JOURNAL OF PHILIPPINE TOURISM
AND HOSPITALITY STUDIES 1 (2019)

JPTHS

Sustainability Science in Indigenous Cultural Landscapes –
A methodological guide for the collaborative development of sustainability indicators

Ivan Anthony S. Henares[a, c], *Roberto S. Soriano*[b], *Virginia J. Soriano*[b], *Richard Philip A. Gonzalo*[a], *Erickson L. Llaguno*[b], *Kristine Mae C. Gotera*[b], *and Jonathon Day*[c]

a Asian Institute of Tourism, University of the Philippines, Diliman, Quezon City, Philippines
b College of Engineering, University of the Philippines, Diliman, Quezon City, Philippines
c School of Hospitality & Tourism Management, Purdue University, West Lafayette, Indiana, USA

Abstract

This article presents the methodology used in developing sustainability indicators for the Rice Terraces of the Philippines Cordilleras, a project the authors carried out in 2016 for the United Nations Educational, Scientific and Cultural Organization (UNESCO) Regional Science Bureau for Asia and the Pacific in Jakarta, Indonesia with financial assistance from the Japanese Funds-in-Trust (JFIT). Utilizing the principle of free, prior, and informed consent (FPIC), and drawing from indigenous knowledge, the authors were able to draw the local community's concept of sustainability and their suggested sustainability indicators. Several data collection methods were employed in the study, including collaborative and iterative focus group discussions, collection of scientific samples, archival research, and interviews. Data analysis revealed the local stakeholders' envisioned future, their core areas of concern about the envisioned future, and a set of ecological and physical, agricultural and economic, tourism and conservation, and social and cultural indicators for sustainable cultural landscapes. The authors were given certificates of validation of the findings after the validation meetings in the selected local communities, following the FPIC process.

Keywords

Sustainability; Sustainability indicators; Indigenous knowledge; Cultural landscapes, FPIC; Transdisciplinarity; Coproduction research and practice

1 Introduction

Sustainable development is founded on the reconciliation of society's development goals with the world's limits (National Research Council, 1999). The strategy to achieve sustainable development involves the promotion of harmony between humanity and nature. The need to strengthen the foundations of sustainable development ¬– economic, social, and environmental – requires the integration of science, society, and policy analysis. (Bertocchi, Demartini, & Marescotti, 2016; Gómez-Limón & Sanchez-Fernandez, 2010; Goodland, 1995)

A range of indicators and methodologies for measuring agricultural and tourism sustainability (Bertocchi et al., 2016; Castellani & Sala, 2010; Fernández & Rivero, 2009; Gómez-Limón & Sanchez-Fernandez, 2010; International Working Group on Indicators of Sustainable Tourism, 2002; Ko, 2005; McCool, Moisey, & Nickerson, 2001; Miller, 2001; Miller & Twining-Ward, 2005; Roberts & Tribe, 2008; Tanguay, Rajaonson, & Therrien, 2013; World Tourism Organization, 2004), and within specific contexts, such as managing community tourism (Choi & Sirakaya, 2006; Tsaur, Lin, & Lin, 2006), carrying capacity (Graymore, Sipe, & Rickson, 2010; Lane, Dawes, & Grace, 2014; Navarro Jurado et al., 2012; Salerno et al., 2013), policy planning (Demartini, Gaviglio, & Bertoni, 2015), measuring the attitude of residents (Choi & Sirakaya, 2005; Tsaur et al., 2006) and local authorities towards sustainable tourism (Dymond, 1997), and actual impacts (Hughes, 2002) have been proposed and utilized.

This article presents a methodology used to develop indicators for sustainability in cultural landscapes managed by indigenous people within a sustainability science framework, explored in the study Establishment of Sustainability Science Demonstration Pilot Project on Rice Terraces of the Philippines Cordilleras (Henares, Soriano, Soriano, Gonzalo, Llaguno, & Gotera, 2016) for the United Nations Educational, Scientific and Cultural Organization (UNESCO) Regional Science Bureau for Asia and the Pacific in Jakarta, Indonesia with financial assistance from the Japanese Funds-in-Trust (JFIT). The key objective of the project was "to develop and implement a community-based natural resource management tool supported by an assessment of land cover and climate change impacts using sustainability science approach, with a particular emphasis on preserving agro-ecosystem equilibrium." This objective necessitated a methodology to determine indicators that incorporated community participation and collaboration.

The Rice Terraces of the Philippine Cordilleras is a World Heritage Site with five inscribed rice terrace clusters, all considered outstanding examples of an evolved, living cultural landscape. All five groups – Nagacadan, Hungduan, Central Mayoyao, Bangaan, and Batad – are located in Ifugao, a landlocked province on Luzon Island that is part of the Cordillera Administrative Region of the Philippines. Ifugao is an "indigenous peoples' enclave" with a population of 202,802 (Philippine Statistics Authority, 2015). There are several Ifugao ethnolinguistic groups: Ayangan, Tuwali, Yattuka, Kalanguya, and Keley-I (Acabado, Martin, & Datar, 2017). Another classification notes that the interaction of Kalanguya and Tuwali resulted in a variation called Hanglulu, of which Keley-i, Yattukca, and Dikkalay are variations (Respicio, 2013). Acabado et al. (2017) point out that while these Ifugao groups may have slight differences in language and practices, they are “bound by a common identity, that of being Ifugao–people of Pugaw or the Earthworld, a realm in their cosmos inhabited by mortal beings.”

2 Literature Review

The concept of sustainable development was defined by the World Commission on Environment and Development (1987): "Humanity has the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs." Before this report, the shaping of the concept of sustainable development

was marked by a convergence between economic growth and environmentalism, first discussed at the Stockholm Conference on Humans and the Environment in 1972 (Hardy, Beeton, & Pearson, 2002).

Defining sustainability science as a discipline that points the way toward a sustainable society, Komiyama and Takeuchi (2006) note that the problem of sustainability is approached at three levels of "system"—global, social, and human, all essential to the coexistence of humans and the environment. Sustainability science analyzes the crisis of sustainability in terms of the breakdown of these systems and the linkages among them (Komiyama & Takeuchi, 2006).

Because each community has differences in needs and quality of life concerns, sustainable development, according to Maida (2007), is a local practice. To ensure sustainable development, sustainability needs to be managed through policy reviews, feedback mechanisms, and impact evaluations. This will necessitate the use of monitoring systems and indicators that assess, among other things, the effectiveness of policies and actions, needed controls, and capacity thresholds (Getz, 1983). Godschalk and Parker (1975), noting that capacity thresholds change over time, proposed a continuous measurement of impacts based on critical indicators. Measuring and managing sustainability is difficult without indicators (Butler, 1999). But before indicators are identified, it is essential to formulate clear objectives and goals that address sustainability and change in specific places and situations (Hunter, 1997; Maida, 2007; Twining-Ward & Butler, 2002). In this study, goals, and objectives were stated in the form of an envisioned future that became the foundation for the selection of indicators.

The importance of Indicators

The process for establishing indicators and implementing a monitoring system requires place-based (National Research Council, 1999; Potts & Harrill, 1998) and situation-based (Hunter, 1997) conceptual, methodological, and operational considerations and processes, and an active and flexible implementation framework that will convert indicator data into action (Twining-Ward & Butler, 2002). Indicators keep track of sustainability and environmental progress, which in turn are integrated into policies. (Organisation for Economic Co-operation and Development, 1998, 1999). Ceron and Dubois (2003) highlight the importance of indicators because of their capacity to hold meaning, pointing out that they offer tangibility and significance that "stakeholders often find lacking in purely theoretical or ideological debates." Falck and Spangenberg (2014) also argue that "indicators that do not resonate with stakeholders will not be considered useful and consequently not be used by them" and their development requires elucidation of stakeholder needs and transdisciplinary processes (Falck & Spangenberg, 2014).

Transdisciplinarity, and community participation in scientific research

Fish, Seymour, Watkins, and Steven (2008) argued, "accommodating different ways of knowing the world is a common marker of sustainability." Thus sustainability and systems related research require the use of transdisciplinary approaches (Fish et al., 2008; Gaziulusoy & Boyle, 2013) due to the diversity, complexity, and dynamics of the processes involved (Hirsch Hadorn, Bradley, Pohl, Rist, & Wiesmann, 2006). Transdisciplinary research is aimed at socially relevant and contextual problems, or societal problem solving, with the common good as its justifying principle (Gaziulusoy & Boyle, 2013; Hirsch Hadorn et al., 2006). It has evolving methodologies, requires collaboration and coordination between different disciplines, and the participation of non-scientific stakeholders, and is normative, allowing it to address "complex, multi-stakeholder real-life problems with high social and environmental relevance" (Gaziulusoy & Boyle, 2013). The traditional knowledge of local stakeholders is vital to transdisciplinarity in sustainability research and can be incorporated in methodologies using a collaborative, iterative approach.

Many cultural landscapes are nurtured by indigenous peoples. Their knowledge systems and practices have helped them survive and remain sustainable. Community knowledge is key to understanding cultural landscapes and developing measures for their sustainability. By understanding the community's distinctive characteristics, the most relevant variables for sustainability in a specific area or setting could be identified. This is key to choosing the appropriate indicators (Bertocchi et al., 2016; Choi & Sirakaya, 2006). Community-based approaches to conservation, defined by Western and Wright (1994) as "natural resources or biodiversity protection by, for, and with the local community," are key to the co-existence of people and nature (Berkes, 2007). They point out the irony that community-based conservation is hardly new since "communities down the millennia have developed elaborate rituals and practices to limit offtake levels, restrict access to critical resources, and distribute harvests." (Croll & Parkin, 1992; Western & Wright, 1994)

Involving the local community in research projects from the earliest stages, and throughout the research process, is increasingly being recognized as beneficial because it enhances the research value to the community, and can, later on, move research to policy. Community involvement and collaboration also brings in local knowledge (e.g., environmental conditions and socio-economic realities), an essential source of insight for the local situation (Inuit Tapiriit Kanatami & Nunavut Research Institute, 2007).

Participatory approaches for research and local development seek a more systematic accommodation of local knowledge because of its connection to sustainability and local community empowerment (Ellis, 2005; Grenier, 1998; Schafer, 1989; Schönhuth, 2002; Sillitoe et al., 1998). Methodologies have been top-down or bottom-up, with bottom-up increasing the capacity of indigenous people to incorporate traditional knowledge with governance (Ellis, 2005). It has been used as a starting point for assessing development policies and determining new methodologies and sustainability indicators as part of the environmental decision-making process (Baker, 2003; Ellis, 2005; Nadasdy, 2003; Spak, 2005; Stevenson, 1996; Usher, 2000), especially in marginal areas (Castellani & Sala, 2010). Encouraging community involvement and shared learning

is a common element of many other indicator planning approaches (Miller & Twining-Ward, 2005).

Local knowledge and perspectives

Sustainability is embodied in indigenous or local knowledge (Agrawal, 2002; Ellis, 2005; Posey, 1996, 2000; Sillitoe et al., 1998), which according to research is highly sophisticated and complex, a result of generations of careful observations of an intimate familiarity with the environment (Krech, 2005; Rajasekaran, Warren, & Babu, 1991). And incorporating local community expertise, viewpoints, and aspirations in the development process produces output that encompasses socio-cultural context (Antweiler, 1998, 2004; Ellen, Parkes, & Bicker, 2000; Emery, 2000; Grenier, 1998; Sillitoe, 2015; Sillitoe et al., 1998; Warren, Slikkerveer, & Brokensha, 1995).

Local knowledge, a term synonymous with indigenous or traditional knowledge (Bicker, Sillitoe, & Pottier, 2004; Posey, 2002) is unique and traditional knowledge existing and developed by people indigenous to a geographic area, orally-transmitted or transmitted through imitation and demonstration (cultural transmission), that is accumulated through generations of experiences, observations, and experiments resulting from practical engagement in everyday life, as people respond to local conditions and changing social and natural environments in order to survive (Antweiler, 2004; Bicker et al., 2004; Ellen et al., 2000; Gadgil, Berkes, & Folke, 1993; Grenier, 1998). Croll and Parkin (1992) note that "the anthropological emphasis on people's local knowledge and use of their environments, often based on years of painstaking observation carried out in the people's language, provides a perspective that few other disciplines can match."

Local knowledge has long struggled for legitimacy and integration with western science (Agrawal, 1995; Christensen & Grant, 2007; Ellis, 2005; Nadasdy, 2003; Sandlos & Keeling, 2016; Spak, 2005; White, 2006). Rather than incompatibility of local knowledge with western science, Agrawal (1995) and White (2006) note that the disagreement is between local culture and the values and procedures of Western-style governance, and that conservation method that engages politics need to be advocated. While McClure (1989) noted “a growing awareness among scientists, scholars, and development practitioners of the tremendous importance of understanding, respecting, and utilizing indigenous knowledge systems when working in developing countries,” Sillitoe, Bicker, and Pottier (2002) enumerated several issues regarding the formulation of appropriate methodologies to incorporate local knowledge into the development process taking into account that (1) local knowledge is neither static nor uniform, subject to stakeholders’ negotiations, and involves constant revision of knowledge and understanding, (2) new methods should promote partnership and an awareness of local perspectives, and (3) local knowledge is not locally homogenous, variations in knowledge exist even within local communities, and new methodologies to assess and gauge them are needed.

Engaging with indigenous communities: free, prior and informed consent (*FPIC*)

Creating circumstances in which collaboration and knowledge sharing can take place is an important task and based on the principles of free, prior, and informed consent (FPIC). FPIC is an international standard for engagement with indigenous peoples (Kwaymullina, 2016; Perera, 2015; The World Bank, 2005), specifically for decisions on development projects, resource extraction, and other investment projects that may affect their lands, territories, or livelihoods (Buppert & McKeehan, 2013; Papillon & Rodon, 2017; Ward, 2011).

Based on international human rights law and explicitly recognized in the United Nations Declaration on the Rights of Indigenous Peoples (UN General Assembly, 2007), FPIC ensures bottom-up participation by requiring project proponents to consult or obtain the consent of indigenous peoples, through an iterative series of discussions, consultations, meetings, and agreement. There are numerous codes of conduct and standards of practice to guide research and conservation projects involving indigenous and local communities (Posey, 2002; Taniguchi, Taualii, & Maddock, 2012) and a number of countries have adopted guidelines for research with indigenous peoples including Australia (AIATSIS, 2012; Kwaymullina, 2016), the United States (Indigenous Peoples Council on Biocolonialism, 2000), and Canada (Canadian Institutes of Health Research, Natural Sciences and Engineering Research Council of Canada, & Social Sciences and Humanities Research Council of Canada, 2014). The International Society of Ethnobiology (2006) Code of Ethics (updated in 2008), which down seventeen principles to establish ethical and equitable relationships with the communities, including prior rights and responsibilities, self-determination, active participation, full disclosure, educated prior informed consent (EPIC), supporting indigenous research, and the dynamic interactive cycle. Specifically, the dynamic interactive period states:

> This principle recognises that research and related activities should not be initiated unless there is reasonable assurance that all stages can be completed from (a) preparation and evaluation, to (b) full implementation, to (c) evaluation, dissemination and return of results to the communities incomprehensible and locally appropriate forms, to (d) training and education as an integral part of the project, including practical application of results. Thus, all projects must be seen as cycles of continuous and on-going communication and interaction (International Society of Ethnobiology, 2006).

Iterative and collaborative stages and the process of continuous and ongoing communication and interaction were reflected in the methodology undertaken by the researchers.

The Philippines also has research protocols issued by the National Commission for Indigenous Peoples (2012) ¬– NCIP Administrative Order No. 01, Series of 2012, The Indigenous Knowledge Systems and Practices (IKSPS) and Customary Laws (CLS), Research and Documentation Guidelines of 2012. The Philippine guidelines are very rigid and bureaucratic, down to defining the specific composition of committees that will oversee the research, and requiring researchers to return to the study area several times to secure a series of consent documents and agreements before the original research can be conducted. The rigidness of the FPIC process outlined by the Philippine government had a significant impact on the methodology undertaken by the

researchers. But with rational and timely implementation, mindful of both respecting the rights of indigenous people and promoting continuous ethical scientific research, these guidelines can support an iterative and collaborative research process.

Grounded theory as a collaborative and iterative research process

To harness essential knowledge about sustainable management techniques and to apply them in conservation of cultural landscapes and transition to sustainable living, the following principles were be used in the course of the study – (1) integration of multiple disciplines, (2) a shift away from conventional models of science to local knowledge creation and sharing, (3) recognition of the collective wisdom of humanity that is embodied in local knowledge systems, and (4) the use of approaches and techniques that can accommodate problem-oriented and place-based inquiry at multiple scales (Henares et al., 2016). To guide the study team, a framework was developed based on the requirements of United Nations Educational, Scientific and Cultural Organization (UNESCO) Regional Science Bureau for Asia and the Pacific in Jakarta (2014) and free, prior and informed consent (FPIC) of the National Commission for Indigenous Peoples (2012), since the scope of study involved the presence of indigenous people in the study areas. Stakeholders representing local government, farmers, community leaders, and the youth provided input into developing the indicators.

3 Methods and Data

To develop sustainability indicators, the study employed a guided grounded theory approach (Bryant & Charmaz, 2007; Charmaz, 2006; Creswell, 2013; Glaser, 1978; Glaser & Strauss, 1967; Goulding, 2002; Matteucci & Gnoth, 2017; Strauss & Corbin, 1997). The project – Establishment of Sustainability Science Demonstration Pilot Project on Rice Terraces of the Philippines Cordilleras (Henares et al., 2016) – was carried out within the framework of the Sustainability Transformation Across the Region (STAR) project developed by the UNESCO Jakarta with Japanese Funds-in-Trust (JFIT) financial assistance. In the study, sustainability science was explored as a framework to develop strategies and tools that can facilitate the transition to sustainable living by harnessing the wisdom of early human and nature interactions.

Figure 1. Research Methodology

Step 1: Initial review & assessment, consultation, and consent

Given the unexplored knowledge of cultural landscapes, the team conducted the research and data collection without a preconceived idea of what sustainability means for the people of the cultural landscape and suggestions of indicators that would measure sustainability. Rather than apply common indicators, the team recognized the need to customize indicators for success in the rice terraces based on indigenous knowledge systems and practices (IKSP) of the community combined with grounded theory (Antweiler, 1998; Bishop, 1998; Kunkel, 2017; Sandlos & Keeling, 2016). Data collection proceeded simultaneously with analysis. Analytic interpretations and discoveries shaped further data collection. And new processes and products of research were developed by the initial data (Charmaz, 2006).

Review of literature on sustainability science, cultural landscapes, and indicators

While the theory is built from the ground, researchers will always be influenced by knowledge from their disciplinary backgrounds to put focus to the research and guide the researchers as they interpret the data (Goulding, 2002). In this guided grounded theory approach, the researchers did an extensive review of literature but did not make any suggestions to the community as to what sustainability is or possible indicators needed to monitor that sustainability. The extant theory makes researchers aware of the conceptual significance of emerging concepts and categories (Glaser, 1978; Goulding, 2002). Goulding (2002) points out that "knowledge and theory are used as if they were another informant," because "without this grounding in existing knowledge, pattern recognition would be limited to the obvious and the superficial, depriving the analyst of the conceptual leverage from which to commence theorizing."

Initial contact and securing consent

Following the FPIC process required by the NCIP, a request letter and copies of the project detailed work plan were sent via e-mail. Upon approval, the team made its first visit to Mayoyao, Ifugao. The team conducted several workshops to secure both FPIC and conduct focus group discussions and key informant interviews (Camacho, Gevaña, Carandang, & Camacho, 2016) to gather data for the study. Before research can continue, a (1) resolution of consent, (2) authorization of representatives to sign MOA, and a (3) memorandum of agreement (MOA) needed to be obtained from each community or group and signed by all those who were to participate in the research. During the first workshop, the team presented the objectives and work plan for the study to representatives from the Office of the Mayor, Sangguniang Bayan or Municipal Council, Municipal Agricultural Office, Municipal Planning and Development Office and its attached Tourism Office, Office of the Municipal Treasurer, and a representative for the farmers.

Two ICC (Indigenous Cultural Community of the Municipality of Mayoyao, Ifugao) resolutions at the municipal level were drafted as part of the requirements for FPIC. The first was ICC Resolution No. 1, Series of 2015 – RESOLUTION OF CONSENT allowing the research team to conduct the study with conditions outlined in a memorandum of agreement (MOA). The second was ICC Resolution

No. 2, Series of 2015 – AUTHORIZATION OF REPRESENTATIVES TO SIGN MOA allowing the attendees and people in Mayoyao, Ifugao, to be signatories of the MOA between the ICC and research team, which detailed the obligations of both parties. The last step for consent was the signing of the MOA itself. The same three-step consent process was repeated in Barangays Mapawoy and Chaya, and the Mayoyao Assumption Academy, and the validation site in Barangay Hapao in the Municipality of Hungduan.

Step 2: Data collection

After consent was secured, several data collection methods were undertaken: collaborative and iterative focus group discussions, collection of scientific samples, archival research, and interviews. This approach following Ajibade (2003), the observation that farmers' indigenous knowledge of their environment in developing countries cannot be obtained using a 'single-method' approach, suggested an 'integrated-data-acquisition' technique mainly dependent on the "researchers' understanding of the people's cultural characteristics, perception, and decision-making process."

Cognizant that a place-based understanding of development recognizes that a society can find its strategy, define problems based on its perceptions, and formulate solutions from its cultural resources (Antweiler, 1998; Bicker et al., 2004; Sillitoe, 2015), this research elicited information from key informants that demonstrated identification of problems, assessment of options, and formulation of strategies to solve problems. The initial objective of the data gathering was to elicit what the community believed was their envisioned future. That envisioned future was the basis for determining and selecting indicators. The community was asked what issues were most important to them, and the feasibility of data collection to address them (World Tourism Organization, 2004). The exercise required the informants to identify their negative perceptions about the rice terraces, the challenges of addressing the negative perceptions, and outside assistance they would need to allow them to solve the problems at hand.

Collaborative and iterative focus group discussions

The process of focus group discussion itself consists of four significant steps: (1) planning and research design, (2) recruiting, (3) moderating and data collection, (4) analysis and reporting of results (Morgan, Krueger, & King, 1998; Nyumba, Wilson, Derrick, & Mukherjee, 2018; Parker & Tritter, 2006). For recruitment, the team made sure that significant sectors of the community were represented and present. With the help of the local coordinators, the best available representatives were identified. Team members and community leaders served as moderators throughout the iterative process of gathering information. Analysis and reporting were also collaborative and iterative, with local knowledge as the central element of the discussions.

During the focus group discussions, rice production was a prominent concern among local people. The enumeration of benefits from the rice terraces revealed that the value of the cultural landscape to the community was founded on its capacity to provide rice for nourishment, like a

source of income for households and the government, as a tourist attraction, and as a form of cultural identity in local and global scales.

The variety of concerns and differing perspectives of sustainability in each community were evident. For example, in Mayoyao, of all these values, the rice terraces could provide food that was the most important reason for the community to continue rice farming. Heirloom rice such as tinawon, despite its higher cost of production, was the preferred staple in Mayoyao. Taste and familiarity were more critical to the community than the price. Thus, there was an aversion to the consumption of lowland rice, which was imported only because the supply of heirloom varieties was not enough for local use. Hence, no issues on rice as a source of income were identified because the Mayoyao community did not view rice as an income source.

This situation was not real however in Hapao, where locals sold their more expensive heirloom mina-angan rice for added income and consumed cheaper imported lowland varieties. Thus, despite being in the same Ifugao cultural landscape, the value of the rice and the rice terraces varied by community. Because the rice terraces were seen as a source of nourishment, its continuous use as a food source meant that disinterest, even among young people in Mayoyao, was not the main threat to its sustainability.

In Hapao, however, the respondents pointed out that more people were leaving. In a family with ten children, two would usually stay in Hapao. That wasn't yet a guarantee that those who remain would undertake to farm. Adding to the labor drain was that the children who leave would usually bring their parents to live with them abroad. Thus, terrace owners are left with no choice but to go their properties to the care of relatives or lease them out to farmers.

These differences in priorities highlight the need for community-driven and community-specific sustainability indicators, even within different communities of the same cultural landscape, which the collaborative and iterative process was able to achieve.

Collection of scientific samples

Water and soil samples were taken to establish baseline data on hydrology, including a field survey of surface and groundwater sources (streams, springs, wells) and discharge measurement, site observation of distribution and control mechanisms for irrigation and water supply, and soil sampling and laboratory analysis for soil texture.

Records and archival research

Data was also collected for value chain analysis, mapping the big picture – cultural workers, local government agencies, enterprises, and other sectors and actors in the destination, the links between them, demand and supply data, and pertinent context; mapping where and when agents do and do not participate, taking note of less visible agents and suppliers.

Interviews

Two fieldwork interviews covering each node of the chain (from production to consumption) were also conducted, guided by a household survey form, to verify information on agricultural management practices and consumption patterns that were gathered from the focus group

discussions. The team decided against doing more field interviews because the responses of the two interviews were similar. The team determined the two interviews were sufficient to get a good picture of the overall experiences of the community. And due to the length of time required to conduct each one, any new interview would be counterproductive.

Questions focused on the type of crops, the planting cycle and its activities, constraints in rice production, strategies and management practices, labor and other farming expenses, and household income, consumption patterns, and costs.

Step 3: Analysis and integration of data

A hermeneutic approach was to be used to analyze the narratives shared by the informants. Indications of the core principles that shaped their views and decisions were derived based on the interpretation of these narratives. The identification of negative perceptions was an exercise on how they made sense of their current situation. Determination of challenges provided information on criteria they used to analyze the feasibility of strategies currently implemented. Identification of the assistance supplied the options they were willing to consider to address the problems at hand. Identifying core principles and the resulting envisioned future was based on the narratives.

Data integration allowed the team to group negative perceptions into problems that were common and specific issues to the barangays covered in the study. Proposed solutions would respond to the groups of issues.

Envisioned future

The problems raised by stakeholders indicated a need for periodic monitoring. The team made an in-depth analysis of the current situation and elicited the stakeholders' picture of their envisioned future, which was summarized as follows:

1. Maintaining the character of Mayoyao and their way of life by regulating development
2. Mitigating the damage to the terraces by minimizing the effects of climate change and pests
3. Ensuring the continuous use of the rice terraces for several generations
4. Enhancing the productivity of rice and other crops
5. Regulated tourism arrivals (Henares et al., 2016)

The core areas of concern for sustainable development were categorized as about the envisioned future, including:

- Ecological and physical factors such as facilities, location, water supply
- Agricultural and economic factors such as technology, tools, equipment, process
- Tourism and conservation factors such as policies, fees, administration
- Social and cultural factors such as attitudes, beliefs, behavior

Value chain analysis was also conducted, mapping the big picture – cultural workers, local government agencies, enterprises, and other sectors and actors in the destination, the links between them, demand and supply data, and pertinent context; mapping where and when agents do and do not participate, taking note of less visible agents and suppliers. As part of the iterative process, this analysis was presented to stakeholders for feedback at the next focus group discussion, and used as a basis for determining feasible solutions.

Identification of feasible solutions

A listing of these challenges and assistance and discussion among the key informants revealed strands of implied strategies that could address the problems attributed to the different capacities of the rice terraces.

1. Strategies to address the capacity of rice as food can be defined as those interventions that can increase the production of the rice that can be readily consumed by the local people.
2. Strategies to tackle capacity of rice as income can be defined as those interventions that can increase rice's economic status in the market. This involves interventions that increase its value when traded by the local people for other commodities and services.
3. Strategies to address the capacity of rice as a source of tourism can be defined as those interventions that can increase the landscape's ability to generate income from recreational and non-agricultural activities that engage visitors.
4. Strategies to address the capacity of rice as a source of cultural can be defined as those interventions that can enhance recognition by local and international institutions. (Henares, et al., 2016)

Step 4: Determining the indicators and validation

The simple enumeration and grouping provide a clear indication of the role of the rice terraces as a resource that will sustain the activities of the people. The analysis can be summarized as follows:

1. Rice terraces are valued for its capacity to provide nourishment.
2. Rice production is founded on the availability of arable land where rice can be grown and its utilization for such purpose.
3. The supply of rice as food can be diminished by decisions to trade land for other purposes and not to utilize it by traditional.
4. The physical appearance of the landscape and the distinctness of Mayoyao rice production, although identified, appear to be minor concerns
5. Though identified, the commercial viability of rice does not seem to be a pressing issue among the local people of Mayoyao. (Henares, et al., 2016)

At the final focus group discussion, the study team reached a consensus with the local community on the following set of indicators: ecological and physical (land utilization, biotic diversity, and irrigation), agricultural and economic (crop yield and consumption), tourism and conservation,

and social and cultural dimensions (population change, occupation, and traditional ecological knowledge and practices) for sustainable cultural landscapes. With the additional local knowledge inputs and feedback received from the community, the team refined the strategies and indicators for presentation and approval during the validation.

To complete the collaborative and iterative process, the research team conducted validation meetings in Mayoyao and Hungduan following the FPIC process to secure certificates of validation. A second workshop was held in which the summary of current issues and range of solution, strategies, and scenarios are presented to all practitioners and stakeholders (representatives). This was followed by a discussion for the selection of the solution as well as its implementation strategy, including funding. The results of the study in the Mayoyao were validated in another area, Hapao in Hungduan. After presenting the findings at each site, the team was given certificates of validation.

4 Conclusion and Recommendations

The field of science and technology studies has highlighted the value of the co-production process, as it investigates "knowledge societies in all their complexity: their structures and practices, their ideas and material products, and their trajectories of change" (Jasanoff, 2004). Much like the other indigenous cultural communities in the Philippine Cordilleras, the cultural landscape of Mayoyao is a testament of its peoples' evolving knowledge and ingenuity in their high-elevation cultural landscape. This is provided for in the local people's sophisticated agricultural system that covers watershed management, irrigation systems, and farming methods (Henares et al., 2016).

Guided grounded level theory to satisfy FPIC requirements advanced a collaborative and iterative process to determine sustainability indicators based on the indigenous community's own envisioned future. As far as the key informants were concerned, the core principle that guided them in making sense of the situation and making decisions affecting rice terraces was primarily practical. The collaboration was both formal and informal. While there were several steps mandated by law in the FPIC process, collaboration with data collection and integration was voluntarily added to the process.

The primary study area focused on one of the five World Heritage-inscribed clusters of the Rice Terraces of the Philippine Cordilleras – Central Mayoyao. Validation was also made in Hapao, which is part of the Hungduan cluster. The validation showed that communities within the same cultural landscape have different envisioned futures. Thus, one set of indicators for all communities may not be appropriate. This highlights the need for co-production and a collaborative and iterative process for sustainable development that incorporates both local knowledge and goals with scientific research.

Using purely current scientific knowledge would not be useful in determining sustainability indicators for cultural landscapes because of the sociocultural, economic, and environmental differences in each community. Local knowledge thus enhanced the quality of the report, as it

outlined problems raised by local stakeholders and solutions that were proposed based on the synergy of scientific and indigenous knowledge.

This process increased the validity of the selected indicators because the evolving local knowledge that was incorporated into their formulation was in effect longitudinal data on the management of the cultural landscape. The collaborative and iterative approach was also reflected in the STAR Sustainability Science Implementation Framework (Fig. 2) that was also developed using an iterative process following initial reports of the pilot sites in the Philippines, Cambodia, and Malaysia (Sugiura, Rahmawati, Katriana, Sulaiman, & Khan, 2017; Sugiura, Rahmawati, Macarombon, Heredia, & Khan, 2016; UNESCO, 2017).

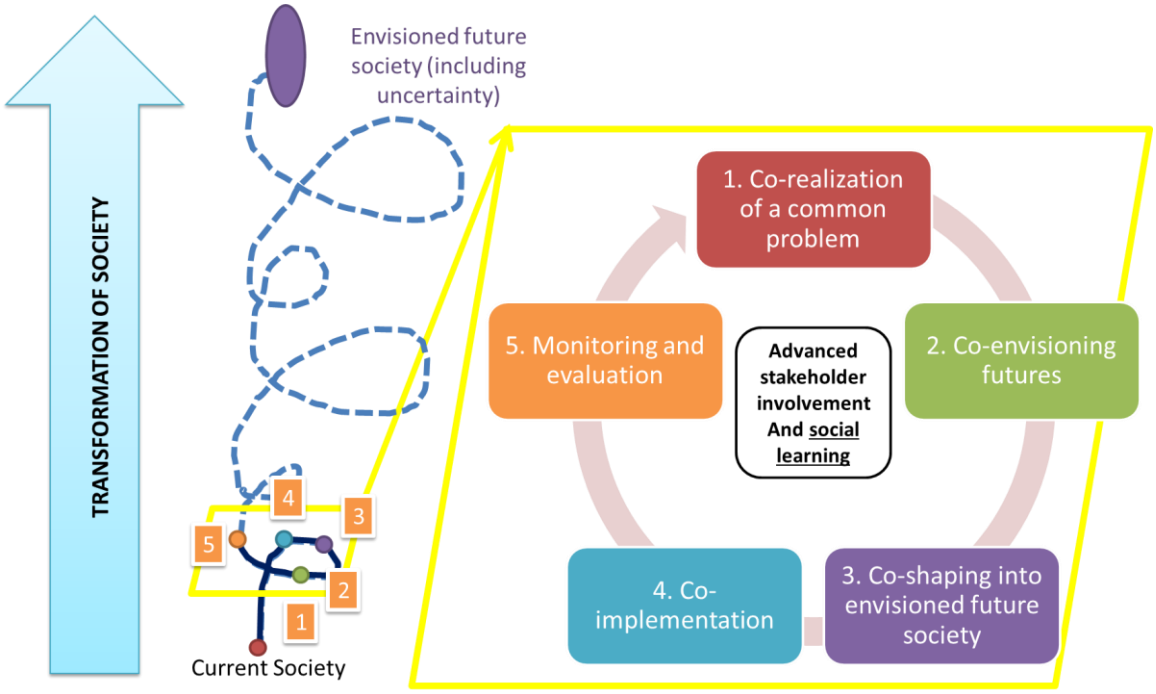

Figure 2. STAR Sustainability Science Implementation Framework (Sugiura et al., 2016)

This collaborative methodology and iterative approach used in determining sustainable cultural landscape indicators for a specific community within an indigenous cultural landscape can serve as a starting point for devising a set of indicators for other communities within the same cultural landscape, the cultural landscape as a whole, and different similar cultural landscapes with indigenous people.

References

Acabado, S., Martin, M., & Datar, F. (2017). Ifugao Archaeology. Advances in Archaeological Practice, 5(1), 1-11. doi:10.1017/aap.2016.7

Agrawal, A. (1995). Dismantling the divide between indigenous and scientific knowledge. Development and change., 26(3), 413-440.

Agrawal, A. (2002). Indigenous knowledge and the politics of classification. International Social Science Journal, 54(3), 287-297.

Ajibade, L. T. (2003). In search for methodology for the collection and evaluation of farmers' indigenous environmental knowledge. Indilinga: African Journal of Indigenous Knowledge Systems, 2(1), 275-105. doi:10.4314/indilinga.v2i1.47002

Antweiler, C. (1998). Local Knowledge and Local Knowing: An Anthropological Analysis of Contested 'Cultural Products' in the Context of Development. Anthropos: International Review of Anthropology and Linguistics, 93(4-6), 469-494.

Antweiler, C. (2004). Local Knowledge Theory and Methods: An Urban Model from Indonesia. In A. Bicker, P. Sillitoe, & J. Pottier (Eds.), Investigating local knowledge: new directions, new approaches. Aldershot, Hants, England: Ashgate.

Baker, D. C. (2003). Evaluating the effectiveness of British Columbia's environmental assessment process for first nations' participation in mining development. Environmental Impact Assessment Review, 23(5), 581-603.

Berkes, F. (2007). Community-based conservation in a globalized world. Proceedings of the National Academy of Sciences of the United States of America., 104(39), 15188-15193.

Bertocchi, M., Demartini, E., & Marescotti, M. E. (2016). Ranking Farms Using Quantitative Indicators of Sustainability: The 4Agro Method. Procedia - Social and Behavioral Sciences, 223, 726-732. doi:10.1016/j.sbspro.2016.05.249

Bicker, A., Sillitoe, P., & Pottier, J. (2004). Investigating local knowledge: new directions, new approaches. Aldershot, Hants, England; Burlington, VT: Ashgate.

Bishop, R. (1998). Freeing ourselves from neo-colonial domination in research: A Maori approach to creating knowledge. International Journal of Qualitative Studies in Education, 11(2), 199-219. doi:10.1080/095183998236674

Bryant, A., & Charmaz, K. (2007). The SAGE handbook of grounded theory. Los Angeles; London: SAGE.

Buppert, T., & McKeehan, A. (2013). Guidelines for Applying Free, Prior and Informed Consent: A Manual for Conservation International. Conservation International. Retrieved from http://www.conservation.org/SiteCollectionDocuments/CI_FPIC-Guidelines-English.pdf

Butler, R. W. (1999). Sustainable tourism: A state-of-the-art review. Tourism Geographies, 1(1), 7-25. doi:10.1080/14616689908721291

Camacho, L. D., Gevaña, D. T., Carandang, A. P., & Camacho, S. C. (2016). Indigenous knowledge and practices for the sustainable management of Ifugao forests in Cordillera, Philippines. International Journal of Biodiversity Science, Ecosystem Services & Management, 12(1-2), 5-13. doi:10.1080/21513732.2015.1124453

Canadian Institutes of Health Research, Natural Sciences and Engineering Research Council of Canada, & Social Sciences and Humanities Research Council of Canada. (2014). Research Involving the First Nations, Inuit and Métis Peoples of Canada. In Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans.

Castellani, V., & Sala, S. (2010). Sustainable performance index for tourism policy development. Tourism Management, 31(6), 871-880. doi:10.1016/j.tourman.2009.10.001

Ceron, J.-P., & Dubois, G. (2003). Tourism and Sustainable Development Indicators: The Gap between Theoretical Demands and Practical Achievements. Current Issues in Tourism, 6(1), 54-75. doi:10.1080/13683500308667944

Charmaz, K. (2006). Constructing grounded theory: a practical guide through qualitative analysis. London; Thousand Oaks, California: Sage Publications.

Choi, H. C., & Sirakaya, E. (2005). Measuring Residents' Attitude toward Sustainable Tourism: Development of Sustainable Tourism Attitude Scale. Journal of Travel Research, 43(4), 380-394. doi:10.1177/0047287505274651

Choi, H. C., & Sirakaya, E. (2006). Sustainability indicators for managing community tourism. Tourism Management, 27(6), 1274-1289. doi:10.1016/j.tourman.2005.05.018

Christensen, J., & Grant, M. (2007). How Political Change Paved the Way for Indigenous Knowledge: The Mackenzie Valley Resource Management Act. Arctic, 60(2), 115-123. doi:10.14430/arctic236

Creswell, J. W. (2013). Qualitative inquiry & research design: choosing among five approaches (3rd ed. ed.). Thousand Oaks: SAGE Publications.

Croll, E., & Parkin, D. J. (1992). Bush base, forest farm culture, environment, and development. London; New York: Routledge.

Demartini, E., Gaviglio, A., & Bertoni, D. (2015). Integrating agricultural sustainability into policy planning: A geo-referenced framework based on Rough Set theory. Environmental Science and Policy, 54, 226.

Dymond, S. J. (1997). Indicators of Sustainable Tourism in New Zealand: A Local Government Perspective. Journal of Sustainable Tourism, 5(4), 279-293. doi:10.1080/09669589708667292

Ellen, R. F., Parkes, P., & Bicker, A. (2000). Indigenous environmental knowledge and its transformations: critical anthropological perspectives. Amsterdam: Harwood Academic.

Ellis, S. C. (2005). Meaningful consideration? A review of traditional knowledge in environmental decision making. Arctic, 58(1), 66-77.

Emery, A. R. (2000). Integrating Indigenous Knowledge in Project Planning and Implementation. Retrieved from Nepean, Ontario.

Falck, W. E., & Spangenberg, J. H. (2014). Selection of social demand-based indicators: EO-based indicators for mining. Journal of Cleaner Production, 84(1), 193-203. doi:10.1016/j.jclepro.2014.02.021

Fernández, J. I. P., & Rivero, M. S. (2009). Measuring Tourism Sustainability: Proposal for a Composite Index. Tourism Economics, 15(2), 277-296. doi:10.5367/000000009788254377

Fish, R., Seymour, S., Watkins, C., & Steven, M. (2008). Sustainable farmland management: transdisciplinary approaches. Wallingford, UK; Cambridge, MA: CABI.

Gadgil, M., Berkes, F., & Folke, C. (1993). Indigenous Knowledge for Biodiversity Conservation. Ambio, 22(2/3), 151-156.

Gaziulusoy, A. İ., & Boyle, C. (2013). Proposing a heuristic reflective tool for reviewing literature in transdisciplinary research for sustainability. Journal of Cleaner Production, 48, 139-147. doi:10.1016/j.jclepro.2012.04.013

Getz, D. (1983). Capacity to absorb tourism: concepts and implications for strategic planning. Annals of Tourism Research, 10(2), 239-263. doi:10.1016/0160-7383(83)90028-2

Glaser, B. G. (1978). Theoretical sensitivity: advances in the methodology of grounded theory. Mill Valley, California: Sociology Press.

Glaser, B. G., & Strauss, A. L. (1967). The discovery of grounded theory: strategies for qualitative research: Chicago: Aldine Publishing.

Godschalk, D. R., & Parker, F. H. (1975). Carrying capacity: a key to environmental planning? Journal of Soil and Water Conservation, July(4), 161-165.

Gómez-Limón, J. A., & Sanchez-Fernandez, G. (2010). Empirical evaluation of agricultural sustainability using composite indicators. Ecological Economics, 69(5), 1062-1075. doi:10.1016/j.ecolecon.2009.11.027

Goodland, R. (1995). The Concept of Environmental Sustainability. Annual Review of Ecology and Systematics, 26, 1-24.

Goulding, C. (2002). Grounded theory: a practical guide for management, business, and market researchers. London; Thousand Oaks, California: SAGE.

Graymore, M. L. M., Sipe, N. G., & Rickson, R. E. (2010). Sustaining Human Carrying Capacity: A tool for regional sustainability assessment. Ecological Economics, 69(3), 459-468. doi:10.1016/j.ecolecon.2009.08.016

Grenier, L. (1998). Working with indigenous knowledge: a guide for researchers. Ottawa: Ottawa: International Development Research Centre.

Hardy, A., Beeton, R. J. S., & Pearson, L. (2002). Sustainable Tourism: An Overview of the Concept and its Position in Relation to Conceptualisations of Tourism. Journal of Sustainable Tourism, 10(6), 475-496. doi:10.1080/09669580208667183

Henares, I. A. S., Soriano, R. S., Soriano, V. J., Gonzalo, R. P. A., Llaguno, E. L., & Gotera, K. M. C. (2016). Establishment of Sustainability Science Demonstration Pilot Project on Rice Terraces of the Philippines Cordilleras. A report submitted to the United Nations Educational, Scientific and Cultural Organization (UNESCO) Regional Science Bureau for Asia and the Pacific in Jakarta, Indonesia with financial assistance from the Japanese Funds-in-Trust (JFIT). Quezon City: IH&MD Heritage+Tourism Consultants.

Hirsch Hadorn, G., Bradley, D., Pohl, C., Rist, S., & Wiesmann, U. (2006). Implications of transdisciplinarity for sustainability research. Ecological Economics, 60(1), 119-128. doi:10.1016/j.ecolecon.2005.12.002

Hughes, G. (2002). Environmental indicators. Annals of Tourism Research, 29(2), 457-477. doi:10.1016/S0160-7383(01)00071-8

Hunter, C. (1997). Sustainable tourism as an adaptive paradigm. Annals of Tourism Research, 24(4), 850-867. doi:10.1016/S0160-7383(97)00036-4

Indigenous Peoples Council on Biocolonialism. (2000). Indigenous Research Protection Act. Retrieved from http://www.ipcb.org/publications/policy/files/irpa.html.

International Society of Ethnobiology. (2006). International Society of Ethnobiology Code of Ethics (with 2008 additions). Retrieved from http://ethnobiology.net/code-of-ethics.

International Working Group on Indicators of Sustainable Tourism. (2002). Indicators for the Sustainable Management of Tourism: World Tourism Organization | Industry Science and Technology Canada.

Inuit Tapiriit Kanatami, & Nunavut Research Institute. (2007). Negotiating Research Relationships with Inuit Communities: A Guide for Researchers. Nickels, S., Shirley, J., and Laidler, G. (eds). Inuit Tapiriit Kanatami and Nunavut Research Institute: Ottawa and Iqaluit.

Jasanoff, S. (2004). States of knowledge: the co-production of science and social order. London; New York: Routledge.

Ko, T. G. (2005). Development of a tourism sustainability assessment procedure: A conceptual approach. Tourism Management, 26(3), 431-445. doi:10.1016/j.tourman.2003.12.003

Komiyama, H., & Takeuchi, K. (2006). Sustainability science: building a new discipline. (Editorial). Sustainability Science, 1(1), 1. doi:10.1007/s11625-006-0007-4

Krech, S. I. (2005). Reflections on Conservation, Sustainability, and Environmentalism in Indigenous North America. American Anthropologist., 107(1), 78-86.

Kunkel, T. (2017). Aboriginal values and resource development in Native Space: Lessons from British Columbia. The Extractive Industries and Society, 4(1), 6-14. doi:10.1016/j.exis.2017.01.001

Kwaymullina, A. (2016). Research, Ethics, and Indigenous Peoples: An Australian Indigenous perspective on three threshold considerations for respectful engagement. AlterNative: An International Journal of Indigenous Peoples, 12(4), 437-449. doi:10.20507/AlterNative.2016.12.4.8

Lane, M., Dawes, L., & Grace, P. (2014). The essential parameters of a resource-based carrying capacity assessment model: An Australian case study. Ecological Modelling, 272, 220.

Maida, C. A. (2007). Sustainability and communities of place. New York; Oxford: Berghahn Book.

Matteucci, X., & Gnoth, J. (2017). Elaborating on grounded theory in tourism research. Annals of Tourism Research, 65, 49-59. doi:10.1016/j.annals.2017.05.003

McClure, G. (1989). Introduction. In D. M. Warren, L. J. Slikkerveer, & S. O. Titilola (Eds.), Indigenous Knowledge Systems: Implications for Agriculture and International Development. Ames, Iowa: Iowa State University Research Foundation.

McCool, S. F., Moisey, R. N., & Nickerson, N. P. (2001). What should tourism sustain? The disconnect with industry perceptions of useful indicators. Journal of Travel Research, 40(2), 124. doi:10.1177/004728750104000202

Miller, G. (2001). The development of indicators for sustainable tourism: results of a Delphi survey of tourism researchers. Tourism Management, 22(4), 351-362. doi:10.1016/S0261-5177(00)00067-4

Miller, G., & Twining-Ward, L. (2005). Monitoring for a sustainable tourism transition: the challenge of developing and using indicators. Wallingford, UK; Cambridge, MA: Wallingford, UK; Cambridge, MA: CABI Pub.

Morgan, D. L., Krueger, R. A., & King, J. A. (1998). Focus group kit. Thousand Oaks, California: SAGE Publications.

Nadasdy, P. (2003). Reevaluating the Co-Management Success Story. Arctic, 56(4), 367-380.

National Commission for Indigenous Peoples. (2012). The Indigenous Knowledge Systems and Practices (IKSPS) and Customary Laws (CLS), Research and Documentation Guidelines of 2012. In (Vol. NCIP Administrative Order No. 01). Philippines.

National Research Council. (1999). Our common journey a transition toward sustainability. Washington, DC: National Academy Press.

Navarro Jurado, E., Tejada Tejada, M., Almeida García, F., Cabello González, J., Cortés Macías, R., Delgado Peña, J., Solís Becerra, F. (2012). Carrying capacity assessment for tourist destinations. Methodology for the creation of synthetic indicators applied in a coastal area. Tourism Management, 33(6), 1337-1346. doi:10.1016/j.tourman.2011.12.017

Nyumba, T. O., Wilson, K., Derrick, C. J., & Mukherjee, N. (2018). The use of focus group discussion methodology: Insights from two decades of application in conservation. Methods in Ecology and Evolution, 9(1), 20-32. doi:10.1111/2041-210X.12860

Organization for Economic Co-operation and Development. (1998). Towards sustainable development: environmental indicators. Paris: Organisation for Economic Co-operation and Development.

Organization for Economic Co-operation and Development. (1999). Environmental Indicators for Agriculture Concepts and Framework Volume 1. Paris: OECD Publishing.

Papillon, M., & Rodon, T. (2017). Proponent-Indigenous agreements and the implementation of the right to free, prior, and informed consent in Canada. Environmental Impact Assessment Review, 62, 216-224. doi:10.1016/j.eiar.2016.06.009

Parker, A., & Tritter, J. (2006). Focus group method and methodology: current practice and recent debate. International Journal of Research & Method in Education, 29(1), 23-37. doi:10.1080/01406720500537304

Perera, J. (2015). Old Wine in New Bottles: Self-determination, Participatory Democracy, and Free, Prior and Informed Consent. In P. Sillitoe (Ed.), Indigenous Studies and Engaged Anthropology: The Collaborative Moment (pp. 147-162). Surrey, England: Ashgate Publishing Limited.

Posey, D. A. (1996). Beyond intellectual property toward traditional resource rights for indigenous peoples and local communities. Ottawa, Ontario: International Development Research Centre.

Posey, D. A. (2000). Ethnobiology and ethnoecology in the context of national laws and international agreements affecting indigenous and local knowledge, traditional resources and intellectual property rights. In R. Ellen, P. Parkes, & A. Bicker (Eds.), Indigenous Environmental Knowledge and its Transformations. Amsterdam: Hardwood Academic.

Posey, D. A. (2002). Upsetting the sacred balance: Can the study of indigenous knowledge reflect cosmic connectedness? In P. Sillitoe, A. Bicker, & J. Pottier (Eds.), Participating in development: Approaches to indigenous knowledge. London: Routledge.

Potts, T. D., & Harrill, R. (1998). Enhancing communities for sustainability: a travel ecology approach. Tourism Analysis, Vol. 3(No. 3/4), pp. 33-142.

Rajasekaran, B., Warren, D. M., & Babu, S. C. (1991). Indigenous natural-resource management systems for sustainable agricultural development—a global perspective. Journal of International Development, 3(3), 387-401. doi:10.1002/jid.4010030312

Respicio, N. A. (2013). The Traditional Tugging Ritual of the Philippines. Retrieved from

Roberts, S., & Tribe, J. (2008). Sustainability Indicators for Small Tourism Enterprises – An Exploratory Perspective. Journal of Sustainable Tourism, 16(5), 575-594. doi:10.1080/09669580802159644

Salerno, F., Viviano, G., Manfredi, E. C., Caroli, P., Thakuri, S., & Tartari, G. (2013). Multiple Carrying Capacities from a management-oriented perspective to operationalize sustainable tourism in protected areas. Journal of Environmental Management, 128, 116-125. doi:10.1016/j.jenvman.2013.04.043

Sandlos, J., & Keeling, A. (2016). Aboriginal communities, traditional knowledge, and the environmental legacies of extractive development in Canada. The Extractive Industries and Society, 3(2), 278-287. doi:10.1016/j.exis.2015.06.005

Schafer, J. (1989). Utilizing indigenous agricultural knowledge in the planning of agricultural research projects designed to aid small-scale farmers. In Utilizing indigenous agricultural knowledge in the planning of agricultural research projects designed to aid small-scale farmers (pp. 116-120). Ames, Iowa (USA): Technology and Social Change Program, Iowa State University.

Schönhuth, M. (2002). Negotiating with knowledge at development interfaces: Anthropology and the quest for participation. In P. Sillitoe, A. Bicker, & J. Pottier (Eds.), Participating in development: approaches to indigenous knowledge. London: Routledge.

Sillitoe, P. (2015). Indigenous studies and engaged anthropology: the collaborative moment: Farnham, Surrey, United Kingdom; Burlington, Vermont: Ashgate.

Sillitoe, P., Bentley, J. W., Brokensha, D., Cleveland, D. A., Ellen, R., Ferradás, C., Zuberi, M. I. (1998). The Development of Indigenous Knowledge: A New Applied Anthropology. Current Anthropology: A World Journal of the Human Sciences, 39(2), 223-252. doi:10.1086/204722

Sillitoe, P., Bicker, A., & Pottier, J. (2002). Participating in development: approaches to indigenous knowledge. London; New York: London; New York: Routledge.

Spak, S. (2005). The Position of Indigenous Knowledge in Canadian Co-Management Organizations. Anthropologica, 47(2), 233-246.

Stevenson, M. (1996). Indigenous knowledge in environmental assessment. Arctic, 49(3), 278-291. doi:10.14430/arctic1203

Strauss, A. L., & Corbin, J. M. (1997). Grounded theory in practice. Thousand Oaks: Sage Publications.

Sugiura, A., Rahmawati, A., Katriana, T., Sulaiman, S., & Khan, S. (2017). Lessons Learnt from Sustainability Science Pilots Project Implementation in Selected UNESCO Sites in Asia-Pacific. Paper presented at the Asia Oceania Geosciences Society (AOGS) 14th Annual Meeting, Singapore.

Sugiura, A., Rahmawati, A., Macarombon, H., Heredia, M. I. d., & Khan, S. (2016). Sustainability Transformation Across the Region. Introduction to Sustainability Science Pilots Project Implementation in Asia-Pacific. Paper presented at The 7th International Conference on Water Resources and Environment Research (ICWRER2016), Kyoto, Japan.

Tanguay, G. A., Rajaonson, J., & Therrien, M.-C. (2013). Sustainable tourism indicators: selection criteria for policy implementation and scientific recognition. Journal of Sustainable Tourism, 21(6), 862-879. doi:10.1080/09669582.2012.742531

Taniguchi, N., Taualii, M., & Maddock, J. (2012). A Comparative Analysis of Indigenous Research Guidelines to Inform Genomic Research in Indigenous Communities. International Indigenous Policy Journal, 3(1), n/a. doi:10.18584/iipj.2012.3.1.6

The World Bank. (2005). Operational Statute 4.10 – Indigenous Peoples. Washington, DC: The World Bank.

Tsaur, S.-H., Lin, Y.-C., & Lin, J.-H. (2006). Evaluating ecotourism sustainability from the integrated perspective of resource, community, and tourism. Tourism Management, 27(4), 640-653. doi:10.1016/j.tourman.2005.02.006

Twining-Ward, L., & Butler, R. (2002). Implementing STD on a Small Island: Development and Use of Sustainable Tourism Development Indicators in Samoa. Journal of Sustainable Tourism, 10(5), 363-387. doi:10.1080/09669580208667174

United Nations Declaration on the Rights of Indigenous Peoples: resolution / adopted by the General Assembly, (2007).

United Nations Educational, Scientific and Cultural Organization. (2017). Science-Policy-Society Interface Policy Paper: Practical Guidelines to Apply Sustainability Science Frameworks. Retrieved from Paris, France.

United Nations Educational, Scientific and Cultural Organization Office Jakarta. (2014). REQUEST FOR PROPOSAL – RFP Services Ref: JAK/QUO/SC/HYD/053 [Press release]

Usher, P. J. (2000). Traditional ecological knowledge in environmental assessment and management. Arctic., 53(2), 183-193.

Ward, T. (2011). The Right to Free, Prior, and Informed Consent: Indigenous Peoples' Participation Rights within International Law. Northwestern Journal of International Human Rights, 10(2).

Warren, D. M., Slikkerveer, L. J., & Brokensha, D. (1995). The cultural dimension of development: indigenous knowledge systems. The cultural dimension of development: indigenous knowledge systems. London (United Kingdom): Intermediate Technology Publications Ltd (ITP).

Western, D., & Wright, R. M. (1994). Natural connections: perspectives in community-based conservation. Washington, D.C.: Island Press.

White, G. (2006). Cultures in Collision: Traditional Knowledge and Euro-Canadian Governance Processes in Northern Land-Claim Boards. Arctic, 59(4), 401-414.

World Commission on Environment and Development. (1987). Our common future. Oxford; New York: Oxford University Press.

World Tourism Organization. (2004). Indicators of sustainable development for tourism destinations: a guidebook. Madrid, Spain: World Tourism Organization.