization.

Terms used to designate indigenous peoples vary considerably with place, social context and historical moment. Native, aboriginal or tribal peoples, ethnic minorities, hill tribes, scheduled tribes, sea gypsies, bushmen, Indians or First Nations are only a few of the many terms that may be applied to indigenous peoples.

Many groups that self-identify as indigenous peoples are not recognized as such by nation states. Some members of indigenous groups feel the need to hide their identity due to the negative connotations of the 'indigenous label' (Montenegro and Stephens, 2006). Indigenous homelands often extend across national borders, and in some cases a single people may find themselves divided among several countries (UNPFII, n.d.).

Similarly, indigenous peoples have actively engaged in the UNFCCC forest-related discussions, particularly on the issue of REDD+ (UNFCCC, 2009; Schroeder, 2010). In the last fifteen years, as the dams of ignorance, political neglect and sidelining have been broken, research initiatives, international conferences, scholarly papers, dissertations, special journal issues and books on indigenous peoples and climate change have proliferated. Recent literature overviews cite current publications on these topics by many dozen, often by the hundreds (i.e. Crate and Nuttall, 2009; Roncoli et al., 2009; Crate, 2011; Ford et al., 2012; Lazrus, 2012; Nakashima et al., 2012; Maldonado et al., 2013; Bennett et al., 2014; McDowell et al., 2014; Orlove et al., 2014). The flow even triggered criticism by those who call it 'a thriving industry' of studying 'The Endangered Other' (Hall and Sanders, 2015) or point to the growing 'climate fatigue' in some indigenous communities overwhelmed

by visiting researchers and journalists eager to talk about the impacts of changing climate (Marino and Schweitzer, 2009).

In the past ten to fifteen years the amount of available information has changed from a trickle to a steady stream, though it still constitutes but a minute fraction of the overall climate change publication ‘flood’, as witnessed by the assessment reports of the IPCC. Furthermore, it is still unevenly distributed with much attention continuing to be focused on a small number of emblematic peoples and places, and a dearth of information elsewhere. A number of important gaps and shortcomings still need to be addressed and overcome.

IPCC assessment reports, issued every five to seven years since 1990, provide a convenient measure of the growth in attention to indigenous peoples and indigenous knowledge during the last twenty-five years. The First IPCC Assessment Report in 1990 and the second in 1995 include no more than a handful of entries on indigenous peoples/populations/cultures, as well as indigenous livelihoods (IPCC, 1990, 1995). No reference is made to indigenous peoples as holders of knowledge about their environment or about climate change. By 2001 and the third assessment report (AR3), however, references to indigenous peoples in the Working Group II report on Impacts, Adaptation and Vulnerability increase by an order of magnitude, and for the first time a scattering of specific references appear to indigenous or traditional knowledge (IPCC, 2001). Particularly detailed accounts addressing the nature of indigenous populations, traditional livelihoods, specific vulnerabilities, factors of resilience, indigenous knowledge and indigenous resource management are included in the regional chapters concerning Australia/New Zealand and the polar regions, reflecting ongoing research in these locations.

The Fourth IPCC Assessment Report (AR4) in 2007 continues this overall trend, but is distinctive because of a pronounced surge in the number of entries on indigenous knowledge. This includes not only the regional chapters on polar regions and Australia/New Zealand, but also substantial content addressing indigenous perspectives in Africa, North America and in small islands. Particularly noteworthy is an entry in the Africa chapter on ‘Indigenous knowledge in weather forecasting’ (IPCC, 2007a: 456). Important references also appear in thematic chapters, such as Chapter 2 on ‘New Assessment Methods’ that reports: ‘Traditional knowledge of local communities represents an important, yet currently largely under-used resource for CCAV assessment (Huntington and Fox, 2005)’ (ibid.: 138) and a box in Chapter 20 regarding the ‘Role of local and indigenous knowledge in adaptation and sustainability research’ (ibid.: 833). The AR4 also includes cross-chapter case studies with one featuring ‘Indigenous knowledge for adaptation to climate change’ (ibid.: 865). Moreover, for the first time, indigenous knowledge is cited in itself as an information source for understanding the nature of environmental impacts due to climate change:

Traditional ecological knowledge from Canada has recorded current ecosystem changes such as poor vegetation growth in eastern regions associated with warmer and drier summers; increased plant biomass and growth in western regions associated with warmer, wetter and longer summers;

the spreading of some existing species, and new sightings of a few southern species; and changing grazing behaviours of musk oxen and caribou as the availability of forage increases in some areas.

(IPCC, 2007a: 666)

Responding to this growing momentum in the AR4, UNESCO worked with IPCC and other organizations to support and advance global understanding of the links between indigenous knowledge and efforts to adapt to global climate change. UNESCO's Local and Indigenous Knowledge Systems (LINKS) programme and the United Nations University Traditional Knowledge Initiative (UNU-TKI), together with Vicente Barros, co-chair, and Edwin Castellanos and Roger Pulwarty, authors of the IPCC WG II of the Fifth Assessment Report (AR5), convened an international meeting in Mexico City in 2011 to bring together knowledge holders from indigenous peoples and local communities, indigenous knowledge experts and developing country scientists. UNESCO and UNU also produced the publication 'Weathering Uncertainty: Traditional knowledge for climate change assessment and adaptation' (Nakashima et al., 2012), which provided the authors of the AR5 with a review on this theme of over 300 publications from the scientific and grey literature.

In the AR5 published in 2014, both indigenous peoples and indigenous knowledge receive broad and systematic attention in the Working Group II report on Impacts, Adaptation and Vulnerability, with specific subsections dedicated to 'Indigenous Peoples' and to 'Local and Traditional Forms of Knowledge' in Chapter 12 on Human Security. It is in the AR5 that indigenous knowledge is given explicit recognition for the first time in the all-important Summary for Policymakers of the Synthesis Report.

Indigenous, local, and traditional knowledge systems and practices, including indigenous peoples' holistic view of community and environment, are a major resource for adapting to climate change, but these have not been used consistently in existing adaptation efforts. Integrating such forms of knowledge with existing practices increases the effectiveness of adaptation.

(IPCC, 2014: 27)

This growing attention by IPCC authors to indigenous peoples, as well as to indigenous knowledge, is also confirmed by a quantitative analysis of key terms (following the method of Ford et al., 2016). The occurrence of keywords referencing 'indigenous peoples', 'indigenous knowledge' and related terms shows a dramatic increase across the 25-year span of IPCC assessment reports (Figure 1.1). From a mere handful in the first two reports, the number of occurrences suddenly jumps to well over 100 in the AR3 in 2001, followed by a steady increase in the AR4 to almost 400 in the AR5 in 2014. The keyword count shows that the jump in occurrences in the AR3 is almost entirely due to references to 'indigenous peoples or communities'. A surge in the number of occurrences of 'indigenous knowledge' only appears in the AR4 in 2007 with over 80 occurrences, which almost doubles by the time of the AR5. Tabulating the occurrence of the same keywords by region reveals identical upward trends in regional chapters across the third (the first to include regional chapters), fourth and fifth assessment reports (Figure 1.2).

In summary, IPCC authors, reviewing the current state of knowledge in five assessment reports between 1990 and 2014, collectively bear witness to an expanding global awareness

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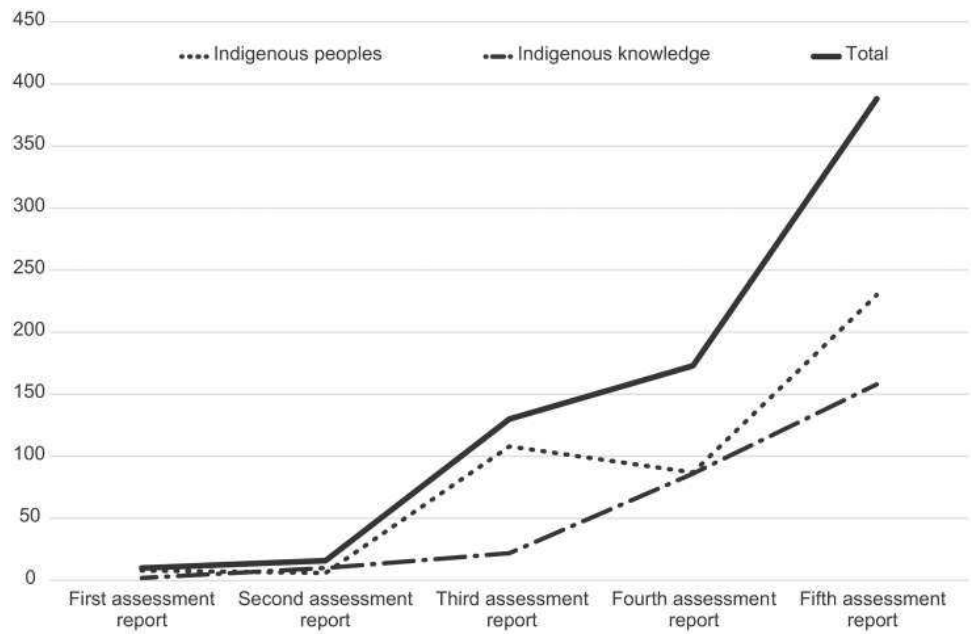


Figure 1.1 References to indigenous peoples and knowledge in IPCC assessment reports. © Tanara Renard–Truong Van Nga.

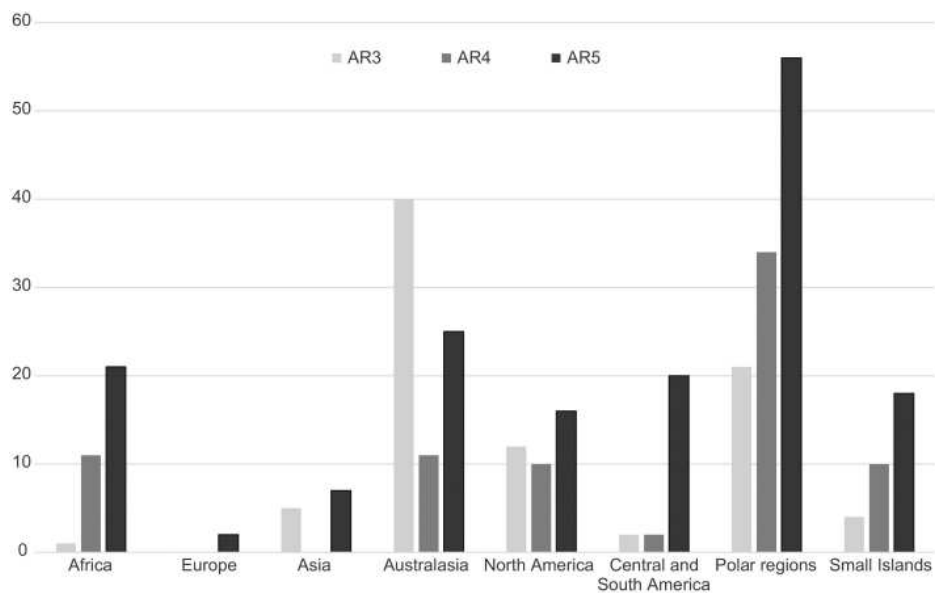


Figure 1.2 References to indigenous peoples and knowledge in the regional chapters of IPCC assessment reports. © Tanara Renard–Truong Van Nga.

of indigenous peoples' issues, in general, and the role to be played, in particular, by indigenous knowledge of climate change observation, adaptation and mitigation.

Paralleling this trend within the IPCC, indigenous issues have also been the subject of increasing attention within the UNFCCC and its subsidiary bodies. The role of indigenous knowledge has emerged in recent discussions on adaptation. The 2010 Cancun Adaptation Framework included indigenous knowledge among its principles for enhancing adaptation action (UNFCCC, 2010: para. 7). In 2013, the Nairobi Work Programme of the UNFCCC released a technical paper addressing indigenous and traditional knowledge for adaptation (UNFCCC, 2013), followed by an expert workshop (UNFCCC, 2014). These advances were then consolidated at the 21st Conference of the Parties (COP 21) of the UNFCCC through adoption of the Paris Agreement that exhorts nations to undertake adaptation action 'based on and guided by the best available science and, as appropriate, traditional knowledge, knowledge of indigenous peoples and local knowledge systems' (UNFCCC, 2015: Article 7). Just as significantly, the COP 21 decision recognizes the need to strengthen indigenous knowledge and 'establishes a platform for the exchange of experiences and sharing of best practices on mitigation and adaptation in a holistic and integrated manner' (UNFCCC, 2015: para. 135).

Indigenous peoples have been influential throughout this evolution. Involved in the COP since 1998 and acknowledged as a separate observer constituency since 2001, indigenous peoples and their representative organizations have engaged in the annual UNFCCC COP meetings to highlight the need for climate action and the desire to be able to actively participate in decision-making (Macchi et al., 2008). Through the International Indigenous Peoples Forum on Climate Change (IIPFCC), a self-organized, inclusive caucus for indigenous peoples at the UNFCCC, they have argued for, among other things, recognition of rights, full and effective participation and traditional knowledge (UNFCCC, 2004; IIPFCC, 2015).

Questioning 'Received Wisdom' About Indigenous Peoples and Climate Change

The growth of attention to indigenous peoples and their knowledge in climate change debates has been accompanied by a proliferation of assertions that, with repetition, are becoming a sort of 'received wisdom'. Increasingly widespread, these claims about indigenous peoples and their knowledge are at best misleading, and in some cases dangerously erroneous. Two of these oft-encountered statements are examined in greater depth here: the reputed vulnerability of indigenous peoples and the announced premature demise of indigenous knowledge.

Indigenous Peoples: Reconsidering Vulnerability

It has become common currency to present indigenous peoples as the first victims of global climate change, underlining their heightened vulnerability in the face of climate change impacts (IPCC 2007a, 2014; Ford et al., 2016). While not false, such a simplified

formulation warrants more careful consideration. For sure, impacts on indigenous communities and their territories are anticipated to be both early and severe due to their location in vulnerable environments, including small islands, high-altitude zones, desert margins and the circumpolar Arctic. Furthermore, climate change poses a direct threat to many indigenous societies due to their continuing reliance upon resource-based livelihoods. Heightened exposure to negative impacts, however, is not the only reason for specific attention and concern. As many indigenous populations are socially and culturally distinct from mainstream society, the decisions, policies and actions undertaken by the major group, even when well-intended, may prove inadequate, ill-adapted and even inappropriate. IPCC points out that ‘those in the weakest economic position are often the most vulnerable to climate change and are frequently the most susceptible to climate-related damages, especially when they face multiple stresses’ (IPCC, 2007b: 65). In this respect, the IPCC AR4 makes specific reference to indigenous peoples and traditional ways of living, particularly in polar regions and small island states.

It would be a mistake, however, to only view indigenous peoples as potential victims of global climate change. Indeed, indigenous peoples rarely represent themselves as helpless or unable to cope in the face of change (Salick and Byg, 2007; Salick and Ross, 2009; Berkes and Armitage, 2010). They commonly emphasize that their environment has always changed and is continually changing (Fienup-Riordan and Rearden, 2010). Even though they often express grave concerns about climate change impacts on their homelands, they also systematically express confidence in their ability to adapt to whatever circumstances climate change may bring (Cochran, 2008; see also in this volume Barber, Chapter 8; Mondragón, Chapter 2). Retter (2009) contrasts the resilience of the diversified and ecosystem-based fishing economies of the indigenous coastal Sami, with the vulnerability of Norwegian commercial fisheries that rely primarily on cod, a species that soon may move out of the Norwegian economic zone as ocean waters continue to warm.

While indigenous peoples make their own detailed observations of dramatic changes in weather and ecological responses, they do not always consider this as a reason for alarm. For example, nomadic Nenets reindeer herders of the Russian Arctic, whose annual migration over hundreds of kilometres takes place entirely at or north of the latitudinal tree-line, have in recent decades witnessed the symptoms attributed by scientists to a warming climate, such as later freeze up in autumn, earlier thaw in spring and warmer winters characterized by more frequent and intense rain-on-snow events (Forbes and Stammer, 2009; Bartsch et al., 2010). The latter can result in ice-encrusted pastures and significant losses (up to 25 per cent) of herds (Bartsch et al., 2010). Yet, so far, herders feel that this variation in weather does not represent a trend and does not endanger their survival in the foreseeable future. On the other hand, they are much more concerned about the impacts on their livelihoods from massive hydrocarbon extraction activities on their traditional territories (Rees et al., 2008; Forbes et al., 2009; Forbes and Stammer, 2009; Kumpula et al., 2012) or policies prescribing large reductions in herd size.

We believe that more circumspect use of the term ‘vulnerability’ with respect to indigenous peoples is required. The ability of systems to adapt to global climate change is often

discussed in terms of both vulnerability and resilience. In the AR4, the IPCC defines vulnerability as ‘the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes’ (IPCC, 2007b: 89; see also Adger, 2006: 268). This definition emphasizes the importance of considering two factors: exposure to stress and an inability to cope.

Another approach differentiates among vulnerability’s three constituent parts: exposure, sensitivity and adaptive capacity (Prno et al., 2011; see also Eriksen, Brown and Kelly, 2005; Parkins and MacKendrick, 2007; Tschakert, 2007; Forbes, 2008; Ford et al., 2008; Keskitalo, 2008; Young et al., 2010). According to the IPCC: “exposure” relates to the degree of climate stress upon a particular unit; “sensitivity” is the degree to which a system will be affected by, or responsive to climate stimuli, either positive or negative; and “adaptive capacity” refers to the potential or capability of a system to adjust to climate change’ (Rosenzweig and Hillel, 2008: Box 8.1). In the context of indigenous communities, exposure and sensitivity refer to the ‘presence of potentially problematic conditions (exposure) and the occupancy and livelihood characteristics that make individuals and communities susceptible to these exposures (sensitivity)’ (Prno et al., 2011: 7364; see also Smit and Wandel, 2006). Adaptive capacity relates to ‘both local determinants – e.g. availability of human and financial capital, access to technology, local institutions – and the larger context within which the community operates – e.g. the terms of self-government and federally sponsored programs’ (Prno et al., 2011: 3).

Thus, rather than describing indigenous groups as ‘vulnerable’ to climate change, it would be more accurate to emphasize their high degree of exposure-sensitivity, while drawing attention to their considerable adaptive capacity. Adaptive capacity contributes to resilience in that it relates to a people’s ability to modify their behaviour and environment to manage and take advantage of changing climatic conditions (Ford et al., 2006).

Indigenous Knowledge in the Face of Climate Change: Imminent Demise or Source of Resilience?

While indigenous knowledge is gaining recognition in climate change decision-making, the announcement of its imminent demise is already circulating. Today it has become commonplace for participants in public forums to assert that indigenous peoples’ knowledge and practices will soon become obsolete. At first glance, the logic behind their position seems sound: as global climate change will transform the environment beyond lived experience, the experience developed by indigenous peoples for dealing with environmental change will soon be outpaced. As a result, they will be, more than ever, climate change victims relying upon external aid to provide them with solutions to the new challenges they will face.

Indigenous peoples, however, do not share this view. At global climate change forums, indigenous peoples have long maintained two positions: first, that their homelands are being transformed irreversibly by climate change; and second, that they have valuable contributions to make towards climate decision-making due to their extensive experiential