



**LANDSCAPE BASELINE ASSESSMENT FOR THE KNUCKLES  
CONSERVATION FOREST AND BUFFER ZONE FOR THE SGP  
UPGRADING COUNTRY PROGRAMME IN SRI LANKA.**

**CONDUCTED AND PREPARED BY**



**ENVIRONMENTAL FOUNDATION (GUARANTEE) LIMITED**

**JANUARY 2018**



## PROJECT TEAM

1. ERIC WIKRAMANAYAKE, PHD  
BIODIVERSITY AND LANDSCAPE STRATEGY EXPERT  
CHAIRPERSON - EFL  
SENIOR CONSERVATION SCIENTIST – WWF
  
2. VINDHYA BUTHPITIYA, MA (HONS), MPhil  
SOCIOLOGIST  
ENVIRONMENTAL FOUNDATION (GUARANTEE) LIMITED
  
3. BUDDHIKA JAYALATH  
COMMUNITY MOBILISATION CONSULTANT  
ENVIRONMENTAL FOUNDATION (GUARANTEE) LIMITED
  
4. CHAMILA WEERATHUNGHE, BSc ENG; MSc ENVT MGT; MSc IWRM  
PROJECT COORDINATOR/ ENVIRONMENTAL SCIENTIST  
ENVIRONMENTAL FOUNDATION (GUARANTEE) LIMITED
  
5. CHATURANGI WICKRAMARATNE, PHD  
ENVIRONMENTAL SCIENTIST  
ENVIRONMENTAL FOUNDATION (GUARANTEE) LIMITED



## Contents

Background .....	1
1. Priority Area for the Baseline Assessment .....	1
2. Situation Analysis .....	4
2.1 Methodology .....	4
2.1.1 Selection of Zones for Consultation Workshops .....	4
2.2 Findings from the baseline assessment .....	6
2.2.1 Key Issues.....	6
2.2.2 Findings of stakeholder consultations and inferences.....	8
3. Landscape-scale Approach to Conservation of the Knuckles Conservation Forest.	20
3.1 Justification for landscape-scaled conservation in the Knuckles Conservation Forest.....	20
3.2. Strategies, Outcomes and Impact Indicators for landscape-scale conservation in the Knuckles Landscape .....	23
3.3 Typology of Community Projects .....	24
3.3.1 Recommendations for Project Interventions .....	24
3.4 Outcomes and Impact Indicators .....	25
3.5 Criteria for Project Selection .....	31
3.6 Criteria for CBO selection.....	31
4. Monitoring and Evaluation Plan .....	31
5. Knowledge Management Plan at the Landscape Level .....	33



## LIST OF FIGURES

<b>Figure 1:</b> Knuckles Conservation Area, its buffer zone, and the demarcation of key Divisional Secretariat Divisions in the Priority Area.....	<b>3</b>
<b>Figure 2:</b> Radar Diagram for the Workshop 1 .....	<b>8</b>
<b>Figure 3:</b> Radar Diagram for the Workshop 2.....	<b>9</b>
<b>Figure 4:</b> Radar Diagram for the Workshop 3.....	<b>9</b>
<b>Figure 5:</b> Radar Diagram for the Workshop 4.....	<b>10</b>
<b>Figure 6:</b> Mean Scores by Zone .....	<b>11</b>
<b>Figure 7:</b> Standard Deviations by Zone .....	<b>11</b>
<b>Figure 8:</b> Landscape diversity and ecosystem protection by Zone .....	<b>12</b>
<b>Figure 9:</b> Biodiversity including agricultural diversity by Zone .....	<b>13</b>
<b>Figure 10:</b> Knowledge and Innovation by Zone .....	<b>13</b>
<b>Figure 11:</b> Governance and social equity by Zone.....	<b>14</b>
<b>Figure 12:</b> Livelihood and Wellbeing by Zone .....	<b>15</b>
<b>Figure 13:</b> Google Earth image to show relative ecological links between the Knuckles Conservation Forest area and the surrounding human habitation, agricultural areas, and protected areas.....	<b>21</b>
<b>Figure 14:</b> Map showing forest connectivity between Knuckles Conservation Forest and Wasgamuwa National Park, and river connectivity with the reservoirs.....	<b>22</b>



## LIST OF TABLES

<b>Table 1:</b> Workshop details.....	<b>5</b>
<b>Table 2:</b> Gender segregated workshop participation data .....	<b>6</b>
<b>Table 3:</b> Area-wise participation data.....	<b>6</b>



# **LANDSCAPE BASELINE ASSESSMENT FOR THE KNUCKLES CONSERVATION FOREST AND BUFFER ZONE FOR THE SGP UPGRADING COUNTRY PROGRAMME IN SRI LANKA.**

**A PROJECT CARRIED OUT BY THE ENVIRONMENTAL FOUNDATION (GUARANTEE) LIMITED FOR SGP GEF PROGRAMME OF THE UNITED NATIONS DEVELOPMENT PROGRAMME**

**SEPTEMBER 2017 TO NOVEMBER 2017**

## **Background**

Knuckles Landscape is one of the three project areas that the 6<sup>th</sup> Operational Phase of the GEF Small Grants Programme in Sri Lanka is working on, and the Environmental Foundation (Guarantee) Limited was entrusted to develop the landscape strategy for Knuckles with the tools adopted from the COMDEKS (Community Development and Management for the Satoyama Initiative) programme. The study was carried out for three months from September 2017 to November 2017 and the report was prepared in December 2017 and January 2018.

### **1. Priority Area for the Baseline Assessment**

The Knuckles Conservation Area lies in Sri Lanka's Central Province, falling within the Kandy and Matale Districts, and spans an area of approximately 21,000 hectares. As of 2009, the Knuckles Conservation Forest (KCF) has formed a part of the designated Central Highlands of Sri Lanka World Heritage Property, which also includes the Peak Wilderness Protected Area and the Horton Plains National Park (Forest Department Sri Lanka, 2017).

The areas increasing popularity as a tourist destination, coupled with other human activities including encroachment linked to cultivation, and illegal logging has exacerbated the deterioration of this area. Furthermore, the region has also been subject to natural disasters such as landslides and floods in the recent years, no doubt aggravated by various human impacts to the landscape and the continued absence of a legal buffer zone. While there is some relief extended by way of the establishment of Environmentally Sensitive Areas (ESA) of a 100m radius surrounding Environmental Protection Areas, by which development activities are controlled to some extent.

The KCF, including the buffer zone, falls across 12 different Divisional Secretarial divisions (DSD), belonging to Kandy and Matale districts (Fig. 1). The total population size of the entire area is 170,609 while the separate values for the Conservation Forest and its buffer zone are 81,733 and 88,876 respectively. These numbers denote the total population of the Grama Niladhari division under which these areas fall, and do not necessarily reflect the number of people living within the boundaries of the Conservation Forest and/or its buffer zone.



Due to its diverse natural vegetation, which includes lowland rainforests and montane forests, the Knuckles area records a very high and unique level of biodiversity. It contains charismatic species such as the Knuckles pygmy lizard, Knuckles rock frog, leopards, and elephants. Further, the Knuckles range is one of the 70 listed Important Bird Area sites in Sri Lanka, and an important watershed, providing 30% of the water to the Mahaweli river basin and reservoir system.

Despite its importance, vital areas of the Knuckles Region have become degraded due to human activities such as encroachment, illegal logging, land clearing, tea planting and cardamom cultivation. The area is also prone to natural disasters, including climate-induced events such as extreme floods and landslides. The buffer zone of the Conservation Forest is particularly affected due to lack of protective regulations. The three major threats to the KCF and its buffer area as identified by this study are from forest fires, tourism, and lack of proper waste management.

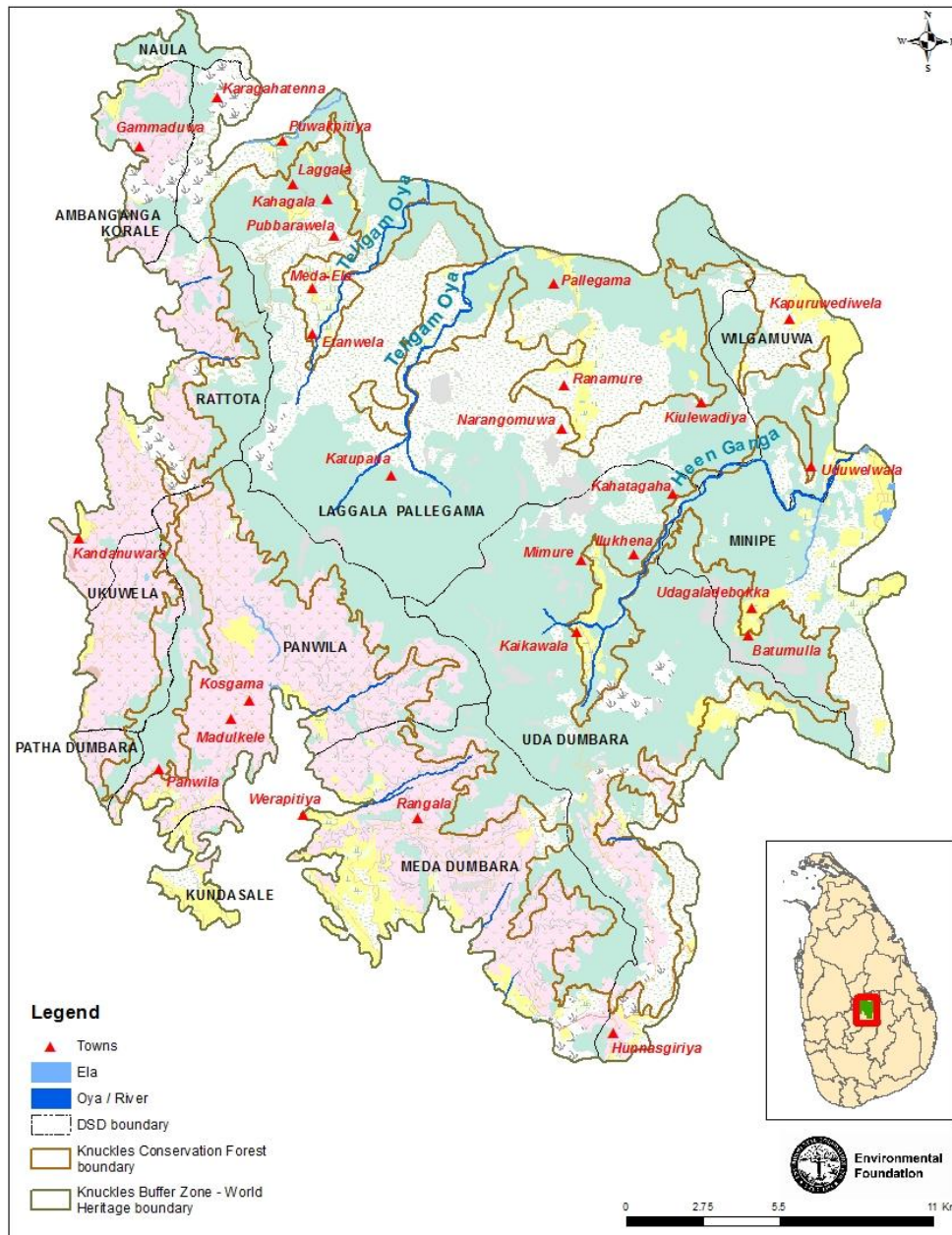


Figure 1 Knuckles Conservation Area, its buffer zone, and the demarcation of key Divisional Secretariat Divisions in the Priority Area

The areas most frequently affected by forest fires are in the Meda Dumbara, Uda Dumbara, Minipe, Wilgamuwa and Laggala-Pallegama Divisional Secretariats. These fires are caused intentionally or unintentionally as a result of human activities, including fires that spread out of control when burning of trash in homes in close proximity to the forest, cultivation, and recreation.

Presently, there is no established waste management system for any part of the conservation area or the buffer zone. Majority of waste is generated by domestic tourists who frequent the area on short visits for sight-seeing and recreational activities. The unregulated movement of people through the Conservation Forest area, particularly along





Naula road, pollutes the habitat with garbage, specifically: styrofoam boxes, lunch sheets, polythene bags and glass bottles.

Other issues include firewood collection, forest clearing, presence and introduction of invasive species, lack of clear boundary demarcation, and land disputes within the KCF, divestment of unproductive tea land by the Sri Lanka State Plantation Corporation (SLSPC) in the Knuckles landscape as discussed later.

## **2. Situation Analysis**

### **2.1 Methodology**

A compilation of secondary information pertaining to socio-economic, ecological, policy and climatic contexts, current issues and other ongoing projects were given in the **Annex 1**.

For the purpose of selecting the project priority area, and organizing workshops, three two days site visits were carried out in late September and October. Moreover, during these site visits, individual meetings were held with some of the Divisional Secretaries and Community and Development Officers, Regional Forest Department Officers, Grama Niladhari, religious leaders, representatives of tea plantations and other key personnel identified. With the information obtained through the literature research and the site visits, it was decided to conduct 04 workshops as follows. In these 04 workshops, COMDEKS methodology was followed as per the guidelines given and local languages (Sinhala and Tamil) were used for communication. In line with the requirement for mainstreaming gender across this process, equitable representation and concerns were accounted for in the consultation process as far as practicality permitted. Furthermore, ethnic diversity as representative of the local community and age balance was also accommodated for where necessary and possible.

#### ***2.1.1 Selection of Zones for Consultation Workshops***

The KCF is a large area with a diverse array of livelihoods, land use practices, environmental and climatic differences. Thus, the area was divided into four major zones. One of the major criteria of selection was livelihood and land use practices together with environmental and climatic similarities of each zone. The information gathered through the pre-meetings was also used. The other crucial factor was accessibility, and convenience at administrative level vis-a-vis organising the workshops. The four zones selected are:

##### **Zone 1:**

Divisional Secretariats of Panwila and Patha Dumbara in Kandy district. This area belongs to the Wet Zone of the country. The boundaries border most of the lowland forests of Knuckles. Several small rivers flow through this area. Kukul oya and Keetool Oya are of particular significance. This area belongs to the North-Eastern part of the lowland wet zone. The livelihood in the areas is based mainly on agriculture and tourism.

##### **Zone 2:**

Divisional Secretariats of Uda Dumbara, Meda Dumbara and Minipe in Kandy district. These three adjoining Divisional Secretariats, with a total of 46 village divisions, are host to many



unique features. Communities in Uda Dumbara and Meda Dumbara are engaged in agricultural practices. The cultivation of tea and pepper is the most common. Some villages, namely Meemure and Kaikawala, are also engaged in tourism. Villages in Minipe mainly grow paddy and other vegetables.

### **Zone 3:**

Divisional Secretariats of Laggala-Pallegama and Wilgamuwa in Matale district. Areas within these Divisional Secretariats are currently undergoing rapid changes due to recent development activities from the Moragahakanda project. Several communities living in this area are affected by the human-elephant conflict. Tourism-oriented activities in the Laggala-Pallegama area are high in comparison to Wilgamuwa, where most people engage in paddy cultivation and other agricultural practices. However, the communities in the latter have halted their practices due to the on-going development activities. Laggala- Pallegama area is important in terms of resettlements of the Moragahakanda- Kalu Ganga project, converting shrub forests and forests into human settlements disrupting some of the ecosystems services. In that context, restoration of those services through external project intervention could be planned under this initiative.

### **Zone 4:**

Divisional Secretariats of Rattota and Ukuwela. These areas belong to the wet zone of Sri Lanka, with elevations ranging from between 300 and 1500 m above sea level. Communities here are mainly engaged in the tea industry together with pepper cultivation and other agricultural practices. Both Sinhalese and Tamil communities are resident in this area.

Special emphasis was paid in getting a good representation for the workshops in each zone, such that participants representing different age groups, diverse of livelihoods, educational backgrounds and more or less similar numbers in both gender attended. The workshop participation was as follows.

<b>District</b>	<b>Date and Time</b>	<b>Venue</b>
W1 –Kandy ( <b>Minipe, Medadumbara and Udu Dumbara DSDs</b> )	10 <sup>th</sup> Nov 2017 8.30 a.m. to 1.30 p.m.	Ududumbara Ekanayaka College
Kandy ( <b>Panwila DSD</b> )	15 <sup>th</sup> Nov 2017 8.30 a.m. to 1.30 p.m.	Panwila Divisional Secretariat office
Matale ( <b>Wilgamuwa, Laggla- Pallegama</b> )	20 <sup>th</sup> Nov 2017 8.30 a.m. to 1.30 p.m.	Rattota Divisional Secretariat
Matale – ( <b>Raththota</b> )	21 <sup>st</sup> Nov 2017 8.30 a.m. to 1.30 p.m.	Hettipola Divisional Secretariat

*Table 1: Workshop details*



	Zone 1	Zone 2	Zone 3	Zone 4
F	11	37	43	23
M	40	44	36	49
Total	51	81	79	72
Female	22%	46%	54%	32%
Male	78%	54%	46%	68%

Table 2: Gender segregated workshop participation data

Number of participants from each DSD								
Zone 1		Zone 2			Zone 3		Zone 4	
Panwila	Pathadumbara	Minipe	Meda Dumbara	Uda Dumbara	Wilgamuwa	Laggala - Pallegama	Rattota	Ukuwela
51	0	4	1	76	57	22	70	2

Table 3: Area-wise participation data

Other than in the first workshop held in Medadumbara which noticed only 22% female participation, all the other workshops were well represented by both gender, such that gender-wise concerns were raised and noted.

## 2.2 Findings from the baseline assessment

### 2.2.1 Key Issues

The key issues that affect the environment and the wellbeing of the communities that have to be addressed through community projects are:

- **Productivity fluctuations** due to landscape degradation, climatic variations, lack of appropriate planting material, inadequate knowledge, lack of advanced technological intervention, severe price fluctuations and lack of proper marketing avenues that marginalize farmers, keeping them poor and vulnerable. This also has further implications for food security, and community health due to insufficient diversity within the local diet and other such inadequacies.
- **Illegal activities related to income and livelihoods** that are causing encroachment of forest lands including clearing for agriculture, cardamom cultivation, gem mining, unsustainable exploitation of non-timber forest products, deliberate setting of forest fires, cutting saplings for stakes for bean and tomato cultivation
- **Soil and water pollution** due to the application of high amounts of agrochemicals, bad agricultural practices that causes soil erosion, and improper waste management, especially from unregulated tourism activities. The implications of this for the increase in CKDus affecting community health must be noted.
- **Inaccessibility to farming lands inside the forest boundary**, which were traditionally cultivated by local communities (paddy in particular) before the KCF was declared a World Heritage site, but is now causing dissent. Further, this might be linked to increasing preference for short-term yield varieties, leading to the diminishing cultivation of heirloom varieties and interlinked traditional knowledge.



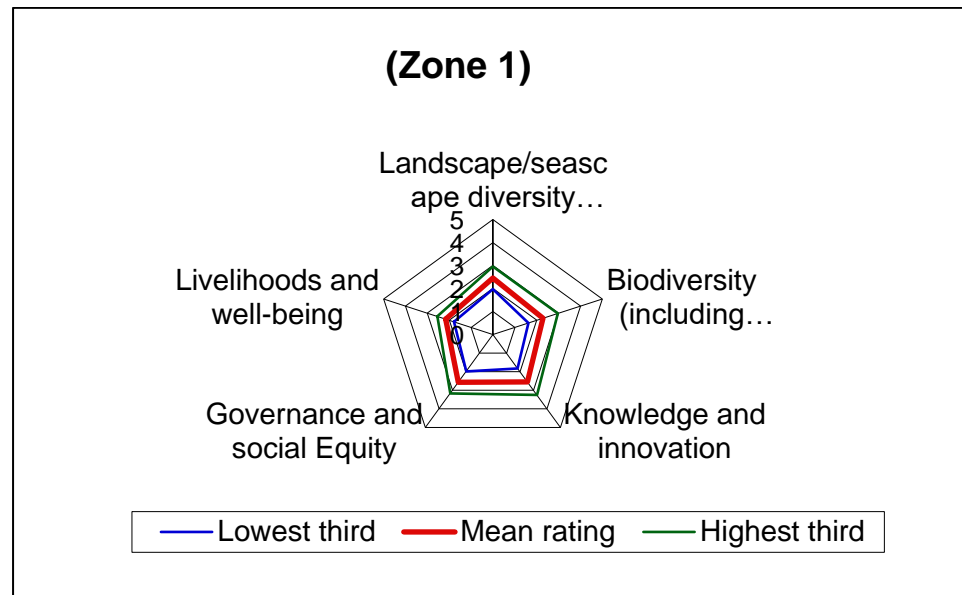
- **Degradation and loss of wildlife habitat** because of expansion of human habitations and agriculture, waste disposal, and increasing human-wildlife conflict, especially with toque macaques.
- **Spread of invasive plant species** due to habitat degradation and change.
- **Expansion of cardamom cultivation** that removes the understory, preventing forest regeneration, and trees being cut for construction of barns for drying cardamom. Loss of forest structural complexity also removes habitat for sensitive and endemic species.
- **Different forms of land ownership and fragmentation of landholdings**, which creates numerous types of unsustainable ad-hoc development of fine-grained different land uses that multiplies the number of small scale enterprises such as plantations and hotel projects. Furthermore, land ownership and boundary demarcation matters have led to encroachment and vindictive actions, threatening the health of the forests; e.g., intentionally set forest fires. This has been particularly problematic in relation to land which has been traditionally occupied for generations with no legal tenure. These occupants have not been offered any viable alternatives
- **Unsustainable land management** (e.g., rice farming, *Chena* and tea cultivation) that is causing severe soil degradation and decreasing crop productivity and biological diversity.
- **Unsustainable extraction of forest products** are degrading forests, exposing slopes and leaving them vulnerable to erosion and drying, impacting habitat for ecologically sensitive endemic species, drying up water sources, and increasing vulnerability to climate change impacts.
- **Over use and commercial-scale extraction of water** for agricultural and other purposes (e.g., mineral water bottling).
- **Large scale gem mining** that is degrading streams and rivers and the biodiversity in them. These activities also block the natural elephant corridors connecting the KCF and Wasgamuwa National park.
- **Abandoned tea plantations** that result in declining productivity and erosion.
- **Lack of proper waste disposal measures**, sanitation facilities and water supply schemes are resulting in pollution of forests and waterways.
- **A large influx of tourists** and unregulated expansion and growth of tourism infrastructure with no proper safeguards are exacerbating pollution and ecosystem degradation.
- **Lack of demand and market value** for small scale and niche crops are lowering economic benefits
- **Lack of an overall policy to manage the buffer zone.** The Knuckles management plan prepared in 1994 recognized the area between the 3,500 ft (1067 m) forest boundary and the 2,500 ft (757 m) contour as a 'buffer zone' and made recommendations to implement development activities. However, when the Knuckles Conservation Forest was declared in 2000 a legally designated buffer zone was not included. UNESCO has designated a buffer zone when it declared the KCF as a World Heritage Site. However, this 35,074 ha buffer zone still does not have legal status, which is a policy gap to implement a landscape management plan that includes the buffer zone that has to be addressed.

A detailed account of issues pertaining to the ecological productivity of the area is given in the **Annex 1**.

### ***2.2.2 Findings of stakeholder consultations and inferences***

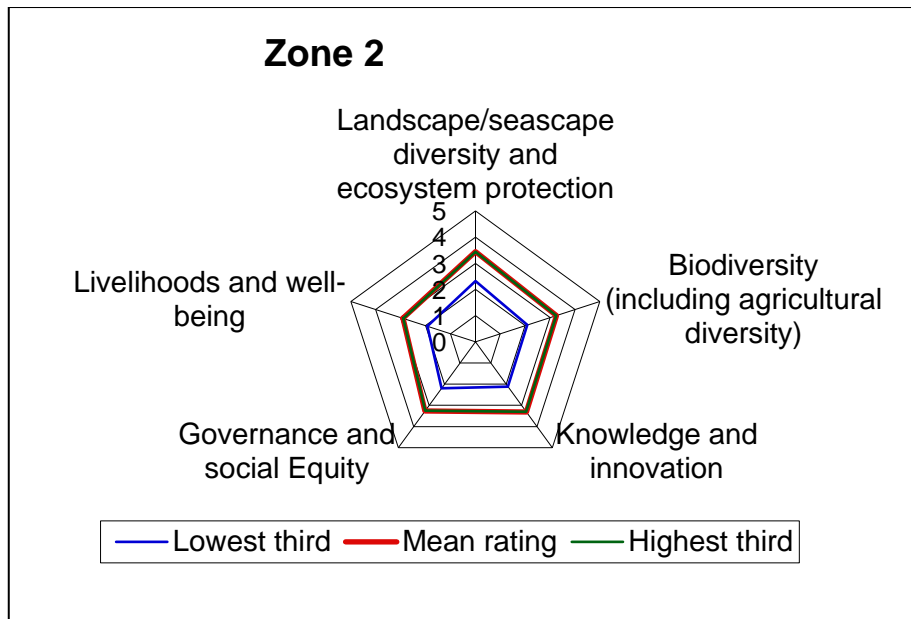
The findings below are from adoption of COMDEKS methodology for the landscape, through conducting 04 workshops as mentioned in the methodology.

#### **Radar Diagrams of 04 workshops under 05 thematic areas given in the COMDESK Methodology**



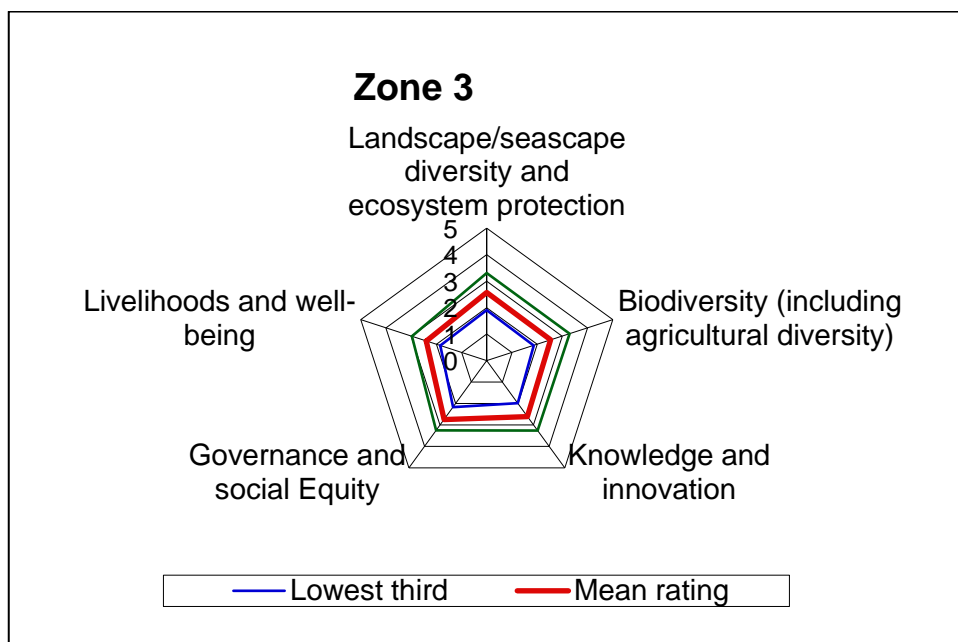
*Figure 2: Radar Diagram for the workshop 1*

For Zone 1, average scores ranged between 2.16-2.57, with the highest value being recorded for Governance and Social Equity and the lowest mean score being recorded for Livelihoods and Well-being.



*Figure 3: Radar Diagram for the workshop 2*

Mean scores valued between 2.4-2.9, with the highest value scored for the Landscape Diversity and the lowest value for Livelihoods and well-being.



*Figure 4: Radar Diagram for the workshop 3*

Average scores ranged between 2.4-2.75, with the highest being observed for Governance and Social Equity and the lowest recorded for Livelihoods and well-being.

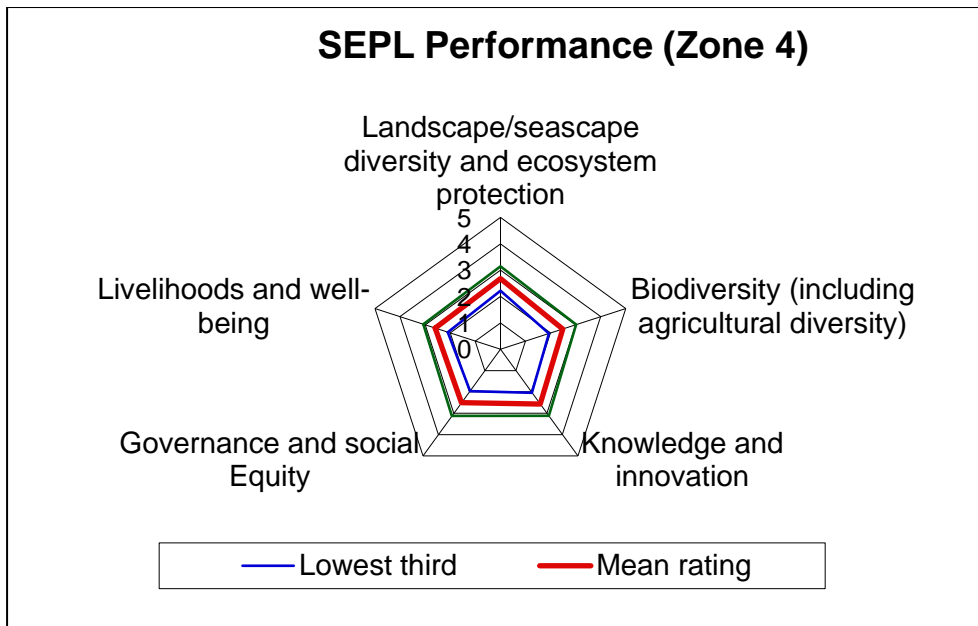


Figure 5: Radar Diagram for the workshop 4

Average scores ranged between 2.49-2.68, with the highest value being recorded for Landscape Diversity lowest observed for Biodiversity.

In summary, all zones except Zone 4, scored the lowest values for the Livelihoods and well-being. Zones 1 and zone 3 recorded the highest scores for Social equity and governance, while Zone 2 and 4 recorded the highest score for Landscape diversity. Only Zone 4 scored the lowest for Biodiversity. As given in Fig. 5, Zone 2 provided the highest mean scores ( $\geq 2.7$ ) for the first four areas but scored  $< 2.5$  for the Livelihoods and well-being. Mean scores recorded by other zones for the thematic areas were an average value around 2.5, and this can arise due to various reasons. It is possible that the content of the scoring tool was too intricate and that many lacked the knowledge and the awareness to score with confidence. On the other hand, this could also be an indication that there are challenges to be addressed but opportunities for improvement in all five thematic areas.

**Analysis of the data in terms of the Mean Scores and the Standard Deviation for the 05 thematic areas**

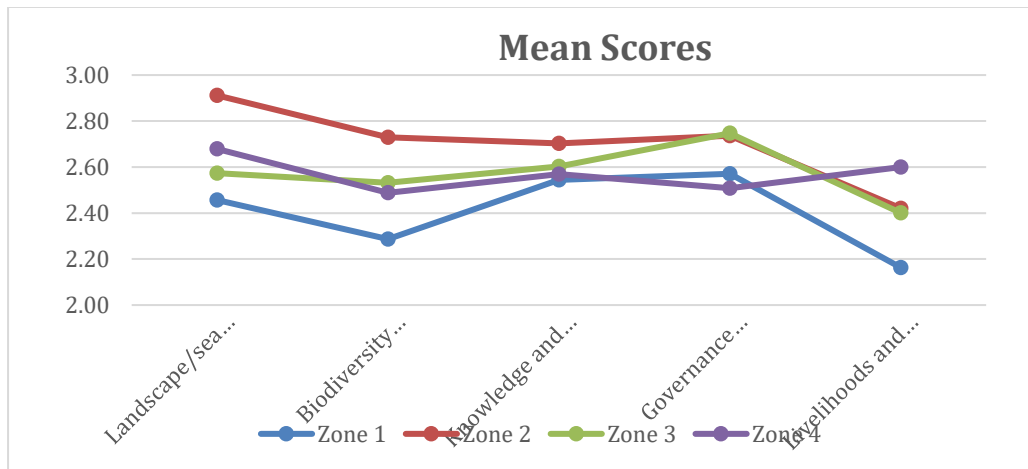


Figure 6: Mean Scores by Zone

Considering the thematic area of Landscape/seascape diversity and ecosystem protection, highest mean score (3.1) is calculated for the Landscape diversity and the lowest (2.3) is for Recovery and regeneration of the landscape/seascape. This highlights the need for mechanisms that increase resilience of the landscape and measures for rehabilitation through reforestation. Highest variation can be observed for Ecosystem protection, where stakeholders' scores show the greatest disparity between zones. Additionally, Zones 1, 2 and 3 scored low for the Ecological interactions between different components of the landscape. From the discussions that followed the scoring exercises, it was apparent that many understood that certain areas are protected but failed to understand the reasons behind it. Hence, there is a need for the enhancement of community's awareness and knowledge on ecosystem services and benefits arising from ecosystem protection.

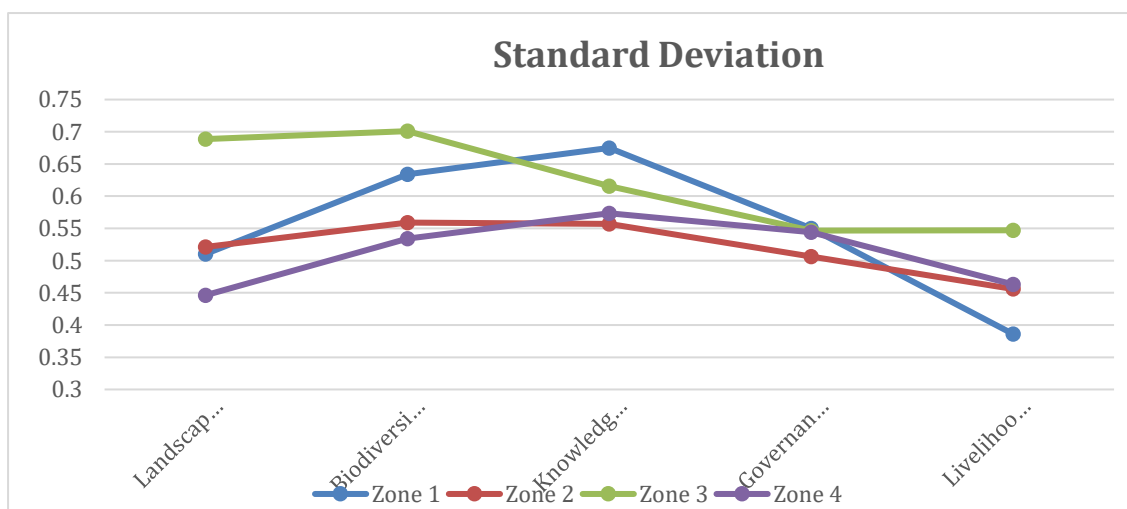


Figure 7: Standard Deviations by Zone



The standard deviation (SD) around the scores given by the stakeholders varied between 0.4 and 0.7, with the lowest was observed for the Livelihoods and well-being area in each zone. This further confirms that most stakeholders are in agreement that their social and economic states need substantial improvement. The highest disparity in scores was from Zone 3 for the thematic areas of Landscape Diversity and ecosystem protection and Biodiversity (including agricultural diversity), demonstrating that there is a considerable variation in the knowledge and understanding on the concepts of ecosystem protection and biodiversity, giving an opportunity for GEF projects to intervene with raising the knowledge base of the communities in need.

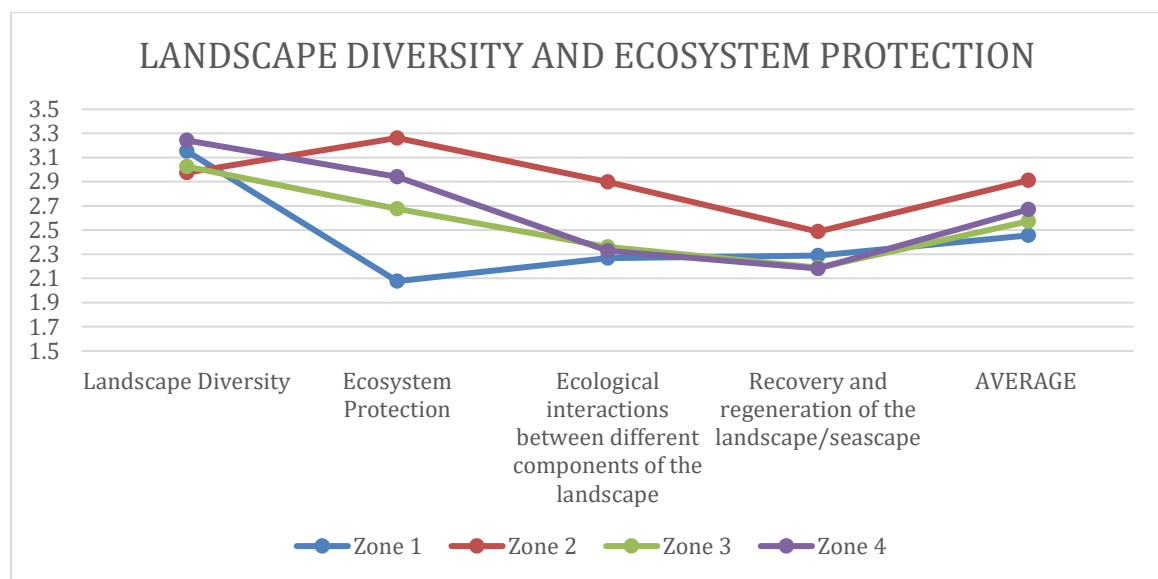


Figure 8: Landscape diversity and ecosystem protection by Zone

Analysis of scores given for the sub areas under Landscape/seascape diversity and ecosystem protection and Biodiversity demonstrate that people in all four zones understand the concept of landscape diversity quite well, however varied views are there in protecting them. In the Panwila area, there's a greater propensity towards protection of ecosystems whereas in the Zone 1 (Minipe, Medadumbara, Udu Dumbara) people lack the required knowledge.

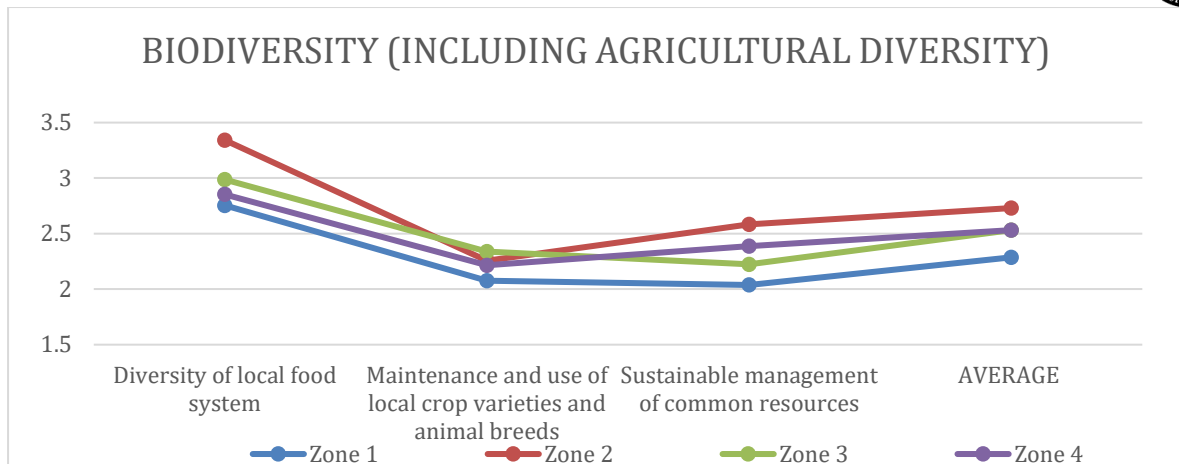


Figure 9: Biodiversity including agricultural diversity by Zone

Scores provided for aspects related to Biodiversity (including agricultural diversity) showed similar trends, with the highest being recorded (2.98) for the Diversity of local food system. However, the use of local crop varieties received the lowest scores in all zones and this was mostly due to the lack of market value for the local crops. Hence, enhancing agricultural biodiversity and productivity through organic farms, and increasing market value for niche crops such as Kitul is imperative.

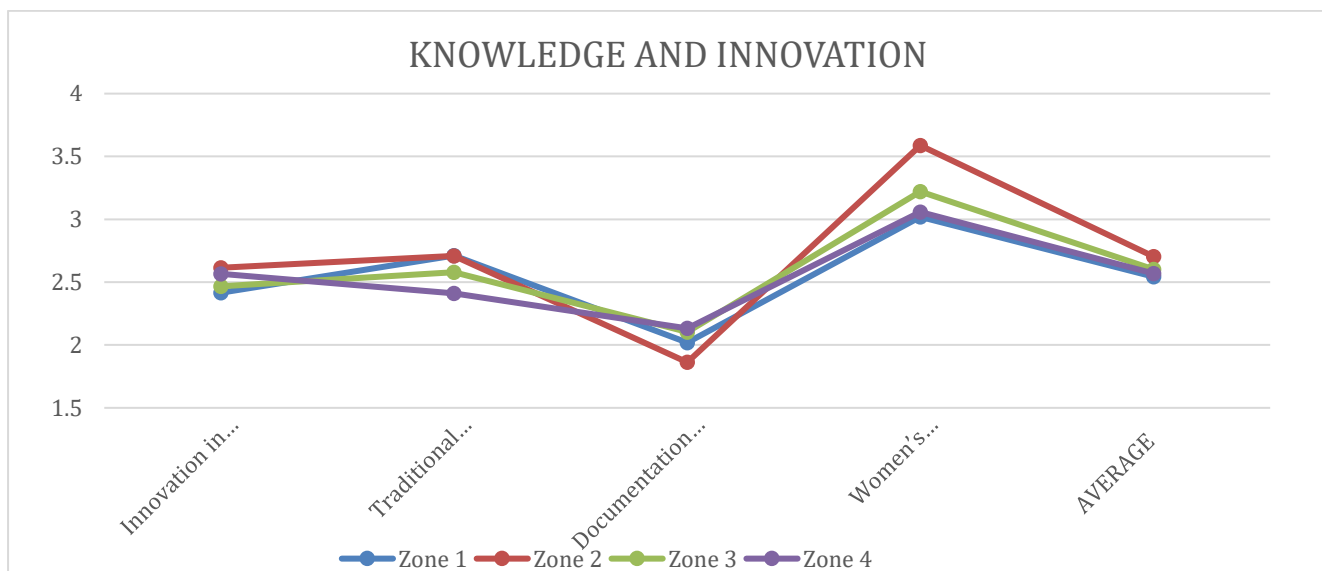


Figure 10: Knowledge and Innovation by Zone

Stakeholders from the four different zones showed similar scores for the aspects related to Knowledge and Innovation. The lowest average score is observed for the Documentation of biodiversity-associated knowledge and the highest was scored for Women's knowledge. Rapidly decreasing local knowledge and related documentation with increasing advances in technology was highlighted during discussions. Most acknowledged the importance of



women’s knowledge but agreed that the women should be more integrated into development work.

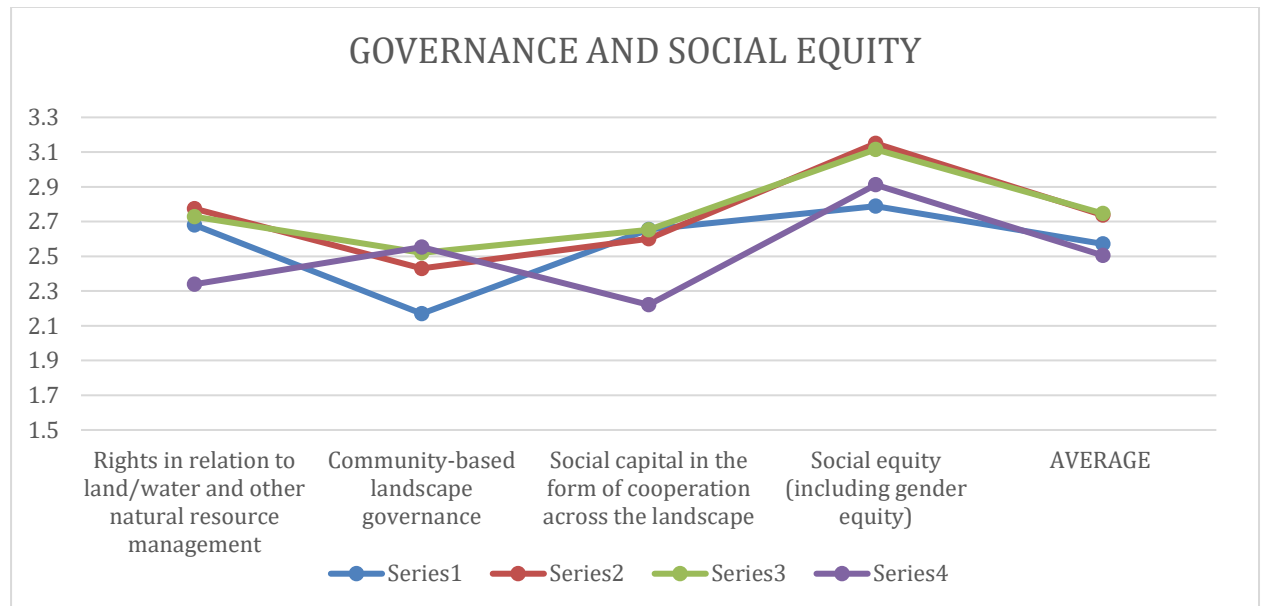
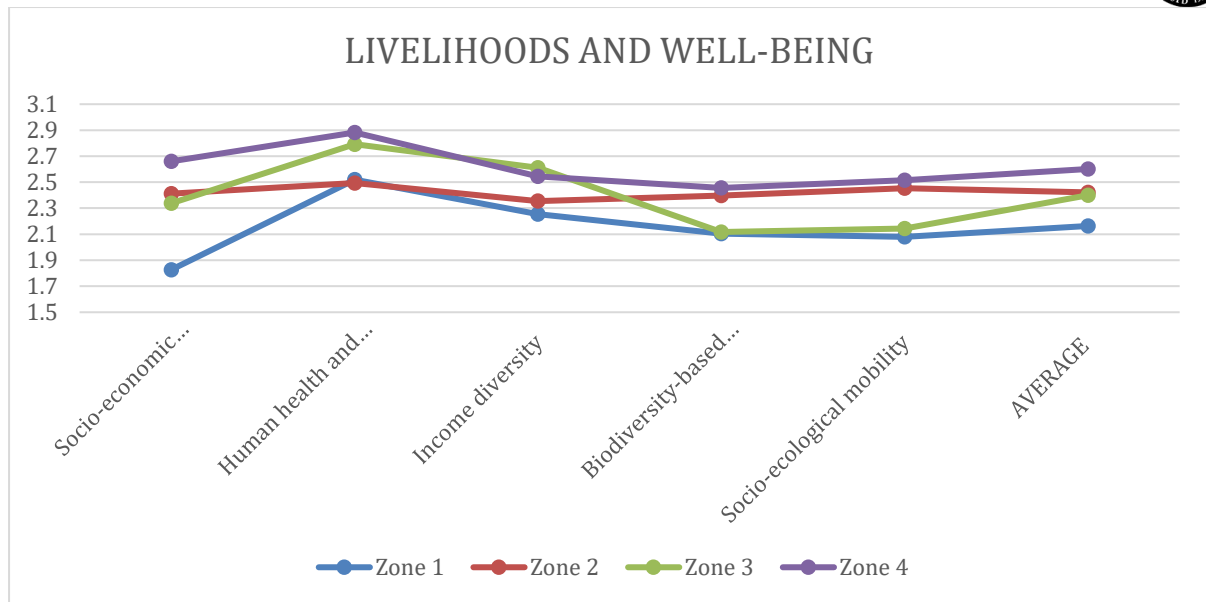


Figure 11: Governance and social equity by Zone

Most of the communities and stakeholders from 04 zones were fairly in agreement in this thematic area – Governance and social equity. However, the participants from Raththota were in varying views in the areas of rights to land, water and natural resources management, and social capital. Comparative low scores given by them for these two areas could either be due their dissatisfaction in using common resources being managed by authorities or the lack of knowledge in understanding the particular aspect to provide a better feedback. It is recommended that possible interventions in terms of governance should be focused on Raththota, so that harmonious existence between regulators and people could be fostered.



*Figure 12: Livelihood and Wellbeing by Zone*

Participants from Minipe, Meda dumbara and Udu Dumbara scored lowest under Livelihoods and well-being, which indicates project interventions and support in terms of infrastructure, and livelihoods should be aimed at that area. Raththota area, in contrast was fairly had contented views on livelihoods and well being and Wilgamuwa and Laggala-Pallegama had varying views for different sub areas. As an example, they had satisfied vies on the environmental conditions, however low scores were given for biodiversity based livelihoods and socio-ecological mobility. Detailed look at the individual requirements is recommended in terms of project interventions in Laggala- Pallegama and Wilgamuwa. It could be due to the resettlement of communities displaced by the Moragahakanda project as well.

### **2.3 Summary of Overall findings from the workshop scores, post workshop discussions, and individual and group discussions**

- **Understanding Landscape Diversity:**

Understanding and appreciating landscape diversity varies considerably, with scores diverging between low and very high even within the same area. Consultations with private sector landowners and preliminary interviews with key informants in the area also revealed that local knowledge of biodiversity is considerably diminishing due to not only out-migration, but disengagement from traditional livelihoods typical to the area, especially among young people. The importance of fostering localised knowledge, that is to say, greater understanding of unique local features was highlighted as a necessity. This also links to the waning of traditional knowledge associated with biodiversity and the absence of concerted efforts to document and transmit said knowledge.



- **Ecosystem Protection**

Members of the communities have a fairly solid understanding of formal means of protection due to prevailing restrictions of access, which are in place as a consequence.

Informal means of protection vary from community to community, and often depend on how proactive and/or invested individuals or community leaders might be. These restrictions in access are viewed as a hindrance, which in turn may highlight not only an inadequate understanding of the importance of protection, but the lack of a sense of ownership within communities with regards to conserving the local environment and the benefits of doing so. Therefore, in order to strengthen local participation, it is essential that community awareness on the benefits of ecosystem protection go hand in hand with the relevance of ecosystem services to their livelihoods including both agriculture and tourism. Members of the community showed particular awareness of the detrimental effects of agrochemicals, notably due to its association with a rising number of Chronic Kidney Diseases in Wilgamuwa in particular. A coordinated effort to enhance awareness on the correct usage of agrochemicals must be pursued. Given also the increased market scope for organic produce, the introduction of organic alternatives and facilitation of interlinked market access to be beneficial to communities in crop diversification.

- **Ecological Interactions**

In line with the scoring for the previous questions, the scoring for this component also varied considerably. However, in line with key informant interviews and the general observations that localised and traditional knowledge pertaining to the environment is diminishing, it might be concluded that understanding of this subject requires greater improvement. This is especially important given the decline in traditional knowledge which may account for biodiversity conservation and ecological interactions.

- **Diversity in Local Food Systems**

While the scoring cards indicate an above average diversity in terms of local food systems, key informant interviews noted that local diets were heavy in carbohydrates as they revolved principally around rice and yams. Restrictions in access to local forest areas where communities have previously relied on foraging as a means of supplementing their diet was highlighted as a cause for declining local knowledge on usable edibles from the forest. The cultivation of these species (various varieties of yams were highlighted in particular as a means of ensuring food security in the past, as these did not 'spoil' and thus permitted for long term storage).

- **Maintenance and use of local crop varieties and animal breeds**

Local crop varieties, principally paddy was observed to being replaced by external, higher-yield varieties that can be harvested in a shorter period of time. Given the increasing local and international interest in heirloom varieties of rice and several successful local initiatives to this effect, potential for livelihood projects aimed at conserving and promoting these varieties can be easily explored. Facilitating market access to this effect also becomes



necessary, given the inadequacies in essential infrastructure in this area and the remoteness of the villages.

- **Sustainable management of common resources**

The sustainable management of common resources varies from community to community, and while some attention is accorded to water sources in particular due to reliance on springs and other natural water bodies such as rivers. These take place in an ad hoc basis, and no community-driven or other cohesive management plans or strategies were observed. Given the increasing strain on water resources where the tourism industry is growing, a cohesive plan must be prioritised at local level. The largest concern in this respect is to do with water, given the shortages prevalent in certain areas and the exacerbation of water pollution linked to the improper use of common water resources and the expanding tourism sector.

- **Traditional knowledge related to biodiversity**

Traditional knowledge related to biodiversity was noted as diminishing due to the rapid transformation to agriculture and forestry practices that existed locally. This was also perceived as taking place as a consequence of the restricted access to forest areas. This was also seen to affect diversity of food available to the local communities. With proper guidance, what remains of this knowledge has potential to be harnessed towards various ecotourism initiatives that are on the rise in the Knuckles area. This may also allow for this knowledge to be preserved for posterity through an active process of documentation and encouraging learning.

Some villages have dedicated programs to reinstate traditional knowledge on local agriculture and provided the communities with seeds and information on natural farming techniques. However, these programs failed largely as people wanted a quick turnover and wanted short term gains through the use of chemical fertilizers/pesticides. Examples of organic farms which use traditional methods were also highlighted as examples which might be studied further and replicated.

- **Documentation of biodiversity-associated knowledge**

While some efforts were observed in this respect in certain villages, there is no coordinated effort for documentation. As stated above, the documentation of this knowledge must be considered a priority, as a generational gap in terms of both awareness and interest has been observed. With proper guidance, what remains of this knowledge has potential to be harnessed towards various ecotourism initiatives that are on the rise in the Knuckles area.

- **Women's knowledge**

While few examples of specialist knowledge by women were noted, it was commonly noted that women participated in economic activities equitably. In preliminary meetings in Ududumbara, it was noted that weaving mats from plant materials (leaves from the niyanda and hana plants were used for this purpose) which the area was once famous for had now more or less vanished, with only very few female members of the community possessing the



knowledge of the traditional patterns. Due to declining interest and income generating potential these skills are on the cusp of being lost, and could potentially be utilised towards developing localised livelihood opportunities for members of the community. However, market access, remains a significant hindrance to livelihood activities in the region.

- **Rights in relation to land/water and other natural resource management**

Land ownership varies considerably depending on the area in question, with some communities holding title deeds, while others have occupied the land traditionally, and have been subject to uncertainty due to the demarcation and enforcement of forest boundaries by the state. This has compounded sentiments of distrust towards institutions and interlinked mechanisms for conservation, which in turn are viewed as impediments to the community's wellbeing and access to livelihoods.

- **Community-based landscape governance**

Community-based management of the landscape varies according to the strength of community leaders in the various villages. There is no cohesive mechanism for community engagement or consultation in relation to establishing conservation-oriented initiatives, which has exacerbated many of the residents' sense of marginalisation.

- **Social capital in the form of cooperation across the landscape**

Cooperation across landscape was observed to be minimal, as there was little interaction between and among communities with respect to landscape management. Any community organising typically takes place at village level.

- **Social equity (including gender equity)**

No striking issues of gender or other forms of social marginalisation were actively vocalised. While some isolated issues of caste-based marginalisation were noted in the preliminary meetings with key informants, such concerns do not appear to be pervasive. Economic hardships were widespread and often linked to the lack of employment opportunities and inability to diversify income generating opportunities at local level as traditional methods such as chena cultivation or foraging were no longer permitted due to restrictions that were in place.

- **Socio-economic infrastructure**

Challenges pertaining to livelihood, market access and income generation were broadly exacerbated by poor infrastructure including roads, public transportation, water supply and electricity, aggravating other concerns including access to healthcare and emergency services. Any long-term plan for aligning conservation priorities with local livelihood and development must account for these inadequacies. In some communities, the lack of water affects community's ability to cultivate, thus directly impacting their principal source of income at great detriment to their socio-economic security and mobility, but their general wellbeing, due to the difficulties in obtaining drinking water.



- **Human health and environmental conditions**

Concerns relating to Chronic Kidney Diseases, although there was no consensus on the causes of this. While some residents attributed this to the overuse of agrochemicals, others denied its relevance citing reasons such as water temperature instead. A very high incidence of breast cancer was also noted in Kandy.

- **Income diversity**

Diversification of income was often bound to necessity due to hindrances to existing means of livelihood either due to environmental, infrastructural or access-related issues. For example, water shortages impacting agricultural pursuits, the lack of motorable roads hindering market access, and restrictions on the cultivation of certain crops such as cardamom were all highlighted. The inadequacy of local opportunities for young people in particular entail that residents are compelled to seek out wage labour or factory work elsewhere. Given the scope for agricultural or eco-tourism oriented entrepreneurial activities in the area, relevant skills development and facilitation of market access could be a valuable means of strengthening local livelihoods and securing traditional knowledge in particular.

- **Biodiversity-based livelihoods**

Biodiversity-based livelihoods are central to the region, be it agriculture or tourism. Formally documenting the extent of this reliance is integral to understanding and strategising how these livelihoods might be carried out sustainably and in line with conservation priorities for the region. At present, residents' relationship to the environment is being regulated with little explanation or awareness-creation, which significantly hampers the community's sense of ownership of conservation processes. This also gives rise to various illegal activities such as encroachment, which is counterproductive to conservation aims. Thereby, a comprehensive assessment of biodiversity-based income generation opportunities must be undertaken in order to assess not only how traditional knowledge might be preserved, but harnessed for conservation-oriented livelihood development.

- **Socio-ecological mobility**

Opportunities for socio-ecological mobility are limited due to not only restriction in access, but inadequacies in infrastructure and market access. This contributes to the community's socio-economic vulnerability due to the lack of viable alternatives for income generation.





### **3. Landscape-scale Approach to Conservation of the Knuckles Conservation Forest**

#### **3.1 Justification for landscape-scaled conservation in the Knuckles Conservation Forest**

The Knuckles area represents the water towers and water sources for vast spatial area with a wide range of stakeholders, including national interests (Figure 6). Within the conservation forest and its buffer zone, the people who live and eke out a livelihood depend on the water sources in the upper catchments for drinking, irrigation and agriculture, and other everyday uses. Industries also collect and bottle mineral water for sale across the country; thus, there is a greater economic and national dependence. However, the dependence on water from the Knuckles area extends far beyond this mountain range; where the area of influence includes the larger landscape beyond the mountains, down the escarpments and into the lowlands.

From this perspective the suite of stakeholders become much greater. The human habitations, agricultural fields, reservoirs, and national parks such as Wasgamuwa that surround the mountains (Figure 5) are dependent on the water supplies from the Knuckles. Loss and degradation of the forests in the Knuckles mountains will, therefore, affect a wider range and larger number of dependent stakeholders than would benefit from clearing the forests in the upper watershed. Furthermore, some of the ongoing nationally important projects such as the Moragahakanda- Kalu Ganga, Victoria-Randenigala depend on the watershed services of the Knuckles Landscape.

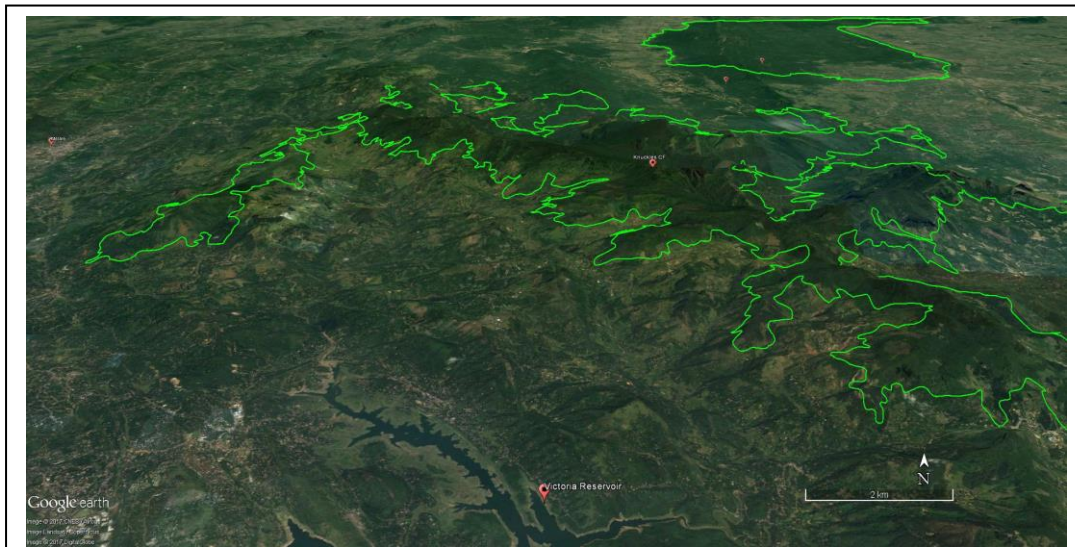


Figure 13. Google Earth image to show relative ecological links between the Knuckles Conservation Forest area and the surrounding human habitation, agricultural areas, and protected areas. The Knuckles mountain range is the water tower for these surrounding areas, and supply the necessary water to suppose ecological and human communities. Without a landscape-scale analysis these ecological links that should be conservative imperatives will not be considered for lack of perspective.

The stakeholder consultations indicated that the forest fires, some set deliberately, have destroyed forests in the Meda Dumbara, Uda Dumbara, Minipe, Wilgamuwa and Laggala-Pallegama Divisional Secretariats. Degradation of the watershed areas in the Meda Dumbara and Uda Dumbara areas due to these fires can affect the viability and longevity of the Victoria-Randenigala reservoirs, if environmental flows in the rivers that supply the reservoirs (Figure 7) are lost. Thus, the hydropower operators should become stakeholders in a conservation strategy designed from a landscape perspective to address forest fires in the Meda Dumbara and Uda Dumbara District Secretariats.

The northern sections of the KCF still has forest connectivity with Wasgamuwa National Park in the north (Figure 5). Elephants frequent the northern sections of the KCF, especially in the Laggala-Pallegama and Wilgamuwa areas, which have forest connectivity with Wasgamuwa, known for its elephant populations. While there is no confirmed evidence based on robust scientific research to indicate that these elephants may be coming from Wasgamuwa, and if so, are using the existing forest corridors, there is a high likelihood that this is true, especially given that the presence of elephants in the Knuckles is seasonal. While research is needed to confirm these observations, the forest connectivity should be maintained as a 'no regrets' strategy. Loss of this forest corridor due to agriculture or settlement could result in a higher human-elephant conflict. Furthermore, it is important to conserve the ecological gradient from montane to lowland, especially since strategies to build climate resilience in ecological communities recommend maintaining such 'climate corridors'.

The KCF includes a large area of the mountain range, and can be considered a ‘landscape’ within itself, rather than a site. Conservation strategies within the KCF should also,

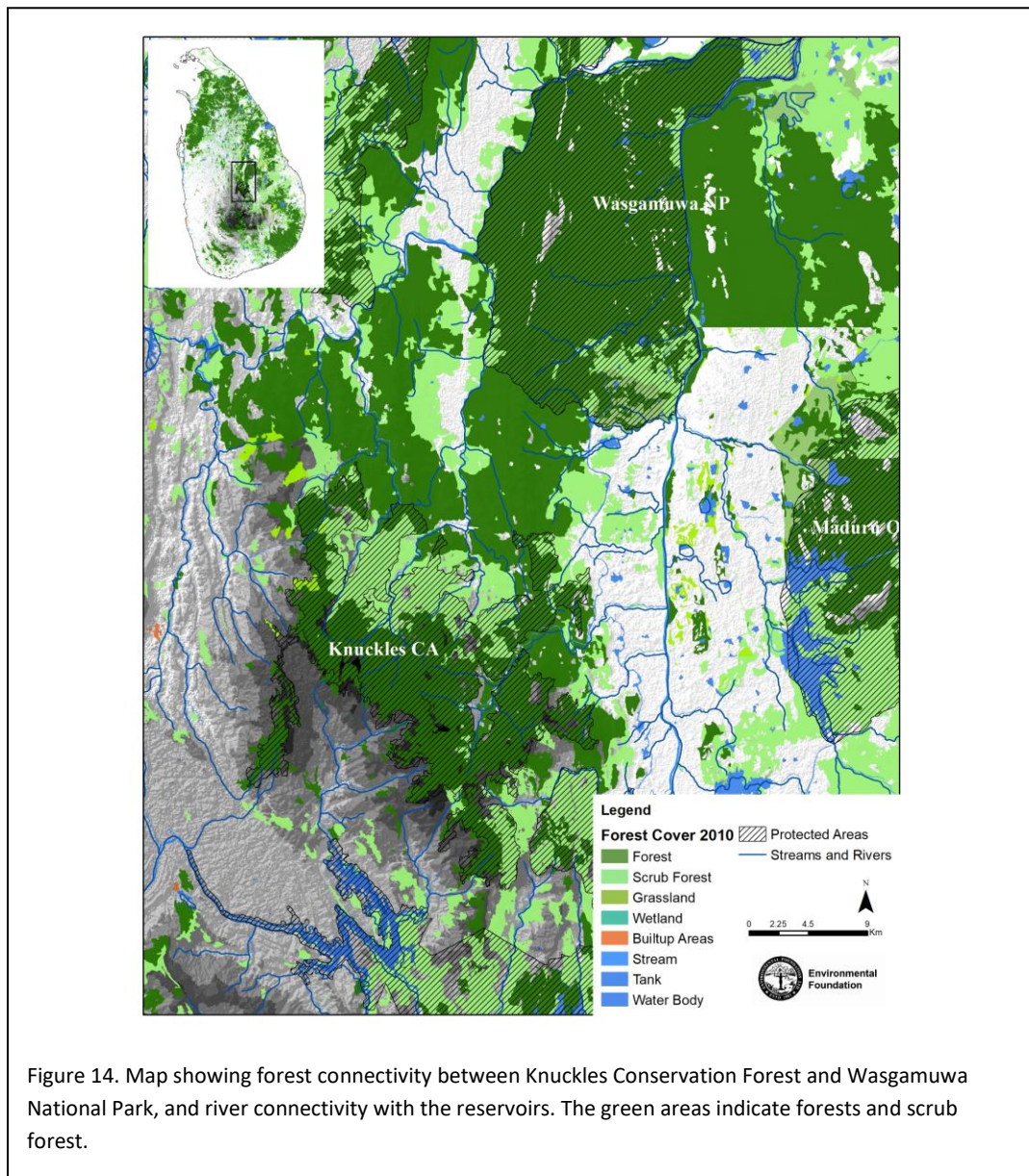


Figure 14. Map showing forest connectivity between Knuckles Conservation Forest and Wasgamuwa National Park, and river connectivity with the reservoirs. The green areas indicate forests and scrub forest.

therefore, include ensuring ‘landscape connectivity’ within the upper elevation zones. Forest fragmentation within the Knuckles is isolating populations of larger species, including leopards, sambar, barking deer, and forest birds, lizards, and butterflies. Forest conversion and degradation affects endemic species, restricting them to small habitat patches that are susceptible to ‘edge effects’ that cause environmental changes inside the core areas, and thereby the species. Thus, a forest conservation plan for the KCF should include a zoning plan to identify where forest conversion for anthropogenic land use, including for tea, cardamom plantations, *chena*, tourism, etc. will be disallowed, and where these land uses can be allowed to prevent ad hoc land conversion and habitat loss. Degraded lands that can contribute to connectivity through restoration should be identified using spatial planning analyses. Community-centred conservation efforts aligned with extant local livelihoods must



be actively mobilised towards this effect, towards also enhancing awareness on the importance of interlinked ecosystem services.

Thus, overall, a landscape-scale approach to ensure effective conservation of the Knuckles landscape should include the following:

- A spatial analysis to identify the ecosystem services accrued to the people/human communities and their livelihood activities within the KCF and in the surrounding area of influence, including in the lowlands.
- A spatial analysis to identify the ecosystem processes that maintain the natural communities and focal species (e.g., the endemic species, habitat specialists, threatened and endangered species) in the Knuckles area, and the habitat requirements to maintain these communities and species populations.
- A spatial analysis to identify the ecological linkages between the Knuckles and the ecosystems in the lowlands.
- 
- A conservation strategic plan and landscape and site-scale interventions through a science-based analysis with stakeholder consultation.
- 
- A baseline survey towards obtaining localised data on livelihoods (particularly the informal sector), community-environment relationships, natural resource use and mapping extant community-driven conservation efforts.

### **3.2. Strategies, Outcomes and Impact Indicators for landscape-scale conservation in the Knuckles Landscape**

The strategies and interventions will have both, top-down and bottom-up elements in the plan and planning process. Thus, while the landscape-scale approach will seek to streamline large scale processes in an integrated, multidisciplinary manner that combines natural resource management with environmental and livelihood considerations, the challenges within the KCF and buffer zone areas lie in reconciling the optimal nexus of cultivation, the burgeoning tourism sector, and conservation of some of Sri Lanka's irreplaceable biodiversity and critically important ecosystem services—sustainable water, pollination and slope stabilization to prevent natural hazards and disasters—for communities, including those located far beyond the boundaries of the Knuckles landscape. These interactive dynamics relating to land and natural resource use must be addressed in a way that fosters greater local awareness, community stewardship, and does not alienate local residents, which was raised as a concern during stakeholder consultations.

The landscape-scale approach and the recommendations for community projects have been identified within the context of: existing policy and laws; important biodiversity and ecological conservation needs, especially in terms of providing ecosystem services to the communities; and enhancing local participation in the development of community-centred and driven conservation initiatives, mindful of ensuring gender equality whereby women's participation is encouraged at all levels from inception to implementation, and generating



sustainable localised opportunities for securing livelihoods and enhancing economic benefits for communities while preserving the ecological value of the area.

The present attempts at conservation in the KCF and buffer zone have been decidedly top-down, imposed with little involvement or engagement with the local communities. This no doubt problematises the sustainability of conservation efforts, especially when the communities view them as an impediment to their wellbeing and economic mobility due to the prevalent restrictions in terms of owning land and access to resources. But some regulations are also necessary since *ad hoc* activities, including tourism-related construction, absence of provisions for crucial requirements such as waste management and disposal, unsustainable use of the forests and watershed, *chena* cultivation, and health and safety are central to the challenges faced locally. These also affect another larger community of stakeholders downriver. Therefore, the strategies will have to reconcile these inevitable differences, especially those that bring changes to local livelihoods.

### **3.3 Typology of Community Projects**

#### ***3.3.1 Recommendations for Project Interventions***

Recommendations for a landscape-scale conservation management strategy and approach of the KCF and buffer zone to address these key issues discussed in the Annex 3 include:

- 1) increase forest protection, and restoration in key areas that increase ecological connectivity, restore ecological integrity of forests and soils, and ensure sustainable provision of ecosystem services in line with existing community knowledge and traditional initiatives pertaining to conservation and landscape restoration;
- 2) conserve representative biodiversity with a focus on the irreplaceable endemic and endangered species and control the spread of invasive species;
- 3) improve and enhance livelihoods and localised income generation opportunities centred on the pillars environmental, social and economic sustainability through sustainable agricultural systems and alternative livelihoods informed by traditional knowledge and methods, and environmentally-sound innovations that rely on sustainable forest resource uses and natural resource conservation;
- 4) strengthen institutional structures and governance mechanisms for better, responsible natural resource and land management and greater community participation in the development and implementation of local conservation plans and initiatives;
- 5) regulations to govern and determine exploitation of natural resources and tourism activities which seek to empower, and not marginalise local communities;
- 6) build climate resilience and reduce vulnerabilities from natural disasters through better, community-driven ecosystem conservation and resilience building; and
- 7) increased environmental awareness among local communities and other stakeholders through knowledge transfer and exposure and documentation of extant traditional knowledge.



8) Geared to ensuring gender equality and emphasising the participation of women and youth at all stages, in relation to the documentation and adaptation of traditional knowledge, development and implementation of localised conservation plans and initiatives, and within the scope of livelihood efforts.

While many interventions will be implemented at local scales with community engagement, the following outcomes and types of project interventions are proposed as complementary and synergistic contributions to achieve the landscape-scaled targets. It is essential that the community is consulted from inception to implementation in order to assure a defined role for the community in carrying these actions forward in line with the pillars of economic, social and environmental sustainability. While the following table summarises the type of interventions, the **Annex 2** will provide more details along with maps for particular intervention.

### 3.4 Outcomes and Impact Indicators

Project typology and interventions needed	Impact Indicators
<p><b>Outcome 1 : Manage the Knuckles landscape through a “public – private partnership”</b></p> <p><i>Key Stakeholders: Forest Department, Divisional Secretariat representatives, other government stakeholders, private sector and local community representatives</i></p> <p>Target area: Entire landscape of Knuckles KCF and the boundary</p>	
<ol style="list-style-type: none"> <li>1. Support at least 2 consultative workshops (Kandy and Matale Districts) and preliminary meeting to from the management committee, draft the terms of reference according special attention to community role and its economic, social and environmental sustainability, code of conduct, and enter into a formal Memorandum of Understanding among stakeholders for sustainable management of the KCF and buffer zone through a PPP. Community stakeholders will be selected by according special attention to gender, age and ethnicity.</li> <li>2. Support strategic management plan for the landscape (i.e., the KCF and buffer zone).</li> <li>3. Address community role, sustainability, management</li> </ol>	<ul style="list-style-type: none"> <li>• Formal agreement to manage a landscape through a PPP</li> <li>• A PPP multi-stakeholder management committee adequately representative of community demographic in terms of gender, age and ethnicity formed.</li> <li>• Climate change-integrated, landscape conservation-management strategic plan developed and approved by the management committee.</li> <li>• Framework for an enabling policy to manage the conservation area according to the strategic plan developed and approved through government gazette.</li> </ul>



<p>responsibilities, project implementation targets assigned to respective DSs (but within context of landscape strategy).</p> <p>4. Support process to formulate and approve a policy framework for enabling conditions to manage the KCF and the buffer zone as a contiguous landscape through PPP. Necessary to empower management committee, including to acquire and amalgamate abandoned and unoccupied private lands, regulate/ prevent destructive practices such as mining, tourism and other impacts (e.g., solid waste, behavior etc.).</p>	<p>Increased financial support from private sector and other ongoing projects including the Moragahakanda – Kalu Ganga to carry out collaborative projects</p>
<p><b>Outcome 2: Support conservation interventions to protect and restore sensitive ecosystems, habitats, and species, and prevent further degradation of the natural resources in the core area, especially in headwaters of the streams.</b></p>	
<p>1. Support development and implementation of in-situ conservation action plans for endemic species. Led by National Biodiversity Secretariat and Department of Wildlife conservation. With citizen scientists from the KCA, Academic Institutions, NGO experts (e.g., Young Zoologists Association)</p> <p>2. Support habitat restoration and management for endemic/habitat specialist species. Maintain ecological connectivity; climate corridors. Prioritize KCA core, where illegal logging, chena, and fires have degraded or converted forests. Most affected by illegal logging and chena (Panwila, and Wilgamuwa DSs) fire (Meda Dumbara, Uda Dumbara, Minipe, Wilgamuwa and Laggala- Pallegama DSs).</p> <p>3. Mobilize and train citizen scientists from the KCF and buffer zone communities in priority DS's to</p>	<ul style="list-style-type: none"> <li>• At least 1,300 ha of forests with abandoned cardamom plantations under reforestation and sustainable management by community forest management groups.</li> <li>• 320 ha of chena in the KCF and buffer zone under restoration and reforestation projects.</li> <li>• The ~ 900 ha of tea lands inside the KCF core area (in Rattota, Ukuwela, Panwila, Meda Dumbara, and Uda Dumbara) are acquired and being reforested through a gradual process of thinning and planting with indigenous trees.</li> <li>• At least 500 ha of under forest restoration and management are made eligible for carbon funds as a pilot UNREDD+ project.</li> </ul> <p>At least 25 citizen scientist groups formed (gender disaggregated), trained and are actively engaged in biodiversity conservation</p>



<p>manage and monitor sensitive habitats and species.</p> <p>4. Mobilize and train citizen groups in priority DSs to create awareness of environmental best practices to control and prevent pollution and fires.</p> <p>5. Restore disused tea plantations in core area Rattota, Ukuwela, Panwila, Meda Dumbara and Uda Dumbara DSs.</p> <p>Develop pilot reforestation projects for eligibility for carbon credits under UNREDD+.</p>	<p>and enhancing ecosystem services.</p> <p>At least 20 members of the local community actively involved in the development and implementation of the conservation plans with equitable representation in terms of gender.</p>
<p><b>Outcome 3: Conserve and increase forest cover in the buffer zone of the KCF by restoring lands that are degraded or mismanaged through community - based restoration interventions</b></p>	
<p>1. Acquire degraded and unmanaged tea estates in the buffer zone from the SLPCA for reforestation through community forestry programs. Based on landscape spatial analysis to identify strategic areas. Prioritize tea estates in the Meda Dumbara, Patha Dumbara, Panwila, Ukuwela and Rattota DSs</p> <p>2. Restore the abandoned cardamom plantations. Laggala Divisional Secretariats (Ranamure, Narangamuwa, Attanwala, and Rambukoluwa grama Niladari Divisions), Kandy Divisional Secretariats (Meemure and Ranagala Grama Niladari Divisions)</p> <p>3. Establish community forest management groups (disaggregated by gender) to manage acquired tea estates. Meda dumbara, Patha Dumbara, Panwila, Ukuwela, and Rattota DSs. CUG formation and transparent governance structures, with equitable ethnic and gender representation.</p>	<p>At least 1,000 ha of abandoned tea in critical water source areas of the buffer zone under community forestry using analog forestry.</p>



<p>4. Establish community - based natural resource committees (disaggregated by gender) within the Moragahakanda resettlement communities.</p> <p>Guide sustainable land, water, and forest management plan for the immediate areas of resettlements and areas of impact, through inclusive and consultative processes</p> <p>5. Introduce and support crop - depredation and human – wildlife conflict mitigation measures.</p> <p>6. Mobilize and train community - based fire prevention and control units with rapid response capability Meda Dumbara, Uda Dumbara, Minipe, Wilgamuwa and Laggala - Pallegama DSs</p>	
<p><b>Outcome 4: Support sustainable agricultural practices that preserve and enhance agricultural biodiversity and productivity.</b></p>	
<p>1. Introduce and promote organic agriculture, and innovative agricultural techniques that promote soil conservation and enrichment, and low water use and dependency.</p> <p>Laggala - Pallegama and Uda Dumbara DSs, where erosion and soil degradation is high.</p> <p>2. Develop direct market linkages between the farmers and national and international commercial enterprises for assured market and price points.</p> <p>Laggala- Pallegama and Uda Dumbara DSs, where innovative agricultural technologies will be promoted.</p> <p>3. Support and promote innovative and novel agricultural strategies.</p> <p>e. g., cardamom cultivation in Pinus</p>	<ul style="list-style-type: none"> <li>• At least 5,000 ha of tea estates available for divestment in the buffer zone brought under alternative, sustainable land uses, including farming using methods that promote soil conservation and alternative livelihoods (e. g., horticulture) that encourage ground cover to stabilize slopes and conserves soils.</li> <li>• At least 2, 000 ha of land cultivated using traditional crop varieties.</li> <li>• At least 2 farmer - group enterprises equitably engaging both men and women linked with corporate sector for better market access and price guarantees.</li> </ul>



<p>plantations; process produce (e. g., tomatoes, pepper) using solar dryers and add value; promote SALT technologies; plant <i>Gliricidia sepium</i> along hedgerows for biomass energy.</p>	
<p><b>Outcome 5: Ecologically sustainable, community - owned revenue generating schemes to improve livelihoods of people</b></p>	
<p>1. Support pilot projects to develop alternative livelihood opportunities to reduce pressure on the natural ecosystems e. g., fruit and vegetable processing, mushroom cultivation, greenhouse horticulture and nurseries in home gardens, bee- keeping, organic composting, etc. Prioritize remote, isolated villages where livelihood options are low, and people rely heavily on forest resources, and Moragahakanda resettlement communities.</p> <p>2. Form local entrepreneur groups and develop partnerships with corporate sector for market access with guaranteed price points.</p> <p>3. Develop a “Knuckles or “Dumbara” brand and create awareness to access niche markets and for value addition. Designation of Origin (PDO) in line with the European Union mechanism to protect the names, methods and quality of agricultural produce and speciality products and create awareness nationally and internationally to access niche markets and for value addition. PDO Schemes are geared towards not only promoting products of specific geographic origin, especially those from underserved rural areas, improve the income of local farmers in line with a commitment to maintaining quality, create localised</p>	<ul style="list-style-type: none"> <li>• A landscape- scale “ecotourism” program developed and implemented with benefits to community- based enterprises</li> <li>• Branded local produce marketed in niche markets through corporate partnerships</li> <li>• A community- based waste disposal and recycling enterprise.</li> <li>• Number members in the community (gender disaggregated) receiving direct benefit from these schemes.</li> </ul>



<p>opportunities in local areas, and the provision of clear information on origin to consumers.</p> <p>4. Develop and support implementation of a strategic, landscape - scale tourism program. Establish committee to manage and monitor operations with transparent governance systems.</p> <p>5. Mobilize, train, and establish community-based (gender-disaggregated) naturalist groups with an accreditation system and a web-based system to engage their professional services.</p> <p>6. Establish a community- based and operated solid waste disposal, recycling, and anti- litter program.</p> <p>Priority is main Naula road, and at specific spots such as Riverston and Mini World's End (Uda Dumbara, Raththota)</p>	
<p><b>Outcome 6: Increase knowledge and capacity of the local communities and institutions to increase resilience of the overall landscape, communities and livelihoods</b></p>	
<p>1. Create awareness programs on the unique features and ecological importance of KCF; landscape and national- scale socio - ecological and economic contributions.</p> <p>Watershed/ecosystem values; sustainable commercial activities. All of the KCF and buffer zone, including the most remote villages.</p> <p>2. Develop and support a knowledge sharing platform for local community groups in the KCF and buffer zone for landscape- scale planning and strategizing.</p> <p>Support technical and expert inputs to advice on climate smarting livelihood</p>	<ul style="list-style-type: none"> <li>• Publications documenting lessons learned from SGP- supported projects produced and distributed</li> <li>• Internet and social media- based knowledge platforms developed for use by communities, national development and conservation agencies and external expert groups</li> <li>• Number of community groups or collectives for knowledge-sharing and transmission established</li> </ul>



options, agriculture and infrastructure.	
--	--

### 3.5 Criteria for Project Selection

Project selection must take place in line with the following subsequent to undertaking a survey of active community-based groups and initiatives undertaken locally:

- Aligned with national policies, the KCF/buffer zone strategic plan, and national and local legislature.
- Must be in compliance with principles of ecosystem and biodiversity conservation and sustainability of using natural resources.
- Must increase ecosystem and social resilience and sustainability, and promote social capital.
- Must bring direct or indirect economic benefits to communities and the local economy.
- Must benefit a wider group rather than a few individuals; in the case of the latter, must not cause negative impacts and harm on the larger community.
- Must be geared to actively solicit local/traditional knowledge, community participation, engage women and youth.
- Must be aimed at raising awareness among the wider community members about the importance of conservation and other interlinked concerns, challenges and opportunities.
- Should seek to document, utilize, adapt, disseminate and elevate traditional knowledge and practices specific to the region.

### 3.6 Criteria for CBO selection

- Capacity to implement and previous experience in community mobilisation with a social and/or environmental focus
- Diverse membership reflecting the socio-economic and cultural diversity of the local area, alongside age and gender.
- Capacity to co-finance initiatives, or possess the capacity to mobilise human, material and/or financial capital towards implementation.
- Capacity to handle finances or proof of having sound financial management system
- Registration at relevant government institutions
- Objects of incorporation are in line with UNDP SGP programme objectives
- Willingness to adopt a sound and regular reporting mechanism.

## 4. Monitoring and Evaluation Plan

- Projects must be initiated on the basis of undertaking a comprehensive baseline assessment in order to determine indicators at a localised level, given the diversity of issues and context in the Knuckles Conservation Forest region.



- The indicators for monitoring will necessarily be at different scales. The indicators also have to be practical and 'do-able', with the least number of indicators that will provide the most information with the least effort and cost.
  - Species indicators:
    - Distribution of endemic species. The distribution of endemic species will provide information on the status of the irreplaceable species in the KCF. Indicators can be monitored through field surveys.
  - Composition of forest ecosystem.
    - This indicator will provide information about the integrity of the forests in the KCF. Permanent vegetation monitoring plots will be established in the KCF. Plots will be surveyed for the species compositions every two years. Monitoring should focus on regenerating species, presence of invasive species, and status of species sensitive to environmental change, such as ferns, mosses, lichens, etc. consolidated
  - Forest change indicators.
    - Change in forest and other land cover. Use remote-sensing data (e.g., Global Forest Watch) to track forest loss and gain (e.g., reforestation and restoration areas).
  - Environmental flow indicators
    - Rainfall -runoff in the area and changes in the hydrological regime.
  - Socio-economic indicators
    - Number of new alternative livelihood activities, which are sustainable, implemented
    - Change in the crop yield with the increased use of organic agricultural techniques
    - Inclusivity of local community and authorities in conservation and development within the target landscape
- Establishment of a regular reporting mechanism with at least two M&E sessions held at the landscape level, with one conducted during the implementation and the other at the end of the project.
- Each project will have a robust M&E framework that will monitor the project level indicators and assess the progress of activities against the expected outcomes. Beneficiary organizations will submit quarterly physical and financial progress reports, which will also include case studies presenting the success of the projects and the lessons learned.
- At least two field monitoring visits need to be conducted to evaluate the ground level activities and the overall project progress.
- Setting up of a multi-stakeholder (community members, private and public sector representatives, development partners, technical specialists) steering committee to periodically review progress, and adapt project scope and activities as required.
- Encouraging the setting up of a local newsletter with the support of local schools or youth organisations to update community on progress and raise awareness on relevant issues



## 5. Knowledge Management Plan at the Landscape Level

- Knowledge management will be a main component of the program strategy and the best practices, lessons learned and case studies will be used to generate knowledge sharing material.
- Different multimedia tools including, newsletters, policy briefs, brochures, short-films and video clips will be used to disseminate information. A photo documentary or a video clip to depict key case studies will be recommended.
- As with the M&E framework, grantees will be requested to allocate and develop a knowledge management plan by identifying the type of knowledge management products that will be produced during the course of the project.
- The participants will be encouraged to share their experiences through regular workshops on thematic issues organized with the involvement of various stakeholders (CBOs, NGOs, government bodies, academia). They will be encouraged to participate in nationally and internationally important events and knowledge fairs such as World Environment Day. Platforms such as these will be used as an opportunity to inform and influence policy at the local, regional and national levels. Further, these can be also focused on strengthening local institution and enhancing skills at the local level to monitor and manage activities in a sustainable manner.

## **Annex 1**

### **1.0 Overview of the Landscape**

The communities in Matale and Kandy districts across which the Knuckles Conservation Forest and the buffer zone area are largely reliant on agriculture and other types of cultivation for income generation. Preliminary meetings with stakeholders revealed that there exists some tension in relation to the stringent demarcation of forest boundaries. While there is no uniformity or consensus on the demarcation of boundaries and their enforcement, residents appear to have a good understanding of what the official boundary lines are. Generally, while the importance of conservation was understood, formal efforts at conservation were viewed as detrimental to the community, notably due to the interlinked restrictions on livelihood, be it subsistence cultivation, commercial agricultural practices or tourism-related ventures. Gripses were also expressed in relation to local communities no longer being able to enjoy the local landscape due to restricted access to certain sites of significance such as Lakegala off Meemure. Past practices associated with dependence on forest products for medicinal purposes or to supplement diet were noted to be declining if not absent due to restrictions in accessing the forest area. This was noted in relation to the lack of viable alternative opportunities for income generation, highlighting that top-down efforts at conservation were viewed as alienating local communities and poorly aligned with local development efforts as made evident by the politicisation of, and various failed attempts at completing local infrastructure projects. These sentiments are inevitably associated not only with residents being compelled to seek work elsewhere in order to supplement their earnings, but also the lack of scope and opportunities for young people in particular.

Moreover, what is of particular significance is that tourism is a burgeoning sector in both districts. The Knuckles area is popular with a growing number of domestic tourists, which in turn has led to a rapid incline in the sharing economy through conversion of dwellings into homestays and the construction of small-scale tourist accommodation. These ad hoc constructions coupled with largely unregulated interlinked entrepreneurial activities are a source of considerable concern locally, not only due to fears of both internal and external competition, but the lack of adequate provisions for visitor safety, waste management and other social issues associated with provision of home-stay tourist accommodation.

Tensions persist in relation to access to scenic protected areas, and given the informality with which these ventures take place (and typically, as a means of diversifying or supplementing one's income) entails that very little information is available on the type, scope or scale of these activities. As of 2016, the percentage distribution of informal sector employment in the non-agricultural sector by district, stands at 54.1% in Kandy and 54.3% in Matale highlighting that over half the population in the informal sector are engaged in non-agricultural activities.

## **1.1 Socio-Economic and Demographic Context**

### **1.1.1 Matale**

The Matale District covers an area of 1,993km<sup>2</sup> and is made up of 11 Divisional Secretariats and 545 Grama Niladhari Divisions. As of 2015, the district's total population is 502,000 (242,081 Male, 259,919 Female), with a labour force of 199,142 (2015). 188,518 are listed as employed, while 10,624 (5.3% of labour force) are listed as unemployed. The district's poverty headcount index is 7.8%, with 37,000 persons classified as poor or living below the Official Poverty Line of LKR 3,624 per month (2012/13). The mean household income for the Matale District is LKR 35,004 per month (and LKR 9,392 mean per capita income), which is below the national average of LKR 45,878 (and LKR 11,819 per mean capita income). Percentage of average monthly household income is derived as follows: 29.0% from wages, 12.9% from agricultural activities, 12.6% from non-agricultural activities, 13.0% from other sources of cash income, 15.3% from ad hoc gains, 17.1 non-monetary gains, and 7.3% income in kind. Mean household expenditure is LKR 39,222, which considerably exceeds the mean household income indicating likely debt concerns, and possible economic hardship. The poorest 20% of the population account for 5.4% of the district's income share, compared to 47.6% of the middle 60% and 47% of the richest 20% indicating a considerable level of inequality. However, these figures are more or less on par with the national averages of 4.5%, 42.6% and 52.9% for poorest 20%, middle 60% and richest 20% respectively.

14.8% of the Matale District's population are listed as suffering from a chronic illness or disability, slightly higher than the national average of 14.2%.

### **1.1.2 Kandy**

The Kandy District covers an area of 1,906.3 km<sup>2</sup> and is made up of 20 Divisional Secretariats and 1,188 Grama Niladhari Divisions. As of 2012, the district's total population is 1,340,000 (610,000 Male, 720,000 Female), with a labour force of 508,591 (2015). 481,373 are listed as employed, while 27,217 (5.4% of labour force) are listed as unemployed. The district's poverty headcount index is 6.2%, with 83,000 persons classified as poor or living below the Official Poverty Line of LKR 3,624 per month (2012/13). The mean household income for the Kandy District is 43,138 per month (mean per capita income LKR 10,899), which is below the national average of LKR 45,878 (and LKR 11,819 per mean capita income). Percentage of average monthly household income is derived as follows: 33.9% from wages, 15.5% from agricultural activities, 11.2% from non-agricultural activities, 14.8% from other sources of cash income, 8.3% from ad hoc gains, 16.3 non-monetary gains, and 5.1% income in kind. This indicates a considerable diversity in terms of income generation, but may also suggest a degree of income instability. Mean household expenditure is LKR 41,442, which lies below the average monthly income, indicating then a higher degree of income stability in comparison to Matale. The poorest 20% of the population account for 4.9% of the district's income share, compared to 44.3% of the middle 60% and 50.8% of the richest 20% indicating a considerable level of income inequality. However, these figures are more or less on par with the national averages of 4.5%, 42.6% and 52.9% for poorest 20%, middle 60% and richest 20% respectively.



13.8% of the Kandy District's population are listed as suffering from a chronic illness or disability in comparison to the national average of 14.2%.

The Divisional Secretariat and Grama Niladhari Divisions within the Kandy and Matale Districts that belong to the Knuckles Conservation Forest Area and Buffer Zones are in Table 1.

*Table 1 Administrative divisions within the Knuckles Conservation Forest and its Buffer Zone*

<b>DS division</b>	<b>No. of GN divisions- Knuckles Conservation Forest*</b>	<b>No. of GN divisions- Buffer Zone<sup>+</sup></b>	<b>Total No. of GN divisions from each DS division</b>
<b>Kandy</b>			
Meda Dumbara	14	39	53
Minipe	06	07	13
Panwila	11	03	14
Patha Dumbara	02	02	04
Uda Dumbara	23	06	29
Kundasale	N/A	14	14
<b>Matale</b>			
Laggala-Pallegama	21	05	26
Rattota	08	13	21
Ukuwela	03	03	06
Wilgamuwa	08	01	09
Ambanganga Koralaya	N/A	06	06
Naula	N/A	02	02

\*- Number of GN divisions on the Knuckles Conservation Forest boundary

+ - Number of GN divisions outside the Knuckles Conservation Forest boundary but within the buffer zone boundary

The population data pertaining to the aforementioned administrative areas are in Table 2.

Table 2 Population densities in KCF and buffer zone with respect to DS division

DS division	Knuckles Conservation Forest			Buffer Zone		
	Area (ha)	Populati on	Populatio n Density (per ha)	Area (ha)	Population	Population Density (per ha)
<b>KANDY</b>						
Kundasale	N/A	N/A	N/A	620.06	15349	24.75
Meda Dumbara	2089.04	10237	4.9	5934.5	25557	4.31
Minipe	1305.22	2548	1.952	3876.1	10993	2.84
Panwila	3084	28639	9.286	5300.74	3546	0.67
Patha Dumbara	142.26	4728	33.235	292.22	3671	12.56
Uda Dumbara	9163.86	8883	0.969	2784.49	2143	0.77
<b>Total per district</b>	<b>15784.38112</b>	<b>55035</b>	<b>N/A</b>	<b>18808.1</b>	<b>61259</b>	<b>N/A</b>
<b>MATALE</b>						
Ambanganga Koralaya	N/A	N/A	N/A	1558.51	7801	5.01
Laggala-Pallegama	12899.66	5419	0.42	8068.15	1413	0.18
Naula	N/A	N/A	N/A	452.46	873	1.93
Rattota	1244.73	9857	7.919	2942.23	15584	5.3
Ukuwela	318.27	2285	7.179	1553.33	1697	1.09
Wilgamuwa	1004.9	9137	9.092	1806.35	249	0.14
<b>Total per district</b>	<b>15467.56</b>	<b>26698</b>	<b>24.61</b>	<b>16381</b>	<b>27617</b>	<b>13.65</b>
<b>TOTAL</b>	<b>88876</b>	<b>81733</b>	<b>N/A</b>	<b>88876</b>	<b>88876</b>	<b>N/A</b>

The total population of this area is 170, 609. It is essential to note that the figures reflect the number of people living in the adjacent GN Divisions, rather than those living specifically within the Knuckles Conservation Forest and Buffer Zone areas.

*Table 3 Population by Sector*

DS division	Population by Sector			
	Urban	Rural	Estate	Total
<b>KANDY</b>				
Kundasale	<b>Data unavailable at present.</b>			
Meda Dumbara				
Minipe				
Panwila				
Patha Dumbara				
Uda Dumbara				
<b>Total per district</b>				
<b>MATALE</b>				
Ambanganga Korallaya	--	13518	2689	16207
Laggala-Pallegama	--	12395	152	12547
Naula	--	31998	--	31998
Rattota	--	45585	7620	53205
Ukuwela	1013	63219	6248	70480
Wilgamuwa	--	30557	--	30557
<b>Total per district</b>	<b>1013</b>	<b>197272</b>	<b>16709</b>	<b>214994</b>

As illustrated in Table 3, the majority of the population are rural, followed by those resident in the Estate Sector indicating inevitable differences in socio-economic and environmental

factors including livelihood, cultivation practices, land use and inheritance, and traditional knowledge pertaining to the environment. In the Matale District, only a very small portion of the population living in Divisional Secretariats adjacent to the Knuckles Conservation Area are considered Urban, and they are concentrated in the Ukuwela Division.

The population in and around the KCF depends mainly on agriculture, primarily paddy and chena (slash and burn) cultivation. In addition to these, the surrounding communities engage in tea, rubber, coconut cultivation and small-scale export crop production (Figure 2). Land use patterns in the Kandy and Matale Districts are in Table 4 and 5, respectively.

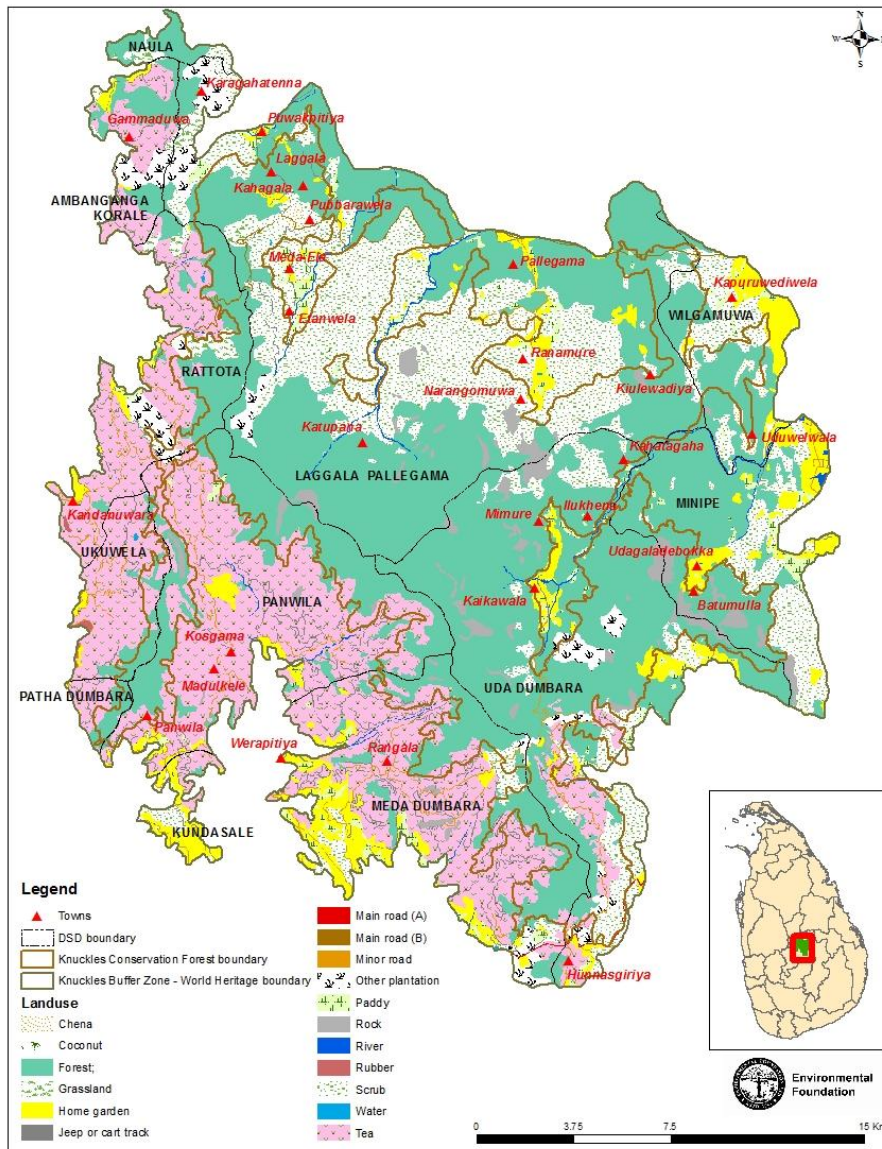


Figure 1 Land use map for KCF and its buffer zone

Table 4 Land Use patterns in the Kandy District

Nature of land	Area (Ha)	Percentage (%)
----------------	-----------	----------------

01. Asweddumized paddy land	22386.1	11.2
02. Tea	3291.0	1.7
03. Rubber	1589.0	0.8
04. Coconut	12370.0	6.2
05. Cinnamon	329.0	0.2
06. Other crops	26328.0	13.2
07. Forests		
1. Dense forests	60711.0	30.5
11. Open forests	11797.0	5.9
111. Planted forests	4093.0	2
08. Thick scrubs/Chena	1320.0	0.7
09. Gardens	38323.0	19.2
10. Reservoirs	4100.0	2.1
11. Buildings	1450.0	0.7
12. Sand and Shelves	4200.0	2.1
13. Waste Lands and Abandoned Lands	3851.9	1.9
14. Other (Dedicated Lands, Roads, Cemetery)	3161.0	1.6
Total	199300.0	100

Land use patterns in the Kandy district reveal that the largest percentage of land use is in relation to tea cultivation, rubber cultivation, grass lands including chena cultivation, and home gardens.

*Table 5 Land Use patterns in the Matale District*

Nature of land	Area (Ha)	Percentage (%)
01. Asweddumized paddy land		

1. Irrigated	11,366	5.9
11. Rainfed	4763	2.5
02. Tea	22,599	11.6
03. Rubber	1,230	0.6
04. Coconut	4,729	2.4
05. Cinnamon	81	0.0
06. Other crops	17,564	9.1
07. Forests		
1. Dense forests	23,317	12.0
11. Open forests	10,759	5.5
111. Planted forests	7,445	3.8
08. Grass lands/Chena	21,755	11.2
09. Marshes and Mangroves	12	0.0
10. Home gardens	49,794	25.7
11. Reservoirs	4,227	2.2
12. Building	1,858	1.0
13. Sand and Mountain	2,406	1.2
14. Abandoned land	9,552	4.9
15. Other (sacred places, roads, cemetery etc.)	543.0	0.3
Total	194,000	100.00

The Matale district has a higher percentage of tea cultivation area and dense forest area, together with paddy, other crops and home gardens taking up a significant portion of utilised land.

## 1.2 Policy and legal Context

Presently the KCF receives state protection under two Gazettes. In 2000, in accordance with the Forest Conservation Ordinance 1907 (No. 16 of 1907) as amended up to 2009 (hereafter referred to as the Forest Ordinance) Section 3 A (1), an area of 31,305 ha was declared a Conservation Forest (Gazette No. 1130/ 22 dated 2000-05-05). This category receives the

highest level of protection under the Forest Ordinance, and the KCF is the first Conservation Forest to be declared in Sri Lanka. Areas protected under the Forest Ordinance are managed by the Forest Department (FD) of Sri Lanka.

The KCF includes other lands that are not owned by the state within its boundary. As the 'Conservation Forest' status is only applicable to state owned land (Forest Ordinance Section 3 A (2)), the protection provided by the new status of the forest was unable to give legal protection against any harmful activities taking place in these private lands.

However, according to the section 3 A (6), of the Forest Ordinance, any immovable property not being state land, which possesses of any features referred to in the section 3 A (1), that is required for the existence and preservation of the Conservation Forest, may be acquired under the provisions of the Land Acquisition Act on the recommendation of the Minister.

To protect these lands till such acquisitions are complete, an Environmental Protection Area (EPA) was declared along the same boundary as the KCF by a second Gazette issued in 2007 (Gazette No. 1507/ 9 dated 2007-07-23) (Annex 2) under the National Environment Act No. 47 of 1980 (hereafter referred to as the National Environment Act). This gazette pertains to all non-state-owned land within the prescribed boundary. EPAs under the National Environment Act are managed by the Central Environment Authority (CEA) of Sri Lanka.

Currently, the Forest Department (FD) has completed most of the land acquisition process regarding the above private lands within and bordering the KCF. According to the officials at the FD the next step is to re-gazette the Conservation Area including these changes.

Thus, the current status is that all lands within the KCF are protected, either as Conservation Forest under the Forest Ordinance or as an EPA under the National Environment Act. The ownership of the land in the buffer zone varies as large private plots of land, small private plots of land (village level) and state.

### **1.3 Biodiversity and Ecological Value including Watershed Services**

Overall, the KCF has been included as a conservation priority in several global analyses, including Endemic Bird Areas, Centres of Plant Diversity, Global 200 ecoregions, Key Biodiversity Areas, and Alliance for Zero Extinction Sites for its biodiversity values and contributions to a global biological repository. Its inclusion as a Global Biodiversity Hotspot flags it as a high biodiversity area that is also under high threat from anthropogenic drivers.

#### ***1.3.1 Biodiversity Values***

The KCF and its surrounding area, including the buffer zone, harbours 31% of higher plants (Angiosperms and Gymnosperms) and ferns (Pteridophytes), and 32% of the species from several faunal groups (Birds, Butterflies, Dragonflies, Mammals, Reptiles, Amphibians, Freshwater Fishes, Land Snails, Tarantula Spiders and Freshwater Crabs) known from Sri Lanka. For example, of the 3,492 plant species (including 943 endemics) known from the country, 1,068 (including 318 endemics) are found in the KCF and its surrounding area. Also, of the 1,615 species (including 658 endemics) of mammals, birds, reptiles, amphibians, freshwater fishes, land snails, butterflies, dragonflies, freshwater crabs and spiders,

recorded from Sri Lanka, 520 (including 195 or 30% endemics) are known to occur in the KCF and buffer zone.

But the Knuckles is also known for endemic species that are restricted to this mountain range. The Knuckles have thus been identified as a site of global importance in an analysis conducted by the Alliance of Zero Extinction.<sup>1</sup> Some of the species that qualify the Knuckles as an AZE site are seven species of frogs (*Nannophrys marmorata*, *Philautus fulvus*, *Philautus hoffmanni*, *Philautus macropus*, *Philautus mooreorum*, *Philautus steineri*, *Philautus stuarti*) that are restricted to these mountains, and are conservation imperatives because of their irreplaceability.

The Knuckles range is one of the 70 International Bird Area (IBA) sites in Sri Lanka listed by Bird Life International (Table 6). Three (A1, A2, A3) of four criteria are fulfilled by the Knuckles range as an IBA.

A1. Globally Threatened Species (47 sites in Sri Lanka),

A2. Restricted-Range Species (54 sites in Sri Lanka),

A3. Biome-Restricted Species (45 sites in Sri Lanka),

A4. Congregations (26 sites in Sri Lanka)

*Table 6: Summary of the Knuckles IBA*

Site ID	National Name	International Name	Final Code	Area (ha)	Criteria
15240	Knuckles Range	Knuckles Range (Knuckles IBA)	LK026	30000	A1, A2, A3

The Knuckles is also a Key Biodiversity Area<sup>2</sup>, a site deemed to be of global importance for biodiversity based on presence of threatened biodiversity, geographically restricted species, ecological integrity, and irreplaceable species and biological processes.

The Knuckles have also been recognized as a Centre for Plant Diversity<sup>3</sup> because of its plant richness and endemism.

### **1.3.2 Watershed values and services**

<sup>1</sup>

[https://web.archive.org/web/20101104180357/http://www.zeroextinction.org:80/database/2010\\_AZE\\_Data.xls](https://web.archive.org/web/20101104180357/http://www.zeroextinction.org:80/database/2010_AZE_Data.xls)

<sup>2</sup> <http://www.keybiodiversityareas.org/what-are-kbas>

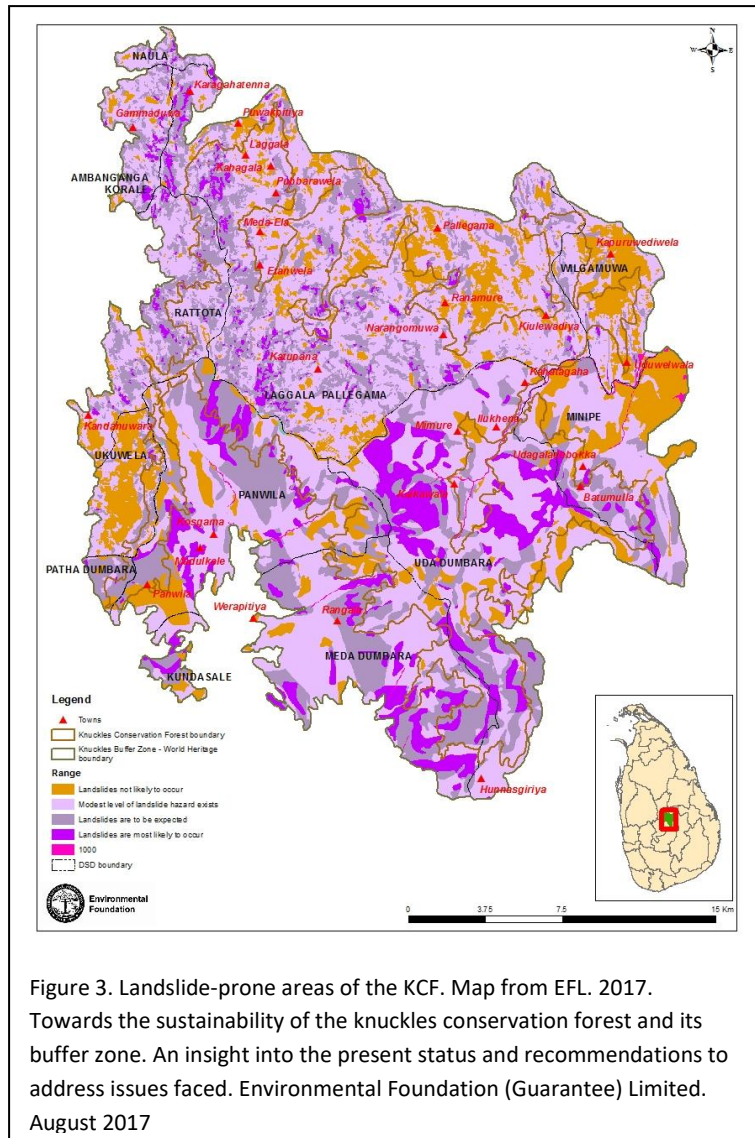
<sup>3</sup> UNEP-WCMC 2013. Centres of Plant Diversity. Version 1.0 (digital reproduction of Centres of Plant Diversity, eds S.D. Davies, V.H. Heywood, WWF and IUCN, Gland, Switzerland, 1994-7)



The KCF and its buffer zone are entirely within the Mahaweli river basin and provide 30% of water to the major reservoirs in the Mahaweli system: Victoria, Randenigala and Rantembe reservoirs. If the watershed's forested slopes are degraded and the soil is exposed, the topsoil will be washed downslope, and into the reservoirs, decreasing their storage capacities. The silt and other particulate matter will abrade and damage the turbines. Furthermore, given the local communities' reliance of natural water sources for consumption, the role of these forests in water purification must be accorded particular attention.

Forest cover on the slopes also plays a crucial role in regulating water quality and flow rate, buffering against floods. Loss of forest cover will greatly reduce the potential for retaining water within the upper slopes by allowing rainfall to percolate into the ground, rather than be lost as surface run-off, and replenish groundwater. Bare slopes without forest and ground cover also leaves the soil exposed to the impacts of rain drops, loosening the topsoil and exacerbating erosion. Erosion also has considerable implications for cultivation and agricultural productivity, which in turn may affect not only livelihoods, but food security for local communities that rely on subsistence. Water shortages have been noted in several areas in the region, and its exacerbation could have serious repercussions.

Analyses have shown that many areas in the KCF are prone to landslides (Figure 3). Thus, forest cover on the slopes in the KCF also acts as a buffer against natural disasters within the mountain range, and far downstream because the forests will stabilize the slopes. Thus, exposed and degraded slopes should be reforested, and existing forest cover should be conserved. Given the inclining incidence of inclement weather in Sri Lanka, the consequences for the physical safety of local communities could be significant. Landslide-related deaths and displacement have increased in the past few years, and the pressure to provide suitable alternatives for relocation have resulted in the clearing of state-owned



Analyses have shown that many areas in the KCF are prone to landslides (Figure 3). Thus, forest cover on the slopes in the KCF also acts as a buffer against natural disasters within the mountain range, and far downstream because the forests will stabilize the slopes. Thus, exposed and degraded slopes should be reforested, and existing forest cover should be conserved. Given the inclining incidence of inclement weather in Sri Lanka, the consequences for the physical safety of local communities could be significant. Landslide-related deaths and displacement have increased in the past few years, and the pressure to provide suitable alternatives for relocation have resulted in the clearing of state-owned

lands with little attention paid to environmental impact that occurs as a result of resettlement and interlinked infrastructure development. These relocations have also been viewed as disruptive to livelihoods, especially where community livelihoods rely on local environmental resources, be it in the form of foraging, agriculture, or other forms of cottage industry.

Thus, an ecologically intact KCF is necessary for sustained provision of water to a large part of the country. Degradation of the watersheds from removal of forest cover would result in loss of sustained water, increased surface erosion, landslides, loss of soil fertility, and will have severe impacts on agricultural productivity and power generation that will affect the national economy and governance.

### ***1.3.3 Climatic context***

Rainfall and temperature are the main controlling climatic factors in this region. Most parts of the KCF and its buffer zone are within the wet zone and receive heavy, intense rainfall, mostly during the months of November to February. The average annual rainfall varies from 2500 to 5000 mm. There are no distinct dry months in the wet zone areas. Small parts of the KCF and its buffer zone are within the intermediate zone, where average annual rainfall ranges from about 1900 to 2500 mm. There are less than three dry months in the intermediate zone areas.

The mean annual temperature of the KCF and its buffer zone at the elevation of 915 m above msl ranges from 13 to 18.5 °C, and drops further with an increase in elevation. In the lower elevation areas the temperature ranges from 20 to 25 °C.

Climate change projections for Sri Lanka show different results in the spatial distribution of the extent and trends in change, depending on the models and projections used, and are ambiguous.<sup>4</sup> However, all models indicate that Sri Lanka's climate is changing, especially the patterns of precipitation that include more extreme events, and there is a gradual, overall increase in atmospheric temperature.<sup>5</sup> There is more annual variability in rainfall, which is also more unpredictable. The national policy on climate change articulates broad statements to guide decisions at national and sub-national levels against the threats from climate change, with connectivity to other policies and plans, especially the National Action Programme for Combating the Degradation of Lands in Sri Lanka (NAP-CDL), which recognizes that climate change can intensify land degradation, resulting in soil erosion and landslides in the montane watersheds that require urgent attention. The National Physical Plan (NPP) also recognizes that development of infrastructure should be cognizant of the environmental fragility of the central montane areas, and the need for conservation of these ecosystems. Thus, although climate projections cannot accurately predict the trends in rainfall and temperature within the Knuckles mountains maintaining forest cover will be important as an adaptation strategy against too much or too little water.

---

<sup>4</sup> <https://www.researchgate.net/publication/267368588>

HOW PREPARED ARE WATER AND AGRICULTURAL SECTORS IN SRI LANKA FOR CLIMATE CHANGE A REVIEW

<sup>5</sup> National Adaptation Plan for Climate Change Impacts in Sri Lanka 2016 to 2025 Climate Change Secretariat Ministry of Mahaweli Development and Environment 2015

## 1.4 Current issues

The major issues facing the KCF and buffer zone area including threats to the ecological integrity, livelihoods, and human wellbeing in the KCF and buffer zone are as follows:

1. A considerable part of tea crop in Sri Lanka is mature and old. For instance, 40 per cent of the tea extent is under seedling tea and about 90 per cent of the seedling teas are over 60 years old and need to be replanted. Similarly, around 30 per cent of the VP tea are more than 30 years old and need replantation (Weeraratna 2017).

There are 30 tea estates that cover over 10,000 ha of tea estates in the KCF and the buffer zone (Figure 4). Most are owned by the state, but managed by private companies and only a few are owned by individual farmers (Bandaratillake 2005). The government owned estates were acquired in the 1970s under the Land Reform Act, to be operated as state enterprises by the Sri Lanka State Plantations Corporation (SLSPC). However, over the years these enterprises have failed; the estates have been badly managed, with loss of productivity. Many have been abandoned. Historically, the living conditions of those resident within these estates have also been notoriously poor, with little effort made to improve housing, infrastructure, essential services and welfare, which has resulted in pervasive poverty and poor quality of life as there are few livelihood options available outside wage labour, upon which housing is contingent. Livelihood and conservation oriented strategies must consider scope for facilitating estate residents to diversify opportunities for income generation. This may also permit for improved retention of labour locally, given inclining outmigration in search of better and more stable employment opportunities.

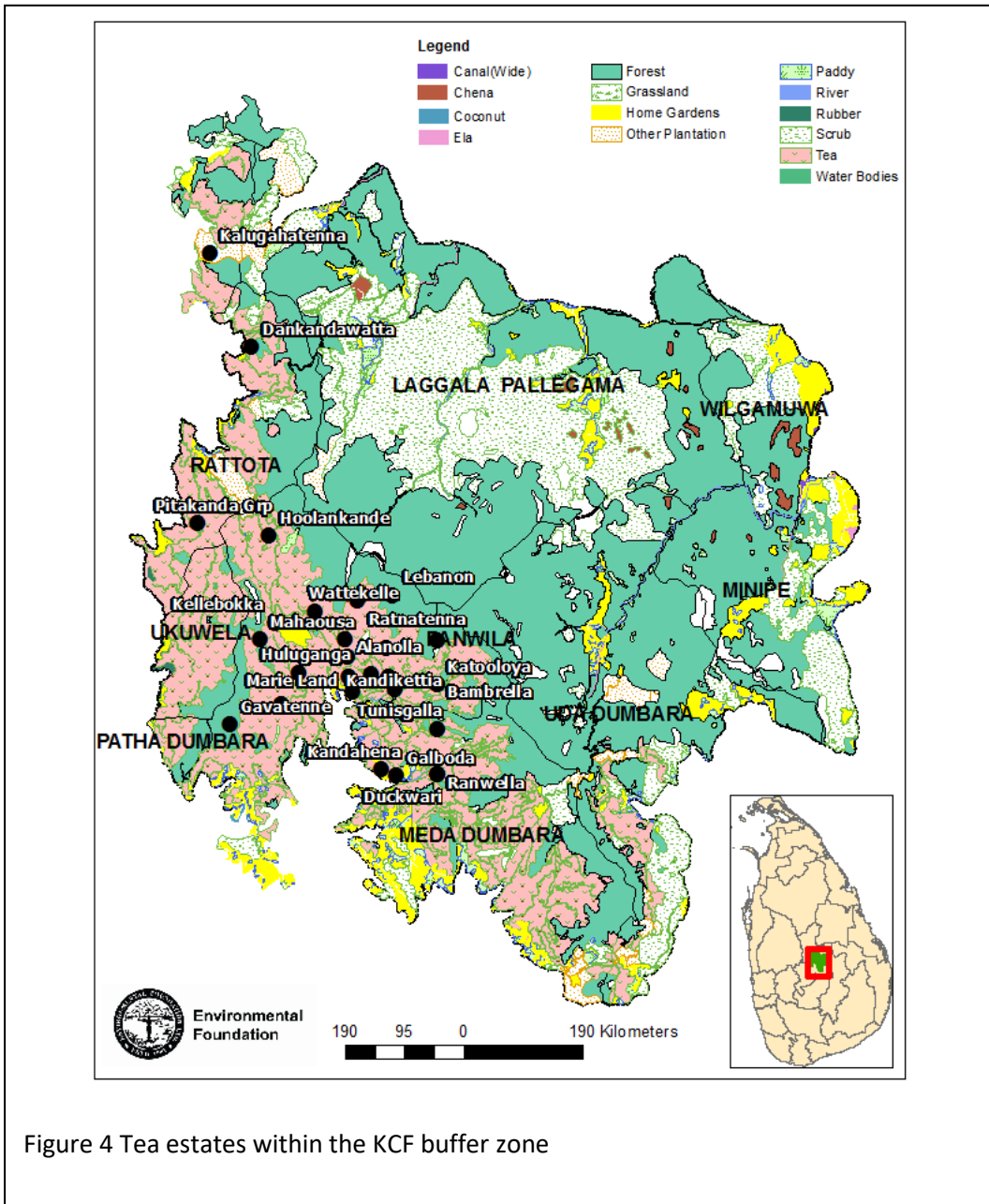


Figure 4 Tea estates within the KCF buffer zone

The state-owned estates are now in the process of being divested for other uses. The Ministry of Public Enterprise Development has, by way of Government gazette, proposed management of these estates through new management arrangements, including public-private partnerships and 30-year lease agreements with small- and medium scale investors that can demonstrate sustainable and financially viable plans to improve productivity of the lands and improve livelihoods. As part of the conservation management strategy of the KCF buffer zone, these estates can be acquired, especially to increase forest and ground cover while providing local communities with alternative livelihood opportunities. Community forestry, horticulture, woodlots that can be sustainably used are some strategies that can reforest these estates and also take pressure away from forests in the core area.

Through contact details provided by the SLSPC, an Estate Manager, Mr. Lakshvijaya Perera (Rangala Estate), was contacted to acquire more information on the status of the tea estates in the Knuckles area. Mr. Perera mentioned that the productivity in the area has decreased

due to shortage of labour and rainfall variability. However, he believes that with adequate field work and better cultivation techniques which include infilling, use of high quality tea cultivars and effective fertilizer and pest management practices, would lead to increased tea productivity over the coming years. It was further mentioned that there was a government initiative to use degraded or abandoned tea estates for other economic ventures and estates have been called upon to submit proposals for their respective areas. Proposals for degraded tea estates include eco-tourism activities, cattle farming and crop diversification such as spice crops, energy yielding crops such as *Gliricidia* and fruit crops which could be cultivated on unproductive lands. SLSPC provides applications for leasing out unproductive lands following a site visit and more information can be gained from their Head Office in Colombo and they will facilitate filtering of related information as per requirement.

2. The Soil infertility caused by slash and burn cultivation and cash-crop cultivation, including small-holder tea are contributing to soil infertility. Excessive use of Nitrogen-Phosphorus-Potassium fertilizers in tea plantations over the years degrading the soils and the waterways. Additional factors such as higher levels of soil acidity, leaf and root diseases, pest infestations have led to soil degradation, infertility and thus, productivity. For instance, Duckwari Group initially (prior to 1898) had a total tea plantation cover of 655 ha, which decreased to 481 ha by 1967, with 125 ha being abandoned and the rest of the land being utilized for paddy (1 ha) and cardamom cultivation (48 ha) (Weerawardhena and Russell 2012). Given the elevation and steep slopes of the area, these lands are also vulnerable for soil erosion, which further contributes to the loss of topsoil and nutrients. Studies have shown that in the case of tea, the loss of 1 cm of topsoil cover is associated with a decline in yield of 44 kg/ha/yr. It is also worth noting the reported incidences of CKDus in adjacent area, the careless and excessive use of chemical fertilizer coupled with soil erosion may also exacerbate issues pertaining to community health.
3. Some areas of the KCF experience forest fires during the dry months. Most fires are anthropogenic; people set fires to clear forests for chena and to create grazing areas for livestock. Fires are also set by hunters to encourage new growth that attracts grazing wildlife that are then hunted. Fires spread rapidly, especially in grasslands with the exotic *Panicum maximum*, and through Acacia and pine plantations, facilitated by the accumulated leaf litter and pine needles. The forest department lacks the resources to prevent and extinguish fires. The areas most frequently affected by fires are Meda Dumbara, Uda Dumbara, Minipe, Wilgamuwa and Laggala-Pallegama Divisional Secretariats.
4. Unregulated and organic growth and expansion of tourism is becoming a significant threat to the KCF. Tourist resorts are being constructed on private forest lands, forest lands on long-term leases, land owned by the Land Reform Commission, and even on forest lands under statutory grants with no proper planning and environmental safeguards. Several hotels are being built, or are already built in forest areas in the Kandy District. Four hotels have been constructed in Riverston and Gonamada Watte in

the Matale District. Furthermore, the unregulated conversions and additions to private households as a means of providing budget accommodation for tourists is common. The occupants and management of these hotels encourage illegal and unregulated activities, including bush meat trade, disposal of effluents and waste into the waterways, clearing the vegetation around the properties, and providing guests with non-biodegradable containers that are then strewn through the landscape as guests visit or travel through the KCF. Damage and degradation of the environment also occurs during the construction phases.

5. Visitors driving and picnicking along the main roads leave behind non-biodegradable waste; the main roadsides and the streams are littered with Styrofoam lunch containers, plastic bags, glass bottles, aluminum cans, and other solid waste. Currently, there is no established waste management system in any part of the conservation area. The largest group responsible for solid waste generation and littering are local tourists that carelessly dispose of garbage along the roads. Such accumulation of garbage not only disrupts the ecology of the conservation area but also degrades the habitat, clogs the waterways, poses a threat to wildlife that attempt to eat this garbage, and creates an unpleasant environment that can become a disincentive for other visitors. It can also spread diseases; for instance, water collecting in these containers can be breeding habitat for dengue mosquitoes. Use of soap and other detergents used by visitors bathing in streams and waterfalls pollute the waterways, affecting aquatic biodiversity that are adapted to clean water and cannot tolerate changes to water quality.
6. Collection of firewood is a major issue, especially in areas with estates along the KCF boundary and buffer zone. Usually, estate workers are settled in close proximity to the estate, thus close to the conservation area. The main source of energy used by these inhabitants is firewood, which is generally sourced (or supplemented) from the forest.
7. Illegal logging and forest clearing is another major threat. People cut down trees and clear forests for various reasons, especially to obtain timber and for chena cultivation. The scale of forest clearing ranges from small, to meet domestic needs, and large, for commercial purposes. Patha Dumbara, Panwila and Wilgamuwa are the most affected Divisional Secretariats. But it is notable that in Meda Dumbara the rate of deforestation is now under control.
8. Forest encroachment for livelihood-related activities also contributes to degradation. Some of these are illegal. For instance, although cardamom cultivation in the core area is now prohibited, banned after the after the government decision in 1994 to discontinue cardamom cultivation in forest lands. However, some cultivation continues, which prevents forest regeneration. According to the Department of Agriculture statistics, about 2,700 ha of cardamom had been planted in and around the Knuckles forest.<sup>6</sup> Over 60% of cardamom cultivation in the Knuckles range is estimated to be in

---

<sup>6</sup> H.M. Bandarattillake. 2005. The Knuckles Range: protecting livelihoods, protecting forests. In: Durst, P.B., Brown, C., Tacio, H.D. and Ishikawa, M. (eds). In search of excellence: exemplary forest management in Asia and the Pacific. Food and Agriculture

environmentally sensitive areas, above 1,200m in elevation and on steep slopes. Because farmers clear the understory to plant cardamom, these slopes are susceptible to soil erosion and drying, that degrades the soil and causes siltation downriver, including in the hydropower reservoirs. Clearing the undergrowth also prevents forest regeneration and reduces structural complexity, which is essential to provide suitable habitat for many of the endemic species.<sup>7</sup> Trees are also cut for firewood to construct barns for drying cardamom.

However, because of fluctuating cardamom prices people have been abandoning cardamom cultivation. By 2009, the Forest Department estimated that the area under cardamom cultivation had reduced to about 400 ha. Legal action against the remaining cultivators is in progress; at present there is some small-scale cardamom cultivation in Panwila, Hagala and Kalupahana. Thus, there is, potentially over 1,300 ha of forests where cardamom has been abandoned that can, and should, be restored and reforested. These are mostly in Ranamure, Narangamuwa, Attanwala, and Rambukoluwa, in the Laggala Divisional Secretariat, and Meemure in the Kandy Divisional Secretariat, all of which are in the core area of KCA.<sup>8</sup> Ranagala in the Kandy Divisional Secretariat is another area with extensive areas of abandoned cardamom in the buffer zone of KCA.

9. Loss of agricultural productivity is being reported by farmers. Forest clearing and historically bad agricultural practices has resulted in erosion and loss of topsoil. Climatic fluctuations and water shortages are also contributing to low yields. Lack of knowledge to predict and assess current and future market demands based on trends, lack of advanced technological innovations in farming practices, and poor access to markets make the farmers vulnerable and marginalized.
10. Crop depredations by wildlife also cause economic losses, and lead to human wildlife conflicts. Loss of natural habitats and food for wildlife forces them to enter human settlements and raid agricultural areas, increasing the level of conflict. Spread of invasive plant species—many of which are weeds—also require additional management of agricultural fields, including the use of stronger chemical controls that in turn affect biodiversity and health of people, from farmers to consumers.
11. Fragmentation of land ownership is also creating a fine-grained land-use matrix that becomes a constraint to developing a landscape-scale conservation management plan. It also fragments and severs ecological connectivity, affecting persistence of species populations, survival of biodiversity, and sustainability of ecosystem processes and services.
12. Other issues that have to be considered and addressed include: lack of boundary demarcation; land issues related to land acquisition for resettlements; water extraction

---

<sup>7</sup> Somaweera, R., Wijayathilaka, N., Bowatte, G. and Meegaskumbura, M., 2015. Conservation in a changing landscape: habitat occupancy of the critically endangered Tennent's leaf-nosed lizard (*Ceratophora tennentii*) in Sri Lanka. *Journal of natural history*, 49(31-32), pp.1961-1985.

<sup>8</sup> Table 3, Project Document.

for commercial bottling; free-grazing livestock in forests; various ad hoc development projects; illegal gem mining that causes erosion and siltation of the waterways; and treasure hunting.

13. Resettlement activities taking place in the Moragakakanda-Kalu Ganga Multi-purpose hydro project and opportunities created for collaboration with. The section below discusses more on the Moragahakanda Project and its impacts, other ongoing and related projects pertaining to this landscape and possibilities for collaboration.

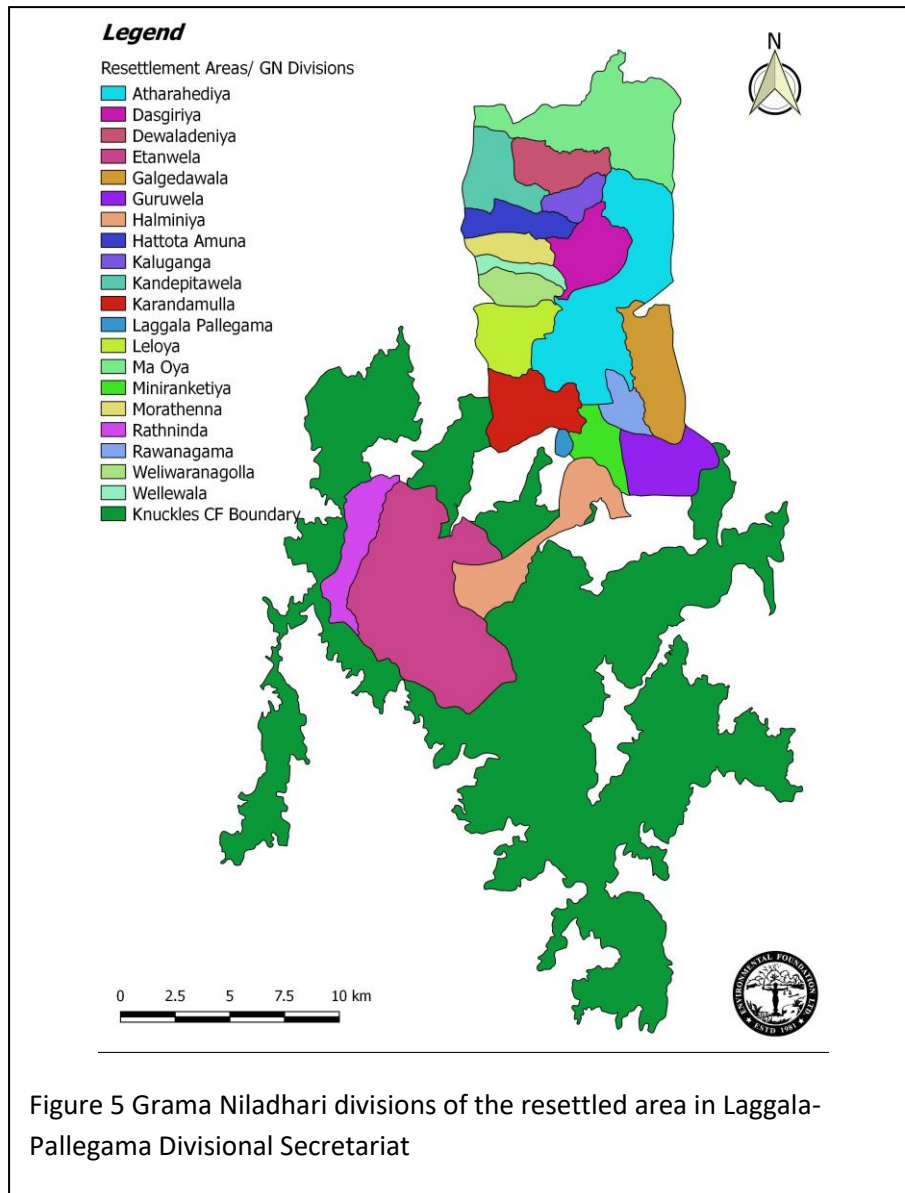
### **1.5. Moragahakanda-Kalu Ganga Multi-purpose Hydro Project**

This section contains information gathered from the Mahaweli Authority of Sri Lanka, their report on Restoration Implementation Programme (RIP), and direct information received from the Moragahakanda Project Office.

This megaproject on the northeastern foothills of the Knuckles has important implications and consequences on the KCF and its buffer zone. Under this project, a dam will be constructed across the Amban Ganga, one of the main tributaries of the Mahaweli river, to create a large reservoir. The multi-purpose irrigation and hydropower project is aimed at generating and providing 25MW of electricity to the national grid, while providing water to irrigate and cultivate 5,154 ha of existing land during Maha and 21,208 ha during the Yala seasons in the North-Central Province, increasing the cropping intensity from 1.55 to 1.85.



The project is being implemented by the Mahaweli Authority of Sri Lanka which was established under the Mahaweli Authority Act of Sri Lanka No.23 of 1979. This is a project identified under the survey of Irrigation and Hydro Power Potentials of the Mahaweli Ganga and the Adjoining River Basins during the four year period from 1965 to 1968 by a UNDP/FAO team with Sri Lankan counterparts. Implementation was commenced in 2007 .



The project activities affect the KCF and buffer zone since people from some of the settlements that were inundated by the reservoir have been resettled in the Knuckles, specifically in the Laggala-Pallegama Divisional Secretariat (Figure 5). The Restoration Implementation Plan (RIP) of this project deals with acquisition and compensation, relocation/resettlements and economic rehabilitation processes of the affected persons (APS) of the Moragahakanda Project, inclusive of other entitlements. The policy framework of the RIP is based on the National Involuntary Resettlement Policy (NIRP) and related enactments on land acquisition and land alienation. The data contained in the RIP are based

on the findings of the socio-economic surveys carried out by MASL in 2006 and 2008 and from the Acquisition Surveys (under Section 2 of Land Acquisition Act) done by the Survey Department in 2009.

The extent of the affected area under this project is 4153 ha, that includes the tank bed, road deviation, an elephant corridor between the Giritale-Minneriya protected areas and Wasgamuwa National Park, the trace for the electricity transmission line and the branch channel trace of Medirigiriya. However, the area of the KCF and buffer zone affected is restricted to Laggala-Pallegama, where the land use and land cover was changed from shrub forests and forests to human settlements and related infrastructure.

Based on the guidelines of Mahaweli Authority of Sri Lanka and prevailing policies pertaining to resettlements, the following assistance schemes are being introduced to provide incomes and livelihood improvements for the affected persons.

- Training and employment opportunities to vulnerable families
- Job restoration grants
- Business grants to owners of business establishments
- Ex-gratia payment for households opted for System 'D'

As per the MASL RIP, the following new ventures have been identified for the long-term sustainability and economic rehabilitation of the affected people.

- Off-farm activities, like fish farming, gem mining
- Establishment of small scale agro based industries.
- Market oriented crop diversification.
- Hi-tech agriculture.
- Involvement in other income generating activities during off seasons
- Establishment of service provider entities.

Furthermore, it has been decided to allocate land for infrastructure including common areas for schools, temples/religious places, business establishments, play grounds, banks, welfare societies, etc. Thus, the resettlements and activities of these people will create a larger area of impact due to livelihood and other related activities, than the actual resettlement footprint. Therefore, interventions to control the area of impact will be necessary.

### ***1.5.1. Status of the Laggala- Pallegama Resettlement***

The System 'F' which is being developed under the Kalu Ganga Reservoir Project lies in the Laggala-Pallegama Divisional Secretariat. The gross area of System "F" is 139 km<sup>2</sup> of which 78 Km<sup>2</sup> have been already developed. At present, a population of 6573 persons live in this area, with a Male: Female ration of 51% to 49%. Most of these people are dependent on rain-fed agriculture and chena cultivation. In the new Laggala resettled area, 911 ha has been used for homesteads, 2113 ha for farmsteads, and about 157 ha for commercial establishments.

### ***1.5.2. The environmental restoration programme for the resettlement and the buffer areas***

An impact assessment has determined that the resettlement programme will result in some soil erosion, destruction of water resources, and disturbance to wildlife. In order to mitigate these impacts, the recommendations of the EIA are being carried out as part of the project implementation. In addition, community forests will have to be established and the reserved land will have to be protected against encroachment and degradation by unsustainable uses. Fences and other physical demarcations may be necessary to prevent encroachment and expansion of the settlements into the forest areas.

The hydro project has also allocated funds for environmental restoration, including in the Knuckles, which creates opportunities for community based organisations (CBOs) become engaged as community conservation stewards.

### **1.6. Other relevant projects/ opportunities for synergy.**

- The GEF project, **Enhancing Biodiversity Conservation and Sustenance of Ecosystem Services in Environmentally Sensitive Areas** will assist the Government of Sri Lanka to safeguard biodiversity in ecologically sensitive areas with multiple land uses by operationalizing a new land use governance framework called Environmentally Sensitive Areas, which will be primarily outside protected areas. One of the main outcomes of this project is biodiversity-friendly management at two sites (at least 200,000 ha). The project will also develop a framework for landscape-scale planning in these areas.
- The **Sri Lanka Community Forestry Programme** (with financing from the Government of Australia) is a four-year program that is expected to result in a substantial increase in the number of community forestry sites, and the area of forest within these sites. This is expected to enhance the livelihoods and reduce the incidence of poverty in those communities participating in the program. It is expected to improve the quality of 23,000 ha of forests under the community forestry approach in 18 districts. The proposed SGP project will cooperate with SLCFP in its activities in particular in improving the livelihood options available for the households and to build the capacity of communities to participate in sustainable community forestry management activities. This project could potentially contribute towards establishing community forestry programmes in the KCF buffer zone.
- The **United Nations Readiness Programme for Reducing Emissions through Deforestation and Forest Degradation (UNREDD)** seeks to establish an appropriate management structure for REDD+ Readiness and Implementation at national and sub-national levels and ensure their effective operation. Placing particular emphasis on the involvement of forest-dependent local communities, the Programme is developing and implementing a comprehensive system of stakeholder consultation, awareness and capacity building for the forest and land-use activities to be covered as part of the REDD+ Programme. A Community-based REDD+ programme will pilot ground level initiatives that feed into the UNREDD process as a demonstration of best practices, sharing experiences and lessons. Through this effective engagement, and consequent discussions, a national strategy will be developed and a framework for activity

implementation. Some of these pilots could potentially be implemented in the KCF and its buffer zone, where degraded lands are slated to be restored through forestry practices.

- The GEF financed **Rehabilitation of Degraded Agricultural Lands in Kandy, Badulla and Nuwara Eliya Districts in the Central Highlands** project aims to demonstrate feasible projects and best practices, arrest erosion and fertility degradation, and provide livelihoods for communities with enhanced incomes. Lessons learned from this project can be applied in the KCF and buffer zone.
- The goal of the World Bank **Ecosystem Conservation and Management** project is to improve the management of ecosystems in two landscapes in Sri Lanka to achieve conservation and community benefits (Government of Sri Lanka, 2006). The project consists of four components: 1) pilot landscape planning and management; 2) sustainable use of natural resources and human-elephant co-existence; 3) protected area management and institutional capacity; and 4) project management. Under Component 2 communities living adjacent to protected areas and other sensitive ecosystems will receive support to plan natural resource use and develop livelihoods. Participatory Community Action Plans will be used. The two landscapes will include a biodiversity rich wet zone and a dry and arid zone forest landscape both of which face different types of development pressures. The KCF could become one of the sites.