

Viewing Change Through the Prism of Indigenous Human Ecology: Findings from the Afghan and Tajik Pamirs

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Abstract The effects of socioecological transformations such as climate change, the collapse of the Soviet empire, and civil war are examined for 14 villages in the valleys of the Pamir Mountains in the historical Badakhshan region, now divided between Afghanistan and Tajikistan. Preliminary findings indicate concern for food sovereignty, evidence of biocultural impacts of climate change, an increasing burden on women, debilitating opium addiction, the ecological importance of sacred sites, and other priorities related to sustainable livelihoods, such as energy needs (for fuel and lighting) and physical and social infrastructure in the form of roads and schools. In the complex setting of the Pamir Mountains, characterized by both cultural and ecological diversity and marked by artificial political boundaries, the creative and pragmatic interaction between indigenous and scientific knowledge sustains the best hope for survival. Applied research must combine *communities of inquirers* (research institutions) with *communities of social practitioners* (farmers, pastoralists, and civil society institutions) to facilitate indigenous participation in generating context-specific knowledge. The goal of such research is practical outcomes that will meet the urgent priorities of village communities. This paper establishes a baseline from which undertake applied human ecological research related to livelihood security.

Keywords Afghanistan · Badakhshan · Climate change · Food security · Human ecology · Indigenous knowledge · Pamir Mountains · Tajikistan

Introduction

The Panj River, which has marked the political border for the division of Tajik and Afghan Badakhshan since the late nineteenth century, now also marks another division. In a variety of areas, people with the same cultural history and ecological profession that were divided for colonial interests are now also divided by their different ways of knowing. On the Afghan side of the Pamirs, indigenous knowledge¹ has been the mainstay for survival in the context of great upheaval, whereas on the Tajik side of the divide, this knowledge has been largely devalued and overwhelmed by scientific knowledge driven by the Soviet command economy. However, with the collapse of Soviet Union and the large population movements caused by the civil war in Tajikistan, practical concerns for survival have caused local knowledge to reassert itself, thereby engendering an environment for synergies with the research institutions and civil society institutions that are best equipped to contribute through scientific knowledge systems. This intellectual plurality, in the pragmatic context of livelihood survival and food sovereignty, is the subject of this paper.

Preliminary findings presented here are from research carried out in the culturally complex and mountainous geography of the Gorno-Badakhshan Autonomous Oblast (GBO), Tajikistan, and the province of Badakhshan, Afghanistan, in 2006 and 2007 (Fig. 1). This work involved negotiating several challenging border crossings across the Panj River.²

¹ For the purpose of this paper, “indigenous knowledge” and “local knowledge” are used synonymously.

² Border crossings from Tajikistan to Afghanistan took place at four locations. The first two, at Khorog and Ishkashim, were across bridges. Special permission was required to cross by Zodiak raft at Shidz and on horseback in the eastern Pamirs, along the Chinese border.

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Fig. 1 Map of Afghan and Tajik Badakhshan, showing villages where research was conducted



These findings provide a basis for discussing the next steps in applied human ecological research that will contribute to livelihood security in the Pamir Mountains of Afghanistan and Tajikistan where war continues to fragment communities and affect livelihood security. After a broad outline of the context, a conceptual framework of indigenous knowledge as emergent science is presented. Specific characteristics of this indigenous human ecological knowledge illustrate its context specificity, its complex connectivity with the surrounding environment, its empirical quality, its dynamic and adaptive character, and its heterogeneous nature. I then outline the findings regarding the impact of current changes on livelihood security and relate them to the priorities identified by villagers. A discussion of the multiple causes of current changes and human adaptation to them concludes the paper.

Context: The New Great Game

The village-centred approach to this applied research was influenced by the historical presence of cultural and ecological diversity within the Pamirs—paradoxically co-existent with externally inspired homogenizing ideologies, like the Soviet command economy in the recent past, and currently Talibanization and the policies inspired by the Project for the New American Century and advanced by strategic alliances. Under these conditions, emergent knowledge is characterized simultaneously by the urgency

to respond to social and environmental change and the uncertainty about *how* to respond: knowledge generation and appropriateness of responses are context-specific and dependent on human ecological relations. The “great game” that characterizes sociopolitical change in Central Asia is briefly summarized below to justify the research approach, in which local knowledge is a valuable key to the complex connectivity of cultural and ecological relations.

This region of the world, located between Europe to the west and Asia to the east and between the Middle East and northern Eurasia, has historically sustained extensive nomadism as well as agro-pastoralism, producing food for subsistence and marketable crops through glacier-fed irrigation. As the Pamirs were part of the Silk Road, the diverse peoples historically engaged in trade and intellectual exchange; they were not isolated, as is commonly asserted of mountainous societies (Grotenhuis 2002; Wood 2002; Kreutzmann 2003; Felmy and Kreutzmann 2004; Kreutzmann 2005; Olimova 2005; Bliss 2006). The notion that mountains both offer refuge and isolate human communities is challenged by the presence historically of agro-pastoral activities combined with mining, trade, portage, smuggling, and raiding (Kreutzmann 2003). The physical remoteness of the Pamirs has not prevented outside political interference nor limited commercial relations and other exchange within the area. Most of Central Asia was under Persian influence until the Arab invasions in the seventh century CE, when the Umayyad and Abbasid dynasties and the Fatimid religious and cultural ethos also

contributed to a flowering of pluralistic Islamic thought, philosophy, and mysticism in Central Asia (Daftary 1990; Hunsberger 2000; Middleton 2003). Because of its strategic significance, this region has been the target of invasions from Arabia, China, Mongolia, and Persia, and since the nineteenth century has been within the imperial vision of Euro-American interests. While transformation is a continuous and dynamic process in the Pamirs, the changes from the nineteenth century onward are characterized by two phases: (1) the European colonial presence, commonly referred to as the “Great Game;” and (2) unfettered globalization referred to as the “*new great game*” (Kleveman 2003).

The “Great Game” began with assertion of colonial control, first by Great Britain and Czarist Russia in the 1860s (Bliss 2006; Middleton and Thomas 2008). With the Pamir Convention of 1895, the Badakhshan region of the Pamirs was divided along the Panj River (Amu Darya or Oxus), artificially splitting various cultural groups such as the Wakhi, Shugni, and Rushani between two spheres of influence: the British in Afghanistan to the south and the Russians in Tajikistan to the north (Fig. 2). The “Game” continued, with a slight change in players, when the Soviet Union emerged and later when the United States became the primary representative of the Anglo sphere.

The territory of what is now Tajikistan belonged to the Emirate of Bukhara. In 1924 under Stalin, the region was divided into separate Soviet Republics in such a way as to maintain a mix of ethnic groups, so that tensions among them could be exploited to justify the strong centralizing institutions of the Soviet system. Tajikistan, initially an autonomous republic within Uzbekistan, became a federated Soviet Republic in 1929 (Middleton 2003), and the Tajik economy was integrated into the centralized Soviet system. Agricultural activities were altered from production for self-sufficiency to production at an industrial scale by means of forced collectivization, mechanization of agriculture, and sedentarization of nomadic peoples. As a result, local seed varieties of grains and fruits and knowledge of how to cultivate them were lost in some regions, potentially diminishing food security (Nabhan 2009).

In contrast, the Afghan region of the Pamirs remained largely ignored, so local agro-pastoral knowledge continued to sustain livelihoods of the population and small-scale production prevailed. The contrast in socioeconomic conditions on the two sides of the Panj River was stark. The Soviet side benefited from education and health care services and received supplies of fuel, food, and consumer goods. On the Afghan side, physical and institutional infrastructure such as roads, health care, education and electricity were limited, if not entirely absent (Felmy and

Kreutzmann 2004; Bliss 2006). The Central Asian peoples and their kingdoms, like “pawns on a chessboard” as Lord Curzon described them (Kreutzmann 2005: 4), were merely the buffer in a game to protect the “Jewel in the Crown” (India). This boundary—which lasted almost 60 years, well into the Cold War—interrupted trade routes for at least two generations.

By 1979 the Pamir Mountains had become a major deployment point for the Soviet military poised to invade Afghanistan, and the stage was set for the “*new great game*” in Central Asia. With the collapse of the Soviet Union, living conditions on the Tajik side deteriorated severely. Thus in the 1990s, along with a period of civil war (1992–1998) in Tajikistan, communities in the Pamirs faced famine and depended heavily on humanitarian aid for survival.³ Property previously expropriated by the Soviet administration was returned in part, and farming families who had become state employees several generations later found themselves as agriculturalists again.⁴ On the Afghan side, the Soviet withdrawal in the face of fierce local opposition with significant financial and logistical support from the United States left a fragmented state, warlordism, and opium cultivation for global markets. In the wake of the Taliban victory, and their subsequent defeat by the US-led alliance, a world war manifested as an internal war continues (Felmy and Kreutzmann 2004). The “*new great game*” continues to be played out as complex political alliances compete for military and economic dominance in this mountainous region in order to access valuable natural resources. Now not only are the traditional rivals of the Cold War participating, but China, India, Iran, Pakistan, and Turkey are also exerting their strength as regional powers. For instance, China is expanding its role in the region as a key provider of development assistance, primarily in the form of preferential loans to Central Asian Republics, like Tajikistan, that lack strong physical and institutional

³ The Aga Khan, Imam or religious leader of the Ismaili Muslims, took responsibility for Russians, Sunnis and Shias alike, and the diverse ethnic groups in Badakhshan by providing emergency aid and establishing development organizations (Bliss 2006).

⁴ In 1992, following the collapse of the Soviet economic system, there were serious food and energy shortages in Gorno Badakhshan. In late 1993, when self-sufficiency in GBAO was just 15%, the local government distributed unused or under-utilized farm land to villagers who wished to become private farmers. Village by village, the lands of the former sovkhozes were distributed equally to every household in the GBAO, but many often lacked traditional and comprehensive farming knowledge because of division of labour in the previous agricultural system. However, farming households were given support by the Mountain Societies Development Support Programme (MSDSP), and received improved seed and fertilizers on credit. Like the land, livestock was privatized and distributed equally among the population, except for yaks, which are threatened by a serious loss of breeds (Breu and Humi 2003a, b).

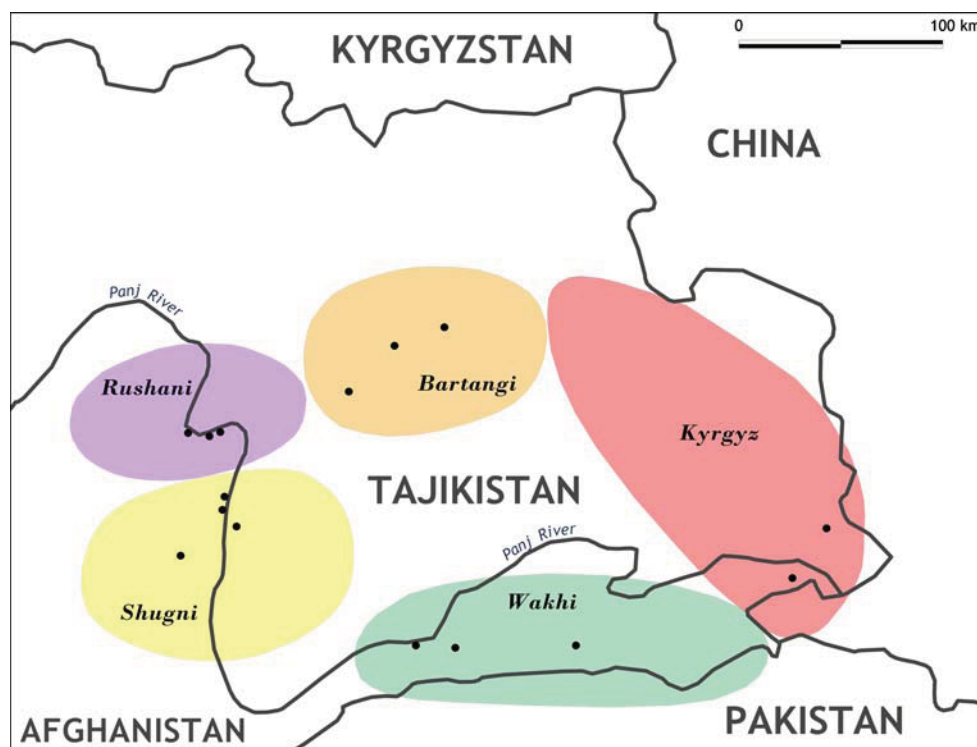


Fig. 2 Ethnic groups and villages in the study area

infrastructure (International Crisis Group 2009). As a major creditor, China wields influence in the region as support is directed towards infrastructure projects such as roads and power plants. Furthermore, the development assistance is growing in conjunction with access to markets for Chinese products in Central Asia (Kassenova 2009). Energy supplies such as oil, natural gas, and hydropower drive this new game (Goodson 2001; Rashid 2002; Kleveman 2003; Bliss 2006). The national boundaries in the “new great game” continue to artificially divide the people of the Pamirs, with very real and potentially fatal consequences.

Intellectual Moorings

The approach to this study is anchored in action research methodology (Greenwood and Levin 1998); the goal is for applied research to contribute to livelihood security. The relevance of indigenous knowledge to understanding change in the Pamir Mountains of Badakhshan is articulated as emergent science responding to practical needs of agricultural and pastoral communities. Specifically, human ecological relations are conceptualized in terms of indigenous knowledge.

Research Approach

Knowledge about Afghan and Tajik Badakhshan has arguably been influenced by reports of outsiders, such as

travelogues and nineteenth-century explorer narratives, which focused on the hardships of travel (Middleton and Thomas 2008). Additional sources are documents archived by colonial administrations, consisting of information gathered by spies and surveyors (Wood [1872] 1976; Curzon 1889, 1896; Murray [1893] 2005; Olufsen [1904] 2005). These works tend to highlight the remoteness and harsh living conditions of the region in addition to its geopolitical significance (Kreutzmann 2003). The present research, in contrast, seeks the voice of local knowledge holders. Badakhshan is marked by considerable linguistic, cultural, and religious differences among the people of the different valleys (Shahrani 1979; Nabhan 2009). The northern districts of Vanch and Darvaz practice Sunni Islam; their language is Tajik, except in the Yazgulom valley, where the Yazgulomi dialect is spoken. People of the districts of Rushan, Shugnan, Roshtkala and Ishkashim are Ismaili Muslims; Shugni is understood in most of these districts, but many people in Ishkashim speak Rehne and Wakhi, as do their neighbours across in the Wakhan Corridor and in northern Pakistan. Rushan and the Bartang valley also have their own dialects. In the eastern high plateau of Badakhshan, the population is mainly ethnic Kyrgyz and Sunni Muslim. On the Tajik side, the Kyrgyz in Murgab were essentially nomadic herders who were sedentarized in the 1950s, while on the Afghan side a small group of Kyrgyz continue nomadic activities. As noted previously, many ethnic communities that lived along

the Panj were divided by Soviet influence to the north (present-day Tajikistan) and the Anglo sphere to the south (present-day Afghanistan).

It was important to visit culturally and ecologically diverse regions to assess differing needs according to local context. As a result, 14 villages in both Afghan and Tajik Badakhshan were included in the exploratory research. Individual and group interviews were conducted in three villages in the Bartang Valley of Tajik Badakhshan and three villages in each of the linguistically diverse regions of Shugnan, Rushan, and Wakhan in Afghan Badkhshan. The residents of these 12 different villages were agriculturalists who also kept animals such as goats, sheep, and camels in pastures during the spring and summer seasons. In addition, in order to provide a human ecological contrast, interviews were held in two Kyrgyz communities in eastern Tajikistan and Afghanistan, in the Little Pamir Mountains near the Chinese border (Fig. 2). Table 1 lists the regions of the Pamirs and the 14 villages where interviews took place. In 2006, a 15th village, Futoor, was also included in order to assess the impact of opium addiction on livelihood security in Wakhan, Afghanistan. In Futoor, discussions were held with the doctors and detoxification experts who have established a clinic in the village to treat addicts. Community members were not interviewed in order to maintain their privacy. In 2006, interviews conducted in small groups were followed up with some individual interviews. In total, 120 individuals (mostly men and some women) participated.⁵ In 2007, supplementary interviews were conducted with small mixed groups of men and women, involving a total of 38 individuals. These interviews were limited to Basid, Savnob, and Ghudara, the three villages in the Bartang Valley of Tajikistan, as I was unable to cross into Afghanistan. In 2008, additional small-group interviews were conducted, but this time with separate groups for women and men, involving a total of 83 men and 53 women. The additional interviews in 2007 and 2008 validated findings from 2006 and provided more depth. The ages of participants ranged from 17 to 75, with the majority between 35 and 55. All were actively engaged in agriculture, pastoral activities, or both.

Discussion with community members centred on the following issues: (1) priorities and concerns, such as energy needs for fuel and lighting, and physical and social infrastructure in the form of roads and schools; (2) seasonal activities; (3) plants collected rather than grown (i.e., medicinal plants); and (4) sacred sites. The semi-structured interviews tended to be based on the livelihood and food-security concerns of the participants. During discussions on seasonal activities and festivals, the villagers

brought up the topic of climatic variation. Similarly, villagers in Afghan Badakhshan raised the subject of opium addiction.

Indigenous Knowledge as Emergent Science

The pace of sociocultural and environmental change, the context of conflict, and the cultural and ecological diversity of the Pamir Mountains of central Asia make it difficult to present research findings that are free of controversy and uncertainty. The distinction made by Latour (1987: 4) between the contradictory voices of “ready-made science” and “science in the making” is conceptually useful to our discussion of the Pamirs. In contrast to the established character of ready-made science, science in the making has more emergent qualities (Sullivan *et al.* 2006). Established scientific knowledge represents knowledge that may be interpreted as uncontroversial and taken for granted.⁶ For instance, the statement that “the Pamirs are a mountain range in Central Asia” is widely acknowledged. This is a textbook version of accepted knowledge. Emergent knowledge, on the other hand, involves uncertainty, exploration of multiple lines of inquiry, and the use of claims that may require testing and revision. It often depends on local, context-dependent knowledge. For instance, the assertion that “a warming trend in the Pamir Mountains of Central Asia is altering the human ecology of the region” requires investigation. The issue of climate change in the Pamirs of Badakhshan is an illustrative example of emergent science. With limited reliable temperature and climate data from weather stations in Badakhshan available because of sociopolitical and economic instability, the most substantive source of knowledge of rapid climate change is local observations by farmers and herders. Emergent science asks *why* and *how* is it this way? What makes emergent science controversial in the Pamirs is the urgent need for a response to these questions. It is apropos, in the complex context of the Pamirs, to describe knowledge-generation as emergent science. The pragmatic priorities of survival require the ability to discern signal from background noise, or insight from mere information. Emergent science has practical concerns: how is indigenous knowledge contributing to livelihoods? Could institutional or established scientific knowledge also contribute in a meaningful manner?

Research in Central Asia, and specifically in the Pamir Mountains of Badakhshan, needs to be viewed in terms of participation of and collaboration between *communities of social practice* and *communities of inquirers* (Argyris *et al.* 1985). *Communities of social practice* include elders,

⁵ My research findings related to climate change and food security from 2006 have been reported by Nabhan (2009: 58–61).

⁶ Established science does tend to be less controversial in practice, but in this paper the contrast with emergent science is heuristic: it is intended to illustrate how indigenous knowledge complements scientific knowledge.

Table 1 Villages and valleys visited in the Pamirs

Valley	Village	Elevation (m) ^a
Bartang Valley, Tajikistan	Basid	2,365
	Savnob	2,680
	Ghudara	3,008
Shugnan, Afghanistan	Dishor	2,694
	Kala-i Bar Panja	3,484
	Pul-i Zirabon	3,900
Rushan, Afghanistan	Pojwar	2,178
	Chowid	2,107
	Chasnud	2,034
Wakhan, Afghanistan	Kala-i Panja	2,840
	Wuzd	Not available
	Sarhad-i Broghil	3,300
Little Pamir, Tajikistan and Afghanistan (Kyrgyz)	Shaymak	3,852
	Tashbulaq	Not available

^a Elevation in meters above sea level was provided by FOCUS Humanitarian Assistance, Tajikistan

farmers, and pastoralists, who generate as well as use indigenous knowledge, and the civil society institutions that work with them; *communities of inquirers* involve academics in the humanities and the physical, biological, and social sciences who contribute through their expertise. Credibility of research depends on validation. In the case of emergent science, the issue of validity is *critical* in both senses of the word: (1) responding to an urgent situation and (2) necessarily a thoughtful response. In addition to *communities of inquirers* who represent knowledge experts, the culturally diverse agro-pastoralists sustaining their livelihoods in these mountainous regions also constitute knowledge authorities. While established science tests the validity of knowledge gathered by their *communities of inquirers* to draw inferences from replicability of propositions, participation of *communities of social practice* in applied research facilitates validation through ground-truthing and assessment of the usability or workability of the research for the people it seeks to serve.

Indigenous Human Ecology

Indigenous human ecology describes the relationships between people and their environment, which includes relations between humans and human relations with other animals, plants, and their habitats (Kassam 2009). Relations such as these generate knowledge that is context-specific: nuanced by complex connectivity with the immediate environment, it is heterogeneous and empirically dense and has cumulative depth (Johnson 1992; Agrawal 1995; Kassam and Graham 1999; Battiste and Henderson 2000; Ellen *et al.* 2000; Kassam and the Wainwright Traditional Council 2001; Kawagley 1995). These relations promote cultural systems that are vitally informed by their natural surroundings in a non-deterministic relationship.

Context-specific

Indigenous human ecological knowledge is context-specific: it is related to, and contained within, a group of people who live in a defined geographic region. Knowledge in this context is derived fundamentally from the environment. It includes a web of interactions between humans, animals, plants, natural forces, spirits, and land forms. Therefore, social, ethical, and spiritual relationships also have an ecological foundation (Kassam 2009). For instance, historically the people of the Pamirs have integrated the human body into the seasons and rhythms of nature through their calendar. To mark the passage of the year and the seasons, they assign a certain number of days to each part or organ of the body, starting from the toenails and moving up the foot to the knee, thigh, genitals, intestines, ribs, heart, and so on, culminating at the head. Then the cycle repeats: a full year contains two cycles. Now the workings of these calendars are no longer widely known in the Tajik Pamirs, as they were replaced by the secular solar calendar under Soviet rule. Nonetheless, in some villages they are still in use, and examples are found in diaries left by farmers from earlier times. Traditionally farmers undertook agro-pastoral and hunting activities using their own bodies not only for labour, but as a mirror of the changing tempo of the seasons. Their bodies both interacted with the life on the land and acted as living clocks to mark the movement of time. Village elders who followed the movement of the sun and moon determined key religious festivals and integrated this information into the calendar of the human body. Thus, specific days are associated with each body part. As there is slight variation in the seasons from valley to valley, depending on the ecological context, these calendars were context-specific to each relevant region of the Pamirs.

Connectively Complex

Complex connectivity is empirically demanding, as well as empirically rich. Indigenous human ecological knowledge encompasses the interconnectedness within an ecological system and that system's relationships to a greater whole. It is obtained by the labour of living and experiencing the context, and not through book learning (Kassam 2009). The calendar of the human body, described above, is an example of such intricate connectivity. Material relations are only one aspect of complex connectivity. These material relations may include food, fodder, water, building sites and materials, medicines, and other natural resources and ecosystem services derived from the local environment. In addition, complex connectivity goes beyond material needs, linking relations based on cultural and ethical values, concepts of sacred spaces, aesthetic experience, and personal or group identity (or both) derived from the local environment (Callicott *et al.* 2007; Kassam 2008). In this sense, indigenous human ecological knowledge is intimately linked to a spiritual and ethical fabric that has a holistic, practical manifestation in day-to-day life. This practical action gives the holders of indigenous knowledge agency, which has consequences for the individuals, their culture, and the ecological system. The seminal work of Nikolai Vavilov in Central Asia amply illustrates the consequentiality of this complex connectivity in the domestication of plants and the generation of human civilizations (Vavilov 1926, [1939] 1997, 1951, 1957, 1992). The Russian scientist and explorer saw a correlation between the origins of fruits and grains (such as wheat, barley, and rye) brought under cultivation in mountainous regions and the origins of human civilizations. He argued that these domesticated plants were ultimately taken from their mountainous origins to the lower valleys, giving birth to various civilizations. Vavilov was among the first to describe a direct link between plants and human cultures. Driven by the desire to prove his hypothesis and by the pragmatic need to find early-ripening species of cereals for agricultural production in the Soviet Union to avert famine and ensure food security, Vavilov undertook expeditions to the Pamir Mountains in 1916, 1924, and 1929, as well as to other regions of Asia and the remaining continents (Vavilov [1939] 1997; Loskutov 1999; Nabhan 2009). He was particularly struck by the fact that highly productive forms of plants developed under conditions of high altitude and ecological isolation. These plants were characterized by early ripening, rapid growth, and tolerance of low temperatures, even in summer. By tracing the origins of cultivated plants, Vavilov illustrates the consequentiality of human action through complex connectivity within the ecosystem. In essence, agriculturalists not only participated, but as a consequence of participation, created a niche within their

ecosystem. Not only were they a product of their environment, but the environment is a dynamic outcome of their presence.

Empirically Based

Indigenous human ecological knowledge is observational, analytical, practical, and effective. Rather than exploring the biochemical or physiological make-up of plants and animals, it responds to questions about where they are found, what methods may be used to harvest them, and how they can be used. It provides valuable and detailed insights into the ecosystem, aiding understanding of the flora and fauna, climatic changes, and how plants and animals behave and interact with each other and are influenced by climatic or seasonal variations. It provides information on harvesting techniques, processing and storage of foods, and the nutritional and medicinal value of various plants and animals and their different parts. In this sense, this knowledge shares a common characteristic with scientific knowledge, in that both are empirical (Kassam 2009). The indigenous methods used for telling the seasons reflect the empirical nature of knowledge of the diverse peoples of the Pamirs. Similarly, the demanding nature of cultivation, which requires planning and organization based on observation of soil, climatic, and other features, also highlights the experiential and experimental nature of local knowledge.

Dynamic and Adaptive

Indigenous human ecological knowledge compels the holders of that knowledge be conscious of the wisdom and observations not only of their generation, but of the generations that preceded them. This does not mean that tradition is fixed in a particular time or age. In fact, the knowledge is dynamic and adaptive. New ideas and approaches are quickly adopted if they are seen to benefit people. In indigenous ecological knowledge, the common theme is humanity's relationship with its habitat (Kassam 2009). The current context of Central Asia illustrates the significance of ecological knowledge for the survival of the people of the Pamirs living through civil war in Afghanistan with little or no government provision for food security. This traditional ecological knowledge has also become relevant for those in Tajikistan in the post-Soviet era. Three recently built bridges⁷ across the Panj River, which once again connect the people of the Pamirs of Afghanistan with those in Tajikistan, represent hope for

⁷ The bridges were built jointly by the governments of Afghanistan and Tajikistan with the support of the Aga Khan Development Network.

stimulating not only commercial exchange, but more significantly, the exchange of knowledge and ideas. Therefore, it would be analytically sterile and factually inaccurate to separate scientific and indigenous knowledge systems. Both coexist and interact in a finely intertwined web of complex relationships. Furthermore, each system is internally heterogeneous. Thus a binary opposition of these two systems is too simplistic: it ends up fixing them in time and space without regard to social context and the dynamic nature of knowledge (Agrawal 1995; Wenzel 1999; Kassam 2008).

Heterogeneous

Finally, neither the knowledge nor its holders are homogeneous. Indigenous ecological knowledge, like many knowledge systems, is sufficiently complex that it does not lend itself to terse and easy characterizations. This is why one can only speak of certain attributes of indigenous knowledge, rather than providing comprehensive definitions. The degree to which an individual within a group may hold this knowledge varies with age, gender, social class, level of experience, linguistic ability, access to oral tradition, and even interest in the subject (Kassam 2009). In the Pamirs, knowledge also varies according to context, gender, and ecological profession. Women have significant knowledge about certain plants and livestock compared to men, and the sedentary agro-pastoralists and the nomadic pastoralists possess different knowledge about their habitat based on their ecological profession.

Preliminary Findings

Given the agro-pastoral nature of activities in the villages on both sides of the Panj River in Badakhshan, indigenous human ecological knowledge provides a basis for discerning changes and their impacts on livelihoods. It is important to note that these impacts have many causes, such as climatic variation, the gender burden of women, opium addiction in Wakhan, Afghanistan, energy requirements, and the need for social and physical infrastructure. Livelihood security is thus dependent on many varied factors.

Indicators of Persisting Indigenous Ecological Knowledge

The interviews suggested that retention of indigenous knowledge is fundamentally dependent on its use. Knowledge is not embedded in people's minds, but in the environment with which they engage. Medicinal plants that people collect but do not grow are a meaningful indicator of indigenous knowledge. Villagers identified more than 40

wild plants that they gather for various uses, from curing the common cold to treating high blood pressure, kidney disease, impotence, anaemia, skin disease, and physical injury. Presence of knowledge about medicinal plants is directly connected to their use.

The loss of specific knowledge due to lack of regular use is reflected in the situation of the villages of Savnob and Basid in the Bartang Valley of the Pamirs in Tajikistan. Under Soviet rule, these regions switched from self-sustaining agricultural production to a command economy and have consequently lost the seeds to grow watermelon. Along with the seeds, the know-how for growing watermelon in their specific montane habitat has also been lost.

Food sovereignty is among the most effective indicators of indigenous knowledge. Research consistently indicates that agrobiodiversity based on indigenous farmer knowledge contributes to food security (Rerkasem *et al.* 2002). Context-specific knowledge about soil variation, temperature, water, characteristics of local plants, and seasonal conditions accumulated over generations enables farmers in the Afghan Pamirs to sustain a dynamic cropping system, which in turn contributes to food security and ultimately food sovereignty, in which farmers have control of their agricultural systems.

Continued use of sacred sites is another indicator of the presence of indigenous knowledge, illustrating the complex connectivity between culture and nature. Some sacred places are grave sites, streams, or trees and groves. Almost all are connected to the land in a very intimate way and illustrate the link of culture to its biological environment. These sacred places, some of which may be more than 1,000 years old, are connected to folk stories that not only illustrate the link between biological and cultural diversity, but also provide valuable information on climatic change and local conservation strategies. Further research related to these sites may provide valuable information on adapting to environmental change. These sites are also a testimony to the resilience of the people of the Pamirs. For instance, the invading Mujahedeen in some regions of Afghan Badakhshan violated sacred sites with the same fanatical fervour as the secular communists in Tajikistan under Soviet rule. Yet many of these sites were rebuilt and continue to be significant to the peoples of the Pamirs. Oral histories and archaeological evidence from these diverse sacred spaces, which have withstood sociocultural as well as environmental changes, may be very informative.

Climatic Variation

Preliminary findings reveal dramatic evidence of climate change. The nature and impact of change differ within a region, depending upon ecological context and altitude. There are signs of increasing water levels in rivers due

to snow and glacial melt. This increase concurs with Dyurgerov and Meier's (2000) findings of an increase in the volume of glacial melt in the northern hemisphere (including the Pamirs) since the 1970s, anthropogenic in origin, accompanied by a rapid loss in glacial density. Overall, villages at lower elevations report the loss of valuable agricultural land to high water levels and changing river patterns. The villages of Basid and Savnab reported increased precipitation in April and May, and the river water also seemed colder in the summer months because of glacial melt. Villagers in Savnab and Shaymak reported that increased rainfall is also affecting the physical integrity of structures. Architectural styles and materials in these regions are more suited to snow than to rain. In terms of monthly averages, precipitation levels seem to be the same as before; the difference arises from the intensity of rainfall, which is now concentrated in a few days rather than being spread over a longer period. Villages in the Shugnan and Rushan valleys of Afghanistan have reported the loss of valuable agricultural land as a result of rising river levels, as well as damage to crops such as potatoes. Villagers also identified increasing problems with avalanches and rock-slides due to rains. They blame environmental changes on the "Soviet side," where a dam and roads were built in the 1980s. However, it seems more likely that these changes are related to climate change.

A recent study (Piao *et al.* 2008) indicates that the warming trend in the past two decades has increased plant productivity in northern regions. With spring starting earlier and winter later, the growing season has become longer, enabling plants to absorb more carbon from the atmosphere. In some villages, ploughing and sowing begin 15 to 20 days earlier than they did a decade ago, and harvesting also takes place 15 to 20 days earlier. Villages at high elevations, where wheat was rarely harvested because of frost damage, can now regularly harvest wheat. Villages reporting these changes include Ghudara (in the Bartang valley, Tajikistan), Pul-i Zirabon (in Shugnan, Afghanistan) Sarhad-i Broghil (in Wakhan, Afghanistan).⁸ Similar observations about growing wheat at higher elevations were made a century ago by Korzhinsky and Vavilov (Fig. 3). Korzhinsky concluded from his 1893 expeditions that the upper limit of a wide variety of wheat found in the Pamirs was approximately 3,250 m, and Vavilov, in 1916, revised this limit to 3,550 m and the upper limit for potatoes and barley to 3,900 m (Vavilov [1939] 1997, 1957)

⁸ Villagers reported there was no snow in Badakhshan in 1997. They explained that it was a particularly warm year. In Ghudara the water level reached the height necessary for farmers to irrigate their land on April 6, 1997. Normally they have to wait until May 10 to irrigate because of the high elevation of their village.

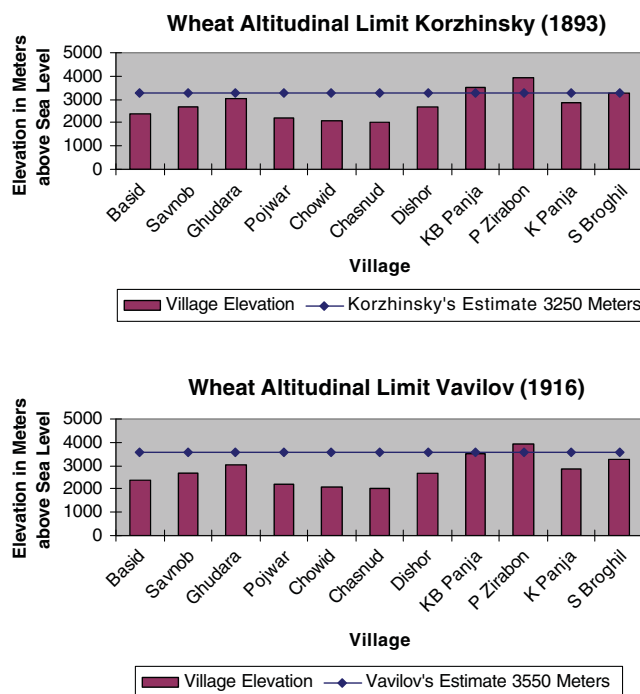


Fig. 3 Upper altitudinal limits of wheat harvesting and altitudes of the Pamir villages

Over two years of discussion and validation of interviews, villagers maintained that their grandfathers used more barley because they could not successfully harvest wheat, but today they grow more wheat and receive an excellent harvest. Diaries of the *khalifa* (religious leader) and the president of the village organization confirm this trend. While there is no credible reason to doubt the villagers' observations of environmental change and wheat growth at higher elevations, it is important to consider a change in preference (e.g., for bread made of wheat instead of barley) as a possible influence in addition to climatic variation. Conversely, preference change may also be influenced by climatic change.

At the same time, villages that once grew certain fruits may no longer be able to grow them or may notice a change in quality. While some of this change is related to loss of varieties and knowledge of cultivation during Soviet rule, fruit trees may also require chilling days in the winter to produce fruit in the summer (Nabhan 2009). Villages reporting such changes include Basid (in the Bartang Valley, Tajikistan), Dishor (in Shugnan, Afghanistan), and Wuzd (in Wakhan, Afghanistan). Farmers have observed more insect infestations affecting their fruit trees, especially apricots. In Rushan, Afghanistan, villagers also identified the need for scientific expertise⁹ because a "worm" not

⁹ The important advice provided in 2008 by Ms. Karamkhudoeva, who is training to be an entomologist, is an example of the value that communities of inquirers bring to communities of social practice.

previously known to this region now appears in the spring and attacks their plants. In Basid, farmers have also reported an increase in rain affecting wheat production. Therefore, some farmers are reducing wheat production and shifting to barley and potatoes.¹⁰

The nomadic Kyrgyz communities report that spring is a continuation of winter. Furthermore, fodder in summer pastures is burnt, and animals are not gaining the necessary weight to sustain them through the winter. It is noteworthy that the UNEP (2003) post-conflict environmental assessment of the Wakhan corridor in Afghanistan's Pamir knot makes reference to oral testimony provided by a Kyrgyz leader in the 1970s, before current concerns over the magnitude and impact of global climate change emerged, indicating that significant changes were then taking place in the climate of the Wakhan. It noted there were changes in precipitation and that traditional grazing lands were becoming less productive. These changes forced pastoralists to seek grazing at higher elevations, severely affecting livelihoods in the region.

People of both agricultural and pastoral cultures complain equally that they can no longer predict the weather. The increasing anxiety levels resulting from dramatic environmental change will have psychological and other consequences that are unknown and yet to be explored. Given that this region of the Pamir Mountains has faced long-term war and repeated prospects for famine, the potential for resilience and adaptation may be diminishing. Food security is a key variable in the context of climatic change. A health and nutrition survey undertaken in 2004 indicates that food security and sovereignty continue to remain major issues of concern from the risk management point of view. While the region of Tajik Badakhshan (the Gorno-Badakhshan Autonomous Oblast, or GBAO) has achieved overall household and economic security, food produced by families lasted only six months, and humanitarian assistance has ceased in most of the GBAO (AKF Tajikistan 2005). Climatic variation may soon threaten food security.

Central Asia is a region with high biodiversity and a large number of endemic species (United Nations Economic Commission for Europe 1998) that are vulnerable to climate change. The biological implications of climatic change are matched by significant cultural consequences: seasonal festivals, indigenous calendars, and sacred sites are all affected. The biological and cultural consequences of change are intertwined.

Whilst the people of the Pamirs contributed the least to human-induced climate change, they will be among the worst affected. According to the Intergovernmental Panel

on Climate Change, "Global mean surface temperature is projected to increase by 1.4 to 5.8°C between 1990 and 2100, which is a much more rapid rate of warming than during the twentieth century and very likely to be unprecedented in at least the last 10,000 years" (Ruosteenoja *et al.* 2003: 7). Without any cuts in greenhouse gas emissions, this study of climate change scenarios predicts increases in temperature for all four seasons in Central Asia between 2010 and 2039 that are outside the range of natural variability, as well as higher precipitation in winter and spring. While villagers are making adaptations such as growing wheat at high altitudes, they are not fully aware of the dramatic implications of climate change. There is an urgent need to facilitate development of adaptation strategies to support resilience capacity. Climate change and adaptation are areas where indigenous knowledge is not merely complementary but contributes to scientific understanding of change. Furthermore, climate modeling can assist in predicting local-level impacts and facilitate planning and risk management.

Opium Addiction

Opium use is not recreational. Community members in Wakhan, Afghanistan, brought up the subject themselves. The reasons for opium addiction are comprehensible: lack of access to medicine, relief from illness and injury, the winter cold, and lack of employment combine in various forms to create an environment for addiction. Addiction does not discriminate—it includes children and adults, men and women. It is noteworthy that Lieutenant Olufsen ([1904] 2005) on the second Danish expedition reported that opium use was not widespread in Wakhan, and addiction was limited to the poor. Today villagers assert that until the Civil War, there was limited and controlled use of opium as a form of medicine. Restricted use of opium under specific medical circumstances was socially sanctioned and accepted. The linkage between poverty and opium use observed by Olufsen in 1904 was most likely an outcome of deterioration in material well-being resulting from addiction. Addiction has the effect of beggaring the user and creates a vicious cycle of poverty. Villagers recounted cases of individuals losing agricultural land and even trading children to support addiction.

In the malevolent environment produced by internal instability in Afghanistan and globalization, international syndicates and interested parties have taken advantage of unfettered opium production, milking massive profits from the narcotics economy. International development institutions recommend less criminalized poppy cultivation for pharmaceutical purposes and the establishment of alternative livelihoods (Kreutzmann 2007). Discussions with villagers and detoxification experts suggest that drugs are

¹⁰ Farmers explained that potato production was largely introduced under Communist collective farming.

largely brought into villages from the outside the region to create dependency. In addition to a community-based detoxification programme, the strategy to reduce or eliminate drug addiction must include economic development, access to medicine, and a secure supply of food and heating fuel.

Gender Burden of Women

In both the Afghan and the Tajik regions of the Pamirs, the gender burden of women is significant since they are responsible for a number of seasonal activities. In the spring, women prepare the land for cultivation by watering and weeding and climb the surrounding mountains in search of firewood. They do this several times, working 18 h a day or more. They tend to their children's needs and cook for their families. And they also prepare for the spring festivals, cook, clean the home, and celebrate. Women are responsible for taking animals to summer pastures, which are often more than 40 km away. They collect goat hair in the spring.

In the summer, women help to renovate their homes and mend household items, while continuing to tend to the land. They also harvest fodder, barley, wheat, and fruits. As there is not sufficient fodder for the winter, they also collect (wild) fodder from the mountains. After harvesting, they dry fruits such as apricots and apples. During the summer, women continue to travel long distances to collect firewood.

In the autumn, potatoes and vegetables are harvested. In addition to their domestic responsibilities, women help the men to thresh wheat, using oxen, and they clean the wheat to prepare it for milling, which is the men's responsibility. Women preserve the vegetables and make jam from fruits. They also bring back the animals from summer pastures.

In the winter, agricultural activities are at a minimum. Women continue to tend to the livestock. They make household items and garments, for example, knitting Pamirian socks. Women who are also professionals—teachers, nurses, and doctors—retain all their other responsibilities.

Kyrgyz of Tashbulaq, Afghanistan, reported an unusually high child mortality rate: “six out of ten children die.” A significant number of the tribesmen were unmarried because the men outnumber the women in the population. Preliminary research indicates that this is indeed the case; however, the cause remains unclear.

Social and Physical Infrastructure

Concern for energy and its environmental consequences was high in the Tajik Pamirs. The need for fuel wood and lighting featured prominently in the villages of the Bartang

Valley as well as the Kyrgyz. These communities have been jarringly weaned of Soviet shipments of diesel fuel—a supply that would not be sustainable in any case in the current context of soaring energy prices. Villagers noted that fuel wood collection is resulting in deforestation and destruction of the environment. In particular, the vital high mountainous plant *teresken* (*Ceratoides papposa*), which protects the slopes from erosion, is being used all year round as fuel. In one village, the result of this deforestation and loss of *teresken* is that apricot trees from local orchards are now being burned as fuel wood. Furthermore, fuel for lamps is expensive and is proving to be a financial burden. Small-scale hydroelectric power generation is the best hope for this context, but with climatic variation, glacial melt, and changing river patterns, it becomes difficult to predict water flows and build reservoirs.

In Afghanistan, the villagers identified their need for social and physical infrastructure, such as schools, irrigation canals, medical clinics, and roads. Opportunities for a post-secondary education were also mentioned repeatedly. For instance, a village leader in Chasnud explained the link between physical infrastructure and energy supply: “The road is more important because we first need to deal with construction of roads. We cannot carry stone on our backs to build a dam. We need the road to deal with the river. For example, we have enough water to construct a power station, but how can we bring the new motor to our village? The road helps us solve other problems.” In the Rushan-speaking region of Afghanistan, villagers explained that the lack of a transportation network keeps humanitarian assistance from reaching them. The nomadic pastoralist Kyrgyz at their spring and summer camp of Tashbulaq, Afghanistan, also echoed the need for roads to allow food security, humanitarian assistance, and transport of their products to market.

In the Wakhan region of Afghanistan, villagers reiterated the need for medical clinics as a means to reduce opium addiction. The cost of transportation from Sarhad i-Brogil to Ishkashim, estimated to equal the price of an ox, is prohibitive. Detoxification programs were also identified as an urgent need.

Discussion

In the Afghan Pamirs, a common refrain was “we need stability in order *just* to live.” This plea underscored the need for political stability so that families may simply sustain a meagre livelihood under conditions of uncertainty and change. Instability and unpredictability are directly related to food security, and potential famine is not far from

the minds of the villagers. There was a palpable fear of the return of the Taliban to the central government in the south. While the Taliban were never able to gain a foothold in the north, their activities had significant impact in generating an environment of instability. Various groups of mujahedeen wreaked havoc on villages, their livestock, food resources, family activities, and sacred sites. Similarly, in the Tajik Pamirs, after nearly a decade of civil war, rising food and energy costs contribute to a major concern for food security. In this region, research fundamentally needs to be practically oriented in order to help achieve stability and must be informed by concrete, pragmatic priorities so as to facilitate understanding of both social and environmental change. The communities in the Pamirs have already demonstrated their capacity for resilience. They have survived under conditions of persistent war. Although they are at the vanguard of dramatic environmental change, ironically they are not primarily responsible for it, or for the global war being played out in their homeland. Mechanisms of international justice, it would seem, are not blind but indifferent.

The effects of environmental change may not proceed in predictable linear patterns but nonetheless anticipation will be essential to mitigate risk. The linkages between climatic variation, addiction, gender roles, and food security are complex. For instance, changes in snow and glacial melt result in changing river flows, loss of fertile land in villages at lower elevations, and loss of road networks, and they displace construction of small-scale, energy-efficient hydropower. Similarly, loss of fertile land and roads would affect food security and restrict the potential for emergency assistance. Figure 4, based on villager accounts, broadly illustrates potential causality resulting from environmental change.

These communities have not adopted a vocabulary of victimhood. Instead, they seek meaningful solutions in order to live. The potential for intellectual pluralism based

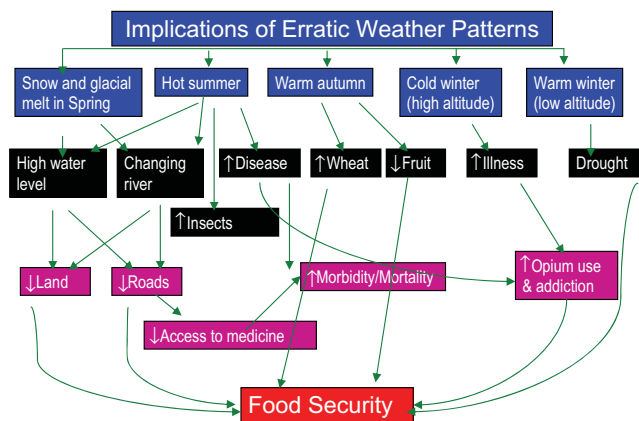


Fig. 4 Causality and connectivity of climate change effects

on the diversity of indigenous ecological knowledge and the presence of scientific institutional knowledge is strong, and such knowledge can be put to practical use. While there is a general sense of being besieged by crisis, the critical contribution that these diverse banks of knowledge can make cannot be underestimated. Further research in this area will need to integrate these two human resources through curriculum development at educational institutions such as the University of Central Asia, as well as contributing relevant, ready-to-use information to civil society organizations committed to development and food sovereignty.

The history of this part of Central Asia offers an interesting paradox of isolation and exchange. An international trade route operated here while Europe was emerging from its Dark Ages. Juxtaposed against this is the externally imposed isolation brought about by the ascension in the twentieth century of two European ideologies with military might, which exploited the people of the Pamirs as pawns in the “great game.” Stalin referred to the Soviet-controlled region of the Pamirs as a ‘lighthouse’ to the rest of capitalist Asia for furthering socialist dogma (Wood [1872] 1976: xii). It would be more constructive to view this strategic region not as an instrument, but as the homeland of diverse peoples who are at the forefront of humanity in adapting to the ravages of war and to remarkable social and environmental change not entirely of their own making. While adaptive responses are not always well chosen, as in the case of burning teresken for firewood, extreme conditions such as warfare and famine limit their options. Positive adaptations such as growing wheat at higher elevations, as well as their actions to protect sacred spaces and eliminate opium addiction, testify to the resilience, agency and creativity of the people of the Pamirs.

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