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Disaster and Cultural Revitalization: The Practice of community-based conservation at Wutai Township Post Typhoon Morakot, Taiwan

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Abstract

Typhoon Morakot was a disaster for southern Taiwan in 2009, which resulted in relocation of some indigenous communities, such as the Rukai, from the mountains to the lowlands. This migration not only separated indigenous people from their lands, but also threatened their cultures and way of life. Successful post-disaster reconstruction requires community residents to maintain their cultural and landscape practices. The mountain forest patrol in Wutai Township showed that it can provide the Rukai with basic information about forest management, allowing their young members to acquire conservation education and skills, coupled with traditional ecological knowledge (TEK). This illustrates the effectiveness of community-based conservation will give community members the ability to stay in their homeland and restore the forest, creating new opportunities for comprehensive resource conservation, cultural heritage, and community development. It also can strengthen disaster recovery which can contribute to natural conservation and cultural preservation.

Keywords: Mountain Forest Patrol, community-based conservation, ICCA, Relocation, Typhoon Morakot

1. Introduction

Taiwanese indigenous is the term commonly applied to the indigenous peoples of Taiwan, who constitute about two percent of the island's population, or more than 500,000 people. Their ancestors may have been living on Taiwan for approximately 8,000 years before a major Han immigration began in the 17th century. Recorded history of the indigenous on Taiwan began around the 17th century, and has often been dominated by the views and policies of foreign powers and non-indigenous. Beginning with the arrival of Dutch merchants in 1624, the traditional lands of the indigenous have been successively colonized by Dutch, Spanish, Ming, Qing, Japanese, and Chinese Nationalist rulers. Each of these successive "civilizing" cultural centers participated in violent conflict and peaceful economic interaction with both the Plains and Mountain ethnic groups. To varying degrees, they influenced or transformed the culture and language of the indigenous peoples.

The government of Taiwan officially recognizes distinct ethnic groups among the indigenous based upon the qualifications drawn up by the Council of Indigenous Peoples (CIP). To gain this recognition, the groups must gather a number of signatures and a body of supporting evidence with which to successfully petition the CIP. Formal recognition confers certain legal benefits and rights upon a group, as well as providing them with the satisfaction of recovering their separate identity as an indigenous. As of June 2014, 16 ethnic groups including Ami, Atayal, Bunun, Hla'alua, Kavalan, Kanakanavu, Paiwan, Puyuma, Rukai, Saisiyat, Sakizaya, Sediq, Tao, Tsou, Thao and Truku, have been recognized.

Among the Rukai mainly live along two sides of the southern mountains of the Central Range. Two branches live on the western side of the Central Range: the western Rukai reside on the Ailiao river drainage area, and the Xia-shan group resides on the Jhuokou River drainage area, a tributary of the Laonong River. One branch, the Danan, or the eastern Rukai, resides on the Lyujiia River on the eastern side of the Central Range. The first two branches that the two case studies we focused mainly live in the mountains around five hundred to one thousand meters above sea level, and the third one lives on Taituang Plain along the feet of the mountains.

Modern trends in natural resource management

Traditional management of natural resources and protected areas has been approached from the viewpoint of scientific management, with national government at the helm, emphasizing scientific knowledge and technology and professional technocrats at the core. Because this model neglects other stakeholders and often ignores the rights and benefits of the local population, at times even relocating them, it has been termed the exclusive approach. Discussions on exclusive and inclusive approaches began as early as the 1960s and 1970s (Brandon & Wells, 1992; West & Brechin 1991). In terms of protected areas, Western Europe is representative of inclusive management as the rights and benefits of the local community are often the core of the management strategy (Borrini-Feyerabend 1996). Although the traditional exclusive scientific management approach has historically been the mainstream standard for government management of natural resources, over the past few decades, an inclusive approach has emerged with proactive and positive contributions to the conservation of areas with more local communities and activities (Borrini-Feyerabend 1996).

Inclusive management of natural resources and protected areas has two primary aims: participation by the local population and seeking a balance between conservation of resources and development of the local and neighboring communities (Holdgate & Phillips 1999; IUCN 1993; Murphree 1994; Western & Wright 1994). There are multiple reasons for having the local population participate in management work: 1. To rebuild the relationship between people and nature. Archeological data shows that earth's modern landscape is closely related to human activity and that people play a key role in the workings and biodiversity of many ecosystems. Therefore, in order to conserve habitats and biodiversity, we must understand where mankind stands in terms of overall ecological functions and find a method for coexistence. 2. Under current administrative conditions, manpower, material, and financial support are often lacking. Management with a centralized authority is difficult to effectively implement in outlying protected areas. 3. Most important is that conservation experts no longer see local (or neighboring) communities as destructive actors, but as main stakeholders and important partners (especially small communities or indigenous peoples) with which they wish to cooperate. To prevent areas with rich natural resources (biodiversity) from becoming ecological islands, to call attention to the importance of human factors and the limitations of government power, and to

create partnerships with the local population, in recent years, international conservation societies have advocated transboundary thinking, in the hopes of planning and integrating more departments and resources on an all-encompassing scale (Lu 2009).

A relationship between a local population and the natural environment forged from long-term interaction, including the use of resources, taboos, and traditions, conforms to modern ecological principles. Some anthropologists and ecologists approve and praise this relationship, which also known as ecological intelligence. Oftentimes, its conservation is more effective than management approaches based on modern technology (Armitage 2003; Becker 2003; Berkes 1999, 2002; Ghimire & Pimbert 1997; Gomez-Pompa & Kaus 1992; McNeely 1994; Smith 2001; Brodt 2001). Therefore, how to maintain long-lasting local traditional land use (resource management) methods, or new patterns of land use founded on traditional use (resource management mechanisms), including traditional ecological intelligence, has become a hot topic in natural resource and protected area management (Hanna et al. 1996; Hellier et al. 1999; Ostrom 1990).

Indigenous and Community Conserved Area (ICCA) theory and practice

Indigenous and Community Conserved Areas (ICCA) are habitat conservation models recently advocated by international conservation societies. In theory, this can be seen as community-based conservation (CBC) or community-based natural resource management (CBNRM). Basically, community-based conservation areas are natural and/or restored ecological systems with high biodiversity value, ecological services, and cultural value that are voluntary conserved by indigenous and local communities (permanent or migrant) through customary law or other effective methods. Community-based conservation areas include ecosystems with varying amounts of human influence, from very low to very high, and are extensions, restorations, or amendments to traditional customs or new activities. Among these areas are many that have yet to be encroached upon by humans, some that people have never used or used very little, and some that have been subject to various types of limited use, ranging from very small to very large tracts of land and bodies of water.

Community-based conservation areas cover a wide range of natural ecosystems and species of wildlife, farmland, and grazing land. These are all managed by the regulations of diverse organizations and mechanisms, and by traditional and modern communities. It is worth noting that community-based conservation areas are not necessarily the “protected areas” officially named by the national government. If the demands of government and public regulations are met and the relevant community is willing, community-based conservation areas can be protected areas. However, cooperation, agreement, and acknowledgment from many parties are required for community-based conservation areas to exist and play their role.

Therefore, the key concerns of ICCAs include environmental resources, the economy, social humanism, system design, and plan implementation, especially as those concerns relate to the continuation of local communities and ethnic cultures, connections between traditional social organizations and modern institutions, and coopetition between traditional customary laws and modern national laws. These issue involve not only negotiation and coordination on the definition of development within the community, but also models and strategies of mainstream society which ensure public safety, protect the environment, and adapt to climate change. They above all require collaboration between various mechanisms and cannot ignore the cooperation and involvement of ecological resources, political systems, social culture, industries, and the

economy.

Regions and lands occupied and used by local populations have abundant biodiversity and wildlife resources. These indigenous and community-based conservation areas hold a vast amount of conservation knowledge, techniques, and practices, which are closely related to local livelihoods, the mentality and values of the local culture, and customary laws on land resource management. Although community-based conservation areas have significant conservation effects, for the past two centuries, they have not been included by the important mechanisms and policies that dominate global conservation; therefore, they have largely been overlooked. In the twenty-first century, however, some important international conservation organizations and agreements have finally started to focus on the long-term contributions of community-based conservation areas. Especially worth mentioning is that each country has acknowledged the function of community-based conservation areas in the Programme of Work on Protected Areas of the Convention on Biological Diversity (CBD). The Millennium Development Goals also emphasize environmental sustainability and the reduction of poverty. The UN Declaration on the Rights of Indigenous Peoples (UNDRIP) asserts the inalienable rights of indigenous in regards to land and natural resources.

Despite the role of community-based conservation areas and the appropriate support given to them, they have already become important issues when facing global climate change and emerging adaptation and mitigation strategies. However, community-based conservation areas and all other areas rich in biodiversity undoubtedly face serious threats from both external and internal pressures. External pressures come from domestic or international sources, for example, the processes of development and commercialization, including mining and extracting fossil fuels, deforestation and reforestation, the fishing industry and marine dredging, large scale grazing and farming (including agrofuel and crops), rerouting waterways and drainage engineering, urbanization and large infrastructure projects, tourism infrastructure projects, wars, violent conflicts, the relocation of refugees, land expropriation (through nationalization, privatization, or conservation plans, especially for the establishment of nationally governed protected areas), the assimilation of social groups in community-based conservation areas (for example through official education systems which have yet to incorporate local cultures, livelihoods, or values, or which plan to propagate different beliefs), exploitation, inappropriate taxation, and other financial burdens, sudden influx, strengthening, or creation of local injustices due to political parties or funds which create segregation and conflicts, unauthorized extraction of wood and other vegetation, air and water pollution, diffusion of invasive/non-indigenous species, climate change, etc. Internal pressures come from changes within indigenous and local societies which create threats; these threats include changes in values and cultural efforts to adapt to mainstream society (this affects younger generations and separates them from their traditions), pressures on resource use, especially the replacement of local subsistence economies by market economies, intrinsic or new inequalities between economies, social classes, and genders in the community, etc.

The aforementioned internal and external threats and pressures have made it more difficult for ICCAs to become conservation and management models acceptable to conservation groups and national governments. Pathak et al. (2005) proposed that if ICCAs wish to successfully operate, they must ensure the rights to land and resources, have fair and transparent decision mechanisms, solid and forceful local leaders, and partnerships with outside parties. Currently many countries and regions around the world are already developing ICCAs, with results helping

conservation efforts, the development of indigenous peoples and local communities, and the preservation of traditional cultures. However, there are only a few countries that have included ICCAs into national systems for protected areas; many still base them on their current environmental and natural resource management regulations and cooperate with indigenous peoples or local development projects to develop an ICCA model for regional environmental resource control. In 2008, the International Union for Conservation of Nature's (IUCN) Fourth World Conservation Congress held an ICCA workshop which shared examples from different countries. In view of the external and internal threats and pressures facing ICCAs, the issues discussed in the conference mainly revolved around strengthening and revising international ties and domestic laws. Internationally, it was suggested that the people in community-based conservation areas be allowed to participate in international forums, not just environmental conventions, including economic and governmental conventions and organizations, in order to establish a better connection between the rights of indigenous peoples and environmental conservation. It was also suggested that relevant places be listed in appropriate global databases (with the permission of the relevant communities), for example, the United Nations Environment Programme's World Conservation Monitoring Centre (UNEP-WCMC) World Database on Protected Areas including community-based conservation areas in special registration books. Civil society organizations can effectively increase awareness by closely monitoring the threats facing community-based conservation areas, and adopt global measures for each threat with the help of international economic and political powers. They can also lead countries willing to recognize and support community-based conservation areas via the CBD and other international forums to ensure that community action plans receive support and do not fail. In addition, exchange programs and learning networks between policy makers could support NGOs from different countries and members of local community-based conservation areas. Community-based conservation areas and their supporters can create global networks or forums to share ideas, plans, and projects. Domestically, it was suggested that the rights of indigenous and local communities to lands and resources should be recognized, as well as that the community is a legal entity capable of adopting conservation and developmental action. The creation of lists of community-based conservation areas was also suggested in order to further understand their effectiveness in managing conservation and livelihoods in the context of the local history and system. Help groups in community-based conservation areas record their own traditions and current knowledge and customs, and with their permission, propagate the knowledge and customs to familiarize official conservationists with the community. It was also suggested that policies be drawn up to understand and recognize that community-based conservation areas have their own rights and that they are protected areas and a part of the country's protected area system, and to provide adequate support (technologies, funding, etc.) based on their needs. Support of national and regional community-based conservation area networks or connections between community-based conservation areas and other conservation projects, including exchanges and visits, was also advocated. In terms of younger people becoming involved in local conservation work, they are encouraged to study their culture and develop a sense of identity and pride, including their relationship with the community-based conservation area, to get young people invested in community conservation work. Effective action includes joint analysis, organized research, and participatory action research into the local environment and society, creating a list of employment opportunities and analyzing biological and cultural diversity, collecting oral and written history about the community-based conservation area and developing videos, songs, or plays, integrating source material related to the community-based conservation area into the local educational system, environmental and cultural festivals and competitions, local celebrations and recognitions

and declarations of the community conservation area, and exchanges, visits, and research by young people from different community-based conservation areas.

This study aims to find energy to support traditional knowledge in contemporary environmental management from two post-disaster reconstruction plans implemented in Taiwanese indigenous areas and attempts to create a path for the implementation of post-disaster reconstruction for indigenous peoples and the restoration of mountain forests.

2. Research Methods

After Typhoon Morakot in September 2009, several Rukai communities within Wutai Township were affected and determined to be relocated for living. The case of Mountain Forest Patrol is the special case which focused their efforts on the restoration of traditional knowledge connected with hunting and natural resources conservation, we thought the case might be a crucial starting point for Taiwan to develop the ICCA and community-based conservation model. The data collection phase of this research pertaining after Morakot was made possible with support from the Ministry of Science and Techonology, the main government agency responsible for promoting and funding science research in Taiwan, and other projects. The authors attended community meetings, official and private negotiation talks, academic symposiums, and NGO conferences during the course of the study. For the field interviews, the authors conducted in-depth interviews with residents of the communities. The subjects interviewed:

1) Community leaders: subjects included the chiefs, members of the nobility, mayor/community heads, representatives, chairmen of community-based organizations.
2) Intellectual elites: subjects included township office staff, and community officials.
3) The members of Wutai Township Mountain Forest Patrol.

When participating in public meetings, a digital recorder, camera, and video camera were used to capture data. Interviews arranged with specific subjects first obtained the party's consent to recording and photography; if criticism of the government or certain individuals came up, subjects were then asked whether they wanted their statement to be open or anonymous in order to ensure that theirs rights and interests were preserved. The subjects of interview count thirty people. The interviews are conducted mainly in Chinese, and in the cases when the Chinese language cannot be used to communicate with the elders in the communities, the interviews are conducted in the Rukai tongue.

3. Post-disaster environmental management and cultural reconstruction: The case study of mountain forest patrol

Creation of the mountain forest patrol

Wutai Township, where many of the Rukai live, was devastated by Typhoon Morakot in 2009. The Rukai communities including Wutai, Ali, Jilu, Dawu, Jiamu, and Yila are all near the northern drainage basin for the Ailiao River. Many homes, farmlands, public facilities, and ceremonial and ritual spaces were destroyed by the typhoon. The entire Kochapogan at the south of Ailiao River was buried in a landslide. After the disaster, the government moved the Kochapogan from the south of Ailiao River to Majia Farm, and the Ali, Jilu, Jiamu, and Yila from the north of Ailiao River were moved to Changjhih Township Tzu Chi Great Love Campus. Finding a place for post-disaster settlement and reconstruction, and the management and use of traditional lands, were especially challenging for the Rukai of Wutai Township. Based on the information above, some of the members of this project participated in the Wutai Township

Mountain Forest Protection Project to help the communities create a community-based nature conservation management model.

Implementation and results

From January 2010, this group began helping the Wutai Township Office to recruit, train, and employ eighteen Rukai members (two or three members from each of the eight communities) to create the "Rukai Mountain Forest Patrol" in charge of patrolling the forests and collecting and organizing data on natural resources and environmental monitoring. The patrol headquarters and all information and data are located at the Wutai Township Library and Information Center. The members of the patrol team elected a chief officer and chose the overall coordination and implementation for each part of the project. Members also autonomously established a conservation treaty, made uniforms, and allocated equipment required for individual outdoor work.

This group organized basic and advanced mountain forest protection and environmental monitoring skill courses, workshops, and field training to improve the patrol team's professional skills. Course content included the relationship between the traditional area and community forestry, the rights and obligations of the mountain forest patrol team and the law enforcement agency, regulations and methods for forest patrol, GPS and tracking device application and data management, traditional borders for each community and patrol trails, survey methods for rare wildlife, processing and storage methods for precious and ethnobotanical plants, collection methods for community chiefs' and experienced hunters' knowledge, and locating and recording important natural resources and devastated areas. During courses, aside from introducing and practicing traditional GPS devices, the group also had the patrol team carry a simple tracking device to record and store data on their movements. Each time the patrol returned to the headquarters, this data was downloaded to the computer to draw a map of their route. After multiple rounds of testing and refinement, we found that tracking devices were cheaper (traditional GPS devices cost approximately NT$10,000-20,000, whereas tracking devices are NT$2,000), lighter, and more convenient, could work for three or four days straight (turning the system off while camping lengthened the operation time even further), had similar accuracy compared to GPS devices, and did not require patrol members to stop while using them. Important information, such as the locations of landslides, cultural ruins, or important plants and animals, could also be retrieved from pictures taken during patrol by verifying timestamps with synchronized digital cameras.

The daily tasks of the "Rukai Mountain Forest Patrol" include: (1) reporting illegal or prohibited actions and aiding the relevant law enforcement agencies;(2) surveying, recording, collecting, and digitizing the damage caused to Wutai Township and its traditional areas (including the homes and farmlands of community' members, important landmarks and scenic areas, bridges, etc.) by Typhoon Morakot; (3) using field surveys to demarcate and digitize the traditional lands, ancient sites, water sources, and historical landmarks of the Western Rukai;(4) systematically and scientifically demarcating, recording, and digitizing medium and large mammals and their tracks and rare or endangered trees and ethnobotanical plants found during patrols. Delineating and drawing a Wutai Township Typhoon Morakot "disaster map" serves to accurately grasp the damage situation and changes to the terrain and to analyze the nature and extent of devastation in each area of Wutai, the damage done to roads and waterways, and other information vital to area safety. After completion, this with help lay out the potential disaster area and integration with local traditional ecological knowledge can help in discussing and planning

future emergency shelters, evacuation routes, and preventative measures. Long-term continuation of natural resource surveys can integrate geographical information systems to analyze conditions within traditional areas and aid in analyzing regional, seasonal, and annual trends and changes in quantity. If further comparison with past data is possible, the required scientific foundation for each phase in future land restorations could also be adjusted.

The Mountain Forest Patrol organized four short normal patrol routes (Figure 1) near several communities. They were also organized into four task groups according to the community that the patrol members belong to and the trails they were familiar with. These four one-day trails covered key locations and roads in and out of Wutai Township. Normal patrols help maintain internal safety; after the road conditions were devastated again during the 2010 rainy season, the shorter Shenshan and Yila routes were maintained within the patrol range. As of mid-October 2010, the "Rukai Mountain Forest Patrol" performed 187 normal short patrols, of which 182 were conducted during the day and five at night. During these daytime patrols, aside from recording the situation of normal roads, slopelands, and village housing, the patrol team encountered five accounts of suspected or serious illegal activity, of which, the illegal logging discovered April 23-24, 2010, had the largest impact and was an effective warning. There were no new incidents after that April, showing that daily patrols and the reporting of illegal activities effectively prevent unlawful behavior.

To extend the scope of the patrols, survey the situation in traditional areas, and collect information on natural resources, the mountain forest patrol also conducted four long-distance patrols (Figure 2). Long-distance patrols ranged from 40km to 100km, and the situations of the roads were completely different than those encountered on the daily patrol routes. The majority of places along these long-distance patrols did not have roads at all, and landslides were more severe than expected; at times it was impossible to find past familiar trails and waterways. The environmental situations recorded with digital cameras during the patrol are important and these were also the first time visiting remote mountain areas after the disaster. The data collected is still being processed and include location information for at least 45 landslides, 45 cultural ruins, and various rare wildlife and ethnobotanical plants. This information and the area they cover were collected through multiple patrols and have a large impact. In 2011, the "Rukai Mountain Forest Patrol" began its second year; in addition to strengthening the protection of their homelands and the collection of environmental and natural resource data, the patrol also added professional training in emergency rescue, disaster prevention, and large tree location (Figure 3) to gradually broaden the technical skills of the patrol team and contribute more to the development of the communities.

Figure 1. Short patrols

Figure 2. Long patrols

Figure 3. Tree demarcation

4. Conclusion

The potential role of traditional ecological knowledge in modern environmental management

In Rukai society, hunting groups regularly traveled into the mountains to hunt and patrol the territories and hunting grounds under the direction of the group leader to prevent illegal trespassing. Therefore, being a hunter, they did more than provide meat; they also protected the community's territory. In the twentieth century, Japanese influence entered the Wutai Township and began to implement nationalization policies, invading their sacred lands to cut down the forests, strictly enforcing land privatization, and forbidding hunters paying tribute to chieftains. These measures severely impacted resource distribution in the Rukai's traditional land and damaged the connection between hunting culture and the natural ecosystem. Under KMT (Chinese Nationalist Party) rule, the government implemented a policy to "make the mountains like the plains" which labeled hunting as barbaric and outdated. Since the 1980s, the government and conservationists have incorporated the majority of traditional Rukai lands into nature reserves and forbidden members to enter. These policies gradually eliminated the people managing this once legendary rich ecosystem and cultural lands (Taiban, 2010). Comparatively, after the indigenous people left the mountains, the forest conservation work under the biased management of the government has deteriorated; in recent years, aside from the reality that logging occurs where the Forestry Bureau has claimed to be implementing forestation, when post-disaster environment conservation demands immediate action, we need to take a serious look at the traditional role indigenous people play in mountain forest conservation.

Environmental management should not separate the economies and societies of indigenous peoples

Consideration for the continuation of the economies and societies of indigenous peoples in mountain forest conservation has become an international trend. Reducing emissions from deforestation and forest degradation (REDD), which was a focus of discussion in the 2009 climate change conference in Copenhagen, deeply impacted indigenous people living in forests. Many scholars and international environmentalist and human rights organizations all call for respect for the rights and benefits of indigenous peoples. During the process of negotiating any international carbon credits and forest conservation sponsorships, community rights must be respected. Content for all plans and economic mechanisms should ensure that relevant community groups are allowed to participate. Similarly, this issue cannot be ignored when discussing environmental restoration in Taiwan.

The above trends show community's willingness to participate in forest conservation and also remind us that it is necessary to reiterate indigenous peoples' rich knowledge of and practices in mountain forest environments through advanced plans so that members are no longer restricted by the conservative forestry policies of past years. Community's traditional intelligence can be used to surpass traditional forestation and economic visions and to strive for diverse conservation policies aside from our current courses of action, such as incentive payments and forest protections. When this happens, promoting conservation can reach the goals for restoring the environment and restoring the culture and livelihood of communities, and give the government and the public a brand new vision of natural resources conservation.

Equal importance of post-disaster reconstruction, national land conservation, and community development

The Rukai's classifications and understanding of space and their management of natural resources have always had traditional knowledge and ethics which maintained balance in the natural environment and resources. However, after government intervention, these traditional knowledge and management systems were threatened and reduced, causing indigenous people to leave the mountains and move to cities. They were even branded with the name "forest killers" because mainstream society misunderstood their hunting culture and forest gathering customs. However, as previously described, the negative effects of the extreme climate on the development of mountain communities and indigenous people are irreversible. After referencing multiple examples from around the globe, we believe discussion of the Rukai reconstruction or their relocation must consider the safety of public assets, the restoration of national lands, and more importantly, cultural heritage, social system, and members' willingness to develop. The conservation of national lands, monitoring of mountain forests, and indigenous development should be important issues that cannot lack either related discourse or practical operations. Therefore, how to maintain the connection between members and their ancestral lands while allowing them to participate in forest protection and natural restoration work and nurturing young men to become involved in future forest restoration work and conservation activities through forest education to return indigenous people to the role of protector of the forests should be the key to whether future reconstruction work is effective.

After the Typhoon Morakot in 2009, most reconstruction projects practiced by government and NGOs focused on cultural industry, tourism and education and that have gotten considerable

achievements. However, the traditional territories, forest resource and cultural practices as hunting and gathering merely got a little concern from the public that led most reconstruction directions to commercialization and urbanization. In fact, the mountain forest patrol plan in Wutai Township can provide the Rukai with basic information to develop forest education, allowing more young members to receive systematic training and learn modern conservation knowledge and skills along with their traditional ecological intelligence. In this way, the forest protection and environmental monitoring urgently required by both the community and the government can be attended to. At the same time, traditional hunter knowledge and intelligence can be transformed to keep in line with modern concepts. In addition, from both public and private perspectives, the feasible local employment proposals in the post-disaster reconstruction strategy developed from indigenous people will give community members the ability to stay in their homeland and restore the forest, creating new opportunities for comprehensive resource conservation, cultural heritage, and community development.

References

Armitage, D. R. 2003. "Traditional agroecological knowledge, adaptive management and the socio-politics of conservation in Central Sulawesi, Indonesia". *Environmental Conservation* 30:79–90.

Becker, C. D., and K. Ghimire. 2003. "Synergy between traditional ecological knowledge and conservation science supports forest preservation in Ecuador". Conservation Ecology 8(1):1.

Berkes, F. 1999. "Sacred ecology: traditional ecological knowledge and resource management". pp. 209. *Taylor & Francis*, USA.

Berkes, F., and C. Folke. 2002. "Back to the future: ecosystem dynamics and local knowledge". in L. H. Gunderson and C. S. Holling, editors. "Panarchy: understanding transformations in human and natural systems". Island Press: 121–146, Washington, D.C., USA.

Borrini-Feyerabend, G. 1996. "Collaborative management of protected areas: tailoring the approach to the context". pp. 67. *IUCN*, Switzerland.

Brandon, K. E. and Wells, M. 1992. "Planning for people and parks: design dilemmas". World Development 20(4): 557-570.

Brodt, S.B. 2001. "A systems perspective on the conservation and erosion of indigenous agricultural knowledge in central India". *Human Ecology* 29: 99-120.

Ghimire, K. and Pimbert, M. P. 1997. "Social change and conservation: an overview of issues and concepts". pp. 1-45 in "Social change and conservation: environmental politics and impacts of national parks and protected areas", edited by Krishna Ghimire and Michael P, pp. 342. *Pimbert. Earthscan*, UK.

Gomez-Pompa, A. and Kaus, A. 1992. "Taming the wilderness myth". *BioScience* 42(4): 271-279.

Hanna, S., Folke, C. and Maler, K.eds. 1996. "Rights to nature – ecological, economic, cultural, and political principles of institutions for the environment". pp. 298. *Island* Press, USA.

Hellier, A., Newton, A. and Gaona, S.. 1999. "Use of indigenous knowledge for rapidly assessing trends in biodiversity: a case study from Chiapa, Mexico". *Biodiversity and Conservation*, No.8, pp. 869-889.

Holdgate, M. and Phillips, A. 1999. "Protected areas in context". pp. 1-24 in "Integrated Protected Area Management", edited by M. Walkey, I.R. Swingland and S. Russell. pp. 299. *Kluwer Academic Publishers*, UK.

IUCN. 1993. "Parks and progress". pp. 240. *Switzerland*.

Lin, Yih-Ren. 2005. "Whose Tradition? Whose Territory? A Critical Review of Indigenous Ancestral Domain Mapping Project in Taiwan". Presented in "*Mapping for Change: International Conference on Participatory Spatial Information Management and Communication*". Nairobi, Kenya.

Lu, Dau-Jye. Ho-Chia Chueh, Sasala Taiban, Kurtis Jai-Chyi Pei, Bor-Wen Tsai, Kai-Fang Cheng. 2009. "Challenges and Opportunities of Co-managed Protected Areas in Taiwan". Presented in *15th International Symposium on Society and Resource Management, University of Natural Resources and Applied Life Sciences* (BOKU). 2009/07/05-2009/07/08

McNeely, J. A. 1994. "Protected areas for the 21st century: working to provide benefits to society". *Biodiversity and Conservation* 3(5): 390-405.

Murphree, M. W. 1994. "The role of institutions in community-based conservation". pp. 403-427 in "Natural Connections- Perspectives in Community-based Conservation", edited by David Western and Michael Wright, pp.581. *Island* Press. USA.

Ostrom, E. 1990. "Governing the Commons: The Evolution of Institutions for Collective Action". pp.280. *Cambridge University* Press, UK.

Pathak, N., Kothari, A. and Roe, D. 2005. "Conservation with social justice? The role of community conserved areas in achieving the Millennium Development Goals". In Bigg, T. and Satterthwaite, D. (eds.) "How to Make Poverty History: The Central Role of Local Organizations in Meeting the MDGs". pp. 55-78. *IIED* Press, UK.

Smith, A. Eric. 2001 "On the coevolution of cultural, linguistic, and biological diversity". In "*Language, Knowledge, and the Environment: The Interdependence of Biological and Cultural Diversity*". edited by Luisa Maffi. Smithsonian Institution Press.

Taiban, Sasala. 2006 "The Lost Lily: State, Social Change, and the Decline of Hunting Culture in Kochapogan, Taiwan". Ph.D. dissertation in anthropology, University of Washington.

Taiban, Sasala.2010. "The Change and Continuity of Hunting Culture-Our Observations and Discoveries through GIS in Kucapungane". In "*Journal of Natural and Human Environment of Indigenous Peoples*". No 2, pp. 123-158.

West, P. C. and Brechin, S. R. eds. 1991. "Resident Peoples and National Parks". *University of Arizona* Press, Tucson, USA.

Western, D. and Wright, R. M. 1994. "The background to community-based conservation". pp. 1-12 in " Natural Connections- Perspectives in Community-based Conservation", edited by David Western and R. Michael Wright, pp.581. *Island* Press, USA.