

CONFLICTING INTERACTIONS BETWEEN ELEPHANT HABITATS AND HUMAN SETTLEMENTS; A CASE OF HAMBANTHOTA

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Abstract

Conflicts between human and elephants are one of the most widespread regional issues in Sri Lanka, particularly in the dry zone. Moreover, human-elephant conflict is increasing, predominantly in areas where expansion of human settlements cultivation, water sources and other developments. Human-elephant conflicts in these regions are increasing despite the management interventions of the government authorities. The impact of human-elephant conflict may take several forms including human death, agricultural crop losses, infrastructural damages and disturbances to the daily routine of the community such as travel to work and school. Habitat fragmentation and habitat loss can be considered as the main reasons for increasing human-elephant conflicts. Habitat fragmentation can be defined as a landscape ecological process involving both habitat shrinking and the dissection of habitat. There is a strong relationship between the habitat fragmentation and the habitat loss. This research work analyses how habitat fragmentation as a process affects on habitat loss of elephants and human-elephant conflicts in Hambanthota region. Therefore, this research questions the causative factors for increasing elephant human conflicts in Hambanthota region based on the information collected through secondary sources, key informant interviews and field observations. Further this research discusses how to manage the human settlements development coherent with the biodiversity particularly elephants' habitats. The paper recommends how to adopt the concept of co-management in order to achieve the twin objectives of biodiversity conservation and safeguarding human security in the process of spatial strategy making.

Keywords: Home range, elephant, conservation, protected areas, regional landscape, and connectivity

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1. Introduction

The relationship between human society and elephants in Asia is so unique. Elephants have been cultural symbioses which have continued to exist with humans for in excess of two thousand years. For longer history, people have shared the landscape with elephants, appreciating them with a strong historical and cultural significance. As a result, at present, elephants are tourism magnets. Nevertheless, present day Human–Elephant Conflict (HEC) impacts take several forms including the loss of human lives, crop raiding, disturbance of daily routine of people, injury or death of elephants, psychological issues, infrastructural damages, social costs and several other opportunity costs. Human deaths to elephant attacks in Sri Lanka, from 2006-2017 is more than 700. Every year, about 50-70 people die in the country due to the HEC. Elephant attack is a major risk to farmers. Agricultural villages predominantly suffers frequent and intensive crop depredation due to elephant attacks. Every year, around 250 elephants are also killed in the country. Both people and elephants become victims of the HEC. However, Asian societies in general appreciate the intrinsic value attributed to the elephants within the given cultural and religious context. The magnitude of HEC is considerably high today, it may become absurdly high tomorrow. In spite of the pro-elephant movements led by environmentalists, wild life conservation measures obtained by the government for decades, the HEC remains as an unresolved socio-economic and ecological issue in the country. The HEC need to be addressed in the national physical development plan along with a supportive land-use policy and spatial strategy. Further, economic value of the coexistence of elephants shall be emphasized with its importance to tourism development. Therefore, this research questions the gaps of the current management practices and the role of the spatial planning in addressing HEC. The latter of the paper discusses the consideration of parameters in the spatial strategy making process.

1.2 Elephant habitats

Sri Lankan elephants are native to the country and play an important role as one of three subspecies of the Asian elephants. Further, Sri Lanka has been recognized with the highest elephant density in Asia. Elephants are also considered as keystone species which performs a vital role in maintaining the biodiversity of any particular ecosystem they live. Elephants affect a broad variety of ecological processes of forest ecosystems through their feeding, digging and movements. Large herbivores help to modify the habitat and the community through their feeding activity. Moreover, elephants are helped to balance the vertebrate herbivore community in terms of the number of ecological processes. Elephants break the branches of large trees in dense forests when accessing their food sources. This opens the lower strata of vegetation to better sunlight creating a space for tree generation, particularly for smaller plants to grow taller. These openings further help other wild animals to create pathways for accessing food sources. In scrubs and grasslands, elephants can reduce the density of bush cover clearing pathways for browsing and grazing animals. Moreover, some flora species completely rely on elephants for seed dispersal.

Asian Elephants are occupied in a wide range of habitats and are commonly found in forests, savana, scrublands and grasslands. Currently, elephants' habitats are largely limited to the lowlands in the dry zone covering approximately 60% of Sri Lanka. However, more than 40% of their home ranges are beyond the wild life protected zones. Elephants are giant herbivores and are consumed up to 150 kg of plant materials per day. However, more than 50% of their food sources are grasses, shrubs, climbers and herbs. Particular juvenile elephants tend to feed predominantly on grass species (Samansiri, 2007). The home range of the elephants is around 50-

150Km². Elephants tend to move freely among wildlife protected areas, forest reserves across agricultural and human settlement areas, as these falls within their home ranges. Therefore, regenerating forests provide more food resources for elephants rather than the mature forests. Accordingly, traditional Chena cultivation is more compatible with elephants and allows temporal resources partitioning between humans and the elephants. Therefore, the irrigated agriculture and other forms of permanent settlements have not compatible with the elephants' habitats.

1.3 Human elephant conflicts

Over the last decades, dry zone of Sri Lanka has undergone socio-economic development, resulting in considerable impacts on its wildlife habitats. HEC is increasing due to the conversion of elephant habitat to settlements and permanent cultivation. HEC has become increasingly significant as human settlements have expanded and encroached upon elephant habitats. Human–wildlife conflict is common where wildlife and human populations coexist and share limited resources. Conflict is generally the highest in close proximity to protected areas that act as elephant refuges. Elephants are progressively forced into closer contact with people, resulting in more frequent and severe conflict over space and resources with consequences ranging from crop raiding to reciprocal loss of life when the wild habitats are shrunk (Liu et al., 2017). Depredation in human settlements is another major area of HEC occurring in small forest pockets, encroachments into elephant habitat, and on elephant migration routes (Dharmaratne, & Magedaragamage, 2014). Therefore, the long-term future of elephants outside the protected areas in Sri Lanka is inextricably linked to the tolerance and appreciation of the society.

Habitat fragmentation and habitat loss are main reasons for increasing of HECs. Habitat fragmentation is usually defined as a landscape-scale process involving both habitat loss and the breaking apart of habitat. There is a strong relationship between the habitat fragmentation and the habitat loss. Native ecosystems are degraded mainly due to expansion of human settlements and the infrastructure development. Increased fragmentation and habitat loss across landscapes, and increasing impacts from climate change will place a significant pressure of community as well as the government.

2. Methodology

First, this study explores the current wild life management practices of Sri Lanka. The case study is focused to Hambanthota area, south of Sri Lanka. It has been analysed how land uses as well as the populations are changed during the decades. Further, it has been demonstrated how the wild life habitat are fragmented during the passage of time. Then the relationship of the land use, human settlement changes and habitat fragmentation was discussed in the context of HEC. The discussion part of the paper further describes the limitations of the existing management practices and the considerations in spatial planning with the perspectives of wild life conservation.

3. Case study

3.1 Changes of the socio economic development in Hambanathota

Hambantota has been identified as one of the metro regions for future planned development in Sri Lanka. In recent past years, Hambanathota region has been undergone rapid spatial transformation due to large-scale development of the area particularly the establishment of international port and airport, expressways, agricultural, industrial and infrastructure development. Many of the roads in the Hambanathota regions are upgraded to highways. The Urban Development Authority has initiated various development plans to make Hambantota socio-economic Development success and a reality. As a result, the population of this region has been increased during the last years. The following figures 3.1 has indicated the change of population and growth pattern in this region.

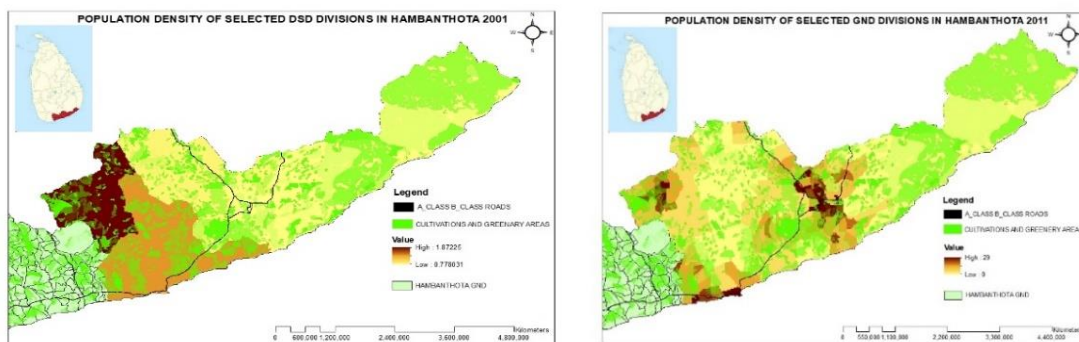


Figure 01 – Changes of population and its distribution pattern

3.2 Changes of natural landscape

Before 2010, (before the Southern region development this area is covered with natural forests of Uda walawe/Bundala/Yala and Lunugamwehera with adjoining land uses like scrubs, paddy fields, chena and other cultivations. After the development of “A” and “B” class main road throughout the area ecological fragmentation in progress to take place in the area. At the beginning, the area was acted as a one ecological patch but since the developments of infrastructure, ecological patches have been started to disrupt into pieces and started to be isolated as separated forest patches. Also fauna and flora became isolated in separate systems but their corridors are still existing since animals use to walk across their previous forest boundary which has been a cause for HEC in the area. After construction of international sea port and airport, again the land extends toward forest patches declining the area to 20% of the previous forest extent. The remaining area are still isolated and it has created lot of development pressure with the rapid increase of population density and building density. As a result of this volume of forest fragmentation is very high in the area.

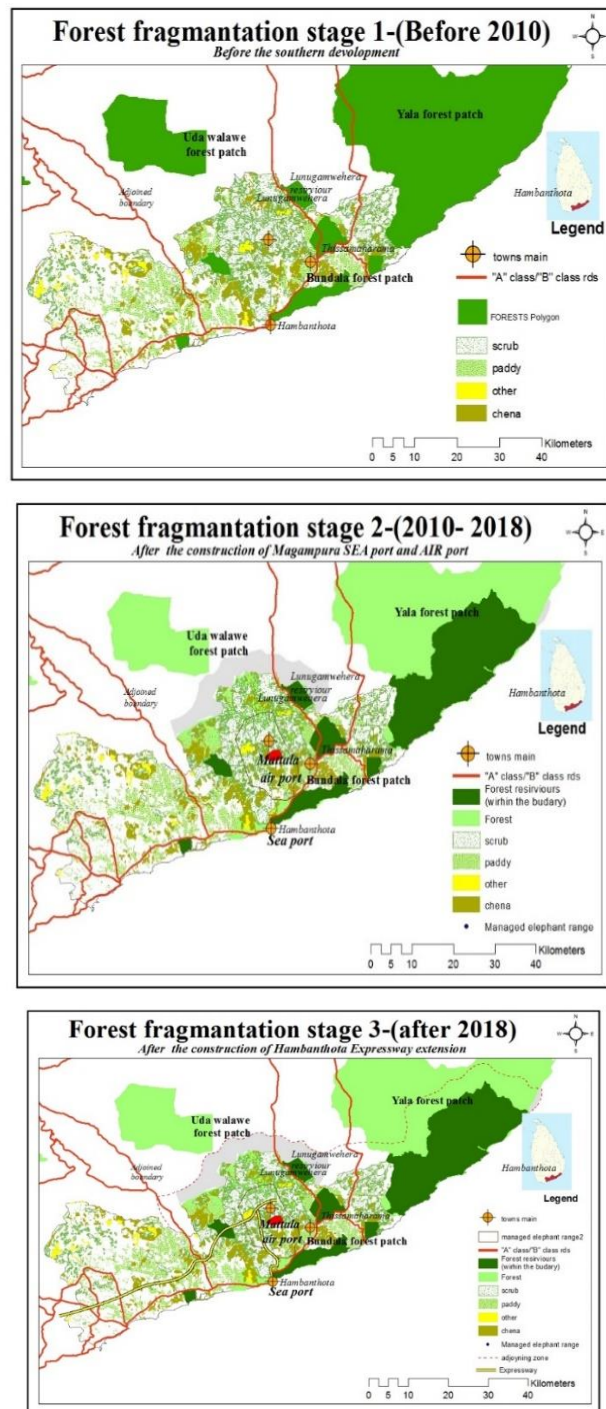


Figure 02 – Changes of natural landscape over the period of time

3.3 Impacts of human elephant conflicts in Hambanthota

The HEC has increased in Hambanthota, Sooriyawewa, Lunugamvehera, and other areas rapidly in the recent past. The continued fragmentation of wildlife habitats is the main reason of elephants entering to village areas.

3.4.1. Current status of Wild life management practices in Sri Lanka

Currently, there are many management measures are adopted to manage this issue. Elephant Drives and Electric Fencing are the most common management measures. In addition, Major initiatives are undertaken to mitigate damage to crops and property by elephants and considerable funds are expended on electric fences and other elephant barriers. Other methods of crop protection, insurance and compensation are also adopting in some areas. Number of protected areas for wildlife conservation was established under the Fauna and Flora Protection Ordinance No.2 of 1937. These national protected areas are mainly classified into six types such as strict nature reserves, national parks, nature reserves, jungle corridors, refuge, marine reserves, buffer zones and sanctuaries. The strict nature reserves, national parks, nature reserves, jungle corridors are categorized as protected areas and they are covered all the ecological regions of Sri Lanka. Refuge, marine reserves, Buffer zones and Sanctuaries have been introduced in 1993 by amending the Flora and Fauna Protection Ordinance. However, no regions have been declared under these categories so far. Protected areas are governed by department of forest conservation and department of wild life conservation of Sri Lanka.

The wildlife protected Areas such as National Parks, Strict Nature Reserves, Nature Reserves, Elephant Corridors, Sanctuaries and Managed Elephant Reserves are under the jurisdiction of the Department of Wildlife Conservation (DWC), which holds the prime responsibility for the wildlife conservation. Elephants are keystone species and play a unique role in the functions of forest ecosystem. Therefore, the presence and the conservation of elephants are important in order to maintain the balance of the ecosystem. The conservation of elephants in Sri Lanka is solely on the shoulders of DWC. At present, over 26% of the land area in the country is legally protected as protected areas. However, HECs in these regions are increasing despite the management interventions of the government authorities.

Cabinet approval has given for the establishment of National Policy for the Conservation and Management of Wild Elephants in Sri Lanka by identifying the National importance of the protection of elephants in 2006. The main objective of the preparation of national policy is to manage the HEC. Further, in 2010, National Action Plan was also prepared based on the national policy and received president's approval for implementation. Department of Wildlife conservation and Forest Department were played a key role in the preparation of both Policies and Action Plans, which were developed with the wider stakeholder participation. However, up to date, both documents have largely been ignored in the planning and implementation of elephant management (Fernando, 2015).

4. A way forward

4.1 Need of co-management interventions for HEC

Wild elephant may be seen as a gentle giant and nature's masterpiece to a strict preservationist. However, farmers regard the wild elephant as a destructive and dangerous pest (Santiapillai et al., 2010). Moreover, the problem with elephants is that the people who wishes to protect them are rarely stomach the livelihood cost of farmers. There are two different perceptions in the society regarding the values of wild elephants. Therefore, it is a high time to take every effort to reduce it to tolerable levels (Santiapillai et al., 2010). Conflict between man and elephant is inevitable when both compete for resources in an area given that both species have similar ecological requirements. Therefore, there is a question of how to design the space in order to

share the benefits to each other. In this circumstances, it is necessary to design the management measures in order to distribute the benefits to the both community and the wild life. These pressures are highlighted in establishing, managing and maintaining comprehensive protected area networks. Well-connected network of protected areas is a measure which will be one of the most important strategies for buffering communities against the wildlife damages and more importantly the impacts of climate change.

4.2. Challenges for the co management practices

Wildlife Habitat is a preferable physical and biological surroundings of any species. According to the Burt's (1947) definition acknowledges that space use can arise from different behavioural activities of a species such as finding food, shelter and partners, and where they survive, reproduce and maximize their fitness. The “home-range” can be used as a spatial tool to generally estimate animal space use and requirement area needs to sustain it. Home-range is defined as the extent of an area with a defined probability of occurrence of an animal during a specified time period (Millspaugh and Marzluff 2001). However, the home-range size, location, and shape may change depending on the state of the individual and the conditions of the external environment as well as the spatial temporal distribution of resources (Blanco et al., 2017). Therefore, size of the home-range size is inversely proportional to resource availability because the area occupied by an animal should be large enough to satisfy its requirements (Blanco et al., 2017). Identification of home-range of the keystone species may be an efficient means of managing a much wider range of biodiversity.

Habitats are usually conceived as occurring in patches and patches are contiguous regions of the same habitat type. Therefore, when the habitat exists in the landscape as a few large patches that exist in network of the habitat is said to be highly connected (Pearson, 2002). At regional or geographic scales, landscapes can be defined as large areas that comprise more than one type of habitat distributed in numerous patches. Thus, spatial connectivity is a parameter of landscape function that measures the processes by which subpopulations of organisms are interconnected into a functional demographic unit (Merriam, 1992). It is necessary to distinguish structural connectivity and the functional connectivity. Structural connectivity is defined physical pattern of habitat and potential connections between areas of habitat with the landscape. Functional connectivity means to the actual movement of individual organisms through the landscape and the degree to which each landscape facilitates or impeded that movement. Shape of the habitat also affects to the quality of the habitat. Reserves can also be designed to have less-edge habitat. The larger habitats are proportionately less influenced by the external pressures. Therefore, extensive edges are generally negative feature of ecological habitats, because when the increase of the edges decrease the amount of mature ecosystem interior and allow penetration of invasive species and the predators (Freedman, 1995).

Traditionally, ecologists, land managers, landscape planners, and spatial planners have ignored the interactions among the different elements in a landscape. They have looked at landscape



elements as separate ecosystems with rare exceptions (Forman, 1981). As a result, the spatial pattern of the socio economic development has increased the pressure on protected areas. Protected areas are considered an essential strategy for managing HEC. Conservation of habitat and landscape are vital for protection of biodiversity because wildlife become more vulnerable to extinction in the face of climate change and rapid land use transformations. Protected areas established in isolation may not fully yield the expected benefits in the long term. Therefore, governments can be certain that their investments in protected areas will pay biodiversity and social dividends well into the future by integrating protected areas into the wider landscape. However, sectoral division of organizations often with divergent institutional issues, administrative structures, management objectives, views and expertise, makes it difficult to undertake landscape level conservation.

One possibility out of this puzzle would be to revert to the original prescription and merge the spatial claims of socio economic development and the wildlife conservations. However, co management of protected area integration entails two main process. The first involves linking protected areas within a broader network of protected and managed lands and waters in order to maintain ecological processes, functions and services. The second involves incorporating protected area design and management into a broader decision making framework of national and regional land-use plans and spatial policies in order to make best use of land for community in the long run. Therefore, it indicates that the inadequacy of the role of spatial planning policies and the strategies in managing HEC prevails in to the future in Sri Lanka.

5. Conclusion

Human–elephant conflict is a complex social issue that cannot be mitigated through reliance on a single mitigation measure. Managing the conflict between human and elephant requires collaborative decision making, which integrate the spatial requirements of social economic development of community and the conservation of wild life habitats. It is therefore necessary to collaborate between the authorities for development and the nature conservation as well as the community. Accordingly, co management measures will only bring sustainability. Therefore, spatial planning as a collaborative planning tool has a significant role in the management of the human elephant conflict. Further, understanding of the wildlife habitats and the consequences of the landscape fragmentation on the socio economic development are important aspects in the spatial strategy making process. Moreover, ecological understanding of the home range of elephants, regional landscape connectivity are core parameters in the spatial strategy making process at the regional and the local scales.

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