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Human-Wildlife Conflict mitigation in Peninsular Malaysia: Lessons learnt, current views and future directions

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Title

Human-Wildlife Conflict mitigation in Peninsular Malaysia:

Lessons learnt, current views and future directions

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Abstract

Among the wild animals in peninsular Malaysia tigers and elephants seem to be the most threatened species after the Malaysian rhinoceros which have dwindled to critically low numbers. Agriculture expansion and palm oil production is the main driving force that affects natural habitat of these magnificent mammals bringing people in conflict with wild animals. Human-Wildlife conflicts is not a new phenomenon and tend to occur when wildlife requirements overlap with those of human populations, creating costs to residents and wild animals. Mitigation methods try to minimize these unwilling conflicts which have negative impacts to farmers' livelihood and animals' population. Governmental agencies as well as NGOs attempt to organize communities in order to prevent potential problems due to mismanagement of natural resources. In this study, participant observation, interviews with conservation agencies and online survey will attend to show the effectiveness of different methods for HWC mitigation. Collaboration among environmental agencies and communities and education seem to be the best method towards environmental conservation.

Keywords: P. Malaysia, wild animals, human-wildlife conflicts, mitigation methods, conservation, collaboration

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1 Introduction

On 31st of January 2013, *14Pygmy Elephants Die Mysteriously in Borneo*, writes National geographic news. In a span of three weeks, 14 endangered Bornean Pygmy Elephants (Elephas maximus boneensis) were found lifeless in the GunungRara Forest Reserve located in the northeastern corner of Borneo. This unique elephant species can only be found in the Malaysian state of Sabah. Conservation officials believe that the elephants were poisoned by workers in palm oil plantation, whereas, wild rangers assume that the elephants probably ate toxic substances, which are used as pesticides, causing bleeding and gastrointestinal ulcers to the mammals. The wildlife rescue unit found three months old calf, standing next to its dead mother trying to wake her up. If the rescue team had not led the calf to safety, probably it would have died beside its mother, too.

Five months later, at the end of June 2013, the illegal burning of forests on the Indonesian island of Sumatra caused air pollution that reached dangerous levels in neighboring countries, Singapore and Malaysia. The reason for the haze that was caused by these illegal and uncontrolled fires was the land clearance for crops replanting mainly for oil palm trees (John Vidal, 2013). Although it is difficult to attribute agriculture expansion as the main causal factor, the impacts of agricultural expansion on Malaysian natural forests and wildlife are clearly significant; around 55-59% of oil palm expansion in Malaysia between 1990 and 2005 originated from the clearance of natural forests (Koh and Wilcove 2009).

Tropical forests in Southeast Asia are under increasing pressure from rapid exploitation of natural resources in order to meet human needs. This has resulted in wildlife and people competing for the same natural resources such as land, water and forests worldwide. This competition brings both humans and animals in close contact with each other with negative impacts for both. In Malaysia conversion of forest into agriculture areas, especially palm oil monoculture, or infrastructure leads to conflicts with wildlife, such as orangutans and elephants in the island of Borneo and elephants and tigers in Peninsula Malaysia. These animals are considered endangered and are totally protected in Malaysia, according to IUCN Red List of Threatened Species

(International Union for Conservation of Nature)[1]. Moreover, mammals, which are more exposed to conflicts, are threatened with extinction (Ogada, 1999). In Peninsula Malaysia, habitat loss and forest fragmentation leads to intense conflicts between farmers and tigers and elephants which stray into cultivated areas destroying crops and attacking livestock, and in extreme cases killing humans, resulting in illegal culling by farmers in defense of their livelihood and their own safety (Sharma et al, 2005).

There are many successful examples of community based organizations in Africa (see Chapter 4.4) that manage their natural resources effectively in support with NGOs and governmental agencies in order to benefit both small farmers and wildlife.

In order this research to be more productive several interviews were conducted in Malaysia between October and December 2013 with conservationists on governmental and local agencies with years of experience in human-wildlife conflict mitigation. In addition, an online survey questionnaire was held between December 2013 and January 2014 in order to evaluate the existing techniques on human-elephant and tiger conflict mitigation that many countries, including Malaysia, use to avoid potential conflicts with wildlife. In this online survey, around 100 people with direct or indirect experience on human-wildlife conflict and environmentalists participated, giving their opinion on the effectiveness of the mitigation methods. Both interviews and the online survey were conducted with prior consent after an assurance of anonymity.

2 The research purpose and problem

Different stakeholders play their own role in the effort of conflict mitigation and organizing into groups is required in order to achieve common goals. According to Colchester, collaboration is translated into intervention which could be either political or technical intervention (Colchester, 1994). Murray Li, (2007), argues that community management is an assemblage of different elements and the assemblage itself is an action of bringing different stakeholder together.

Human-wildlife conflict (HWC) constitutes a major problem for wildlife conservation and people's well-being in Malaysia, as animals stray into agriculture areas searching for food, resulting to economic losses and in extreme cases human casualties. Methods to mitigate the confrontations between humans and wildlife, such as translocation of problematic animals, constitute a curative action, while fences

[1] http://www.iucnredlist.org/

around large or small plantations constitute preventive practices. Thinking of the implementation of such techniques as well as the maintenance of them, the problem question emerged is "*who is responsible, what should be done and how?*"

This study aims to demonstrate the main problems that people and animals have to face due to mismanagement of natural resources worldwide. Furthermore, the study tries to investigate the most effective techniques and methods, based on local perspectives and lessons learnt, which can minimize the negative impacts on both, people and animals. Finally, analyzing the role of different stakeholders who are involved in natural resources management, thus, to human-wildlife conflicts (HWC), can come together and collaborate for a better mitigation result, so, how co-existence between people and animals could be achieved.

2.1 Researchquestions

The main research questions are presented below and connected to the objective of the study and the research problem that will attempt to give answers to the objective of the study:

What are the respective roles of stakeholders involved in HWC and how do they influence HWC mitigation?

How are HWC mitigation methods perceived by local researchers andgovernmental officials?

3 Methodology

This section focuses on the methodology that was used for this study. I will first conduct literature review on HWC and narrow my focus to HWC mitigation in one country – Malaysia. The understanding of conservationists' perspective about the effectiveness of HWC mitigation methods in Malaysia and the importance of local participation in wildlife conservation constitutes a significant factor for this study.

Next, participant observation was carried out with two environmental conservation agencies involved in 1) the promotion of sustainable palm oil management and 2) the conservation of large mammals in a wildlife corridor, respectively.

Finally, semi-structured interviews with several personnel at the frontline of HWC from conservation agencies and an online questionnaire survey were used as methods for this research. As Alversson and Skoldberg stated "*you start at one point and then*

delve further and further…, which brings a progressively deeper understanding of both", part and whole (Mats Andersson and Skoldberg, 2000, p23).

3.1 Participantobservation

Participant observation is the main method that many social scientists, mostly anthropologists, use for collecting qualitative data. It is a method that involves fieldwork and brings the researcher close to the people. As Bernard states, participant observation put you where the action takes place and gives the opportunity of collecting articulate data, noting that fieldworkers are better data collectors and better analyzers. (Bernard, 2006). You cannot have clear understanding of an action if you do not take part in it.

I conducted participant observation in a field of oil palm plantations as well as in a project that took place in the jungle of the Malaysian rainforest and offered me a deeper understanding of the environmental issues in Peninsular Malaysia. Mismanagement of natural resources and human wildlife conflicts constitute the main challenges for farmers and local people, mostly for the farmers who live at the edge of forest reserves, and wildlife seems to stand little chance. Participation in two non for profit organizations related to promotion of sustainable palm oil and to wildlife conservation, respectively, gave me the chance to experience two of the main challenges that Malaysia has to deal with, palm oil production and wildlife conservation.

Participation with WildAsia:

Six months of an internship in Malaysia with WildAsia (see Appendix) gave me the opportunity to see how oil palm trees have dominated the Peninsular Malaysian landscape. Several visits in a small village of the state of Perak, named Tapah and two hours drive far from Kuala Lumpur, have been held from June until September 2013 in order to document the conditions of oil palm trees and the plantations in general. The owners of the plantations are considered small farmers as the average of the plantation size was not more than 4 hectares. Visits in the farms are accompanied by small interviews with the manager of the farms during the audit. Questions related to the size of the plantation, the age of the palm trees, the number of the trees, the harvest frequency as well as the presence of wildlife constituted the first part of the farm audit which my colleague was responsible for. The second part which was under my

responsibility, was the ranking of the farm conditions based on farm observation, like the color of the palm leaves, signs of soil erosion, pruning, waste existence like fertilizer bags and plastic containers. The purpose of these small-scale farm audits was not only the improvement of management practices for environmental conservation but also to help small farmers to be part of the palm oil supply chain through certification. Nowadays, as global demand for environmental friendlier products is increasing due to consumers' concern for healthier and high quality products, small farmers seem to be excluded from the market as it is difficult for them to adapt fast in these change (R. Ruben et al., 2006). Sustainable palm oil certification constitutes a recognized tool towards this direction. Certification which is provided by the Roundtable for Sustainable Palm Oil (RSPO)[2] only when, plantation owners comply with the standards and criteria for sustainable production.

The next step was the training section which was provided by WildAsia experts in order to teach the farmers a better management practices that can benefit both farmers and environment. The role of WildAsia as external auditor is first to organize farmers into schemes, later, get their compliance to the RSPO standards and finally to teach them better agriculture practices. My role there as an intern, apart from helping out my colleague to fulfill the farm audit and organizing the data of the assessment to the excel sheet, was to research and compose guidelines for planting on peat and uses of fires.

Participation with Rimba:

In the beginning of November 2013, I participated in a project for the vital role of a wildlife corridor to the wild animals of the state of Terengganu. There, the Kenyir Lake gave the name to this natural corridor which teems with wild animals like tigers, leopards and elephants, and connects the biggest national park of Malaysia, Taman Negara, with the rest of the state's rainforest. Double-sizecamera trap stations had been set over an area of roughly 150km2 in the Kenyir Wildlife Corridor in order to estimate species density and to determine how the highway that bisects the corridor affects these animals.

A group of 4 people, 3 indigenous guys and me went into the heart of the jungle with only survival equipment. Our mission was to collect the camera traps that were set around the corridor as the project has reached the final stage. For the following six days, we were eating, sleeping and walking for the whole days into the jungle with no

[2] http://www.rspo.org/certification/how-rspo-certification-works#

signs of human presence. After reaching to our base camp, an area where we set our camp next to a stream, we divided into two groups. Following the directions of GPS, each group was responsible to collect 4 cameras before we return back to the camp. Our presence in the jungle had another purpose too, to patrol the area and report to the Department of Wildlife and National Park if we see any sign of poaching. For instance, during my experience in Kenyir, we found ourselves in an empty poaching camp which was captured by the camera and marked by the GPS immediately, in order to locate the camp later on. By the end of the sixth day, the team returned in the field house located in a village close by the lake with the camera traps. After one day of rest the group returned to the jungle for other six days, and this schedule continued until all the cameras to be collected.

In the field house, we were transferring the data from the cameras to the computer in order to identify the animals which were captured in the photos. A comparison with old animal pictures could show us whether the animal was a new one in the area or an old one, as well as its living conditions. Cameras were cleaned at the same time and during the analysis of the data, a process that the local children helped us with. Their curiosity about foreigners, who came to their village, brought them to the field house, when the first meeting took place. Later, and as the field house walls were covered with posters of wild animals, the children were motivated to learn more about them and the purpose of our project. So, a group of 15 children was visiting the field house for the following couple of days. It was school holiday at that period and children did not have obligations.

3.2 Semi-structuredinterviews (SSIs)

The evaluation of mitigation methods through interviews with experts on human-wildlife conflict was held in Kuala Lumpur where most of environmental conservation agencies are located. This study used semi-structured interviews (SSI) which are a powerful tool, to identify the main threat of wildlife in Peninsular Malaysia and the importance of local communities' involvement in wildlife conservation. Semi-structured interviews give the opportunity to the researchers to interact directly with interviewees, building trustful relation between them based on an open discussion rather than asking questions that are decided in advance. Moreover, semi-structured interviews are flexible enough to allow additional fields to be developed during the interviews. Unlike quantitative methods, SSI approach does not pursue large, representative samples but

focuses on relatively small set of informants instead. The aim is to increase the specific outcomes through values and relationships.

SSIs were conducted with experts on wildlife conservation and human-wildlife conflicts with years of field experience in Peninsular Malaysia. Ideally, people working on the ground could provide the best information about wildlife threats and recommend better solutions for HWC mitigation methods. Staff from conservation NGOs, governmental agencies, universities and several other conservation researchers with experience in wildlife conservation, particularly in tigers and elephants, have been interviewed in order to make this research more fruitful.

A list of main questions had prepared in order to discuss the relevant subject of the study and to offer me a clear picture of the human-wildlife conflicts in Peninsular Malaysia. Interviews were conducted mostly in meeting rooms of each participant's office individually and few of them took place in public places such as coffee shops and restaurants. There was only one group discussion with some WWF-Malaysia employees who specialized in human-tiger conflicts and the communication between them and local people. Moreover, most of the interviews were recorded, after the interviewee's permission, in order to allow us to have a flow of discussion as well as for me to double check our conversation. All the interviews were made in English and each typically lasted 40-60 minutes. Parts of interviews are presented below in chapter 5. The interviews helped me to create a wider social network as many of the participants were asking me to interview another person and suggesting me to come in contact with other experts in this field who would be helpful for my study. Personally, I realized that face to face meetings constitute a way towards a bonding time that could easily be evolved into friendship. That explained my participation with Rimba and my friendship with the director of this non-profit organization, who suggested me participation into the project of Kenyir Wildlife Corridor.

3.3 Questionnaire Survey

A questionnaire survey is a research method for collecting information which is mostly developed mostly by sociologists (Bernard, 2010). Surveys are used in order to identify people's expectations, measure satisfaction levels as well as highlight different opinions. Certainly, surveys require a representative sample and deep analysis of the results for inclusion.

Specific questions were sent by email to list of experts in wildlife conservation and HWC from relevant scientific institutes/universities, environmental NGOs and wildlife departments as well as people with several years of experience in wildlife conservation mainly from Peninsular Malaysia and Malaysian Borneo. The list of participants is constituted by 98 individual emails; face to face interviews assisted me to fill the list of contacts. Among the respondents there were agencies such as WildAsia, that are not connected directly with HWC, and their main mission is the environmental conservation through the promotion of sustainability among plantations that can cause HWC. Their opinion is also important to the analysis of the results as wildlife and biodiversity is strongly dependent on the environmental conditions and vice versa.

The questions which were included in the questionnaire were influenced by the works of different researches done on human-wildlife conflicts and the mitigation methods which are used in different countries, focusing on tiger and elephant. For example, Barlow, (2010) listed practices that are used in a tiger reserve of Bangladesh for conflict mitigation (Barlow et al., 2010). Futhermore, mitigation measures in South Asia focused on human-elephant conflicts (Fernando et al., 2008) and case studies on human-wildlife conflict by Elisa Distefano and her analyses of strategic management and practices of conflict avoidance were important for framing the questions in this survey. Analytic results on the existing methods that are used to minimize and avoid HWC are presented in Chapter 5.3 below.

4 Literaturereview

4.1 Human-WildlifeConflict

Ever since people started to cultivate the land for crops, farmers have become more concerned about wildlife in adjoining forests. Thus, human-wildlife conflict is not a new phenomenon. Jeffrey McNeely and Sara Scherr (2003:54) state that "*farmer's resistance to increasing wildlife population can be considerable, even among individuals with a strong philosophical commitment to environmental values*". Considering the growing pressure for access to land for natural resources, interactions with animals come to be increasingly dominated by intense conflicts, particularly in areas with large mammal habitats fragmented by infrastructural and agricultural expansion (Nyhus and Tilson 2004). Human-wildlife conflict (HWC) is fast becoming a serious threat to the survival of many endangered species worldwide, in particular to large and threatened

mammals such as the tigers, lions, orangutans and elephants, mainly because the remaining forest is unable to sustain their populations.

Conflicts between people and wild animals are not restricted to particular geographic areas but happen everywhere where human and wildlife co-exist because they share limited resources. According to the World Conservation Union (World Park Congress, 2003), HWC tends to occur when wildlife requirements overlap with those of human populations, creating costs to residents and wild animals. Contacts with wildlife occur in both urban and rural areas, but are more common around or inside protected areas because of the higher animal population density. The main causes of human wildlife conflicts are competition for food and space between human and wild animals. These intense conflicts affect both sides, causing socio-economic impacts for people such as economic losses to agriculture yield and loss of livestock and in extreme cases human casualties. On the other hand, wildlife is also affected negatively due to human confrontations which can reduce their populations. Ogada, (1999) argues that animals that clash with humans risk becoming extinct.

4.2 Overviewof HWC globally

Africa

In Zimbabwe, conflicts with lions and other carnivores occur regularly in areas of traditional agro-pastoralism located next to protected areas. Rural villages experience the negative impact of these conflicts. Wild carnivores such as lions, leopards and baboons attack and kill domestic livestock resulting in loss of household's income. For example, in the Gowke village located next to Sengwa Wildlife Research Area, the average annual loss per household between January 1993 and June 1996 was 12% of the total family's income due to wildlife predation on livestock. (Butler, 2000)

Carnivores constitute a significant problem for farmers in Kenya as well. In a study which took place in two ranches adjacent to the boundary of the Tsavo East National Park in Kenya, lions, hyenas and cheetahs were responsible for attacking domestic livestock. During a four year period of study, carnivores' predation caused an annual economic loss of US$ 8,749 to the ranches (Patterson et al., 2004).

In the Tanzanian island Zanzibar, a study (Siex, 1999) has revealed that a red colobus monkey which is an endangered species has been blamed by farmers for crop damages. According to this study, another less visible species is responsible for the consumption of coconuts, the Sykes monkey (Siex et al., 1999). Although farmers'

interpretation of Zanzibar may be wrong or they might exaggerate their losses, conflict between people and animals is deemed a significant by both farmers and conservationists in Zanzibar.

Olive baboons, bush pigs, elephants and red-tail monkeys are the most problematic animals in Uganda for the farmers as they stray into cultivated areas which border the Kibale National Park. The financial cost of these conflicts is 4-7% of their total farmers' crop per season (Naughton- Treves, 1997).

In the north of Cameroon, since the establishment of Benoue national park in 1968, local people lost the rights of land use which are restricted to a transitional area surrounding the park's border. Furthermore, their income has reduced significantly due to elephants, baboons, green parrots and warthog crop-raiding. According to Weladji and Tchamba (1993) in an area that animals cause major crop damage, farmers resort to illegal farm encroachment and wildlife poaching in order to secure their livelihood.

High density of human and elephant populations in Namibia causes intense human-elephant conflicts as they compete for the same natural resources, water and land. Moreover, Namibia has the largest free-ranging population of elephants in Africa, 5,000 elephants. Human-wildlife conflicts occur in villages surrounding Caprivi National Park where wildlife easily strays into human settlements. Although human-elephant conflicts (HEC) occur more recently than those with lions, the financial impact of the latter is greater. A study that took place in surrounding villages of Caprivi National Park between 1991 and 1995 looking at the impact of elephant crop raiding, resulted in damages of US$ 39,200, while between 1991 and 1994 the economic loss due to lion predation of livestock was almost the double, US$ 70,570 (O' Connell- Rodwell et al., 2000).

Asia

In India, in the state of Himachal Pradesh which neighbors Kibber Wildlife Sanctuary, snow leopards and Tibetan wolves were responsible for killing livestock. Wild carnivores killed livestock which represents 12% of household's income with livestock holding (Mishra, 1997)). Moreover, in Gujarat state of India where Gir National Park and Sanctuary is located, conflicts with Asian lions and leopards are very common. These carnivores stray into plantations searching for shelter, water and prey, killing buffaloes, cows, pigs and dogs. Some carnivores have been reported to stay in cultivated areas for more than a week and even to breed, usually in fields bordering the

park's edge (Vijayan and Pati, 2002). Tigers and Asian elephants in the south of India cause a significant economic damage to the rural farmers. For instance, in the state of Karnatake, the annual financial cost due to tiger predation on livestock between 1996 and 1999, was 16% of the average annual family's income, while the damage on crops due to elephant crop-raiding is equal to 30% of the annual household income in the region (Madhusudan, 2003). In addition, in Sariska Tiger Reserve, in the Indian state of Rajastan, there are 117 villages which are located in and around the park, agriculture and livestock keeping are the main sources of income for these households. Wild herbivores such as Nilgai, wild boar, sambar and chital are blamed by farmers for crop-raiding while the wild carnivores such as tigers and leopards are considered major threat in the villages as they are responsible for killing domestic animals. However, the economic cost due to livestock loss by carnivores is much less than the economic damage due to crop losses by herbivores (Sekhar, 1998)

The Sumatran tiger is considered to be the animal that creates most conflicts on the Sumatran island of Indonesia. Numerous tiger attacks have been recorded around different parks by Nyhus and Tilson, (2004a) who suggest that priority should be given to buffer zones around protected areas in order to conserve carnivores like tigers.

America

In South America, in the Peruvian Amazon Province of Tambopata, villagers depend on rainforest resources for their living. As a result, they come into intense conflicts with wildlife as the village is inside the Tambopata- Candamo Reserve. Wild herbivores and carnivores stray into cultivated areas searching for food leading to crop losses and livestock predation. Among the wild herbivores the Brazilian tapir, the tayra and the capybara are the animal that causes most damages of crops while, among the wild carnivores ocelot, hawks, jaguars and pumas were blamed for causing most of the depredation (Naughton-Treves et al.,2003).

In North America, wolves are responsible for killing cattle, horses, dogs, goats, bisons, geese and turkeys. In Alberta, Canada, wolves killed 2086 domestic animals between 1982 and 1996 while in Idaho, USA, between 1987 and 2001, wolves were responsible for 728 animal deaths, mainly sheep and cattle (Musiani et al., 2003).

Europe

In the Abruzzo region of Italy, wolves constitute a big problem in some parts of the region, as they are responsible for predation of livestock. Many pastoralists in rural areas are unable to keep predators out from the herbed animals. Moreover, some of the attacks occur when animals are lost from the main grazing route. Nevertheless, Cozza, 1996, argues that the socio-economic losses to families' income due to predation of livestock by wolves is not known in this area (Cozza et al., 1996).

In Israel, rural farmers blame golden jackals for killing livestock such as turkeys, hens and young calves. According to a study in 1993, the economic cost, due to calve losses by golden jackals that year, was estimated to be around US$ 42,000 (Yom-Tom, 1995). He states that conflict with golden jackals potentially would be more intense as farmers keep burring livestock carcasses, supporting the high density of animal's population (Yom-Tom, 1995).

4.3 Conflictmitigation

Mitigation efforts should aim to reduce problems caused by HWC. However, strategies and techniques that can solve one kind of conflict are not always applicable to others due to geographic differences, the species of animals involved and the prevailing attitudes of the local people towards wildlife. For instance, elephant mitigation techniques used in Africa cannot be applied in Asia and vice versa due to environmental differences and weather conditions. Similarly, preventive techniques for orangutans in Sabah for straying into the plantations might not be efficient for tigers in Peninsular Malaysia. This requires ongoing monitoring and research to develop new suitable approaches. The best way to mitigate and manage human-wildlife conflict is by protecting the natural habitat. However, mitigation can be either preventive or curative. Preventive mitigation actions are always preferred in order to avoid disturbances caused by animals' behavior, while curative action attempts to solve the problem after the incident has occurred. In addition preventive monitoring actions are more effective in the long term than curative actions which give a temporary solution to the problem (Eko H. Yuwono et al., 2007). However, the implementation of mitigation techniques will be more effective if there is strong collaboration between experts and other stakeholders as well as involvement of locals in the land use planning and executing processes in a long term basis (Beale, 2010).

4.4 Organizations in HWC- NGOs and CBOs

Defining NGOs

Although the common understanding of NGOs is that they are non-profit and non- governmental organizations, some are created and/or maintained by governments. NGOs are civil society groups that their primary purpose is the promotion of social and/or environmental issues rather than the achievement of economic or political power. However, there are associations that lobby on behalf of commercial interest, such as the International Chamber of Commerce (ICC) and other trade industry associations. NGOs gain resources primarily through “integrative power” of the citizens, whereas the governments do so through “threat power” and business organizations primarily through “economic power” (Korten, 1990).

The purpose of NGOs is often to provide social welfare services when governments fail or seem unable to manage social crisis and tensions, such as social inequalities, poverty, environmental degradation, sustainable management of natural resources, etc. The anthropologist William Fisher gives an explicit description of the NGOs’ designation and purpose of their creation stressing that NGOs differ because of cultural, economic, and social contexts and do they all have different political significance (Fisher, 1997). According to another anthropologist, Tanya Murray Li, social associations are formed under the “urgent need” and the strategic purpose to govern or to facilitate social outcomes. This urgent need and will for improvement can perceived as an assemblage of heterogeneous elements including “discourses, institutions, forms, laws, philosophical, moral and philanthropic propositions” (cf. Foucault, 1980). Stakeholders such as villagers, laborers, entrepreneurs, officials, activists, donors and scientists with different interests in profit, livelihoods, control, sustainability and conservation come together in order to address social and environmental struggles that society requires and environment needs, creating an increasingly complex and wide-ranging network. These organizations’ networks link local, regional, national and international levels with each other and at each of these levels there are additional formal and informal connections with one another, with governments, with donors and with international and regional NGOs (Brysk, 1993;

Finger 1994a; Fisher 1993, 1995b; Kamarotos 1990; Leatherman et al 1994; Peterson 1992; Shaw 1992).

Role of NGOs

Varieties of NGOs, international or national, regional or local, are involved in political system from global to national, and they are able to form civil societies. Moreover, these collective actions and its complex of network have profound impacts on global and on local policies. The World Bank (1991), for example, has noted that "*NGOs have become an important force in the development process [mitigating] the costs of developing countries' institutional weakness*" (p. 193). NGOs play a major role in pushing for sustainable development at the international level. Campaigning groups aided by advances in information and communication technology have helped to pay attention on social and environmental issues of business activities. Even those businesses, that their product is part of the final product which reach to consumers, can feel the pressure as campaigners develop techniques to target downstream customers and shareholders. In response to such pressure, even local communities co-operate with international NGOs in order to meet market demand and conserve environment. Willing to do good or not, NGOs can influence the politic agenda and they constitute a source of potential development, but critics from each camp may differ.

Defining CBOs

Just like non-for profit organizations, -Community Based Organizations (CBOs)-, are based on voluntary initiatives that operate within the communities. They are small spatial units whose members share common interest and objectives. They are local community associations that usually have formed so as to solve problems within the community and achieve community development and they are, usually self-funded. The term community development refers to the process that brings people together in order to develop their own community. The central meaning of the community development is a people's programme with governmental aid and "not" a governmental programme with people's aid (Kamath, 1961). Hamilton (1992) defined community development as

> *"aplanned and organized effort to assist individuals to acquire the attitudes, skills, and concepts required for their democratic participation in the effective solution of as wide a range of community improvement problems as possible in*

the order of priority determined by their increasing levels of competence." (Hamilton, 1992: 29)

Although, community-based organizations are the main solvers of local problems and improving quality of life, community participation is identified as a key implementation strategy toward meeting community's goals. Community development cannot take place if there is no participation by the community. Hence, participation plays a key role and has some benefits for the community (Treves et al., 2009). People's participation to community organizations empowers people to work as a group and to achieve a set of objectives for themselves. The World Bank (1996, p. 3) has identified participation as *"a process in which stakeholders influence and share control over development initiatives and the decisions and resources which affects them".* Members of community organization involve in defining the issues of concern to them, in formulating and implementing policies, planning, developing and in taking action to achieve changes (Breuer, 1999).

Role of CBOs

Community contribution to activities aiming to solve common problems and achieving common goals, is a fundamental factor for successful implementation of the projects. Benefits of such projects can include the creation of more jobs, the establishment or improvement of community relations with neighbor communities, community empower, improvement of local welfare, environmental restoration as well as enhancement of the quality of life. Without the community involvement to the revitalization projects of any community, no matter the size, a project may never get off the ground and it will not be accepted once it is completed. For instance, studies conducted in Turkey has shown that lack of community involvement related to the post-disaster housing process generate problems to the failure of rehabilitation and construction projects (Oliver-Smith, 1992; Enginöz, 2004). On the other hand, Namibia constitutes a significant example of successful community-based organizations which achieved to manage their natural resources effectively which allow communities to benefit from wildlife through conservation. By 2007, Namibia had established 50 management bodies, called conservancies that contributed to wildlife recovery and

economic and social benefits for people[3]. Many scientists have led to the recognition of local community involvement to the effective management of protected areas (Brandon and Wells 1992; Oviedo and Brown 1999; Rao et al. 2002b).

CBOs can be categorized into four organizational structures based on the organizations that wield the most authority, the degree of community involvement in decision-making and the attitude of community participants (Campbell and Shackleton, 2001). Different cases of community-based natural resources management in Africa below give a clear view of these categories.

1. The communities have little involvement in resource decision-making about the natural resource management of the region. In Zimbabwe, for instance, the Rural District Councils interact with the Village Development Committees wielding control over them, making impossible their contribution to decision-making process. Similar in Zambia, there are barely functions of communities in village levels.

   Additionally, in Sengwe Zimbabwe all decisions over CAMPFIRE (Communal Areas Management Program for Indigenous Resources), are made in district level. Villagers are represented by a counselor who is coming from a poor village with little interest on CAMPFIRE. Thus, many decisions are made by governmental officials at the district level rather than the counselors.

   Decisions regarding the wildlife in Game Management Areas (GMA) in Zambia are made by forums such as the Wildlife Management Authority in the Mumbwa GMA case and Leader's Committee in the Lupande GMA case. These organizations report directly to the wildlife department. Community members are not represented in these multi-stakeholder forums thus, decisions are made for them but without them.

2. Several cases of village committees such as Village Natural Resource Management Committees in Malawi, Village Forest Committees in Tanzania, and Resource Management Committees in the Zimbabwe Gokwe case, have successful community-based natural resources management (CBNRM) organizations. Committees in Malawi and in Tanzania have a clear role in the forest management of the area. Their role include making and enforcing rules on

[3] http://www.developmentprogress.org/sites/developmentprogress.org/files/namibia_environment_widlife_conservation.pdf

forest conservation, planning forest patrols and fire fighting as well as regulating the utilization of forest products. Unlike in Gokwe, the role of the committees limited to the assessment of forest products from the state forest and to the monitoring of resource use in the village.

The role of the forestry department varies among the cases. In Malawi, forest areas are under committees' management exclusively, and forest reserves on the state land are jointly managed by the state and the committees. In Tanzania, the department has a facilitative role, and committees decide how to manage the forest. On the other hand, in Zimbabwe, the forest department has a more dominant role in the decision-making with minimal committee authority and legitimacy.

3. The Residents' Association in South Africa, called Fish River, and the committee of Chivi in Zimbabwe are two cases where the organizations based on authorities outside of the state hierarchy. Traditional leaders are responsible for natural resources management with no governmental intervention, even though do not have the legal mandate. In the Fish River case study, local people feel powerless to stop the incursions of neighbors into their areas for resources and in Chivi traditional leaders fail to support their efforts at the District Level.
4. In Botswana, Namibia and Makulele of South Africa, there are cooperations which consisting by community members themselves. Natural resources such as wildlife, governed by legally-recognized constitutions. These constitutions have the authority to make rules and decide the management over their resources or to enter into partnership with the private sector. Rules are made through the committees and traditional leaders in consultation with residents of each conservancy. Governmental councilors have no official role in these conservancies.

Although in Namibia conservancies have the legal right to manage community resources such as wildlife on their own, government do not allow them to decide on how to deal with problem animals. In South Africa, on the other hand, the Makulele community after regaining the ownership over the land in Kruger National Park, the land rights and all commercial rights were transferred to Makulele community. The new situation brought the Makulele community against the South African National Park Board for the wildlife management of the community's land. Something, that probably it

would not have done so if community had not been in the powerful position of holding the land rights.

Importance of collaboration

Many scholars argue that local people have deeper understanding for their environment than outsiders and greater interest in the sustainable use of natural resources; they are able to manage natural resources effectively through local practices or with partnership with other institutions (Brosius et al, 1998; Tsing et al, 1999; Murray Li, 2007). However, resource users need to be educated and reminded of this interest. For example, a study in Philippines and in Guinea has shown that governmental intervention is necessary to forest management as local people do not know how to conserve and replant forests (Gauld, 2000; Fairhead and Leach, 2003). Moreover, the international NGO, WaterAid in joint venture with the World Bank and in collaboration with local NGOs in Ghana and in Nepal, have shown that when local NGOs have strong community links are the most effective, means of delivering appropriate water, sanitation and hygiene promotion at the community level[4].

Due to the high degree of experience in using participatory approaches and in facilitating in community conflicts, in many cases NGOs empower communities to take responsibility for their own development. Working in partnership with different NGOs, international and national, national and local as well as collaboration with communities is a key principle for project implementation and community development. According to Brown and Tandon (1994), community development work requires a collaboration with a variety of actors in order to build common purposes and supportive interactions. They call the approach towards the collaboration between community organizations, the "sectoral level", where NGOs need to establish a joint venture with other actors and share common goals and objectives. Additionally, NGOs may promote strategies to ensure that their requests remain on the political agenda.

4.5 Malaysian biodiversity and palm oil

Malaysian Biodiversity

Malaysia is located in the Southeast of Asia with a total land area of 329,847 km2. The country is divided into the peninsular Malaysia in the West and the northern part of Borneo Island in the East, separated by the South China Sea. Peninsular

[4] Contracts or Partnerships: Working through local NGOs in Ghana and Nepal, 1999

Malaysia border on the north with Thailand and on the south with Singapore, whereas in Borneo Island shares borders with Brunei and Indonesia.

Malaysia is largely covered by rainforest below the equatorial zone that teems with wildlife. The Malaysian rainforest has a remarkable variety of fauna and flora[5]. Although it has only 0.2% of the world's land mass, its variation of flora and fauna makes it one of the richest countries in the world in terms of biodiversity per unit area, according to the World Development Indicators. Besides the thousands of tree species, the forests provide habitat for thousands of animals. Of these, around 12% are endemic which means that cannot be found in another country (*see below Table 1).* The natural orchestra of the forest is normally led by various species of monkeys, elephants and many carnivores. Among the variety of monkeys, orangutans are the most famous animals of tropical countries which can be found only in the rainforest of Borneo. According to the IUCN Red List of threatened species, (2014), the Borneo orangutan classified as endangered (EN) with an estimated decline of over 50% of its population the last 60 years. Asian elephants, while smaller than their African cousins, are limited and live deep within the Malaysian rainforest and are considered as the most social animals. Asian elephants belong to the endangered category of the Red List as their population has been decreased with over 50% the last three generations (IUCN, 2014). Among the carnivores, Malayan tiger is the symbol of the country and the most terrific wild animal which can be found only in Peninsular Malaysia. A researcher on tiger density, suggests a population "up to several hundred", based on estimates from camera trapping (Lynam et al, 2007). IUCN clarified Malaya tiger as endangered in the Red List of threatened species. Among the variety of animals, other smaller animals that can be found in Malaysia are deers, bats, wild pigs and variety of reptiles.

Table 1:Breakdown of Malaysia's biodiversity

Organisms	Total species	Endemic species
Mammals	286	27
Birds	736	11
Reptiles	268	69
Amphibians	158	58
Trees	15,000	N.A

5 Biodiversity in Malaysia, 2006

Source: Ministry of Natural Resources and Environment, Malaysia

Source: Convention of Biological Diversity, Malaysia

Palm oil and economic growth

Due to the high demand of automobile and transport industry worldwide, rubber was the source of income and the main agricultural crop in Malaysia in 1950s. However, the advert of synthetic rubber led to the dramatic reductions of incomes to those involved in rubber. Malaysia was suffering an economic crisis and in 1969, the high poverty led to the bloody racial riot between rural and urban inequalities (Mohd Noor, 1997). In 1970, the rural poverty was at a high of 68 per cent with the paddy sub sector with 88.1 per cent, fishermen with 73.2 per cent, rubber smallholders with 64.7 per cent and coconut smallholders with 52.8 per cent (Table 2). Early 60s Malaysian government recognized the need for a new policy agenda for economic growth and it was then that governmental agencies like FELDA (Federal Land Development Authority) developed land, mostly with rubber trees and latter with oil palm trees, to be distributed to the landless poor. Also replanting funds were provided to rubber plantation owners who wished to switch to oil palm plantation. From 1970 to 2000, cultivated land for palm oil expanded from 320,000 hectares to 3,4 million hectares, while the land for rubber reduced from 2,2 millions to 1,6 million hectares. Of this total, small farmers counting for more than 41 per cent of the total palm oil in the country (MPOB, 2001). So, the agriculture poverty declined from 68.1 per cent in 1870 to 21.1 per cent in 1990 and to 11, 8 per cent in 1997, with oil palm smallholders to not be considered as significant group related to poverty since 1984 with only 8,2 per cent of oil palm smallholders considered poor.

Table 2: The number of poor households in agriculture, Peninsula Malaysia, 1970

Subsector	Total Households ('000)	Total Poor Households ('000)	Incidence of poverty (%)
Rubber	350.0	226.4	64.7
Oil Palm	6.6	2.0	30.3
Coconut	32.0	16.9	52.8
Paddy	140.0	123.4	88.1
Other Agriculture	137.5	126.2	91.8
Fishermen	38.4	28.1	73.2
Estate Workers	148.4	59.4	40.1
Total	**852.9**	**582.4**	**68.1**

Source: Malaysia (1976). Third Malaysia Plan, 1976-1980, Kuala Lumpur

Table 3: Agricultural land use, Malaysia, 1970-2000

Crops	1970	1985	1990	1995	2000
Oil Palm	320.0	1,482.4	2,029.5	2,539.9	3,338.3
Rubber	2,181.8	1,948.7	1,836.7	1,679	1,590
Cocoa	n.a	303.9	419.1	190.7	111.4
Paddy	533.4	655	680.6	672.8	692
Coconut	348.64	334.1	315.6	248.9	115.7
Pepper	10	5.4	11.5	10.2	10.9
Vegetables	n.a	31.8	35.2	42.2	32.1
Fruits	n.a	150.1	204.6	257.7	261.7
Tobacco	n.a	16.2	10.2	10.5	18.5
Others	n.a	70.6	85.2	90.4	14.5
Total	**n.a**	**4,998.2**	**5,628**	**5,742.3**	**6,185.1**

Sources: i. Malaysia (1970), Second Malaysia Plan

ii. Malaysia (1999), Third National Agricultural Policy (NAP3)

Favorable growing conditions in Malaysia have facilitated the expansion of the agricultural sector, contributing 12% to the nation's GDP (World Bank, 2011). Palm oil constitutes the main agriculture crop with high contribution to national economy.Current estimates put the palm oil industry's contribution to the Malaysian economy at around 9% of GDP and 37% across various agriculture commodities[6] . The palm oil industry provides a source of income and economic development to a large number of people, directly or indirectly. Over the past decades, palm oil industry expansion has been a significant source of poverty reduction through farm cultivation. According to a World Bank report, published in 2010, Malaysian agriculture land in 2009 constituted 7,87 million hectares of which 57% was under oil palm cultivation. Malaysia is the second

[6] Dept of statistics and economic planning unit

biggest producer of palm oil after Indonesia with 33 and 53 percent of global production respectively (USDA, 2013). Moreover, from 1980 to 2011, the annual world production of palm oil has increased from 4.5 million tonnes to 55 million tones, making palm oil one of the most profitable crops for Malaysia.

In Malaysia almost one third of the whole population[7] lives in rural areas and their livelihood depend entirely on rainforest resources for food, shelter, economic needs and for cultural and spiritual traditions. As economic growth requires people's involvement to local and global market, agriculture seems to be a way towards this achievement for rural people. As the demand for oil palm, the last decade, has been increasing rapidly due to the high productivity and the low cost, many farmers in Malaysia prefer to cultivate palm trees instead, as a cash crop in order to improve their livelihood. According to the Malaysian ministry of agriculture, the agriculture sector in Malaysia employs 14.6% of the total national population[8], thus, for 1, 5 million people, agriculture considered a source of income. A recent study by Md. MahmudulAlam, (2010) in North-West Selangor, showed that agriculture is the main income source for almost 90% of Malaysian farmers and palm oil is the main cash crop with 63,90% across various crops like rubber, cocoa, coconut and rice (Md. MahmudulAlam et al., 2010).

4.6 HWC in Peninsular Malaysia

Considering human population growth in combination with high demand for natural resources and access to land, the pressure on Malaysian ecosystems has negative impacts on the ecosystem. Forest degradation due to deforestation, agriculture expansion and infrastructure development are the main drivers of HWC. The large home ranges of elephants, for instance, have also brought them closer to rural human settlements and plantations with more accessible crops to satiate their large daily dietary requirements.

In Peninsular Malaysia, conflicts with animals often stem from human intolerance for crop and livestock losses respectively. According to the Malaysian DWNP, elephant disturbances cases which were received through Peninsular Malaysia in period of 2006-2010 were 4,684reports with an average of 933 incidents annually while tiger reports constitute only 4% of total human wildlife conflicts. The number of tiger conflicts reported is in decline (from 355 cases in 1999 to 123 cases in 2006) but the reasons

7 http://www.tradingeconomics.com
8 Overview of Agriculture Sector in Malaysia, 2006

behind this are unknown as data is incomplete. Nevertheless, Long-tailed Macaque conflicts were the most reported disturbance cases among all wildlife cases through Peninsular Malaysia from 2006-2010, with total of 37,822 cases (DWNP). Moreover, retaliatory killing of elephants and tiger have occurred after humans were attacked or killed.

Mitigation techniques for HWC such as electrified fences and translocation, constitute important tools for wildlife conservation. Competition for food and lack of space bring human and wild animals into close contact and livestock become an easy prey for carnivores to attack. So, many farmers in order to protect their properties resort to illegal culling, using snares and poisons. Illegal hunting constitutes main drive force to animal extinction in Malaysia such as Malayan tiger. Asian elephants and Malayan tiger are listed as endangered on the red list of Threatened animals (IUCN) as their population has been decreased dramatically within the last century. Moreover, connecting forest corridors between fragmented forests plays a key role to the survival not only of elephants and tigers but of many other species as well as to the reduction of economic losses (Linkie et al., 2006; Eko H. Yuwono et al., 2007; Salman Saaban et al., 2011).

Social impacts of HWC

HWC is an increasing global problem and there is an urgent need of conflict management in order to minimize negative impacts on biodiversity, human livelihoods and human well-beings. However, a deeper understanding of social dynamics that generate these conflicts constitutes a fundamental factor for a positive outcome. The integration of a social context in combination with both impacts and evaluation of conflict management approaches can lead to an effective conflict management and conservation benefits in the long run.

The Role of the Malaysian Federal Government in HWC mitigation

The Malaysian federal government, under the department of Wildlife and National Parks (DWNP), which is the main body that tries to control threats against wildlife, with the current regulation under the Wildlife Conservation Act (2010)[9], tries to increase the population of Malaysian wildlife by reducing poaching, which has decreased significantly

[9] https://www.unodc.org/res/cld/document/wildlife-conservation-act-2010_html/Wildlife_Conservation_Act_2010.pdf

the wildlife population the last two decades and minimize human-wildlife conflicts. In Peninsula Malaysia, elephants have been elevated from the status of protected species in 1972 to totally protected species in 2010. According to the new status, any person who shoot, kill, take or possess an elephant or parts of it, commits an offense and the penalty is a fine of RM100,000 (US$ 31,430) to 300,000 (US$ 94,302) or 3-10 years of imprisonment, or both (WCA, 2010: 68(1)). The fine depends on the sex and the age of the elephant. Specifically, the maximum fine for a young elephant carcass is RM200,000 (US$ 62,860) or 10 years imprisonment or both (WCA, 2010, 69(1)). Regarding the tigers, Malaysian tigers are considered as totally protected species since 1976 and the fine for any offense is between RM100,000 and RM500,000 with imprisonment of 5 years (WCA, 2010:68 (2c)).

Regarding the implementation of HWC mitigation methods, the DWNP (Perhilitan) installed electric fence in three main sites of concern in Malaysia under the 9th Malaysian Plan between 2006 and 2010. One electric fence constructed in Perak and two in Johor due to the intense human- wildlife conflicts. Length of 70 km fence was introduced in these areas. Under the 10th Malaysian Plan, another 190 km of electrified fence is being installed in conflict hot spots along the country to mitigate human-wildlife conflicts and prevent both people and elephants. The director of the biodiversity conservation division of Perhilitan, says that since the introduction of electric fence in 2006 until 2011 conflict cases have been reduced by 36 per cent. Also, he notes that maintenance of the fence is necessary to work in order as there are many disrupt factors that can stop the function of the fence. For instance, undergrowth vegetation and fallen trees on the fence can incapacitate the fence. Moreover, Perhilitan is responsible for capture and translocation of any problem animal, with trained staff.

The role of conservation agencies in HWC mitigation

In Malaysia non-governmental organizations play a significant role towards wildlife conservation and mitigation of HWC. WWF-Malaysia and Wildlife Conservation Society are the main organizations that are in the forefront of battle for protecting wild animals such as tigers and elephants from extinction. The ultimate goal of these organizations is to achieve long-term and sustainable conservation impact for Malaysia by conserving, recovering and protecting biodiversity. They are responsible for monitoring wildlife in areas with critical population of wildlife and manage joint projects. In addition, they facilitate communication between partners as a matter of better

collaboration and last but not least, they provide training to stakeholders to raise awareness of better management methods for conservation.

In 1998 for instance, WWF-Malaysia started a project in FELDA Jerangau Barat (FJB) in order to minimize Human-Wildlife Conflicts (HWC) in the area, as many small plots of land were given to rural communities for oil palm plantations. Also, in 2005 a second initiative was started by the same organization in the district of Jeli, Kelantan for developing better management practices to mitigate human-tiger conflicts. Jeli had the highest incidences of tiger attacks and it is one of very few sites where tigers are known to have killed humans in recent years. Although WWF-Malaysia's work started out initially as a Human-Tiger Conflict (HTC) project, Human-Elephant Conflicts (HEC) were also happening in the area, and increasing each year. This situation prompted WWF-Malaysia to include both HTC and HEC components in the project. Throughout WWF-Malaysia's involvement in HWC mitigation, a few techniques were implemented or experimented with to deal with both HTC and HEC. Mitigation approaches used for HTC include tiger-proof paddocks, community clean-ups and the use of air-horns.

Since 2007, WCS has been working in Endau-Rombin landscape in Peninsula Malaysia, to initiate a recovery of tigers and other wildlife species. In order to ensure tiger recovery in that area, WCS works closely with the state and federal governments of Malaysia. WCS provides support for anti-poaching efforts trying to involve local communities through education programs and regular monitoring of tiger and tiger prey population numbers to determine if the conservation efforts are successful.

The role of farmers in HWC

The last few years, forested area in Malaysia have been cleared to make space for plantations and close proximity of humans settlements to the forest reserves bring people in intense conflicts with wildlife. Also, ineffective management of livestock results in livestock predation by tigers and other carnivores. For instance, between a period of six months in 1997 to 1998, 53 heads of cattle were killed by tigers in FELDA, Jerengau Barat alone (Vidyadaran&Sharma, 2000). According to a study conducted by WWF-Malaysia (2006) in Jerangau Barat many land owners do not practice effective livestock management. The cattle are left to graze on whatever plant materials they can find along the road side or undergrowth vegetation in palm oil plantations. Additionally, cattle are sometimes left to sleep along the plantation roads and within the plantation itself. Even when livestock are herded into paddocks, the structure is not effective enough to

prevent tigers from getting in. Some livestock owners do not even have paddocks for their animals. From experts experience, night stalls used by rural farmers for keeping cattle at night are of poor design and insufficient to prevent tiger attacks, and even to keep cattle inside. Moreover, some paddocks are built in unsuitable locations such as areas that are far from human supervision, therefore making the paddocks prone to tiger visits.

In order to prevent their livestock from carnivores such as tigers and reduce crop-raiding from herbivores like elephants, many farmers apply illegal methods. Low cost practices such as physical barriers (trenches, stone walls, moats, buffer zones) are not effective enough to prevent neither livestock predation from tigers nor elephants from straying into cultivated areas. In rural communities, which are located close to forest reserves, farmers in order to protect their livelihoods do not hesitate to kill them setting snares around their plantations or even hiring an illegal hunter. For instance, in FELDA Jerangau Barat as a result of human-tiger conflict, one tiger was shot for killing 30 cattles in a single week (Vidyadaran&Sharma, 2000). There are also unofficial reports that more tigers have been killed by local farmers throughout the years as retaliation for livestock predation. Even though there are no official records for illegal killing of elephants due to crop-raiding in Malaysia, rural farmers in their effort to protect their crops poison elephants.

Collaborations between the government, NGOs and farmers in HWC mitigation

With regards to conservation the role of Federal government, the Department of Wildlife and National Parks (DWNP), in collaboration with other partners like, NGOs, rural communities, wildlife biologists, local and foreign scientists and academic institutions, has published a series of National Conservation Action Plans as part of the state's strategic approach towards protecting Malaysian biodiversity and wildlife.

The National Elephant Conservation Action Plan or NECAP[10], published by DWNP in collaboration with Wildlife Conservation Society (WCS), provides a series of strategies for Asian Elephant conservation. Mitigation of human-elephant conflict, with either passive or active methods (Osborn and Parker, 2003), is considered an important part of the strategic plan for elephant preservation. NECAP refers also to the necessity

10 http://newsroom.wcs.org/News-Releases/articleType/ArticleView/articleId/5234/Launching-of-the-Malaysian-National-Elephant-Conservation-Action-Plan.aspx

of law enforcement and law monitoring for an effective management of elephant habitats. Nevertheless, as the last solution for the survival of wild elephants in areas where wild elephant population has been lost NECAP suggests the reintroduction of captive elephants. However, there is a risk of such reintroductions as captive elephants are not afraid of human contact and it could result to intense conflicts.

Regarding the strategy for tiger conservation, a similar plan has been published by DWPN in collaboration with other NGOs such as WWF-Malaysia, under the National Tiger Conservation Action Plan for Malaysia[11] (NTCAP). As reported by this Plan and similar with NECAP, tiger conservation is a long process through, improvements and knowledge. Moreover, this Plan relies on the power of accountability between all parties are involved directly or indirectly in tiger's disturbance. Additionally, for a successful strategic plan for tiger conservation, stakeholders should not been excluded and they must be engaged to the implementation of the NTCAP. Progress monitoring of the plan's implementation is a shared responsibility by both primary and secondary stakeholders but very important part of the strategy.

Apart from the governmental-NGOs partnership, the DWNP is collaborating with local universities as well. For instance, the University of Nottingham studies the impacts of electric fence that DWNP installed, on local communities. The outcome of this study will enable the department to determine whether electric fencing reduced conflicts and has enabled farmers to continue their agriculture activities without fear of elephants destroying their crops. Another example of joint venture is the umbrella group of MyGajah, between the DWNP and conservation groups. This group has formed to implement actions which are included in the action plans. Additionally, and as the importance of maintenance was mentioned above, community involvement, to the maintenance of the fence as well as to ensure that elephants will not stray into villages or farms because there are several entry points, is required. Community guarding is an additional preventive method using simple tools such as spotlights, noise making gadgets which are provided by conservation groups (see below).

[11] http://globaltigerinitiative.org/site/wp-content/uploads/2013/04/National-Tiger-Action-Plan-for-Malaysia.pdf

Collaboration examples:

In 1998, WWF-Malaysia, together with the Department of Wildlife and National Parks (DWNP), the Department of Veterinary Services (DVS) and the FJB Management, started work in FELDA Jerangau Barat (FJB), Terengganu, where numerous of cattle were killed within a period in a short period (Vidyadaran& Sharma, 2000). A second initiative was started by WWF-Malaysia in 2005 in the district of Jeli, Kelantan. Together with local communities and DWNP, WWF-Malaysia has been developing better management practices to mitigate HWC there.

A tiger-proof paddock was first tested in FJB together with DWNP and DVS. It was constructed using high-quality wood pillars, a zinc roof and a cement base, and fenced using chain-link which was inexpensive and easy to obtain. A proper management plan was also developed and adopted by the participants. Guidelines were developed for suitable times to allow cattle to graze in the plantation. Supplementary feed was also to be provided within the paddocks to compensate for the shorter grazing duration. Free-ranging cattle were gathered and housed in selected shared paddocks. In addition, WWF encouraged the locals to work together to clean up plantations from undergrowth vegetation. An unkempt plantation provides habitat for tigers similar to the forest. The shrubs and bushes provide excellent hiding place for tigers to rest and hunt prey (Kanchanasakha et al. 1998) Equipment such as grass-cutters, machetes and pesticide spray pumps were provided.

In the Malaysian village of LubokBongor formed the first community-based wildlife protection unit (WPU) similar to Indonesia's efforts to mitigate HEC via Elephant Flying Squads. It is a team of rangers and special trained domesticated elephants who chase away wild elephants and drive them back to the safety of the jungle[12]. Most of the participants in the WPU were those directly affected by the conflict. A unit of 21 volunteers, farmers and entrepreneurs, was established to guard and patrol conflict areas within their village, assisted by WWF- Malaysia. The herds of elephants were crossing the Pergauriver, entering the village, eating vegetables, uprooting trees and terrifying villagers in general. The WPU conducted their patrol every night along rivers and jungle paths since 2008 (Ong, 2011). They used a variety of techniques to chase away wild elephants, starting with noise-makers made of metal pipes loaded with carbide, which make a loud booming sound when lit with fire. Training and materials for

[12]http://www.wwf.org.uk/what_we_do/safeguarding_the_natural_world/wildlife/what_is_an_elephant_flying_squad.cfm

guarding and patrolling were provided to this unit by WWF-Malaysia[13]. Equipment such as hand-torches, spotlights, megaphones, boots, walkie-talkies, survey forms and maps were also provided. Using only basic tools to scare away wild elephants, human-elephant conflicts gradually declined and elephants moved to another area. Later, WPU built an electric fence to the elephants entry points for a sufficient defence[14]. Moreover, the Wildlife Protection Unit reported that the best method to chase away elephants was the use of pipe cannons.

Since February 2014, joint patrols in protected areas to combat poaching and trespassing, have resulted in the arrest of 13 foreign poachers. Besides, studies conducted between 2010 and 2013 which took place in both protected areas and forest reserves, NGOs destroyed more than 2,941 poacher traps and 1728 illegal camp sites. Meanwhile, between 2000 and 2012, around 100 tigers were confiscated in Malaysia, based on 33 seizures.

[13] http://www.wwf.org.my/?uNewsID=6900
[14] http://www.youtube.com/watch?v=nr6a2JL3rsU

5. Results and Opinions

5.1 Semi-structured interviews

Below, several interviews with experts on human – wildlife conflicts are presented below which were held in Malaysia between October-December 2013. Experts, with years of experience in the field with animals and close contact with local communities, were interviewed in order to give their perspective on current situation of human-wildlife conflict. The interviewees give answers on responsibility for the implementation of human-wildlife conflicts mitigation methods as well as future views. However, for these subjects, the interviewees wish to remain anonymous.

- A.Z who is a researcher on human-elephant conflict and elephant behavior with 8 years of experience on both human-elephant and human-tiger conflicts mentioned that the elephants among others which live in the edge of forest reserves may cause problems to the farms. He says that "*once the elephants get the easy food with more nutrition, they do not need to walk as far to find it, so corridors as mitigation practices are not going to work. Corridors are there to ensure the genetic diversity among isolated forests not to mitigate conflicts.*"
  Regarding to the most effective mitigation solution, A.Z states that the combination of methods and a long-term collaboration among different stakeholders is the key for wildlife conservation. In addition, responsibility is a sharing duty among all stakeholders, saying that "*if the government invests millions to build electric fence and the local community is not willing to help on the fence maintenance, NGOs take the responsibility to give advice and gain their involvement for the common benefit. On the other hand, big companies should invest on mitigation practices like guarding, construction of electric fence on their own responsibility*."

About the current situation in Malaysia, he noted that only the DWNP seems to take the lead towards conflict mitigation but there is scarcity on communication skills with locals. So, with the assistance of NGOs in this part, the involvement of local people can be increased. However, he says, "*it is hard to get the involvement of locals because some are very pessimists, very negatives to save elephants and they see elephants*

only as pests." During his employment with WWF-Malaysia, the establishment of a guarding group for elephants, in 2007, was a successful achievement but suddenly elephants disappeared. He assumed that possibly moved to another area due to the clearing of neighboring forest.

He ended up the interview stating that "*human-elephant conflict is a never-ending story as long as there are elephants, as long as conversion of forest is still taking place. So, if we do not have proper use planning and protect areas of high conservation values, wildlife will always be in the losing side of that "battle"*.

- A principal investigator A.C of Management and Ecology of Malaysian Elephant stressed that elephant as one of the largest mammals can give the knowledge on how to manage human-wildlife conflicts in general.The combination of both habitat loss and human-elephant conflicts are the main threats for Malaysian elephants, saying that "*as the human-elephant conflict is still increasing is not about habitat loss is about the conflict*. *Habitat loss comes first, then the conflict and later the problem*".

In the question of the most effective technique to mitigate human-elephant conflict, A.C noted that "*there is no silver bullet, no single method is effective and it is a matter of having clear objectives*". Besides, translocation and electric fence are the most effective methods to prevent elephants from crop-raiding according to A.C. However, in Malaysia, there are no strong evidence on translocated elephants and the creation of new conflicts, compared to Sri Lanka where those elephants in their effort to move to another area they create further conflicts. As far as the natural corridors, he says that natural corridors can increase the conflict but, as the aforementioned interviewee refers, the benefit is not the conflict, it is the connectivity between two isolated populations.

Concerning the responsibility, A.C refers that it is not a top-down approach which government or NGOs tell people what to do. All stakeholders are responsible for conflict mitigation and wildlife conservation. For instance, "*government has some responsibility but the company which transforms the landscape for plantation is responsible for it. What planters are doing now is just enjoying all benefits without caring about wildlife ".* He then arguesthat '*farmers think that wildlife is someone else's fault and someone else's problem'*.

About local participation, A.C refers that it is important to understand and have a clear substantial level of agreement. One of his main concerns is the engagement of people who are not directly affected by wildlife and how we can persuade them that is a common problem and everybody needs to support each other.

- According to the interview with the team manager of Species in WWF-Malaysia, the ecologist Dr. H.K, the main threat for tigers and elephants in Malaysia is the habitat loss due to forest conversion. Also, tigers are threatened by poachers for the black market because tiger parts cost a lot of money. Dr. H.K also mentioned that, "*Although Asian elephants are not threatened by poaching as African elephants due to the fact that they do not have big tusks; retaliation killing is still taking place in Malaysia*". As an effective method for conflict mitigation, he says that most of the time rural farmers use noisy tools like fire crackers or drums to make their presence noticeable.

Talking about the responsibility for the implementation of mitigation methods he states: "*Supposed to be the Department (DWNP) but, to be fair, it should be a joint implementation with other departments such as the Dept. of Forestry and the Dept. of Town and County Planning*". Regarding the NGOs, their role is important, they are here to puss the governmental agencies to the right directions. According to Dr H.K., "*ten years ago the government was seeing NGOs as an enemy, but now they have to work hand to hand. For example, government needs the NGOs initiatives to make a research, put the data and show to the governments"*.

Referring to the relationship with local communities and the level of local participation, Dr. H.K says "*in places where there is a project, the relationship with the communities is good but in other areas may do not know us"*. Moreover, the level of local participation definitely affects the conflict mitigation effort, saying that young generation is more willing to help. Additionally, in the interview he talks about the community house which WWF established in order to be used as community center in his project area. "*This house is the beginning of a community-based organization",* he says*, "in which people come together and can discuss common problems such as human-wildlife conflicts*".

In his point of view, the WWF-Malaysia Species Conservation manager, believes that DWNP should committee more effort to wildlife conservation, stressing that "*We*

need also more initiatives from government and NGOs in order to expand conservation". At the moment, Dr. H.K thinks that too much talking about wildlife conservation but no so many actions. Talking about the local participation, Dr. H.K thinks that more often meetings are crucial in order to raise the level of local involvement, saying "*if you do meetings once in a while people forget easily everything but of course the frequency depends on the financial support we have*". Regarding the tiger he says, "*If we do not committee to the effort for tiger conservation, in ten years from now, Malay tigers will be gone*".

- A group discussion with three employees in WWF-Malaysia with four, eight and nine years of experience, respectively, working on communication and awareness program noted that agriculture expansion and poaching are the main threats for tigers and elephants in Malaysia. Regarding the natural corridors they say "*natural corridors could decrease human-wildlife conflicts because fragmentation does not give any other choice to elephants rather than crop-raiding*". However, in their opinion the most effective mitigation method is community corporations. They referred to the establishment of voluntary units such as wildlife protection units as patrolling guards.

According to the group the responsibility for wildlife conservation, thus, the mitigation of human-wildlife conflicts, is a share jurisdiction of all stakeholders who involve with wildlife. They say characteristically, "*Our responsibility as a communication team is to let farmers understand why human-wildlife conflicts occur, because authorities alone cannot solve the problem without the support from local people*". Nevertheless, at the beginning of each project the relationship with locals is bad, but as they say, it takes time in order to establish a relationship of trust. Only after the establishment of trusty relationship with the community, the assistance to community is possible, either assistance for life improvement or for wildlife conservation.

As far as the future of wildlife and Malay tigers in particular, they do not seem very optimistic. Noting that if poaching for tigers and fragmentation of forests are not authorities' priority in order to save tigers from extinction, tigers will lose the battle of survival and probably the next generation could see them only as images. "*Land use planning should be the priority for government, however, we do our best as conservationists to save this magnificent creature*", they say.

- The director of biodiversity conservation in Malaysia of the Dept. of Wildlife and National Parks (DWNP) Dr. S… agrees with most conservationists that the main threat for wildlife is the habitat loss and fragmentation of forest. Moreover, illegal hunting of tigers is the main cause of tiger decrease. According to Dr. S..the best technique to avoid human-tiger conflict is the clearance of undergrowth vegetation and the construction of tiger-proof paddocks. He says, "*In Jeli with high level of human-tiger conflicts, we realized that vegetation of plantations was overgrown, so a good cover for tigers. Thus, we advised farmers to clean it and also to construct paddocks for the cattle*". For elephants, he believes that the best method is the electric fence in combination with trenches, but the construction is expensive. In areas where electric fence is not suitable, the monitoring of the area is necessary in order to prevent elephants of getting in and chase them back. As last solution, DrS..reveals the translocation to another area, saying "*We translocate elephants usually to Taman Negara national park but it is difficult to say if this method is effective because we have noticed that some elephants go back to their home range*".

Regarding the responsibility of conflict mitigation methods, Dr. S notes that owners of big plantations should invest on their own, on the construction of electric fence and other necessary methods for wildlife avoidance. About the small farmers, government is responsible for implementation of the fence in the areas with intense human-wildlife conflicts, because small farmers do not have the money to build up an electric fence. For big projects like connectivity of isolated forests, he says with certainty that government is responsible because it requires big investment, adding that "*natural corridors can minimize conflicts as they provide more space for elephants to move, but, of course, in combination with additional techniques such as electric fence*". However, for the elephant management it is necessary the engagement from all stakeholders, from the federal government, the state, the local communities and from conservation agencies like NGOs, "*We need to work as a team*", he says.

Local communities can be the ears and the eyes to the DWNP, in case of poaching or illegal activities in the forest. Also, the DWNP needs the local involvement to patrol together in areas where conflicts occur, so local people can help the Dept. to identify the pressing areas.

About the future of wildlife, Dr. S. seems optimistic about tigers. He comments the goal of MYCAT (Malaysian Conservation Alliance for Tigers) which is the double of tiger population until 2020, saying that*" since we have a plan for the connectivity of main forest complex in Malaysia and in combination of high penalties for poaching, this goal can be achieved*". Elephants in Malaysia do not seem to be under threaten and their population is stable, he argues. However, with the connectivity of main forest complex we can ensure the viability of Asian elephants in Malaysia.

- According to the interviewee, Mr. L.S, a field assistant of Wildlife Conservation Society (WCS) in elephant and tiger project in Terengganu, Malaysia, since 2007 states that tiger poaching for meat consumption but no for local consumption is the main threat in Malaysia. Regarding the elephants the human-elephant conflict is a big issue in Malaysia due to habitat destruction because elephants require big territories.

As for the mitigation technique to avoid elephants, Mr. L.S believes that the best prevalent method is the electric fence and the maintenance of the fence. About the small farmers the Indonesian example of the 'siren fence' has proved effective. "*The siren fence is an alarm fence which can be activated when elephants pass through and the quard team is able to chase elephants back to the forest"*, he says. Regarding the tigers, plantations which have cattle to herd into, have the problem, because cattle is the tiger's prey, sotiger-proof paddocks is the best method to avoid livestock loss by predators. He gives the example of some Orang Asli villages, saying "*In some villages where Orang Asli have no cattle but only chicken, tigers cross villages without any conflict, thus, the cattle management is the problem, no the tiger itself".* Moreover, Mr. L.S thinks that natural corridors should be wide enough in order to be effective as conflict mitigation, if they are too narrow, he says, instead of solving the problems, may increase the conflicts.

Talking about responsibility of human-wildlife conflict mitigation, government is responsible for land use planning but in his point of view each owner should be responsible for his own farm/plantation. Farmers cannot expect that government will solve their problems with wildlife. According to his opinion, local communities should come together and act as a team and then government and other agencies can help them by providing tools like noisy tools for elephants, in order to minimize conflicts with

wildlife. "*If there are lots of people, elephants are discouraged to enter the village or the plantation, but if there is couple of people, elephants have the advantage*", he notes.

The WCS representative, Mr. L.S, talks about the collaboration between stakeholders saying that the collaboration between the DWNP and WCS is strong but no with other conservation agencies like NGOs. Additionally, the relationship with local communities in the area that MNS works is good, noting that it is a slow process of creating a trusty relationship and it takes time, "*but there is still room for improvement*". The first step of a project, according to Mr. L.S, is a meeting with villagers in order to demonstrate the main problems, then, in the next meeting, MNS shows the mitigation scheme following by a sign contract.

In the question about the future of wildlife in Malaysia, Mr. L.S mentions that people need to put more effort in terms of money and time for wildlife conservation, only then, tigers and animals which are threaten by extinction will come back. Also, he notes that when there is alternative for mitigation, people are willing to conserve the animals. Particularly, villagers do not want to involve in conflict with the wildlife within the society, because the whole village will have bad reputation. Ending the interview, Mr. L.S says, "*We need long-term project in an area in order to monitor and conserve wildlife*".

- Loss of natural habitat, agriculture expansion, development pressure and deterioration of forest quality are the main threats for wildlife in Malaysia, according to the representative of the Malaysian Nature Society (MNS), Mr. B.P. Also, he says, that the creation of small forest pockets, due to infrastructure development, give easy access to poachers for illegal hunting which is threaten the Malay tiger most.

As far as the existing technique, Mr. B.P mentions the trenches as a mitigation method because elephants are not able to pass them. Despite the effort of conservation agencies to conserve wildlife and minimize human-wildlife conflict, there are some people who have opposite attitude, saying that "*there are people who do not want to avoid the conflict but they create them instead, so wildlife can disappear from their area in order to avoid potential problems later on*". Moreover, he expresses his disappointment about the current land-use planning which is not biodiversity friendly. However, the representative of MNS is very positive about the natural corridors,

especially for big mammals. "*Elephants are like ants, if we block their path, they will go around it*", he says.

Regarding the responsibility of human-wildlife conflict mitigation and as Mr. B.P mentioned before, government is the responsible one for the land-use planning. Nevertheless, all stakeholders share responsibility. For small farmers, "*a conflict with wildlife is life or death*", he says, because they can lose a significant amount of income if elephants destroy their crops or a tiger kills some cattle, so farmers kill wild animals to protect themselves. Conservation agencies are here to teach farmers or livestock owners how to manage their property in order to minimize potential conflict and conserve wildlife. On the other hand, in his point of view the collaboration between local NGOs and the DWNP is very formal, in a way that the department does not allow NGOs to take initiatives because government wants to have the control. Talking about the responsibility, he states that everybody is responsible for wildlife and everybody should participate.

In order to improve people's participation in wildlife conservation so as to human-wildlife conflicts mitigation more awareness programs should be formed around the country. Conservation agencies should focus more on moral values in order people to change the way of thinking, saying "*as long as power and money are the priority value for people, our mission as conservationists is difficult*."

5.2 Questionnaire survey

The online questionnaire was sent by email to 98 people who are related with wildlife conservation and environmental conservation in general, in Malaysia. The sample was selected in a period of time by conducting staff from different agencies and giving me contacts that, they believed, were able to answer these questions. Sixty five responses out of the total sample were received with the end of the survey which is the 66, 3 per cent. From this percentage who has responded almost the same percent has been involved in human-wildlife conflicts and has an average of 9 years of experience, while the rest 35 % does not have any involvement in conflict with wildlife. The respondents of the survey gave their opinion on the effectiveness of the existing techniques for both elephants and tigers that are described below.

Taking examples from other countries and the methods that were used for conflict mitigation, different methods have been tested in Peninsula Malaysia too, with variety of success. Some methods have been proved effective enough to prevent crop-

raiding from elephants and some other practices not sufficient in a long term to avoid tigers. However, others might be effective in combination with others.

5.3 Existing Human-elephant conflict (HEC) mitigation measures

Crop guarding

Farmers in order to avoid crop-raiding by elephants attempt to chase elephants away from their farms working individually or collectively. The presence of the people may discourage elephants of coming from raiding crops, so crop raiding team is an important part of any traditional deterrence method. Different actions accompany the effectiveness of crop guarding. According to Fernando, observation from the trees provides an advantage against elephants as it offers a degree of safety and immediately response of the team for minimizing elephants damage (Fernando et al., 2008). However, crop guarding has decreased the last years as many people move to cities seeking employment (Lahm, 1996). Moreover, elephants are intelligent animals and when they realize that there is no real danger, they soon overcome the fear. The online survey reveals that half of the respondents believe the crop guarding team constitutes a short term solution and only 17 % believe that it is effective in a long term (see Table 4). Many scholars argue that elephants become quickly habituated to people presence as they do not feel threatened (Barnes, 1999; Hoare, 1999a; Nyhus et al., 2000; O'Connell-Rodwell et al., 2000; Osborn & Rasmussen, 1995; Sutton, 1998).

Noise

Any kind of noise is one of the most common strategies to scare elephants as it is a way of making human's presence to be detected. Noise as a disturbance method is used in both Africa and Asia to frighten off elephants such as bamboo explosions and whip-cracking (Kamiss&Turkalo, 1999; Hart & O'Connell, 1998; Hoare, 1995; Nyhus et al., 2000). However, a study in Mozambique by De Boer and Ntumi has shown that noise made by drumming is not so effective as a deterrence method, only half of 79 farmers confirmed that noise is an effective deterrence method (De Boer and Ntumi, 2001). Similar to De Boer's study, the online survey in Malaysia shows that 36 out of 65 participants agree that noise is an effective deterrence method in a short term (see Table 4). Fernando states that noisy activities indicate to elephants the presence of aggressive people (Fernando et al., 2008).

Fire

Using of fire is a universal ancient method against elephant and other wild animals as most wild animals avoid fires. Fires at the field entry points or at field boundaries constitute a short term disturbance method. In some areas in Africa capsicum seeds and sheep dungs are added in the fire as farmers believe that elephants dislike the smell of burnt dungs and chilly smoke bothers them (Hillman-Smith et al., 1995;Hoare, 2001a; Osborn & Rasmussen, 1995). This kind of activity loses its effectiveness after a short period as elephants become easily habituated; Fernando argues that male elephants appear to habituate more readily than females in a herd (Fernando et al., 2008). That is the reason why fire as a method is not effective with 26 % of responses to support this statement and the 49% to argue that it is effective only in a short period (see Table 4) until elephants realize they are not in danger. On the other hand, fires are dangerous deterrent method as they easily can go out of control due to weather conditions with negative impacts to the environment generally.

Alarm

Alarms along the periphery of crop fields work by alerting farmers for the presence of elephants, who then can apply additional disturbance practices to scare the elephants. Although elephants learn that there is no serious threat and they habituate quickly, alarms can help farms to act immediately before elephants enter the fields. Alarms do not constitute a disturbance method but they serve as a warning system to crop guards for immediate response. O'Connell-Rodwell (2000) experimented the effectiveness of alarms in Namibia but there was no impact on the overall number of HEC reported in a year (O'Connell-Rodwell et al., 2000). Almost half of the respondents (46%) consider the alarm method not effective in a long run and one out of three believes that there is possible capability of conflict mitigation (see Table 4).

Flashlights

Power flashlights in combination with fire and noise are used in the island of Sumatra by some villagers to chase elephants (Nyhus et al., 2000). Moreover, thunder-flashes and flares have been used in Zimbabwe with initial success (Hoare, 2001a). According to the results of the online survey, there are 24 responses in favor of the short term of flashlight effectiveness and 20 respondents who argue that is not effective

at all (see Table 4). The rest of them consider the flashlight method a potential solution while only three state the long term effectiveness of this practice.

Killing problematic elephants

Although killing of elephants is not an acceptable method for both, elephant conservation and the socio-cultural climate of Asia, culling of problematic elephants is a quick-fix solution and a cheap method that provides temporary relief (Nelson A. et al., 2003). Communities believe that killing of elephants is the last solution and extreme method for conflict mitigation. Shooting of elephants is normally carried out by trained wildlife authorized personnel and elephants that get killed are mostly males (Fernando et al., 2008). A research in northern Cameroon by Tchamba, (1995), has shown that control shooting of elephants did not reduce the crop damages, despite satisfying local communities (Tchamba, 1995). However, many traditional villagers hire a hunter to kill crop raiding elephants as an act of retribution. Most of the participants in the survey with 62%, meaning 40 responses out of 65, reveal that killing of problematic elephants is not effective method and only 14 people think that it is effective only in a short period of time (see Table 4).

Translocation

Theoretically, translocation constitutes the best solution as it removes problem elephant to an area where contact with people and their crops will be reduced. Taman Negara National Park holds the largest population with at least 290-350 elephants in Malaysia because it is the biggest national park and it has been the main release area for translocated conflict elephants since 1983 (Salman Saaban et al., 2011). Translocation of group elephants has been practiced in Africa, while in Asia is limited to individual elephant, usually adult males. For instance, the last suspected male of Negeri Sembilan, state of Malaysia, captured and mislocated to Taman Negara National Park in February 2011 (Ibrid, 2011). However, there is risk of exporting the problem to another area, as translocation offers, in many cases, a temporary relief for farmers as elephants have been noticed to return back in their site of capture. In India studies have shown that translocation is not so beneficial for people or elephants and it is useful dealing with problem elephants only (Fernardo, 2008). However, the identification of the problem elephant is not easy due to the time lapse between the incident and capture. Also, the cost of translocation an elephant is high as it requires number of activities and

heavy machinery as well as time. The average time for a single capture translocation is about one week (Ibrid. 2008). Fisher and Lindenmayer, 2000, state that translocation aimed to solve human elephant conflict failed. On the other hand, its major benefit is that is not fatal to elephants. Although translocation is the best current method to mitigate HEC, most of the respondents support that it is effective only in a short term (see Table 4), because the problem will move soon to the release area or the elephant will be replaced by another trouble maker.

Physical barriers

(trenches, stone walls, moats, buffer zones)

The preventive function of physical barriers is often seen as enduring solution in HEC situations. However, the results have often fallen below expectations because of the expense and effort required for maintenance (Suresh, 1992). Natural barriers such as rivers, coasts or mountain ranges occur along forest reserve or national park boundaries while man-made barriers are built by farmers in order to prevent crop raiding. The type of these artificial barriers depends on local availability materials. Trenches and moats have been used with some success in Asia against elephants (India: Fernando, 2008; Indonesia: Alastair Nelson, 2003) but the main problem of trenches is the erosion due to rainfalls, enabling elephants to cross it. Stone walls are not sufficient preventive method as elephants are able to break them. In Lakipia District, in Kenya, elephants breached a stone wall 101 times in 3 months (Thouless&Sakwa, 1995). Additionally, clearing boundaries are used by farmers to create buffer zones between crop land and forest edge but do not have great success on crop- raiding by elephants. The most effective purpose of buffer zone is for guards to monitor the land and chase elephants away before they enter. Planting crops that are not consumed by elephants seem to be a more effective method for decreasing crop raiding but only in a short term as elephants quickly become habituated by simply traversing en route to the preferred food (Bell, 1984). Natural fence by different types of physical barriers is the method in which participants of the survey did not give clear answer. Their response divided, almost equally, between short term, long term and the option of maybe with 25%, 28% and 32% respectively. While, the rest of them believe that natural fences are not effective to prevent elephants of getting into plantations (see Table 4 below).

Electric fences

Electrified fences are perceived to be the best preventive solution in a long term for HEC. Is the most common method employed by individual farmers and private companies to protect their land and by governments and conservation agencies to restrict elephants to particular areas. The purpose of electric fence is to transfer an electric shock to elephant which will discourage elephants to challenge the wires. In Asia, electric fences have been more successful than in Africa because only some male Asian elephants have tusks and can challenge the fence. Despite numerous difficulties (expense and maintenance) electric fences successfully are used to separate wildlife from human settlements and agricultural land (Kenya Wildlife Service, 1996). Although installation and maintenance of electrified fence require a big investment, it has demonstrated that electric fence is a cost- effective investment as it reduces elephant attacks, which in turn result in crop increase and an increased income for farmers. Concerning the online survey, data reveal that electric fence is the most effective method in a long term with half of the participants to choose the long term effectiveness of this mitigation practice, while 25% is in favor of the short term effectiveness (see Table 4).

Repellents

The repellent method is the use of not palatable crops or aerosols in order to alter animal behavior but is still in experimental stage. Unpatable crops in buffer zone can be used as a barrier for elephants (physical barrier method). However, wild Asian elephants in Sri Lanka have begun to feed on plants like chilies, that elephants dislike (Fernando et al. 2008). Moreover, Osbon and Rasmussen tested the capsicum spray on wild African elephants in Zimbabwe with some success as most of the elephants reacted to the atomized cloud (Osbon and Rasmussen, 1995). In addition, another repellent method, which has described above, is the burning of capsicum seeds and sheep dungs to enhance the repellent effects of the smoke. Similar with natural fence, the answers for this method divided into three categories of short term with 29%, maybe with 32% and not effective with 31% (see Table 4). While, only 3 out of 65 voted the long term effectiveness of this method.

Table 4: Effectiveness of HEC mitigation practices

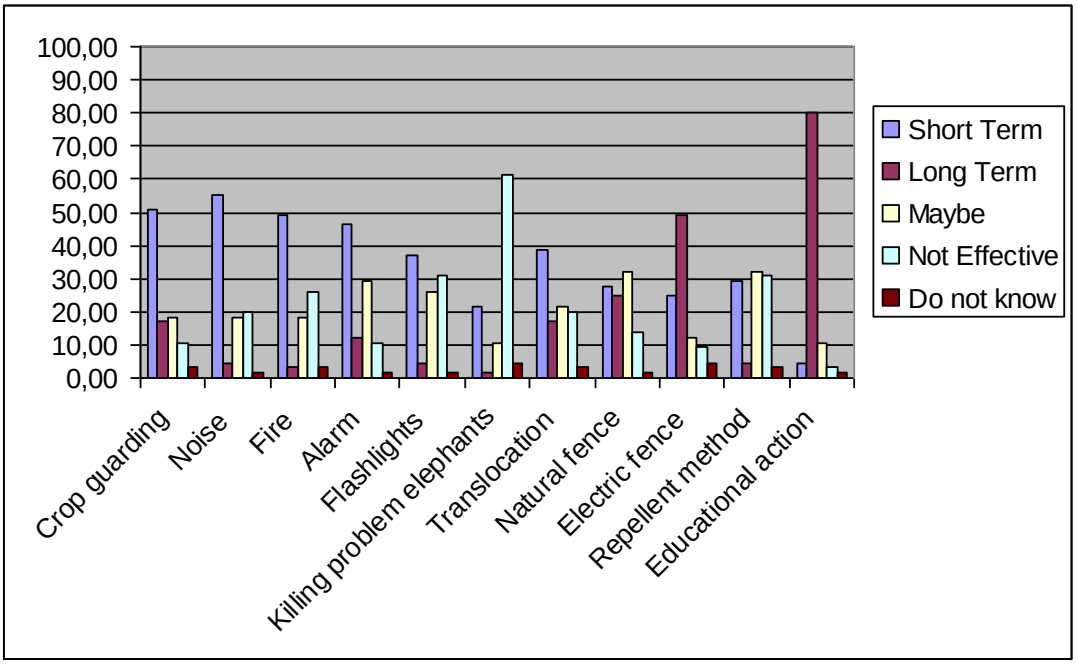
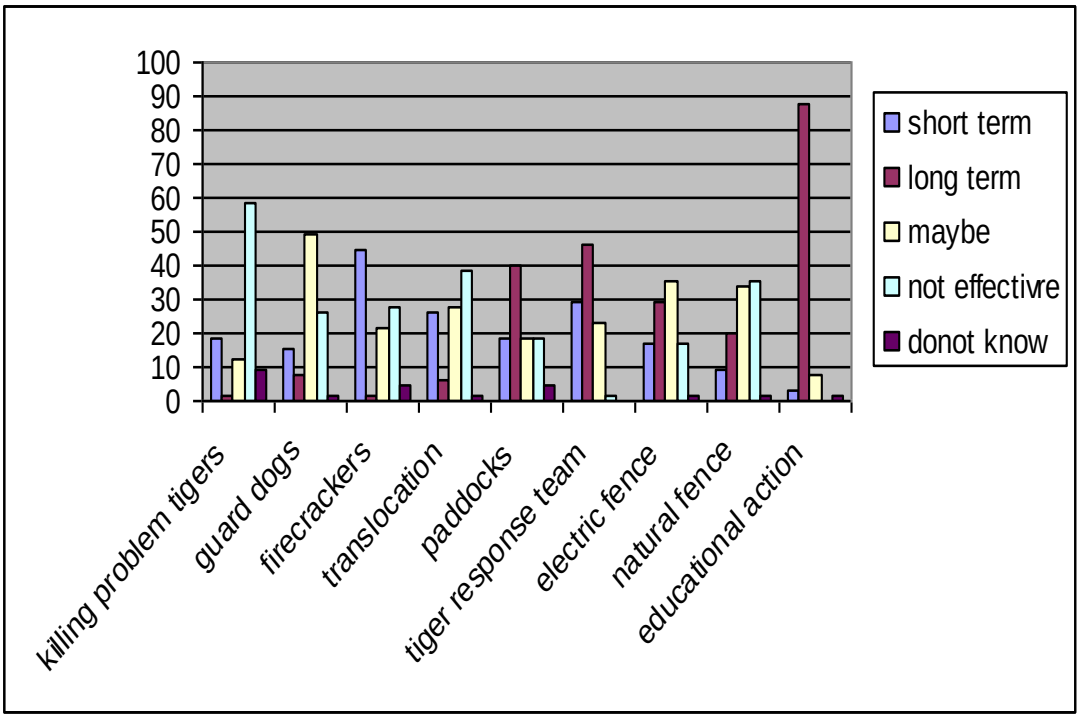


Table5: Effectiveness of HTC mitigation practices



5.4 Existing Human-tiger conflict (HTC) mitigation measures

Killing problem tigers

Similar to the elephant methods, killing of problem tigers is a quick-fix solution and a cheap method to prevent both HTC and livestock predation by tigers. Moreover, decrease of tiger population means fewer conflicts with humans. For instance, the sudden increase in HTC in Jeli, the State Chief Minister even announced that all tigers should be killed (Azran Aziz, 2002). Tigers can be killed only under specific circumstances when they threaten lives or property and, by law, any incident must be reported to DWNP (NTAP, 2008). Although, unauthorized killing of tigers is illegal, livestock depredation by tigers leads to illegal killing by farmers in defence of their livestock. A research in Bangladesh about human-carnivore conflict shows that killing of tigers considered the best option for reducing human deaths. However, to reduce tiger deaths, killing of tigers is the worst solution (Barlow et al., 2010). According to the online survey for this study, more than the half of the participants claim that the method of killing is not effective at all, and around 10 per cent thinks that is effective only in a short term (see Table 5 above).

Guard dogs

The method of guarding an area with dogs has some degree of success to protect livestock from tigers and other carnivores (Green et al., 1984; Andelt, 2001). Dogs can detect the presence of tiger or other animal faster than a man that gives time to react and move away. Hence, dogs may prevent some tiger attacks on human (Khan, 2009). According to Barlow and his study, guard dogs as a conflict mitigation method considered the most cost-effective after killing of problem tigers but better on reduction of tiger deaths (Barlow et al. 2010). However, there are no records in Peninsular Malaysia about the effectiveness of this practice and the survey reveals the uncertainty of this method with the 50% of the respondents to not be able to give clear answer. Also, the one fourth of the participants (26%) considers this method ineffective in a long run (see Table 5).

Firecrackers

Forest workers use firecrackers to scare away tigers from an area before getting in and starting work. Local people in Bangladesh who live close to the Sunderban Tiger Reserve report that firecrackers have limited results on tigers ((Barlow et al., 2010). In

Peninsular Malaysia firecrackers are not so successful method due to short time effectiveness. Less than half of the respondents supports that firecrackers as a mitigation method is a temporary solution, 28% believes is not effective at all and 14 out of 65 think that may help to minimize conflicts (Table 5).

Translocation

The method of translocation is the same method that described above for mitigation of human-elephants conflict. The problem tiger should be captured and be relocated to another area in order to avoid further problems such as livestock predation and minimize tiger deaths by farmers. According to Barlow and his study in the Bangladesh Sundarbans tiger translocation is in the same level of success as firecrackers regarding the human lives saved while, it has better success on tigers saved (Barlow et al., 2010). Moreover, the cost of translocation is very high (Ibrid). Because in Malaysia this method is not implemented as captured tigers are not considered of releasing back to the wild and they are sent to the zoos instead participants on the survey did not give clear answer with less than 40% to declare that translocation is not effective (Table 5). While, the 28% claim that is effective in a short run and the rest believe that translocation as mitigation method could be a possible solution (Table 5).

Paddocks

Paddock is a small enclosure that used to keep livestock into it. This practice is much known mitigation method in Malaysia in combination with better livestock management as the tiger proof paddocks prevent both tigers and other carnivores such as leopards of getting in and domestic animals like cattle of getting out. Also, studies have proven that strong enclosures can reduce livestock depredation rates through elimination of mass attack (Jackson and Wangchuk, 2004). According to the survey, most of the participants, with 40%, consider tiger-proof paddocks an effective method in a long term to mitigate conflicts and livestock predation by tigers, while, the effectiveness in a short period, the non-effectiveness and the possible solution, has the same number of supporters, 12 voters out of 65 (Table 5).

Tiger-response team

In areas of high level of HTC, tiger-response team can prevent livestock predation by chasing the tigers away and save humans by providing first aid in case of human injuries due to tiger attack. In Banglash, tiger-response team is considered the most effective method compared to other alternatives mitigation methods regarding the lives of tigers that have saved (Barlow et al., 2010). In combination with tiger collaring as an accompanied method, tiger response team is the best overall action in terms of impacts and cost effectiveness. Moreover and as the table 5 shows above, almost half of the participants believe that this method is the most effective solution for HTC mitigation in long run. Less than the one third of the respondents thinks that is effective only in a short term (Table 5).

Electric fence

According to Barlow (2010) electrified fence is the most costly mitigation method Barlow et al., 2010). Moreover, there are no official records on how electric fence can contribute on reduction of livestock predation by tigers. However, the electric fence may be able to prevent tigers of both straying in the plantations and attacking domestic animals. Twenty three respondents think that this method constitutes a potential solution and 19 out of 65 believe that is a long term method for minimizing tiger attacks.

Natural fence

Although fencing made with natural material constitutes the cheapest mitigation method among other practices, it has proved the most cost effective solution in the tiger reserve of Sundarban in Bangladesh (Barlow et al., 2010). However, there are no few people among the participants who think that this method is not effective for minimizing tiger attacks and the same number of responses believes that natural fence has the potential ability to mitigate conflicts. On the other hand, only 20% claim natural fencing as a long term method and only 10% believe to the short term effectiveness (Table 5).

5.5 Lessons learnt

Participation with WildAsia:

As I described in previous chapter, my participation with WildAsia was to promote better management practices of natural resources in order to include small-farmers in the supply chain of palm oil market and at the same time to conserve environment. In few words, the role of WildAsia was to promote sustainability.

The most important step towards this achievement is to organize independent farmers into schemes. Of course, farmers should be willing to change traditional practices and at the same time their behavior against environment and wildlife in general. According to group interview with WWF-Malaysia, it is necessary to build a trusty relationship with locals, in order to convince them that your guidance for better management practices will benefit their livelihoods, not only biodiversity.

Communication barrier was the main problem that a foreigner has to face when a study requires direct contact with locals and English is not the common language. In my case, several visits in the farms limited in farm audits and office work, standing aside of my collegue discussion with farmers due to the fact that many farmers could not speak in English.

Regarding the wildlife that appears in the farms, where me and my collegue visited during my internship in the village, a bit further from rainforest, only wild boars and monkeys are claimed by farmers for their presence. However, tigers, leopards and elephants can be seen when a farm is closer to a forest reserve resulting to economic losses either from crop raiding or livestock killing by predators. As farmers told us, several farmers whose farms are vulnerable to animal raid, deal with wild animals like pests and apply illegal methods to avoid them. Retaliation killing with poisons and snares are the most common and quick solution, something that Dr. H.K. confirms in

his statement (pers. Interview). Many small-farmers are not aware of endangered species and they see animals only as pests and threat for their crops.

So, the role of WildAsia is not only to promote sustainability but, also, to include local into wildlife conservation through partnership with other conservation agencies, like WWF-Malaysia and MNS. According to A.C researcher, when it comes to wildlife conflict mitigation, the community participation needs to be actively involved, saying "*if locals are not part of the solution, it will not be a solution. This can be done only with the engagement of the community*" (pers. Interview).

Participation with Rimba:

During my experience in the jungle of Malaysian rainforest with Rimba, I realised the important role of local knowledge in guidance. During our hike in the deep forest, we did not come in contact with any animal because, according to their opinion, animals like tigers and elephants avoid humans. Although we could hear elephant sounds we did not face even one.

Some experts talk about patrolling team who are responsible for chasing away animals like elephants. Responsibility which can not ignore local partnership if a mitigation effort should be effective. Nevertheless, technology and experts' knowledge are tools for more effective actions and results. For instance, without cameras to check the numbers of animals in the natural corridor this project would not have any substance. In addition, despite the knowledge of indigenous people on guidance, the use of GPS proved very significant for mission complete.

Finally, regarding the communication between me and the rest of the team which went into the jungle, was impossible. We were trying to talk to each other using body language and it was our fun time for both during our breaks from the hike. For a researcher or just a traveler, common language is very important in order to fulfill his goal.

6 Future directions

Loss of natural habitat, illegal hunting and agriculture expansion constitute the main threats for elephants and tigers in Peninsular Malaysia. Additionally, fragmentation of natural habitat, forest conversion for timber production and the development for infrastructures constitute some other additional reasons that lead to loss of biodiversity and threat wildlife. All these mentioned reasons constitute the main driving forces which

lead to intense human-wildlife conflicts, as animals compete with humans for scarce resources in Malaysia.

Governmental agencies and local conservation agencies working in close contact with people who are the most vulnerable due to human-wildlife conflicts can play a fundamental role towards wildlife conservation and improvement of rural livelihood. The need for sufficient mitigation method is a share responsibility among all stakeholders who are involved in human-wildlife conflicts. The Malaysian state should have a clear objective in its policy about wildlife conservation and land-use planning seems to be the best way towards this goal, as most of conservationists suggests. Moreover, maintenance or creation of natural corridors for preserving wildlife requires a strong collaboration between local communities and other stakeholders such as NGOs, governmental agencies and plantations. For instance, the role of NGOs such as WCS has proved effective of bringing common problems in the surface of the policy agenda by making rural people's voice to be heard.

Techniques such as translocation of problem elephants in combination with electric fence, natural corridors and crop guarding seems to be the most effective mitigation method, according to the online survey, in a long term. Particularly, WWF-Malaysia in the effort of wildlife conservation tries to form community-based organizations so as to be able to work as a team and supporting them with equipment in order to minimize conflicts with wildlife. For example, the establishment of voluntary Wildlife Protection Units in the LubokBongor village, following the Indonesian example, has proved effective for crop-raiding by elephants. Regarding the tigers, the most effective method is the cattle management as tiger see cattle as prey. The tiger-proof paddocks which WWF- Malaysia introduced in the district of Jeli, Kelantan and in Jerangau, Terengganu with intense human-tiger conflicts, in combination of clearance of overgrowth vegetation and better management practices decreased the conflict significantly. These mitigation practices are not guaranteed to be effective if implemented on its own without having a secondary action to accompany. For example, paddocks may not be effective if the design is too simple nor it would be effective if the cattle owner does not adhere to the timing for letting the cattle to graze. Thus, definitely, the involvement of local people is important to the sufficient conflict mitigation and as the most interviewees state, "without local participation, a project is not going to work".

Malayan tigers and Asian elephants are in danger to disappear forever from Malaysian rainforest if habitat loss, fragmentation and illegal hunting continue to take

place unconsciously. Educational actions such as awareness programs are the best way in order to achieve wildlife conservation and human-wildlife conflict minimization in a long term as all of the participants agree on that (see Table 4&5). In view of the increasingly threatened conservation status of tigers and elephants in Peninsular Malaysia, it is recommended that resources (i.e., money and manpower) be diverted from further field-testing towards the implementation of two key strategies to mitigate the proximate and ultimate causes of the conflict among humans, tigers and elephants respectively. A formation of Community-Based Organizations (CBO), focused on wildlife protection, improvement of land use planning, as well as raise awareness through local education, constitute significant factors for environmental and wildlife conservation consequently.

At last, it is worth to mention that killing of problem animals may solve the problem of conflicts as there will be no carnivores or herbivores to kill livestock or to damage crops any more, statement that many farmers may agree, but is this the solution? The answer is definitely no. Similar to Milton Friedman's observation *"what one man regards as good, another may regard as harm"* (Friedman, 1962). Nevertheless, human-wildlife conflict is a never ending story as long as people and animals share and compete for the same resources. However, mitigation techniques require on-going research and monitoring. Also, further research on the impacts of these mitigation methods on biodiversity as well as the social impacts on farmers is necessary.

7 Reference

- ✓ **Andelt, W. F.**,(2001), Effectiveness of livestock guarding animals for reducing predation on livestock. Endangered Species Update 18:182-185
- ✓ **Barlow A.C.D., Greenwood C.J., Ahmad I.U. & Smith, J.L.D.**,(2010), Use of an action-selection framework for human-wildlife conflict in the Bangladesh Sundarbans. ConserBiol 24: 1338-1347.
- ✓ **Barlow A.C.D., Greenwood C.J., Ahmad I.U. & Smith, J.L.D.**,(2010), Use of an action-selection framework for human-wildlife conflict in the Bangladesh Sundarbans. ConserBiol 24: 1338- 1347
- ✓ **Barnes R.F.W.**,(1997), A proposed solution to the Kakum elephant problem. In: Facing the Storm: Five years of research in and around Kakum National Park, Ghana. GhanaWildlifeDepartment, P O Box M239 Accra. Ghana. 18pp
- ✓ **Beale C.M, Sue van Rensberg, Bond W.J., Coughenour M., Fynn R., Gaylard A., Grant R., Harris B., Jones T., Mduma S., Owen-Smith N., Sinclair A.R.E.**, (2013), Ten lessons for the conservation of African savannah ecosystems. Biological Conservation (167):224–232
- ✓ **Bell, R.H.V.**,(1984), The man-animal interface: an assessment of crop-damage and wildlife control. In Conservation and Wildlife Management in Africa (eds R.H.V. Bell & E. McShane-Caluzi), pp. 387–416. U.S. Peace Corps Office of Training and Program Support, Washington, DC, USA.
- ✓ **Bernard, H. R.**,(2006). Research methods in anthropology. Lanham, MD:Altamira Press.
- ✓ **Breuer D.**, (1999), Community Participation in Local Health and Sustainable Development: a working document on approaches and techniques European Sustainable Development and Health Series: World Health Organization, pp: 9-10
- ✓ **Brosius JP, Tsing AL, Zerner C**., (1998), Representing Communities: Histories and Politics of Community-Based Natural Resource Management, Society and Natural Resources 11: 157-168
- ✓ **Brown, L.D. and Tandon, R.**,(1994), Institutional development for strengthening civil society, Institutional Development, Vol 1, No 1, pp3-17
- ✓ Brysk A. (1993). From above and below: social movements, the international system, and human rights in Argentina. Comp. Pol. Stud. 26(3): 259-85

- ✓ **Butler, J.**,(2000), The economic costs of wildlife predation on livestock in Gokwe communal land, Zimbabwe. *African Journal of Ecology*, 38(1):23-30
- ✓ **Campbell B., and Shackleton S.**,(2001), The Organizational Structures for Community-Based Natural Resources Management in Southern Africa, Florida, African Studies
- ✓ **Colchester, M.**, (1994), Sustaining the forests: the community-based approach in South and South-East Asia. Development and Change, 25: 69–100.
- ✓ **Cozza, K., Fico, R., Battistini, L. and Rogers, E.**,(1996), The damage-conservation interface illustrated by predation on domestic livestock in central Italy. *Biological Conservation*, 78(3):329-337
- ✓ **Daim MS.**,(2002), The care and management of domesticated elephants in Malaysia. In: Baker I, Kashio M (eds) Giants on our hands: proceedings of the international workshop on the domesticated Asian Elephant. FAO Regional Office for Asia and the Pacific (RAPA), Bangkok, 5–10 Feb 2001
- ✓ **De Boer, W.F. and Ntumi, C.P.**,(2001), Elephant crop damage and electric fence construction in the Maputo Elephant Reserve, Mozambique, Pachyderm 30: 57–64
- ✓ **Desai, A. A.**, (2002), Design of Human-Elephant Conflict Mitigation Strategy for the Proposed TessoNilo Protected Area, and Possible Expansion of Such Strategy into the TessoNilo Conservation Landscape, and the Province of Riau. WWF-Indonesia, Jakarta.
- ✓ **DWNP (Department of Wildlife and National Parks)**, (2008), National tiger action plan for Malaysia. DWNP, Kuala Lumpur
- ✓ **Eko H. Yuwono, Susanto, P., Saleh, C., Andayani, N., Prasetyo, D. &Atmoko, S.S.U.**, (2007), Guidelines for the better management practices on avoidance, mitigation and management of human orangutan conflict in and around palm oil plantations. WWF Indonesia
- ✓ **Elisa Distefano**,(2005), Human-Wildlife Conflict worldwide: collection of case studies, analysis of management strategies and good practices. Food and agricultural Organization of the United Nations, Rome
- ✓ **Enginöz, E. B.**, (2004), A study in post-disaster home environments: a comparative case study between people living in villages and in the town center of Dinar, Turkey, Conference Proceedings, Second International Conference on Post-disaster reconstruction: Planning for Reconstruction, 22-23 April, Coventry University**.**

- ✓ **Fairhead, J and Leach, M.**,(2003), Science, Society and Power: Environmental Knowledge and Policy in West Africa and the Caribbean, Cambridge: Cambridge University Press
- ✓ **Fernando P., M. A. Kumar, A. C. Williams, Wikramanayake E. , Tariq Aziz, S. M. Singh**,(2008), Human-Elephant Conflict Mitigation Measures Practiced in South Asia. WWF
- ✓ **Finger M.**, (1994a), NGOs and transformation: beyond social movement theory. See Princen& Finger 1994, pp. 48-66
- ✓ **Fischer, J., and D. B. Lindenmayer**, (2000), An assessment of the published results of animal relocations, Biological Conservation, 96, 1- 11.
- ✓ **Fisher J.**, (1993), The Road from Rio: Sustainable Development and the Nongovernmental Movement in the Third World, West-port, CT: Praeger
- ✓ **Fisher W.F.**, (1997), DOING GOOD? The Politics and Antipolitics of NGO Practices, Annual Reviews Inc (26): 439-464
- ✓ **Foucault M.**, (1980), Power/Knowledge: Selected Interviews and Other Writings 1972-1977, Brighton, Harvester Press
- ✓ **Friedman M.**,(1962), Capitalism and Freedom, Chicago: Univ. Chicago Press
- ✓ **Gauld, R.**,(2000), Maintaining centralized control in community-based forestry: policy construction in the Philippines, Development and Change 31:229-54
- ✓ **Green, J. S., R. A. Woodruff, and T. T. Tueller**, (1984), Livestock guarding dogs for predator control: Costs, benefits, and practicality. Wildlife Society Bulletin 12:44-50
- ✓ **Hamilton, E.**, (1992), Adult Education for community development, New York: Greenwood Press, pp:25-69
- ✓ **Hart L.A. and O'Connell C.E.**,(1998), Human Conflict with African and Asian Elephants and Associated Conservation Dilemmas, Center for Animals in Society in the School of Veterinary Medicine and Ecology Graduate Group, the University of California.
- ✓ **Hillman-Smith, A.K.K., de Merode, E., Nicholas, A., Buls, B. and Ndey, A.**, (1995), Factors affecting elephant distribution at Garamba National Park and surrounding reserves, Zaire, with a focus on human-elephant conflict. Pachyderm 19: 39-48.
- ✓ **Hoare, R.E.**, (1995), Options for the control of elephants in conflict with people. Pachyderm 19: 54-63.

- ✓ **Hoare, R.E.**,(1999a), Determinants of human-elephant conflict in a land-use mosaic. Journal of Applied Ecology 36: 689-700
- ✓ **Hoare, R.E.**, (2001a), Management implications of new research on problem elephants. Pachyderm 30:44–48
- ✓ **Jackson, R. M., and R. Wangchuk**,(2004), A Community-based approach to mitigating livestock predation by snow leopards. Human Dimensions of Wildlife 9:307-315
- ✓ **Jeffrey A. McNeely and Sara J. Scherr**, (2002), Ecoagriculture: Strategies to Feed the World and Save Wild Biodiversity. Washington, Island Press, pp 54
- ✓ **Kamarotos AS.**, (1990), A view into NGO networks in human rights activities: NGO action with special reference to the UN Commission on Human Rights and its sub-commission. Presented at Int. Polit. Sci. Assoc., April 10-14, Washington, DC
- ✓ **Kamath, M.G.**, (1961), Extension Education in Community Development, India: Glasgow Printing Co, pp: 3-4
- ✓ **Kamiss, A. Turkalo, A.K.**,(1999), Elephant Crop Raiding in the Dzanga-Sangha Reserve, Central African Republic. Associate Conservation Scientist, Wildlife Conservation Society, Bangui, Central African Republic**.**
- ✓ **Kanchanasakha, B., S. Simcharaen, and U T. Than**,(1998), Carnivores of mainland South East Asia, WWF-Thailand Project Office, Bangkok, Thailand
- ✓ **Kawanishi, K., Y. SitiHawa, A. H. A. Kadir& T. Rahmat**,(2003), Distribution and potential population size of the tiger in Peninsular Malaysia. Journal of Wildlife and Parks (Malaysia), 21: 29–50.
- ✓ **Khan MM.**,(2009), Can domestic dogs save humans from tigers, Pantheratigris?, Oryx 43: 44–47
- ✓ **Khan, M. K.**,(1987), Tigers in Malaysia: prospects for the future. In: Tilson, R. L. & U. S. Seals, (eds), Tigers of the World: the biology, biopolitics, management and conservation of an endangered species. Noyes Pub., Park Ridge, New Jersey, U.S.A. Pp. 75-84.
- ✓ **Koh, L.P. &Wilcove, D.S.**, (2009): Oil palm: disinformation enables deforestation. Trends in Ecology &Evolution 24: 67-68
- ✓ **Korten, D.C.**, (1990), Getting to the 21st Century: Voluntary Action and the Global Agenda. West Hartford, CT: Kumarian
- ✓ **Lahm S. A.**,(1996), A nationwide survey of crop-raiding by elephants and other species in Gabon. Pachyderm 21: 69 – 77

- ✓ **Leatherman J, Pagnucco R, Smith J.**,(1994), International institutions and transnational social movement organizations: challenging the state in a three-level game of global transformation. Work. Pap. Ser. Ser. Joan B. Kroc Inst. Int. Peace Stud., Univ. Notre Dame
- ✓ **Linkie, M., Chapron, G., Martyr, D.J., Holden, J. & Leader-Williams, N.**, (2006), Assessing the viability of tiger subpopulations in a fragmented landscape, Journal of Applied Ecology, 43,pp: 576–586
- ✓ **Locke, A.**,(1954), The tigers of Terengganu. Museum Press Ltd., London, UK
- ✓ **Lynam, A.J., Laidlaw, R., Wan Shaharuddin, W.N., Elagupillay, S., Bennett, E.L.**,(2007), Assessing the conservation status of the tiger Pantheratigris at priority sites in Peninsular Malaysia. Oryx 41, 454–462
- ✓ **Lynam, A.J., Laidlaw, R., Wan Shaharuddin, W.N., Elagupillay, S., Bennett, E.L.**, (2007), Assessing the conservation status of the tiger Pantheratigris at priority sites in Peninsular Malaysia. Oryx 41, 454–462.
- ✓ **Madhusudan M. D.**,(2003),Living Amidst Large Wildlife: Livestock and Crop Depredation by Large Mammals in the Interior Villages of Bhadra Tiger Reserve, South India, Environmental Management, 31(4):466-475
- ✓ **Mats Alvesson and KajSkoldberg**,(2000), Reflexive Methodology: New Vistas for Qualitative Research, London, SAGE
- ✓ **Md. MahmudulAlam, ChamhuriSiwar, Md. Wahid Murad, Rafiqul Islam Molla and MohdEkhwan bin Toriman**, (2010), Socioeconomic profile of farmer in Malaysia: Study on integrated agricultural development area in north-west Selangor, Agricultural Economics and Rural Development, New Series (2): pp.249-65
- ✓ **Mishra, C.**,(1997), Livestock depredation by large carnivores in the Indian trans-Himalaya: conflict perceptions and conservation prospects. Environmental Conservation, 24(4)338-343
- ✓ **Mohd. Noor, M.**,(1997), Inter-industry linkages and the Unbalanced Growth Approach to Economic Development: With Special Reference to the Malaysian Economy, Unpublished Ph.D. Thesis, U. of Hull, UK, Jan, 1997
- ✓ **MPOB**, (2001), The Performance of the Malaysian Palm Oil Industry in 2000 (mimeo). Rudner, M (1975), 'The Malaysian Quandary: Rural Development Policy under the First and Second Five Year Plans" [In] Readings on Malaysian Economic Development, ed: David Lim, Oxford University Press, Kuala Lumpur

- ✓ **Murray Li T.**,(2007), Practices of assemblage and community forest management, Economy and Society, London, Routledge
- ✓ **Murray Li, T.**,(2007), Practices of assemblage and community forest management, Economy and society, 36(2): 263-293
- ✓ **Musiani, M., Mamo, C., Boitani, L., Callaghan, C., Gates, C., Mattei, L., Visalberghi, E., Breck, S. and Volpi, G.**,(2003), Wolf Depredation Trends and the Use of Fladry Barriers to Protect Livestock in Western North America, Conservation Biology 17(6):1538-1547
- ✓ **Naughton- Treves**,(1997), Farming the forest edge: Vulnerable places and people around Kibale National Park, Uganda. Geographical Review, 87(1):27-46
- ✓ **Naughton- Treves, L., Mena, L., Treves, A., Alvarez, N.andRadeloff, C.**,(2003), Wildlife survival beyond park boundaries: The impact of slash-and-burn agriculture and hunting on mammals in Tambopata, Peru. Conservation Biology', 17(4):1106-1117
- ✓ **Nelson, A., Bidwell, P. and Sillero-Zubiri, C.**, (2003), A review of human-elephant conflict management strategies. People and Wildlife Initiative, Wildlife Conservation Research Unit, Oxford University.
- ✓ **Nyhus P., Tilson R.**, (2004a), Agroforestry, elephants, and tigers: balancing conser 23-30vation theory and practice in human-dominated landscapes of Southeast Asia. Agriculture, Ecosystems & Environment, xxx.
- ✓ **Nyhus, P.J., Tilson. R. &Sumianto**, (2000), Cropraiding elephants and conservation implications at Way Kambas National Park, Sumatra, Indonesia. Oryx 34: 262-274
- ✓ **O'Connell-Rodwell, C.E., Rodwell, T., Rice, M. and Hart, L.A.**,(2000), Living with the modern conservation paradigm: can agriculturalcommunities co-exist with elephants? A five-year case study in East Caprivi, Namibia. Biological Conservation 93: 381-391
- ✓ **O'Connell-Rodwell C.E., Rodwell T., Rice M. and Hart L.A.**, (2000), Living with the modern conservation paradigm: can agricultural communities co-exist with elephants? A fiveyear case study in East Caprivi, Namibia. Biological Conservation, 93(3):381-391
- ✓ **Ogada, M., Woodroffe, R., Oguge,N. and Frank, G**., (2003),Limiting Depredation by African Carnivores: the Role of Livestock Husbandry. Conservation biology 17(6):1521-1530

- ✓ **Oliver-Smith, A.**,(1992), Problems in post-disaster resettlement: cross cultural perspectives, Disaster and the Small Dwelling, Chapter 8, James and James Science Publishers Ltd, London NW1 8PR, England, p. 58-67
- ✓ **Ong J.**,(2011), Wild Asia Heroes: The LubokBongor Conservation, Cultural, Social and Welfare Society. Wild Asia,
- ✓ **Osborn, F. V. and Parker, G. E.**,(2003), Towards an integrated approach for reducing the conflict between 18 elephants and people: a review of current research, Oryx 37: 80–84
- ✓ **Osborn, F.V. and Rasmussen, L.E.L.**, (1995), Evidence for the effectiveness of an oleo-capsicum aerosol as a repellent against elephants in Zimbabwe. Pachyderm 20: 55-64
- ✓ **Oviedo G. and Brown J.**, (1999), Building Alliances with Indigenous Peoples to Establish and Manage Protected Areas in Stolton S. and Dudley N. (eds), Partnerships for Protection: New Strategies for Planning and Management of Protected Areas. IUCN and WWF-International, Gland, Switzerland
- ✓ **Patterson B. D., Kasiki S. M., Selempo E. and Kays R.W.**, (2004), Livestock predation by lions (Pantheraleo) and other carnivores on ranches neighboring Tsavo National ParkS, Kenya. Biological Conservation, 119(4): 507-516
- ✓ **Peterson MJ.**, (1992), Transnational activity, international society and world politics. Millennium 21(3):371-88
- ✓ **Rao, M., Rabinowitz, A. and Khaing, s. T.**, (2002b), Status Review of the protected Area system in Myanmar, with Recommendations for conservation. Conservation Biology 16(2): 360-368.
- ✓ **Ruben, R., H. Lu, and E. Kuiper**, (2006), Marketing chains, transaction costs and resource intensification: efficiency and trust within tomato supply chains in Nanjing City, World Development (forthcoming 2006).
- ✓ **Salman Saaban, Nasharuddin Bin Othman, MohdNawayai Bin Yasak , BurhanuddinMohd Nor , Ahmad Zafir and Ahimsa Campos-Arceiz,** (2011), Current Status of Asian Elephants in Peninsular Malaysia, Gajah 35: 67-75
- ✓ **Sekhar, N.U.**,(1998), Crop and livestock depredation caused by wild animals in protected areas: the case of Sariska Tiger Reserve, Rajasthan, India. Environmental Conservation, 25(2):160-171
- ✓ **Sharma, D. S. K., Siong, B. L. M., MohdAzlan, J. and Ahmad Zafir A. W.**,(2005), Living in harmony: resolving conflicts between people and tigers and FELDA

Jerangau Barat, Peninsular Malaysia. Unpublished report. WWF-Malaysia. Petaling Jaya, Malaysia.

- ✓ **Sharma, S., Y. Jhala& V. B. Sawarkar**, (2005), Identification of individual tigers (Pantheratigris) from their pugmarks. Journal of Zoology, 267: 9-18
- ✓ **Shaw M.**, (1992), Global society and global responsibility: the theoretical, historical political limits of "international society." Millennium 21(3):421-34
- ✓ **Siex, K.S. and Strushsaker, T.T.**,(1999), Colobus monkeys and coconuts: a study of perceived human–wildlife conflicts. *Journal of Applied Ecology*, 36(6):1009-1020
- ✓ **Suresh**, (1992), Economics of elephant proof trenches and electric fences in Bannerughatta National Park. Dissertation. Submitted to the Wildlife Institute of India. Dehradun
- ✓ **Sutton, W.R.**, (1998), The costs of living with elephants in Namibia. Cooperative Regional Wildlife Management in Southern Africa.
- ✓ **Tchamba, M.N.**,(1995), The Problem Elephants of Kaélé: a Challenge for Elephant Conservation in Northern Cameroon, Pachyderm, 19: 26-32
- ✓ **Thouless, C. and Sakwa, J.**, (1995), Shocking elephants: fences and crop raiders in Laikipia District, Kenya. Biological Conservation, 72, 99–107
- ✓ **Topani, R.**,(1990), Status and distribution of tiger in Peninsular Malaysia. Journal of Wildlife and Parks (Malaysia) 9: 71 – 102
- ✓ **Treves A., Wallace R.B., White S.**,(2009), Participatory Planning of Interventions to Mitigate Human-Wildlife Conflicts, Conservation Biology
- ✓ **Tsing, A.L., Brosius, J.P. and Zerner, C.**,(1999), Assessing community-based natural resource management. Ambio 28(2): 197-8.
- ✓ **Vidyadaran, M.K. and Sharma R.S.K.**,(2000), Cattle management in relation to tiger predation at FELDA Jerangau Barat oil palm estate, Terengganu: Current practices and recommendations for improvement, Unpublished report for World Wide Fund for Nature Malaysia, Petaling Jaya.
- ✓ ***Vijayan S. and Pati B. P.***,(2002), Impact of Changing Cropping Patterns on Man-Animal Conflicts Around Gir Protected Area with Specific Reference to Talala Sub-District, Gujarat, India Population and Environment, 23(6):541-559
- ✓ **Weladji, Robert B. – Tchmba, Martin N**, (2003), Conflict between people and protected areas within the Bénoué Wildlife Conservation Area, North Cameroon. Oryx, 37(1):72-79

- ✓ **Wells, M.P. & Brandon, K.**,(1992) People and Parks: Linking Protected Area Management with Local Communities. Washington, DC, USA: World Bank/WWF/USAID: xii 1 99 pp
- ✓ **World Bank**, (1991), World Development Report 1991: The Challenge of Development. Washington, DC: World Bank/Oxford Univ. Press
- ✓ **World Bank**, (1996), The World Bank Participation Sourcebook, World Bank, Washington.
- ✓ **WPC Recommendation 20-** Preventing and Mitigating Human-Wildlife Conflicts IUCN- World Park Congress 2003
- ✓ **WWF-Malaysia**, (2006), Living together in harmony: Resolving conflicts between people and tigers at FELDA Jerangau Barat, Peninsular Malaysia, Report by World Wide Fund for Nature Malaysia, Petaling Jaya
- ✓ **Yom-Tov, Y., Ashkenazi, S. and VINER, O.**,(1995), Cattle predation by the golden jackal Canis aureus in the Golan Heights, Israel. Biological Conservation, 73(1)19-22
- ✓ **Yuwono EH, Susanto P, Saleh C, Andayani N, Prasetyo D, and Atmoko SSU**, (2007), Guidelines for the Better Management Practices on Avoidance, Mitigation and Management of Human–Orangutan Conflict in and around Oil Palm Plantations, Jakarta, Indonesia: WWF

APPENDIX I

➢ Malayan Tiger

The Malayan tiger (*Pantheratigrisjachsoni*) is one of only five remaining tiger subspecies, reduced from eight by recent extinction. The Malayan Tiger is one of the smallest tigers of all subspecies, weighing around 120 kilograms as an adult and two and half meters long. They live in the rainforest of southern and central parts of Peninsular Malaysia. They prefer to stay conceals in a dense forest, surreptitiously stalking its prey and hiding back into safety. They might be found on land that was previously used for agriculture purposes and has become overgrown with vegetation providing cover and safety.

Malayan tiger camera trapped in the selectively logged forest of the Kenyir Wildlife Corridor ©Rimba

As with all other tiger subspecies, the Malayan tiger is a carnivore and an expert hunter. Its diet relies on prey such as wild boar, deer and sun bear. They will not lose the opportunity to attack baby elephants if they are too weak, sick or vulnerable in general. Thus, the population density of Malayan Tigers depends on the availability of prey. In 1950, the Malayan tiger population was estimated to approximately 3,000 wild tigers (Locke, 1954) and in 1987, this figure was revised to less than 1,000 individuals (Khan M.K., 1987). Today, Peninsular Malaysia has an estimated tiger population of only up to several hundred based on surveys and human tiger conflicts, on the assumption of tiger territory and on camera trapping *(Topani, 1990; Kawanishi et al, 2003; Lynam et al., 2007)*. According to the government report (DWNP, 2008) the Malayan tiger population is around 500 individuals in the wild.

Loss of natural habitats, fragmentation and poaching constitute the main threats for tigers. For many years tigers have been hunted as a status symbol for decorative items such as walls and floor covering as well as for Asian medicine.

By the early 1990s, trade in tiger bone for traditional medicines threatened to drive tigers to extinction. Today, international trade of tiger's derivatives is totally illegal but illegal hunting is still taking place. Agriculture expansion and road networks are driving tigers to smaller, isolated areas which are more accessible to poachers than large tracks of natural forests. Tigers need vast territories (*Kawanishi et al, 2003).* Thus, reduced habitats mean that fewer tigers can survive in the wild. Their habitats are increasingly coming into conflict with humans as they attack livestock and sometimes people. The conversion of forest for other land use and the introduction of big scale livestock bring tigers into conflict with humans leading to the mortality of tigers by farmers or farmer managers who they kill them out of fear or for retaliation (Sharma et al, 2005).

- **Asian Elephant**

The Asian elephant (*Elephas Maximus*) is the only remaining living species of the genus Elephas which is distributed in Southeast Asia, from India to the island of Borneo. Asian elephants are smaller than their African cousins with relatively smaller ears. They are around two to three meters tall with adult weighing around six tonnes. Recent studies estimate the size of the total population between 41,410 and 52,345 individuals (IUCN, 2013). Malaysia is home for around 1,200-1,700 Asian elephants on the peninsula Malaysia and around 1,500 Pygmy elephants in Borneo, Sabah. According to Daim (2002) these figures likely are not represent the real elephant status in Malaysia as the elephant estimate have derived mostly from "*footprint-count"* methods (Daim,2002).

Asian elephants are found in scrub forest, favoring areas with grass and low woody plants and trees. They are very sociable animals, forming groups of six to seven females that are led by the oldest female, the “matriarch”. These groups unusually join other groups to form herds. They spend the most of the time feeding on grasses, but large amount of tree barks, roots, leaves and small stems are also eaten. Elephants stray into cultivate areas when their habitat has been blocked, eating bananas and the vegetation point of young trees, such as rubber and palm trees. Crop raiding by elephants is the prevalent form of human-wildlife conflicts in Malaysia. Although many elephants mostly raid crops when they are unable to find sufficient natural resources to sustain them others become habitual raiders (Desai, 2002). In addition, elephants are always close to the source of fresh water because they need to drink at least once per day. Elephants are characterized as an umbrella species because they play crucial role to the survival of other species. They are vital to maintaining the rich biodiversity which share with other species.

Camera trapped Asian elephants crossing the underpass corridor in the Kenyir Wildlife Corridor ©Rimba

Elephants require huge amount of land for their home range and as the forest is shrinking fast, they become isolated in smaller forest islands leading to conflicts with humans. Habitat loss and fragmentation are the main threat for the survival of Asian elephants. Large development projects, such as dams, roads, industrial complexes as well as plantations block traditional routes that are used by elephants as migratory paths. The increasing human encroachment into the rainforest and the large home ranges of elephants have also brought them closer to rural human settlements and plantations with more accessible crops to satiate their large daily dietary requirements. So, elephants come frequently into close contact with human settlements where they are not welcome, resulting in intense human- elephant conflicts. Although hunting and poaching of elephants do not take place in Malaysia often, compared to the situation of the Malayan tiger, the population is still decreasing as elephant habitat disappears rapidly.

APPENDIX II

Online Survey

Effectiveness of HWC mitigation methods in Peninsular Malaysia

1. Have you ever been involved in human-wildlife conflict mitigation?

- Yes
- No

2. If yes, how many years of experience you have?

***3. In your opinion, which of the following human-tiger mitigation methods could be effective in Peninsular Malaysia.**

	Shortterm	Long term	Maybe	Noteffective
Electricfence				
Firecrackers				
Natural fence (trenches, stone walls, moats)				
Translocation				
Killingproblemtigers				
Guarddogs				
Paddocks				
Tiger-responseteam				
Educationalaction				

Other (please specify)

*4. In your opinion, which of the following human-elephant mitigation methods could be effective in Peninsular Malaysia.

	Shortterm	Longterm	Maybe	Noteffective
Cropguarding				
Noise				
Fire				
Alarm				
Flashlights				
Killingproblematicelephants				
Translocation				
Natural fence (trenches,stonewall,moats)				
Electricfence				
Repellentmethods (chilligrease)				
Educationalaction				

Other (please specify)

*5. In your opinion, how important is the participation of local communities in the mitigation of human-wildlife conflicts in Peninsular Malaysia.

Unimportant Important Donotknow