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# Periodic review of the Sinharaja Biosphere Reserve

Sri Lanka Man and Biosphere Committee  
Review Report by Jinie D. S. Dela December 2003  
Prepared for the National Science Foundation





On the Sinharaja forest....

“ The straightness of the stems of the trees is a striking feature everywhere. Branches are only given off towards the tops, and the vertical pillar-like stems give the impression of the interior of a cathedral, which has struck observers of rainforest on other parts of the world. It presents the characteristic features of a virgin tropical rainforest.”

Baker, 1937

# **Periodic Review of the Sinharaja Biosphere Reserve**

**By the  
Sri Lanka Man and the Biosphere Committee**

**Review Report by Jinie Dela**

**December 2003**

**With financial support from UNESCO, INDIA**

## Acknowledgements

The preparation of the 2003 periodic review report of the Sinharaja Biosphere Reserve was undertaken by the National MAB Committee of Sri Lanka on behalf of the UNESCO-MAB programme. Dr Jinie Dela carried out the review for the National MAB Committee, developed the review indicators and prepared the review report. Mr Leslie Wijesinghe, Chairman of the National MAB Committee and Mr Sarath Fernando, Conservator General of Forests and member National MAB Committee provided valuable contributions for improving the review indicators and for finalising the framework for the review process.

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Mr Milton Liyanage prepared the black and white map of the Sinharaja Biosphere Reserve (from the map of the Sinharaja Reserve available in the Forest Department) for inclusion in the review report. The layout and design of the report is by Dr Jinie Dela. Mr Prasanna Weerakkody designed the cover page.

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## Preface

*Biosphere reserves are internationally recognised areas established to promote and demonstrate a balanced relationship between humans and the biosphere. Thus, unlike in most other categories of protected areas biosphere reserves take a people-centred approach, where solutions to conserving the environment should reconcile conservation of biological resources with sustainable use of the environment to ensure sustainable development for people. Although the concept of biosphere reserves dates back to the 1970s, it is eminently compatible with the emerging ecosystem approach to conserve protected areas not as isolated islands, but as parts of a bioregion or watershed, and including people and their activities in "biophysical and socio-economic dimensions".*

*This review which is a UNESCO-MAB requirement according to Article 9 of the Statutory Framework of the World Network of Biosphere Reserves was undertaken by the National Man and Biosphere Committee of Sri Lanka. Two particular challenges met with during the review were the designing of the criteria and indicators for the evaluation and a framework for the review report in the absence of preset guidelines. These have been met with, and the set of indicators used to objectively assess how the Sinharaja Reserve and its current management match up to the ideals of a biosphere reserve are included in the report.*

*The review involved the collation of information from various sources and facilitated contact between various players that can further enhance the value of the Sinharaja Biosphere Reserve. One such outcome of national importance is that joint work will be initiated for the first time between the reserve's managers and the premier ex-situ conservation centre in Sri Lanka for collection and conservation of the reserve's plant genetic resources. It is hoped that this review will lead to further innovative approaches to conserving this unique biosphere reserve which has legal designation as a National Heritage Wilderness Area, is a World Heritage Site and is set in a highly populated area, but is yet open to participatory management with local people to combine conservation with sustainable development.*

*The review process received unreserved support of the Forest Department, which manages the Sinharaja Biosphere Reserve, for a comprehensive and impartial assessment. There have been many discussions with a wide range of stakeholders involved with conserving the Sinharaja Biosphere Reserve supported by field visits and the review of literature. The National Man and Biosphere Committee thanks all those who contributed to the preparation of this review, particularly those who gave of their time for discussions; organised the interviews, field visits and workshops; made available various documents and photographs; and provided valuable comments on the draft report.*

*The periodic review of biosphere reserves in the World Network of Biosphere Reserves is designed to ensure that individual reserves are managed in a manner that is compatible with the MAB concepts and not as closed environments for total protection of nature that are inaccessible for people. It is also the wish of the National MAB Committee that the review will serve as an in-depth evaluation of the Sinharaja Biosphere Reserve, particularly to promote participatory management, raise its image as a biosphere reserve and showcase its functions as a testing site for sustainable development on a regional and national scale.*

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## Abbreviations and acronyms

BR	Biosphere Reserve
CBD	Convention on Biological Diversity
CBOs	Community Based Organisations
CTFs	Community Trust Funds
DCCs	District Coordinating Committees
EIA	Environmental Impact Assessment
IBR	International Biosphere Reserve
IEC	Information and Education Centre
KCC	Kudawa Conservation Centre
LRC	Land Reform Commission
MAB	Man and Biosphere Programme
MCC	Morningside Conservation Centre
Mya	Million years ago
NHWA	National Heritage Wilderness Area
NTFPs	Non-Timber Forest Products
PCC	Pitadeniya Conservation Centre
PGRC	Plant Genetic Resources Centre
S/W	Southwest
S/W RCP	Southwest Rainforest Conservation Project
UNESCO	United Nations Educational, Scientific and Cultural Organization
VFPMC	Village Forest Participatory Management Committee
VS	Vigilance Committees
WHS	World Heritage Site

## National Review of the Sinharaja Biosphere Reserve in Sri Lanka

### EXECUTIVE SUMMARY

#### Background

The Sinharaja Forest of Sri Lanka was declared a Man and Biosphere (MAB) Reserve by UNESCO in 1978, in recognition of its global importance and representative value as a Tropical Humid Evergreen Forest Ecosystem. Currently the reserve consists of 11,187 ha, and contains the largest unmodified and primeval tract of lowland rain forest remaining in the island. It is a requirement of the UNESCO-Man and Biosphere Programme (MAB) that biosphere reserves within its global network are subject to a ten year review. Accordingly, this review report has been prepared by the National MAB Committee of Sri Lanka on behalf of the UNESCO MAB programme for fulfilment of this requirement. The review is based on a comprehensive set of indicators that take into account (a) the requirements of Articles 3 and 4 of the Statutory Framework of the World Network of Biosphere Reserves and (b) the goals, objectives and recommendations of the Seville Strategy and its implementation indicators for individual reserves.

#### Findings

The Sinharaja forest is a biologically unique lowland rain forest of high national significance. It provides resources at varied user levels to local people, and is a reservoir of genetic material that could be of immense value, both nationally and globally. Despite its undeniable ecological and socio-economic importance, the location of the forest in a densely populated area, amidst human settlements and plantation agriculture, is a constant threat to its conservation. Despite this, and the fact that the entire Sinharaja forest reserve is under legal protection as a World Heritage Site and a National Heritage Wilderness Area, this review found that the Sinharaja Biosphere Reserve has retained the features and qualities that warranted its declaration as an International Man and Biosphere Reserve. It continues to be an important member in the World Network of Biosphere Reserves, due to:

- (a) its high conservation value; particularly its ecological uniqueness and representativeness, and its high biodiversity and hydrological value.
- (b) the current management approach which is compatible with economic and human development that is socio-culturally and ecologically sustainable for Sri Lanka's wet zone, and
- (c) the logistic support it offers as a centre for conservation education, research and training.

The continuance of Sinharaja as a viable representative of the Tropical Humid Evergreen Forest ecosystem has received considerable impetus from the conservation focus provided by the national and international recognition it has received. Its declaration as a Biosphere Reserve in particular has helped to deflect many threats that this unique forest faced in the 1970s, and has contributed to the concepts that underlie its present management. The participatory approach for forest conservation now gradually being adopted by the Forest Department for managing the Sinharaja Reserve conforms with the biosphere reserve concept, and there is increasing acceptance of "... sustainable use of the reserve and its resources through involvement of multiple stakeholders and partnerships." Drawing on the Sinharaja experience this approach is also being integrated into national planning within the forestry sector and for biodiversity conservation. It can also be justifiably reiterated that this forest continues to be "... the best known of the lowland rainforests in Sri Lanka and the most visited and studied."

There are areas, however, where integration of the different functions of the biosphere reserve into the management process could be enhanced through capacity building, with technical assistance and funding. Recommendations are provided as to how the role of the Sinharaja Forest as a biosphere reserve can be further enhanced, and where assistance from the MAB

programme is best required and most productive.

**Report structure**

- Section 1 - Introduction,
- Section 2 - Methods used for the review
- Section 3 - The review findings
- Section 4 - The recommendations

**Annexes**

- Annex 1: contains the indicators used for the review
- Annex 2: is the questionnaire given to communities (at community consultation workshops) and to field forest officials (individually) to gauge forest uses and threats
- Annex 3: is the questionnaire used to gauge community participation in forest management at the community consultation workshops
- Annex 4: gives all people consulted during the review
- Annex 5: lists all sources of information for the report. These are cross-referenced to the text
- Annex 6: indicates the Terms of Reference for the review consultant
- Annex 7: give the working rules of CBOs mobilised through the S/W Rainforest Conservation Project
- Annex 8: lists selected publications on research carried out at Sinharaja

## 1.0 INTRODUCTION

### 1.1 THE NEED FOR A REVIEW

Biosphere reserves are internationally recognised areas established to promote and demonstrate a balanced relationship between humans and the biosphere. They highlight the value of nature conservation within a particular natural region and reconcile the conservation of biological diversity with sustainable use. They also support an ecosystem approach to the conservation of protected areas which is now widely accepted. Consequently they are ideally suited to meet today's conservation needs when human populations are increasing and the practicality of leaving aside large areas to protect pristine natural wildlands is decreasing, despite the fact that more people than ever before are dependant on wild species and natural ecosystems for their well-being.

The World Network of Biosphere reserves declared under UNESCO's Man and Biosphere programme currently number 411 reserves in 94 countries. It is a requirement of Article 9 of the Statutory Framework of the World Network of Biosphere Reserves that the UNESCO MAB Programme reviews each biosphere reserve once in 10 years. This periodic review ensures that biosphere reserves continue to satisfy Article 4 of the Statutory Framework while remaining under the sovereignty of their respective countries of location. The review by UNESCO is based on a report prepared by a selected authority at the national level, which in the case of Sri Lanka is the National Man and Biosphere Committee.

**Goal of the 2003 national review of the Sinharaja Biosphere Reserve:**

- ▶ To ascertain whether the Sinharaja Biosphere Reserve continues to satisfy criteria listed in Article 4 of the Statutory Framework of the World Network of Biosphere Reserves.

The Sinharaja Biosphere Reserve is the largest relatively undisturbed lowland rainforest in Sri Lanka. In 1978 a total of 8,864 ha of the Sinharaja forest was declared an International Biosphere Reserve (IBR).<sup>1</sup> As a part of the forest was logged between 1971 and 1977,<sup>2</sup> about 65% of this area was under high forest while about 34% was modified and comprised secondary forest and fernlands (Banyard and Fernando, 1988).<sup>3</sup> The biosphere reserve covers 11,187 ha at present and coincides with the area declared a National Heritage Wilderness Area (NHWA) and a UNESCO World Heritage Site (WHS).

### 1.2 THE BACKGROUND TO FOREST CONSERVATION IN SRI LANKA

#### ● Status of forest cover

Sri Lanka's natural forest cover is now around 31% of the island's 65,610 sq km, and natural closed canopy forests have dwindled to 22.5 % of the total land area<sup>4</sup> from 44 % in 1956.<sup>5</sup> It is significant that tropical humid forests, which form the natural vegetation type of the island's ever-wet southwestern quarter, have shrunk to about

9.5% of this region.<sup>4</sup> These forests are also heavily fragmented and few are more than 10,000 ha in extent.<sup>6</sup> Although much of the endemic species among both fauna and flora are concentrated in the wet zone,<sup>6,7</sup> lowland rain forests of this region comprise about 1.9% of the island's land area. Wet sub-montane and montane forests cover a further 1.01 % and 0.05% respectively.<sup>4</sup> Although about 9,462 sq km of natural forest and scrubland amounting to around 15% of the island is declared Protected, only about 18% of this network occurs in the biologically rich wet zone.

## ● Key institutions for forest management

"Conservation forests are established in forest areas of outstanding natural value and are managed primarily for the conservation of biodiversity (i.e. genes, species and ecosystems), the maintenance of ecological processes and services, and the preservation of cultural traditions. Conservation Forests are distinguished from Production Forests in that they are to be maintained in perpetuity free from the commercial exploitation of their timber resources, though, where appropriate, the sustainable and regulated use of renewable natural forest products by local people will be sanctioned"

Two institutions bear principal responsibility for managing the country's forest and wildlife resources. The Department of Wildlife Conservation (DWLC) is responsible for the management of protected wildlife parks and reserves, termed Strict Natural Reserves, National Parks, Nature Reserves, Jungle Corridors and Sanctuaries. The Forest Department deals with the conservation and management of almost all the balance land under natural forest, including much of the wet zone forests as well as forest plantations managed for production. The Designated Areas under the Forest Department up to 1995 were Forest Reserves, Proposed Forest Reserves and one National Heritage and Wilderness Area - the Sinharaja forest<sup>8</sup> - declared under the National Heritage Wilderness Areas Heritage Act No. 3 of 1988. Since then, a category termed Conservation Forests has been introduced by an amendment to the Forest Ordinance (Act No 23 of 1995) to identify forests set aside for strict conservation.

The Knuckles Conservation Forest and 14 mangrove areas have been legally declared under this category up to now. There are 31 other wet zone forests designated as Conservation Forests - excluding the Sinharaja<sup>8</sup> - pending

legal declaration and gazetting. Sri Lanka has two internationally recognised biosphere reserves - the Sinharaja and the Hurulu reserves - managed by the Forest Department. Apart from these, there many national biosphere reserves in Sri Lanka: 33 under the Forest Department and four under the Department of Wildlife Conservation. Many of these are within legally defined categories of protected areas.<sup>9</sup>

## ● National forest policy and trends in forest management

Over the years the focus of forest policy in the island has changed considerably from timber production to forest conservation. In the mid 1960s the forest policy advocated harvesting timber from wet zone forests to meet the country's growing resource requirements. A section of the Sinharaja forest was released for mechanised logging for plywood production in 1969, which began in 1971.<sup>2</sup> A strong wave of public concern against this resulted in a halt to the logging in 1977.<sup>2</sup> A cabinet decision was taken to abandon the logging operations in 1978,<sup>3</sup> and the Sinharaja forest was declared the island's first International Biosphere Reserve in the same year. By this time, however,

<sup>8</sup> The Sinharaja forest has a higher degree of Protection as a National Heritage and Wilderness Area.

about 1,400 ha<sup>2</sup> - 2, 025 ha<sup>3</sup> of forest had been logged in the western part of Sinharaja and 37 km of roads had been opened up.<sup>2</sup>

The Sinharaja forest thus emerged in the forefront of public opinion pressing for conservation of the country's biodiversity rich wet zone forests, resulting finally in a reorientation of forest policy in the 1980s and the subsequent halt of selective logging in wet zone natural forests. This was followed in 1990 by a moratorium on logging in all natural forests which is still in force.

#### ● Forest biodiversity assessments in Sri Lanka

Forest conservation received considerable impetus from a detailed biodiversity assessment of natural forests through the National Conservation Review, carried out by the Forest Department and IUCN - The World Conservation Union from 1991-1996. This survey covered all (204) accessible (i.e. due to the civil strife in some areas) natural and near natural forests larger than 200 ha in the country. The findings of the NCR showed that wet zone forests are the most important of all forests in Sri Lanka for biodiversity, soil and water conservation, especially as they harbour most of the endemic reptiles and amphibians, about 50% of the endemic freshwater fishes and about 80% of the endemic bird species. The NCR was preceded by an Accelerated Conservation Review (ACR) from 1990-1991 for a rapid appraisal of the ecological value of 30 natural forests covering 48,000 ha in the wet zone. This led to them being positioned for conservation. Concurrent to these initiatives the Forest Department also carried out a national survey of the traditional uses of forests by local communities and has set up a database on forest biodiversity.

FD/IUCN/WCMC/FAO, 1997, <sup>6</sup> BCAP, 1999<sup>10</sup>

During the past decade the functions of the Forest Department have become 'greener' and shifted from one of production to conservation of the nation's forest biodiversity. The Department now manages 148,512 ha (about 2.2 per cent of the land area) for conservation.<sup>6</sup> There has also been a marked reorientation of forest management practice in Sri Lanka during the past decade with the growing acceptance that complete restriction of the use of forest resources by local people is counter-productive to achieve forest and biodiversity conservation, except when essential to conserve biologically sensitive areas.

The current National Forest Policy of 1995 and the Forestry Sector Master Plan (FSMP) of 1995 (for the period 1995 to 2020) identify biodiversity conservation as a key objective of forest and wildlife conservation. They both advocate reorientation of the traditional approach to forest management by enabling greater involvement of local people in planning and managing Protected Areas. The five-year implementation programme of the FSMP now in progress, via the Forest Resources Management Project (FRMP), promotes participatory sustainable forest management, awareness and extension, agroforestry, rehabilitation of degraded forests, buffer zone development and boundary demarcation around the 33 Conservation Forests, including the Sinharaja.

## ● Community participation in forest management - the Sri Lankan perspective

The realisation of the need to win grassroots level support from local people for conservation efforts has led to the acceptance of a more participatory form of forest management by government, paving the way for communities in the wet zone to play a recognisable role in conserving and managing forests adjacent to their villages.

It must be noted, however, that community participation in forest management in Sri Lanka - particularly in the wet zone - is different to that of most developing countries, particularly in the South Asian region, where local people are heavily dependant on forests for their very survival. Rural communities in Sri Lanka's wet zone do extract forest resources to varying degrees, but forest dependency for livelihood has been decreasing since the 1980s with the veering of the rural wet zone economy towards tea cultivation in small holdings.<sup>2,11</sup> High literacy levels and changes in job aspirations among the younger generation are also partly responsible for decreased forest dependency. Consequently the major problem for conserving wet zone forests from the early 1990s was not so much exploitation of renewable forest resources but loss of forest land due to illegal encroachments for agriculture and settlement.<sup>11</sup>

Most wet zone forests are now eroded up to their biologically sensitive core areas as a result of plantation agriculture and the high population pressure which had resulted in large scale deforestation in the past, and more recently because of illegal encroachments for tea cultivation in small holdings. Many valuable forest patches in the southwestern lowlands are down to a few hundred hectares, although they still remain surprisingly high in biodiversity and endemic species.

Participatory management of Sri Lanka's biodiversity rich protected forests of the wet zone is, therefore, centred mainly on the buffer zone - an area which extends outward from the Protected Area and acts as an external buffer to it. These conceptual buffer zones have no legally defined outer limits, and are determined by the extent of influence and benefit to the Protected Area. Much of the lands in the buffer zones of wet zone forests are under private ownership, and land use is mainly settlements with agricultural small holdings or large monoculture plantations of tea or rubber. Despite this, buffer zone management has emerged as an important and intrinsic component of managing Sri Lanka's wet zone forests.

Taking these factors into account, a consensual and strategic approach to participatory forest management in the wet zone is now being pilot tested in the Sinharaja and Kanneliya forests by the Forest Department. People's participation in forest conservation and management is being secured through an ongoing project to help them turn away from adverse forest practices (such as encroachment) by enhancing income generation, helping to increase productivity in existing agricultural small holdings, providing technical and logistic assistance for community-related activities, and enabling greater involvement of local people in the decision making process for managing forests than in the past.

The possibility of a gradual and conditional transfer of full responsibility to communities for all the various aspects of forest management is, however, not likely in the Sri Lankan context in the near future. This approach has been pilot tested in three wet zone forest sites, but the results have indicated that low forest dependency by local people for their livelihood and high reliance on tea as a cash crop do not encourage acceptance of greater responsibility by communities for forest

management.<sup>12</sup> The biodiversity and hydrological value of wet zone forests earmarked for conservation, their small size and fragility, and the relatively low level of forest dependency by local people have thus determined that overall management responsibility remains vested in government (via the Forest Department), but with a local consultative framework in place for a consensual sharing of management responsibility - with considerable emphasis on participatory buffer zone management.<sup>13</sup>

### 1.3 INTRODUCING THE SINHARAJA FOREST

#### ● Location

The Sinharaja Biosphere Reserve occurs within the southwestern quarter of the island between 6°21' - 6°26' North Latitude and 80°21' - 80° 34' East Longitude.<sup>1</sup> It extends into the three highly populated administrative districts of Galle, Matara and Ratnapura within the Southern and Sabaragamuwa Provinces (Figure 1), and lies between the tributaries of the *Kalu Ganga* (in the north) and the *Gin ganga* (in the south). The southern half of the reserve coincides with the area declared by Ashton and Gunatilleke (1987)<sup>14</sup> as floristically the richest in South Asia.

The Sinharaja forest is part of a group of forests called the "*Sinharaja Adaviya*" which is about 47,350 ha and includes the Kudumeriya, Dellawa, Morapitiya-Runakanda, Diyadawa, Walankanda and Delgoda forests<sup>1, 6, 11</sup>

#### ● Topography and climate

This forest reserve occurs at mid elevation in the Rakwana massif which lies somewhat apart from the central uplands, and extends from a height of around 200 m to a maximum of about 1,200 m.<sup>4</sup> Although some parts of the eastern section of the forest consists of flat plains, the reserve consists of rolling terrain overall, and exhibits a trellis of continuous ridges and valleys which lie in an eastwest direction in the eastern part of the reserve, and in a northwest to southeast direction in the western part.<sup>1, 11</sup> The forest contains about nine prominent peaks ranging from 575 m to 1,170 m.<sup>1, 11</sup>

The Sinharaja Biosphere Reserve is hot and wet as are the other forests of the rainforest biome.<sup>15</sup> The climatic trends within the reserve from 1984 to 2000 indicate a mean annual rainfall of 5,016 mm, ranging from 4,087 to 5,907 mm, which is well distributed throughout the year. January and February are revealed as the driest months with an average of 16 dry days each and a rainfall of over 170 mm; the heaviest rains are from May - June and September - October.<sup>15</sup> The humidity is high, ranging between 50 - 95.<sup>1</sup> The mean annual temperature ranges between 22°C and 28°C, with the lowest mean monthly temperature of 23.8°C recorded in December.<sup>15</sup> The forest has high value as a watershed and for amelioration of the climate.<sup>6</sup>

#### ● Geology and soils

The Sinharaja forest has unique geological features. One is the presence of a distinctive zone of basic rocks referred to as the "Sinharaja Basic Zone" which extends from Denuwakanda to Labugama.<sup>16</sup> This zone is apparent in aero-magnetic maps due to the presence of magnetite which forms the main component of basic rocks.<sup>11</sup> It is also believed to be the cause of "desilication" in the surrounding areas which are replete

with "gem-fields of cordite-bearing rocks."<sup>11,17</sup> Another distinctive feature is that the reserve lies within the transition zone of two important groups of rock types in the island, the southwestern group and the highland group. The common rock types in the reserve are khondolites among other metasedimentary rocks and charnockite gneisses of the Highland Series, and metasediments, charnockite gneisses and other rock types of the Southwestern Series.<sup>16,17</sup> The soils of the Sinharaja forest are mostly Red Yellow Podzolic soils and are well drained with very little accumulation of organic matter.<sup>17</sup>

## ● Environs of the reserve

### Settlements:

Due to historical factors that influenced land use in the wet zone of Sri Lanka, human settlements around the reserve go back a long period of time. There are records of human occupation in the reserve in the 1800s<sup>2</sup>, and private ownership of land in the reserve east of *Sinhagala*, from the days of the Kandyan Kings, is indicated by a late 19<sup>th</sup> century deed of gift.<sup>18</sup> At present there are about 39 villages around the reserve at varying distances from its boundary, including two villages (Indigaswila and Warukandeniya) and two families resident at Kohilarambe within the reserve (Figure 1). At least 12 of these villages have an ancient history which date back more than 400 years to indigenous monarchical rule, and some have originated as land grants for services to the crown.<sup>11</sup> The spilling-over of these ancient villages with time and population growth into adjoining areas for settlement and permanent agriculture have resulted in the growth of satellite villages. On average each village has around 40-50 families, of which the ethnic majority are Sinhala Buddhists.<sup>2</sup>



Photo © Jinie Dela

Part of a 19<sup>th</sup> century deed

### Agriculture and land use in adjacent areas:

The reserve grades directly into human settlements and agriculture along most parts of its southern boundary, where land use abutting the reserve comprises mainly tea smallholdings and home gardens interspersed with small extents of paddy, rubber and cinnamon cultivations. In the Matara District the land use along the southern boundary also contains a few state owned *Pinus* plantations and several large tea plantations (estates) under private or state ownership. Some of these plantations contain forest areas under-planted with wild cardamom (*S. ensal*). The eastern side of the reserve is sparsely populated and bounded by several large tea estates which also contain forest patches under-planted with wild cardamom. Many of them have abandoned tea lands that are reverting back to high forest. There are currently about nine large tea estates under state and private ownership (i.e. Beverley, Paulwatte, Ensalwatte, Morningside, Illumbakanda, Amerasinghe, Manikke and Goshan in the eastern and southern areas of the buffer zone and Ananda at the southwestern end). The resident labour force of

some estates are located near the reserve boundary (e.g. Sinhagama village). The landscape changes again along the northern boundary of the reserve which in most parts abuts state owned forests and *Pinus* plantations interspersed with villages containing home gardens, tea small holdings and small extents of cinnamon, rubber and paddy. Some state owned 'other' forests are located between the reserve boundary and buffer zone villages.

#### Access to the forest:

There is good access to Sinharaja through about 10 roads and tracks<sup>11</sup> of which four from Kalawana -Weddagala, Morningside, Deniyaya and Neluwa are now considered the principal access routes.

#### The socio-economic status of peripheral villages:

##### ● The socio-economic situation of local people

Prior to the 1980s, the villagers living near the forest were largely a homogenous group in terms of socio-economic status.<sup>19</sup> Most houses were simple wattle and daub structures with roofs thatched with beru (*Agrostistachys longifolia*) and bamboo (bata) leaves (*Ochlandra stridula*) or coconut thatch; clay tiles were infrequent.<sup>1</sup> By the 1990s the situation was changing due to the shift from subsistence agriculture to intensive tea cultivation throughout the previous decade.<sup>2</sup> By 1993 almost all houses had modern roofing material such as corrugated sheets and tiles, and were constructed with permanent materials.<sup>11</sup> By the mid 1990s social differentiation had become discernible resulting in a social mix of relatively wealthy and poorer people, although a majority of people remained below subsistence level.<sup>2</sup>

At present tea continues to be the main source of livelihood and occupation for the villagers around the Sinharaja reserve. Much of their time is spent as family labour in their small holdings, which leaves little time and inclination for other activities, including gathering forest products on a daily basis. Despite this, many families continue to collect some forest produce, albeit in varying degrees and mostly for domestic use. Local people collect food items, ingredients for traditional medicines and small wood requirements for domestic use as and when required, but very few collect items for sale. The most dominant forest use in villages along the southern and northern periphery is kitul tapping for the production of treacle and jaggery - a local candy like sweetener. Though a traditional occupation and a good income earner, this practice is largely confined to the older generation and is generally looked down upon by the educated younger generation as it involves tree climbing.



Although tea cultivation brings in a good income for the villagers in the Sinharaja buffer zone, and lifestyles and housing conditions have improved tremendously during the past decade, educational and medical facilities and transport infrastructure have lagged behind. Despite the fact that literacy levels are high, and there are an adequate number of schools, the villagers consulted during this review were unanimously dissatisfied with the available educational facilities in the primary schools and many of the secondary schools.

This was attributed to a severe dearth of basic resources and teachers. Consequently most of the resource deprived schools have low student attendance and there is a

concomitant exodus of students to the few schools with better resources which are further afield. Low student attendance in turn precludes a flow of resources to the smaller schools, and understaffing is compounded by the lack of accommodation for teachers who are mostly not from the area. According to the villagers' perception over 90% of students in the buffer zone areas are schooling, but lack of access to schools with good facilities has resulted in lower schooling rates of about 60% in some areas of the buffer zone (Matara District). Despite this, most students in the Sinharaja buffer zone villages continue schooling to levels between grade eight and eleven (Ordinary Levels).

A survey in 1996-1997 of six villages peripheral to the Sinharaja forest has shown that 67% of cultivated area was under tea, 8% under cinnamon and a smaller per cent under rubber. About 85% of households in these areas cultivated tea, 29% cultivated cinnamon, 2% had rubber holdings, while about 53% cultivated paddy. Access to paddy lands are often based on fixed rotation of shares. Over half the income of respondents was from tea and around 2% from cinnamon. Less than 40% of households had clear titles to their lands, and almost 20% were settled on encroached lands. Well over half the people had land holdings smaller than 0.5 ha. (Source: Kariyawasam, Ph D thesis in prep.)<sup>2</sup>

Another study in two peripheral villages (Kudawa and Pitakelle) shows 95-100% of households surveyed had tea as a commercial crop, and 46 - 59 % had home-gardens ranging up to 0.4 ha. (Kathirarachchi, 2002 cited by Gunatilleke and Gunatilleke, 2003 in prep.)<sup>3</sup>

Similarly buffer zone villagers have poor access to western medical facilities, and hospitals with required facilities are few and far between. The problem of access to hospitals for the sick has been exacerbated due to the recent flood damage as the makeshift temporary 'bridges' made out of tree trunks preclude the passage of even a motorcycle or pushcycle. Due to the paucity of motorable roads and an undulating terrain, access to and from these villages is difficult at the best of times, and the main mode of transport is the motorcycle. Consequently there is a growing aspiration among the more well to do young people to leave these buffer zone villages and their traditional lands and to settle in areas with more facilities and economic opportunities.<sup>20\*</sup> This type of transition can have an impact on the Sinharaja Reserve if it promotes an exodus of people from outside who will settle in these areas for purpose of tea cultivation.<sup>20</sup>

The use of traditional medicines by local people has declined through the years due to greater reliance on western medication, and this has led to the gradual dying out of such practitioners in the area along with their extensive knowledge of local medicinal plants and their varied uses. The few remaining traditional practitioners of high calibre are mainly those who treat fractures or snake bites. Similarly people with a knowledge of folklore, local customs and traditional rituals are also dying out as the younger generation is not interested in preserving this knowledge,<sup>20\*</sup> mainly due to lack of economic incentives to do so. Consequently the invaluable local knowledge of forest products associated with medicinal use and local customs and rituals will also soon be lost.

#### **Impacts of the 2003 floods:**

Although the severe floods in May 2003 had drastically affected a considerable number of villages in the buffer zone of the reserve, tea continues to be the most popular source of livelihood, and people were beginning to resume a semblance of their former lifestyles during the September and October 2003 field visits for this review.

\* Also perceived during this review



Three community consultations were held in the Galle, Matara and Ratnapura Districts for the review. Each participant was given the opportunity of responding to the questionnaires individually while working in groups by marking their responses on a chart. Facilitators ensured that all participants understood the questions, were not unduly influenced by other group members and were free to give their opinions without restraint.

Surprisingly most tea holdings which had been completely submerged had survive were yielding, except where damaged or destroyed due to the landslides which followed the floods. Many areas around the reserve sported new houses and several buildings were being built, some of it with state or private sector aid. It is creditable that this wave of construction activity has not led to an appreciable acceleration of timber felling in the Sinharaja reserve by the local people. Some villages are more affected from the floods and earthslips than others, and it is to be expected that it will take some time before they regain the socio-economic status they enjoyed previously. The damage to roads and bridges has also created much hardship to people on a daily basis in some areas, particularly for the transport of tea leaves to collection centres as they now have to be hand carried precariously across several temporary bridges made out of bamboo stems and arecanut trees.

## 2.0 REVIEW METHODS AND PROCESS

The method used for the review is designed to reflect the current status of the Sinharaja Biosphere Reserve, and whether it continues to satisfy the qualities required for inclusion in the world network of biosphere reserves, taking into consideration the cultural and socio-economic status of the State in which it occurs.

The approach adopted was to assign the development of indicators for the review and preparation of the review report to an independent reviewer who would work in close collaboration with the National MAB Committee and liaise with the Forest Department and other stakeholders as required.

In accordance with the goal and scope of this exercise, a review strategy was developed with the concurrence of representatives of the National MAB Committee\* to identify indicators/criteria that were applicable and feasible to (a) gauge conformity of the reserve with MAB requirements, (b) identify data needs, and (c) ascertain methods of data collection. A comprehensive set of indicators was developed by harmonising (a) the requirements of Articles 3 and 4 of the Statutory Framework for the World Network of Biosphere Reserves and (b) the goals and objectives of the Seville Strategy and its implementation indicators for individual reserves.<sup>21</sup> The indicators were subject to key stakeholder\* review and finalised prior to adoption. Annex 1 contains the indicators and demonstrates how they relate to (a) and (b).

A range of data gathering mechanisms were used during for this review. They include two field visits by the reviewer to ascertain the present status of the Sinharaja Biosphere Reserve and buffer zone; facilities available for research, education and training in the reserve; and for consultation with local people, visitors to the reserve and Forest Department field officials. The educational/training and research functions of the reserve and the facilities for research and education/information were assessed through visits to all three conservation centres and discussions with field staff. Three structured meetings with members of local Community Based Organisations (CBOs) and other buffer zone villagers, as well as several informal interviews with local people in their homes helped to ascertain community perception of whether the Sinharaja IBR serves conservation requirements while satisfying local needs in an ecologically sustainable manner. The same questionnaire was used to obtain and compare the views of local people and field forest officials on forest uses and threats (Annex 2).

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\* The Conservator General of Forests and the Chairman of the National MAB Committee

Another questionnaire was used to gauge community participation in forest management at the community consultation workshops (Annex 3).

The present status of biodiversity in the forest was assessed based on scientific evidence from recent biodiversity surveys carried out by the Forest Department and other institutions and from studies by key researchers in the Sinharaja forest and its buffer zone. The research and training potential of the reserve was assessed through discussions with researchers and Forest Department officials. Researchers working in the reserve were also interviewed to obtain their individual views on forest condition and perceptions of the forest management approach. All people consulted during the review are listed in Annex 4.

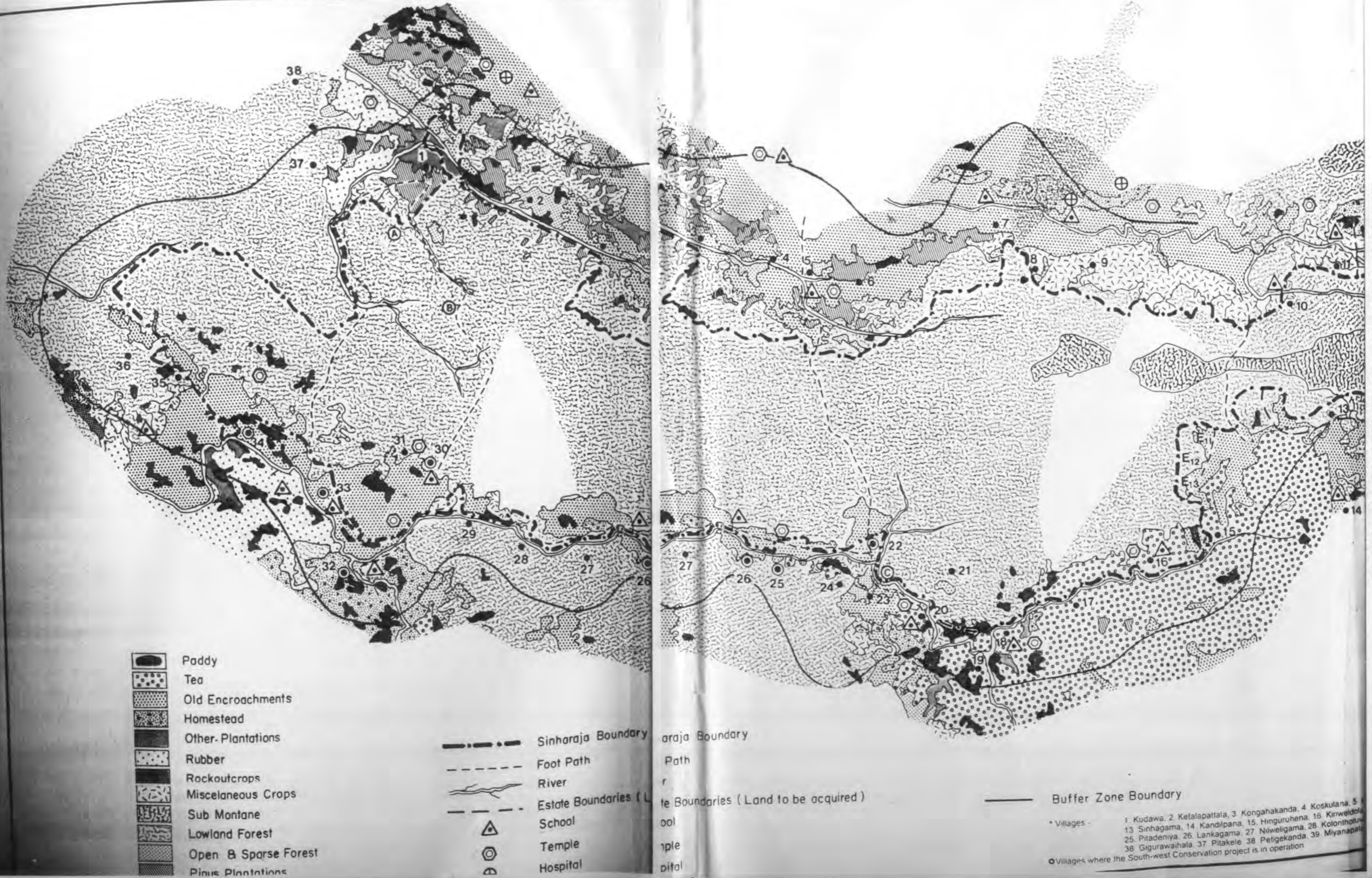
Meetings, interviews and discussions were supported by review of relevant reports, management plans and other conservation plans and programmes. All sources of information for the report are documented (Annex 5).

The review was considerably delayed due to the severe floods in May 2003 which affected the buffer zone villages around the reserve and disrupted their social life as never experienced in recent history. Visitor use of the reserve was also disrupted for many months as the roads to the reserve were inaccessible and the conservation centres were closed for repair and renovation. As a result, the scheduled field visits had to be postponed until some degree of normalcy had returned to the buffer zone villages and to the day to day management of the Sinharaja Biosphere Reserve.

The Terms of Reference for the review are given in Annex 6.

Figure 1

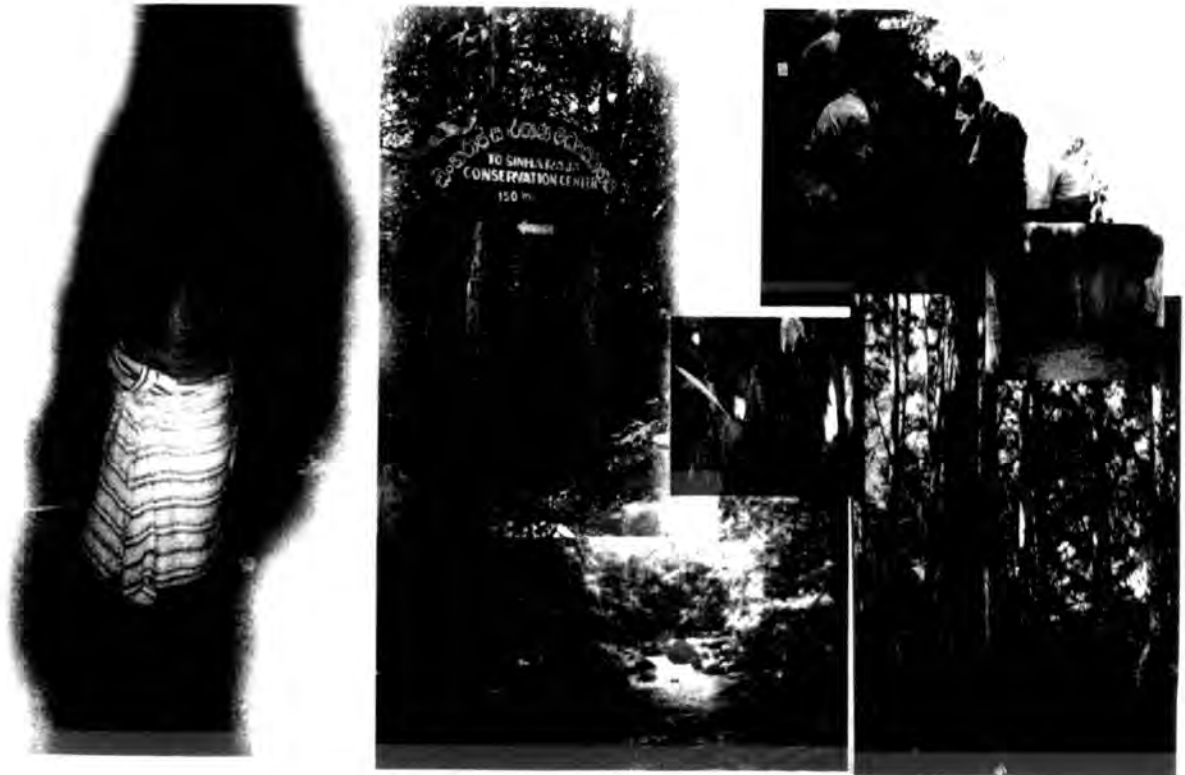
Major Forest Types in Sinharaja and Land Use Land Use Pattern in the Buffer Zone





- 1 Keskulana, 2 Kamburugoda, 3 Palwatta, 4 Mugunuwala, 5 Dombagahamulla, 6 Mederigewatta, 7 Daivawakkanda, 8 Kudagoda, 9 Illumbakanda, 10 Kiriweldola, 11 Dehigampola, 12 Kirwalagama, 13 Poddana, 14 Mederipitiya, 15 Kohilarambe, 16 Watugala, 17 Dombagoda, 18 Watugalagama, 19 Kolontholuw, 20 Walugedaragama, 21 Warukandeniya, 22 Indigaswila, 23 Madugeta, 24 Tambalagama, 25 Kosmulla, 26 Gigurawapahala, 27 Miyanapala

### 3.0 RESULTS OF THE REVIEW



**Seville Strategy**

**GOAL 1:**

Use Biosphere reserves to conserve natural and cultural diversity.

**Objective 1.1**

Improve the coverage of natural and cultural biodiversity by means of the World Network of Biosphere Reserves.

**Action at national level:**

- ... establish, strengthen or extend biosphere reserves as necessary, giving special attention to fragmented habitats, threatened ecosystems, fragile and vulnerable environments, both natural and cultural.

**Article 3.(a):** [functions of a biosphere reserve]  
**Conservation – contributes to conservation of landscapes, ecosystems, species and genetic variation.**

**Article 4.1:**

It [a biosphere reserve] should encompass a mosaic of ecological systems representative of major biogeographic regions, including a gradation of human interventions.

● **Global significance**

### 3.1 SIGNIFICANCE FOR REPRESENTATIVE AND CONSERVATION VALUE

**Indicator 3.1.1. Representation of key global vegetation and ecosystem type/biogeographic region**

**A rainforest of high biological value:**

The Sinharaja forest was designated an International Biosphere Reserve (IBR) in 1978 as a representative of the Tropical Humid Evergreen Forest Ecosystem of the Indo-Malayan Realm. It is at present the only International Biosphere Reserve representative of this ecosystem type in Sri Lanka; the other IBR (the Hurulu Biosphere Reserve) is located in the dry zone of the island.

This forest is a remnant of the now fragmented far-eastern group of rainforests which occurred in South and Southeast Asia. Consequently it contains some elements in common with the forests of the Malayan Archipelago, while also representing one of the "... few surviving links between the African and the Southeast Asian major forest blocks." <sup>1</sup> Due to the island's evolutionary and geological history, the Sinharaja species, particularly the flora, show affinity to those of Gondwanaland<sup>1</sup> - the super continent which dates back to the Tertiary Period <sup>16</sup> - as well as to those which evolved under the more equatorial conditions of the Deccan Plate (comprising India and Sri Lanka) which broke away from it around 55 million years ago<sup>1</sup>. The separation of the island from India about 20 Mya <sup>22</sup> has led to particularly high levels of endemism. Despite this, there is much similarity between the species of Sri Lanka and the Western Ghats of India due to migration facilitated by brief land connections during the Pleistocene. <sup>14,23</sup>

**Indicator 3.1.2: Globally recognised conservation value**

**A global biodiversity hot spot:**

The southern sector of the Sinharaja reserve covers an area believed to be floristically the richest region in South Asia. <sup>14</sup> Further, southwestern Sri Lanka (where Sinharaja occurs) was identified in the 1980s as one of 18 global biodiversity hotspots <sup>24</sup> based on high concentrations of endemics and unusually rapid rates of habitat modification. A more recent assessment has identified the Western Ghats and Sri Lanka as one of the world's 25 biodiversity hotspots. <sup>25</sup> Within these, the Sinharaja Forest Reserve has been recognised specifically as one of the highest priority Protected Areas for the conservation of threatened primates. <sup>23</sup>

**A World Heritage Site:**

The Sinharaja forest was declared a UNESCO World Heritage Site (WHS) in 1988<sup>12</sup> due to its unique biological features, making it the first natural area in Sri Lanka to receive such a distinction.

● **National significance**

**Indicator 3.1.3: State recognition of conservation value**

The Sinharaja forest was first declared a state owned forest reserve in 1875, and re-declared a Forest Reserve by the Forest Ordinance of 1941. <sup>2</sup> Since then, special state recognition has been given to this forest as an area of particular concern due to its distinctive biodiversity, importance for soil and water conservation and its cultural and service values. Consequently two blocks of virgin forest totalling 1,840 ha were declared a national Man and Biosphere Reserve in 1977, <sup>3</sup> and a further 8,864 ha of modified and primary forest was subsequently declared an International Biosphere Reserve (IBR) in 1978. <sup>1,6</sup> Fostered by global and national recognition the Sinharaja Reserve received, another 2,687 ha of contiguous forest was included within the reserve (although some heavily encroached areas were excluded), and the government of Sri Lanka formally recognised 11,187 ha of the forest as a National Heritage Wilderness Area under the specially enacted National Heritage

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<sup>+</sup> Covering 6,091 ha of forest categorised then as Forest Reserves and 2,773 ha of Proposed Reserves

Areas Act No. 3 of 1988.\* This made Sinharaja the first legally declared Protected Area to be established under the Forest Department.\*\* Arrangements are now underway to add a further 2,598 ha to the Sinharaja Biosphere Reserve/National Heritage Wilderness Area/World Heritage site\* (Figure 1).

According to one legend the name of the forest - which literally means lion (*sinha*) king (*raja*) - stems from the fact that it was once a royal preserve of the ancient Kings of the Lion Race (*Sinhala* people), whose descent is allegedly from a union between an Indian Princess and a lion. Another legend links its name to a spirit of a king watching over the forest in the guise of a lion. Other interpretations suggest that the forest was the refuge of the now extinct lion of Sri Lanka, while local folklore suggests that the name is derived from a rock in the forest which is shaped like a lion. While the origin of its name is blurred with the mists of time, the proximity of this forest to Galle, the island's premier port in the 16<sup>th</sup> and 17<sup>th</sup> centuries, and the existence of a route from Galle through the forest to the sacred Adam's Peak mountain, suggest that the Sinharaja forest was well known, and frequently traversed in ancient times.

(*De Zoysa and Raheem, 1990*;<sup>1</sup> *IUCN 1993*<sup>11</sup>; and *Jayatileke, pers com.*<sup>20</sup>)



*Duwill ella* which feeds the stream supplying water to the Walawe Ganga (river)

villagers from Pitakele on the northern border trek through the Kosmulla - Pitakele footpath annually to offer alms to the hermitage. This footpath which traverses the forest has been used by pilgrims from Kosmulla (and from as far as Galle) to visit Adam's Peak in ancient times.<sup>11</sup> Communities consulted during this review confirmed that this practice continues, albeit less frequently.

#### **Indicator 3.1.6: Contribution for watershed protection**

The forest constitutes an important watershed for a network of water ways, chief among which are two major rivers: the Gin Ganga and the Kalu Ganga. A hydrological survey of natural forests carried out through the National Conservation Review (NCR) which ended in 1996 has shown that out of the 281 forests evaluated in the island, the Sinharaja is one of 85 forests deemed of

#### **Indicator 3.1.4: Contribution to national forest cover**

The Sinharaja forest is known as one of the last viable remnants of the once widespread mid-Miocene tropical rain forests of Sri Lanka, and it is estimated to constitute about 10-11% of the severely fragmented forest cover in the island's lowland wet zone (Pushparaja, 1985a cited in IUCN, 1993).<sup>11</sup> It is currently acknowledged as the largest and most biologically significant patch of relatively undisturbed lowland tropical humid forest remaining in the country, and is a repository of exceptionally high levels of biodiversity and endemism.

#### **Indicator 3.1.5: Recognised historical/cultural value**

Most people in Sri Lanka traditionally recognise the importance of forests, but the Sinharaja forest has special national significance in terms of existence value. Many myths and legends connected with this area have enriched folklore<sup>20</sup> indicating its strong cultural association with the people of this country.

Cultural and religious associations with the forest exist even today. The *Sinhalena Tapowanaya* - a Buddhist hermitage located near Kosmulla just inside the forest's southern boundary continues to attract many visitors from the adjacent villages as well as from more further afield. For instance

\* This coincides with the MAB IBR and UNESCO WHS areas.

\*\* All other Protected Areas were under the Department of Wildlife Conservation at this time.

priority importance for soil protection and flood control in the island.<sup>6</sup>

The Sinharaja also contains many scenic waterfalls such as the *Brahmana ella*, *Galdoratu ella*, *Uravetuna ella*, *Duvili ella* (at Kosmulla) and *Duvili ella* (at Morningside).

**Indicator 3.1.7: Vulnerability to human population pressure**

The Sinharaja Biosphere Reserve is located in the densely populated wet zone which has a population density of about 583 persons/sq km, which is double the average for the entire island.<sup>26</sup> A recent estimate of population size around the reserve based on village level administrative reports is about 26,000 persons in 6,500 families living in about 40 villages (compared with 5,457 in 1980), with a range of 42-429 households in a village.<sup>27</sup>

There are at present about 39 villages boarding the reserve, as well as two villages (i.e. Indigaswila and Warukandeniya) and two families at Kohilarambe within the reserve boundary (Figure 1). The paucity of unused lands for settlements and agriculture due to the high population density in the wet zone continues to be a threat to this unique forest necessitating that continued priority be given for its conservation and management.

**Article 4.2.** It [a biosphere reserve] should be significant for biodiversity conservation.

## 3.2 SIGNIFICANCE FOR BIODIVERSITY CONSERVATION

### ● Species

**Indicator 3.2.1: Species diversity**

A biodiversity assessment of 204 natural forests in the island was carried out through the National Conservation Review (NCR) which culminated in 1996. Of the forests surveyed, Sinharaja was identified as:

- one of 133 forests required to conserve Sri Lanka's indigenous woody plants and faunal species (i.e. vertebrates, molluscs and butterflies).<sup>6</sup>
- the richest forest for woody plant species, and the second richest for faunal species.
- one of eight units of contiguous forests in which at least 79% of the island's woody plant diversity was represented.<sup>6</sup>

The NCR survey, though incomplete in terms of documenting all species (due its goals and scope), recorded at Sinharaja a total of:

- 337 woody plant species (out of 1,153 recorded from all forests) within 191 genera and 71 families<sup>6</sup> (Table 1).
- 107 species of vertebrates, butterflies and molluscs (out of 410 recorded from all forests), within 84 genera and 55 families.<sup>6</sup>

More recent surveys have added to the understanding of species diversity among the fauna (Table 2).

The vegetation structure of the forest is complex as in all rainforest systems, providing habitats in the canopy, sub-canopy, under-story and undergrowth. This serves to accommodate a high diversity of woody and herbaceous plants, climbers, epiphytes, fungi, ferns, etc. This vegetation structure supports a wide diversity of faunal species associated with the different vegetation levels and types.

It is also significant that many Sinharaja species are rare and localised. For example, in the primary forest area about 50% of tree species are represented by an average of 10 individuals/ha, and 15% by one individual/ha.<sup>1</sup> Similar trends are noted for shrubs and herbs.<sup>1</sup> Rarity of species extends to minor forest products and about 26% of 53 species used commonly for food, medicinal purposes, fibre, resin, pigment and thatching by peripheral communities are considerably localised in their distribution.<sup>28</sup>

Table 1: Species diversity among the woody plants and lianas in the Sinharaja IBR

Floral group	Number of species recorded	Percentage endemics	Number of species listed in the 1999 list of nationally threatened species <sup>33</sup>
Woody plants and lianas (from a study of individuals $\geq 30$ cm gbh in 1980s) (Gunatilleke and Gunatilleke 1987) <sup>28</sup>	211 species (from 119 genera and 43 families)	63% -65%	Out of 152 species occurring at Sinharaja that were evaluated, 139 were found to be threatened (this excludes the Orchidaceae for which data were not available for this review)
Records of all species of woody flowering plants ( $\geq 10$ cm dbh) in the mid 1990s using the gradsect method to record maximum biodiversity. IUCN/WCMC/FAO (1997). <sup>6</sup>	337 woody plant species from 191 genera and 71 families (in 7 transects and 46 plots of 100x5m each)	57%	

A high species diversity is also expected among the fungi, non-vascular plants, ferns and herbs although there is little data on these groups as in all Sri Lankan forests.

Table 2: Species diversity among the vertebrates in the Sinharaja IBR

Faunal group	Number of species recorded	Number of endemics	% of endemics from total in the island	Number of species listed in the 1999 list of nationally threatened species **
Fish	19 <sup>x</sup>	10 <sup>x</sup>	31%	10
Amphibians	27 <sup>*</sup> (33) <sup>x</sup>	19 <sup>*</sup> (23) <sup>x</sup>	(58% <sup>x</sup> )	24
Reptiles	71 <sup>x</sup>	35 <sup>x</sup>	43%	36
Birds	147 <sup>*</sup>	22 <sup>*</sup> (23) <sup>x</sup>	100% <sup>x</sup>	29
Mammals	44 <sup>**</sup>	8 <sup>**</sup>	57%	15

Sources:

<sup>x</sup> Bambaradeniya et al. in press<sup>29</sup>

<sup>+</sup> Wijesinghe and Dayawansa, 2002,<sup>30</sup> and Dr M R Wijesinghe personal communication, 2003<sup>31</sup>

<sup>\*</sup> Prof. S.W Kotagama personal communication, 2003<sup>32</sup>

<sup>\*\*</sup> 1999 List of Nationally Threatened Species, IUCN 2000<sup>33</sup>

Among the vertebrate species recorded are the leopard (*Panthera pardus*), rusty spotted cat (*Prionailurus rubiginosus*), small civet (*Viverricula indica*), palm civet (*Paradoxurus hermaphroditus*), wild pig (*Sus scrofa*), pangolin (*Manis*

*crassicaudata*), sambhur (*Cervus unicolor*) and three endemic primates: the purple-faced leaf monkey (*Trachypithecus vetulus*), the toque macaque (*Macaca sinica*) and the red slender loris (*Loris tardigradus*). There are also several species of rodents including *Rattus kellarti*, *Rattus rattus kandianus*, *Mus mayori*, the Ceylon bicoloured spiny rat (*Srilankamys ohienensis*), the flame-striped jungle squirrel (*Funambulus layardi*), *F. sublineatus*, the giant squirrel (*Ratufa macroura*), the small flying squirrel (*Petinomys fuscocapillus*) and several endemic shrews such as the Ceylon long-tailed shrew (*Crocidura miya*), Ceylon jungle shrew (*Suncus zeylanicus*) and *Feroculus feroculus* (Kelaart's long-clawed shrew). The last of the wet zone elephants inhabit the plains at the eastern end of the Sinharaja reserve and one is a rare visitor to the Morningside Conservation Centre and its nature trails.

The invertebrate fauna in the forest has been relatively less surveyed, but a high species diversity is indicated. There are records of 34 species of mosquitoes from 10 genera from past research (Kulasekera and Amerasinghe, 1990),<sup>3</sup> about 40 species of snails from an ongoing study,<sup>34</sup> and about 85 species of butterflies,<sup>29</sup> including 23 listed as nationally threatened.<sup>33</sup>

**Indicator 3.2.2: Importance as a habitat for endemics**

● Sinharaja as a refuge for endemic species

A study of small mammals in the Sinharaja forest has shown that endemic species are less adaptable to disturbance than non-endemics,<sup>35</sup> and many endemic amphibians and reptiles are also unable to establish viable populations in disturbed areas.<sup>36</sup> Most endemic fish found in waterways of wet zone forests are very sensitive to siltation and pollution.<sup>10</sup> Similarly, some wet zone forest endemic birds such as the blue magpie find it difficult to establish themselves in disturbed areas due to non-availability of ecological conditions required for nesting.<sup>32</sup> In terms of the flora, the dipterocarps that form the climax community of the southwestern region of the reserve are also poor dispersers, and their regeneration is threatened with excessive disturbance of forest canopy cover.<sup>14</sup> It is also noteworthy that comparative studies in the reserve have shown that the proportion of endemic species decreased from 62% to 44% with increasing forest disturbance and canopy gap size.<sup>37</sup>

The National Conservation Review (1991-1996)<sup>6</sup> has revealed that the Sinharaja forest:

- is one of 71 forests required to comprehensively protect the island's endemic fauna and flora;
- comprises one of eight units of contiguous forests in which at least 88% of endemic woody plant diversity and 85% of endemic faunal diversity are represented; and
- supports 57 % endemism among the woody plants (192 out of 337 recorded), and 47% endemism among the faunal groups inventoried (i.e. 50 out of 107 species recorded).

Studies in the early 1980s showed high endemism (64%) of the sampled tree flora, and the Dipterocarpaceae which dominates the forest canopy had endemism greater than 90%.<sup>28,38</sup> This is corroborated by the NCR findings.<sup>7</sup> Notably, 13 flowering plant genera endemic to Sri Lanka are found in the Sinharaja forest.<sup>39</sup>

Due to the small and fragmented nature of forest cover in the southwestern lowlands, there is concern that many of the wet zone forest patches may be inadequate to maintain functional ecosystems or sustain viable populations of the larger faunal species in the long-term.<sup>10</sup> Thus the Sinharaja Biosphere Reserve is an important refuge for the conservation of endemic species that require a relatively undisturbed rainforest habitat for their survival.

**Indicator 3.2.3: Contribution to agro-biodiversity**

There are many indications that the reserve has considerable value in terms of agro-biodiversity. This aspect has, however, received very little attention as yet and is an important area for future research and investigation in the reserve.<sup>40</sup>

The forest is of value as a reservoir of crop germplasm as indicated by the wild relatives of crops that have been collected from its vicinity. For example, wild ochra (*Abelmoschus* spp.) has been collected by the Plant Genetic Resources Centre (PGRC) from Ensalwatte, a plantation in the buffer zone,<sup>41</sup> part of which is now due for acquiring to expand the reserve. Other collections for the PGRC made from the reserve's buffer zone include traditional varieties of cultivated food crops such as rice, finger millet (*Setaria italica*; *S: tana-hal*), banana (*S: marathamalu*) and horse gram (*Macrotyloma uniflorum*; *S: kollu*) collected from Pothupitiya, a village in the reserve's buffer zone.<sup>41</sup> Wild mango (*Mangifera zeylanica*), wild durian (*Durio* sp.) wild olive and wild banana (*Musa balbisiana*) have been observed within the reserve.<sup>41</sup>

Wild cardamom (*ensal*) is a food item that continues to be collected from the forest for domestic use, and by some for local markets as well. This is now cultivated by under-planting in forest patches in tea plantations - especially in the eastern buffer zone of the Sinharaja Biosphere Reserve.

● **Ecosystems, habitats and landscapes**

**Indicator 3.2.4: Presence of diverse ecological systems/ habitats**

**Varied ecological systems and vegetation types:**

The Sinharaja forest is classified as a tropical evergreen forest, with lowland forests and sub-montane tropical forest areas.<sup>11</sup> Overall, three main vegetation types have been recorded which vary with the topography of the lower slopes and valleys (150 m - 600 m), middle slopes (>600 m - <1000 m), and upper slopes and ridges (>1,000 m). Each of these vegetation types has distinct species and structural variations, ranging from *Dipterocarpus* communities in the lower areas, *Messua-Shorea* communities in the mid slopes to sub-montane vegetation in the upper slopes where one can even observe typically stunted montane vegetation in the exposed summits.<sup>1</sup> The eastern section of the reserve, and the new area to be annexed to it (see section under Indicator 3.1.3) contain sub-montane forest which is very distinctive from the northern and southern sectors of the forest. The Thangamalai Plains within the reserve has grassland habitats and there are records which indicate that this area was used for paddy cultivation (or considered arable land suitable for paddy cultivation) even at the end of the 19<sup>th</sup> century.<sup>18</sup>

The reserve also shows considerable micro-climatic differences within a relatively small spatial area.<sup>10</sup> No one single area of the forest is representative of its entirety, highlighting the importance of conserving the entire forest.<sup>42</sup>

There are distinct species differences among the flora at different sites, and this is particularly obvious in the canopy and sub-canopy.<sup>1</sup>

**Agricultural landscapes:**

The reserve's eastern boundary is fringed by several large tea plantations and some wild cardamom holdings due to under-planting in forest patches; several of these are state owned (i.e. private lands acquired by the Land Reform Commission in the 1970s) while a few are still privately owned. Many of these contain abandoned tea lands which are now reverting back to climax forest. Some of these plantations also have undisturbed climax forest patches due to past forest policy which required the maintenance of forest patches in tea lands to provide fuelwood for the tea factories. There is also intensive tea cultivation in private small holdings in the buffer zone landscape along the southern boundary and near some areas of the northern boundary. There are also small amounts of paddy and other miscellaneous crops in the buffer zone (Figure 1).

Despite the predominance of tea in the landscape, many home gardens in the peripheral villages sustain multi-storeyed, multi-species agroforestry systems that are valuable in terms of agricultural biodiversity. Traditional varieties of crop plants and their wild relatives have been recorded in home gardens and rice fields in private lands of the buffer zone villages.<sup>41</sup>

**Indicator 3.2.5: Changes in ecosystem health**

Over the years there has been a positive improvement in ecosystem quality in the forest due to forest regeneration in areas that were selectively logged in the 1970s.

**Specific Indications of forest regeneration:**

- A long-term study of mixed-species bird flocks in the reserve since the 1980s has revealed a slight reduction in the incidence and occurrence of bird flocks which usually move along the skid trails established in the 1970s for logging operations. Similarly, the frequency of some endemic birds in these flocks have declined, while populations of some species favouring undisturbed forest have increased. Researchers suggest that these changes are due to the gradual regeneration of logged areas to climax conditions, and the resultant changes in vegetation patterns and the fauna they sustain.<sup>32,43,44</sup>
- Small mammals that are more common in primary forest now occur quite frequently in areas that were selectively logged in the 1970s, indicating that these areas are now reaching climax conditions.<sup>31</sup>
- Vegetation observed to be in the seedlings phase in the mid 1980s are now in the building phase of the forest, and reaching the mature phase.<sup>45</sup>
- Long-term monitoring of skid trails opened up for logging in the 1970s has shown that the canopy cover is closing, and early successional species such as *Trema orientalis* and *Osbeckia* are dying out. These areas are being taken over by late successional species such as *Shorea trapezifolia* and *Shumacheria castaneifolia*.<sup>39</sup>

- There has been considerable regeneration of sub-montane forest in abandoned tea lands located in the eastern buffer zone of the reserve.

**Flood damage:**

Despite these positive signs of forest regeneration in previously logged areas, the heavy floods in May 2003 have caused some damage and forest disturbance in various parts of the reserve. An example is the large number of small earth slips and tree falls along the Kudawa - Sinhagala skid trail (**Figure 2**) which was opened up to facilitate logging in the 1970s before the reserve received IBR status. The path itself is reportedly cracked at some points and may give rise to future earth slips. Similarly, a narrow strip of forest in the reserve bordering the river along the access road to the Pitadeniya Conservation Centre (PCC) has been lost due to widening of the river. Despite these very visible impacts, the reserve as a whole has not suffered serious changes due to the floods. Much of the damage seen was in areas that had already been subjected to human modification during the 1970s.



The old skid trail part of the Sinhagala nature trail is badly affected with earthslips, and tree falls.



The community sales outlet at the Pitadeniya Conservation Centre has been completely washed away when the river changed its course.



The river has widened taking a strip of forest bordering a nature trail which remains undamaged.

Photo © Forest Department



Visitor accommodation at the Kudawa Conservation Centre



Visitor accommodation at the Pitadeniya Conservation Centre



Through the mist ... Visitor accommodation at the Morningside Conservation Centre

### Key to the map

- A - Kudawa Conservation Centre (KCC)
- B - Jeep tracks from KCC to the KRS
- C - Malawala peak
- D - Kudawa Research Station (KRS)
- E - Gal-ley-yaya
- F - Suthagala pass
- G - Pitadeniya Conservation Centre (PCC)
- H - Pitadeniya tickler corner
- I - Track from Mederipaya to PCC
- J - Kukulala Acacia tree
- K - Kekinnella
- L - Pacharoyaella
- M - Dewalulla (Kukulala)
- N - Morningside Conservation Centre (MCC)
- O - Natural Pool
- P - Dewalulla (Morningside)



### Nature Trails in Sinharaja

- 1 - Welhucawa-Jelawella
- 2 - from KRS to giant *Wassia* tree
- 3 - from Suthagala trail to Gal-ley-yaya
- 4 - Suthagala trail from Kudawa
- 5 - Kukulala Acacia trail
- 6 - Kukulala & Pacharoyaella trail
- 7 - Suthagala trail from Pitadeniya
- 8 - Dewalulla trail from Deniwakanda
- 9 - Dewalulla trail from MCC
- 10 - From MCC to the natural pool

## ● Genetic resources

### **Indicator 3.2.6: Potential as a gene reservoir**

#### **Indications of genetic resources of value to humankind:**

Sinharaja is believed to be one of the richest reservoirs of genetic material in the country, due to its micro-climatic differences and species richness among the flora and fauna, many of which are endemic. The forest yields many species of use to local people for their daily needs, and past research has shown that about 53 species growing in the forest and buffer zone are commonly used by local people for food, medicines or other domestic uses.<sup>28</sup>

Wild species in the reserve are probably of potential value to humankind for medical use and enhancing agricultural productivity by carrying genes that can be used to breed new strains with higher yields and better disease resistance. For example two varieties of wild rice *Oryza granulata* and *O. eichingeri* endowed with crop enhancement potential have been found in other wet zone forests adjacent to Sinharaja, and there is high probability that they occur within the reserve as well<sup>41</sup> (see also section on contribution to agrobiodiversity).

#### **Specific indications of genetic diversity:**

- Different populations of dipterocarp species show reproductive isolation within the Sinharaja forest which is attributed to genetic variation.<sup>46</sup> A study of ten sub-populations of *Shorea trapezifolia* within and around the Sinharaja forest has revealed genetic variation between subpopulations separated by distances ranging from 0.5 - 40 km. (Dayanandan. B. 1989).<sup>3</sup>
- Studies on *Shorea cordifolia* and *Syzygium rubicundum* in the Sinharaja and Gilimale forest reserves have shown that crosses between trees from different forests cause out-breeding depression and a discernible drop in fruit set compared with within-forest crosses, indicating distinct genetic differences of species in the two forests (Stacey *et al.*, 2001).<sup>3</sup>
- There is marked behavioural variation among sympatric subspecies of small mammals in the reserve indicative of genetic differences, a fact which has implications for species conservation.<sup>31</sup> Genetic variation is a likely factor for differences in assigning species within the various dipterocarp genera by various taxonomists:
  - Kostermans recognised 6 species of *Shorea* in 1992, while Ashton in 1980 had differentiated them into 15 species.<sup>45</sup>
  - Ashton in 1980 recognised 15 species of *Stemonoporus* which Kostermans in 1992 differentiated into 26 species based on morphological features.<sup>39, 45</sup>
- An ongoing project in the forest on the collection and selection of the spice crop *Garcinia quaesita* has brought to light wide genetic variation which has implications on the taxonomic status of the closely related *Garcinia zeylanica* - a commercially important spice crop which is a native of Sri Lanka's wet zone forests.<sup>47</sup>

GOAL 1:

● **Bioregion represented**

**Objective 1.1**

**Indicator 3.2.7: Significance of bioregion for biodiversity conservation**

**Action at national level:**

- Prepare a biogeographical analysis of the country as a basis, *inter alia*, for assessing coverage of the world network of BRs.

The Sinharaja forest is located in the wet lowlands (*Bio-region 4*), one of four terrestrial bioregions prioritised out of eight identified in the 1999 (current) national Biodiversity Conservation Action Plan (BCAP) for conservation action. The reasons are: (a) significance for biodiversity and endemism, and (b) the highly fragmented nature of its remaining forests, and (c) high vulnerability to human pressure. The Sinharaja forest is specifically identified in the BCAP as one of the richest sites for biodiversity and endemism within *Bio-region 4*.<sup>10</sup>

**Article 4.4:** it [a biosphere reserve] should have an appropriate size to serve the functions of a biosphere reserve as set out in Article 3. (Article 3i: for Conservation; Article 3ii: for Development; Article 3iii: for logistic support).

### 3.3 SIZE OF BIOSPHERE RESERVE

**Indicator 3.3.1: Change in size after declaration as a biosphere reserve**

The reserve has grown in size since its declaration as a Biosphere Reserve. At the time of declaration, the Sinharaja Biosphere Reserve was about 8,864 ha, of which approximately 65% was primary high forest while the balance comprised fernland and secondary forest (Banyard and Fernando, 1988 cited in Gunatilleke and Gunatilleke, 2003 in prep.).<sup>3</sup> Subsequently, encroachments at the peripheries were exercised, but the total reserve area was expanded to 11,187ha in the 1980s by including other contiguous forests in this forest complex.

Arrangements are now being made to seek Cabinet approval to expand the reserve with the acquisition of contiguous forest areas located in 2,598 ha of state owned lands (LRC lands) bordering the eastern boundary of the reserve (**Figure 1**). Much of these forests are sub-montane, and hence will expand the species and habitat diversity of the reserve even further.

**Indicator 3.3.2: Adequacy for biodiversity conservation**

**The existing reserve area:**

Surveys since the mid 1980s through the 1990s confirm that the reserve in its present size is important for biodiversity conservation in the long-term. For example a recent study has shown that the 2,687 ha of forest annexed to the reserve at its eastern end in 1988 is much more important for conservation of amphibians than the original area declared as a MAB reserve in 1978.<sup>30</sup> The same area is also more significant in terms of molluscan diversity than the other areas of the forest.<sup>34</sup> Bird species diversity has also increased with the eastern expansion of the reserve due to the inclusion of sub-montane forests so that all 23 endemic species of birds are now recorded from the reserve.<sup>29</sup>

The reserve is also sufficiently large for research and education and development functions as required under Article 3.

**New areas to be annexed:**

The proposed inclusion of a further 2,598 at the eastern side of the reserve will further enhance the reserve's biodiversity value as this area contains mid-elevation montane forest and grassland. This will help enhance conservation of faunal groups such as amphibians and molluscs<sup>31</sup> and provide refugia for large mammals such as sambhur and the very few elephants that remain in the wet zone.

**Article 4.7:** In addition mechanisms should be made for:

[b]: a management policy or plan for the area as a biosphere reserve

[c]: a designated authority or mechanism to implement the policy or plan.

### 3.4 MANAGEMENT OF THE BIOSPHERE RESERVE

#### ● Past conservation measures for the Sinharaja IBR

Strident public opinion against mechanised logging of the Sinharaja forest in the 1970s provided the momentum for conservation measures targeting this forest. It also caused the Sinharaja forest to receive considerable attention from government, conservation organisations, scientists, the general public and many national and international agencies. A positive result was the preparation of specific management plans for the forest in 1986 by the then Ministry of Lands and Land Development and the Forest Department, with support from The World Wildlife Fund and IUCN - The World Conservation Union. This was followed by the development of a management programme for the forest by IUCN in collaboration with the ministry dealing with forests and the Forest Department. Phase I of this programme was implemented through 1988 to 1991. A revised management plan for the Sinharaja forest was prepared by the Forest Department and IUCN in 1993.

Seville Strategy Goal IV:  
Implement the  
Biosphere Reserve  
concept

Objective IV.1  
Integrate the functions of  
BRs.

**Reserve level:**

- Prepare, implement and monitor an overall management plan or policy that includes all zones of BRs.

- Define and establish institutional mechanisms to manage, coordinate and integrate the reserve's programmes and activities.

#### **Indicator 3.4.1: Management plan prepared for the reserve**

The Management Plan for Conservation of the Sinharaja Forest prepared in 1993 governs the present management of the Sinharaja Biosphere Reserve. The Plan strongly recommends that forest management should be undertaken with the highest level of participation by the local people in the buffer zone.<sup>11</sup>

#### **Indicator 3.4.2: Authority defined for management plan implementation**

The Forest Department (which currently comes under the Ministry of Environment and Natural Resources) operates several field bases in the Sinharaja forest (Figure 2) and is responsible for overall implementation of the 1993 Management Plan. Forest officials from the main head office (a Deputy Conservator of Forests), district level (three District Forest Officers) and field level (six Range Forest Officers and 11 Beat Forest Officers, helped by 21 field assistants) are responsible for managing the forest and for coordination with other governmental institutions at the provincial and local levels as relevant. They also liaise with local people, Community Based Organisations (CBOs) and other non-governmental organisations to implement the concepts and recommendations proposed in the Management Plan.

**Article 4.5:** It should include these functions [of a biosphere reserve], through appropriate zonation, recognising:

- [a].** a legally constituted core area devoted to long-term protection, according to the conservation objectives of the biosphere reserve, and of sufficient size to meet these;
- [b].** a buffer zone or zones clearly identified and surrounding or contiguous to the core areas, where only activities compatible with conservation objectives can take place;
- [c].** an outer transition zone where sustainable resource management practices are promoted and developed.

**Indicator 3.4.3: Management plan recognises zones consonant with the biosphere reserve concepts**

The Management Plan for the Sinharaja forest identifies an area primarily for conservation and a surrounding external buffer zone. It recommends strategies to ensure maximum possible protection of the conservation area (in keeping with management objectives) while enabling the livelihood and traditional practices of people in the buffer zone in a manner that is not harmful to the forest.

The zoning system adopted for conservation forests (such as the Sinharaja) in Sri Lanka is a resource-based approach by which the forest resources are classified according to their need for protection, level or intensity of management and the capacity of each area of the forest to accommodate traditional or public use. Based on this concept the entire legally defined Sinharaja Conservation Area is equivalent to the "core area" of a biosphere reserve. This is surrounded by an external buffer zone as shown in Figure 1 (also see section on community participation in forest management - the Sri Lankan perspective under section 2.2: The background to forest conservation in Sri Lanka).

There is no Transition Zone within the Sinharaja Reserve. This is due to the intrinsic nature of the wet zone forests in Sri Lanka where the 'core area' often grades in to private lands consisting of human settlements and agriculture in the buffer zone which coincides with the functions of a transition zone as well. This is the case with the Sinharaja reserve, particularly along its eastern and southern boundaries.

**Indicator 3.4.4: Management zones include a core area of adequate size devoted to long-term protection.**

The zone set aside as the Conservation Area, which is equivalent to the area declared a National Heritage Wilderness Area, a World Heritage Site and a Biosphere Reserve (covering 11,187 ha) is consonant with the concept of 'core area' for long-term protection of biodiversity, soil and watershed protection. Access to this is limited, but non-destructive forest uses such as nature tourism and kitul tapping are permitted subject to certain conditions. The community meetings held during this review showed that food gathering and kitul tapping (sometimes sans a permit) do occur in the core area, but this is at an extremely low level and with no adverse impacts on the forest.

**Indicator 3.4.5: The core zone is legally constituted**

The Sinharaja National Heritage Wilderness Area (which corresponds to the area declared a Biosphere Reserve and a World Heritage Site) is gazetted under the

National Heritage Wilderness Act No. 3 of 1988 and is thus legally constituted.

**Prohibited actions in the Conservation Area:**

As a National Heritage Wilderness Area, no one can cut, mark, lop, saw, convert remove or collect any plant, tree or part of these, or any forest produce; pollute water; remove/destroy/injure/damage any plant or animal; sell or offer for sale any plant or animal; kill/snare or molest animals or disturb the nest of any bird; fire a gun that will disturb wild animals or their breeding places; use traps; cut grass or pasture cattle; cultivate land inside the forest; make fresh clearings for cultivation in the forest; kindle fires inside the forest; construct temporary or permanent buildings; construct any roads; or damage/alter/remove any boundary markings as they are prohibited by law.

In recent years, however, there has been a relaxation of some of these rules and there is a tacit understanding between the Forest Department and the communities to allow limited and non-destructive use of some resources. This is in accordance with the participatory management approach being adopted and the MAB concepts. Examples of such forest uses are local people's use of longstanding footpaths traversing the forest (Figure 1), kitul taping with permits and non-destructive, small scale, collection of some plant items for food and medicinal use.

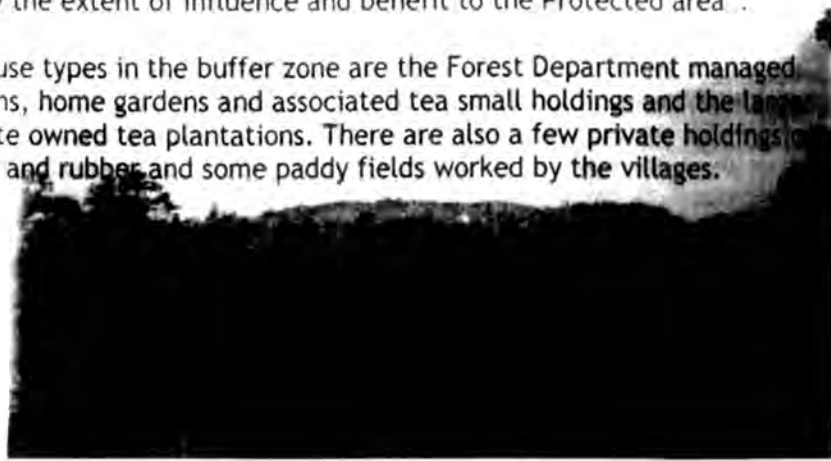
**Indicator 3.4.6: Buffer zone promotes sustainable development of the reserve and preserves the core zone\***

The definition of a buffer zone in the Sri Lankan context follows Sayer (1991), and denotes the region bordering (outside) a protected area where restrictions are placed upon resource use, or special development measures are undertaken to enhance the conservation value of the protected area.

In keeping with the prevailing concept of the buffer zone for managing Sri Lanka's wet zone forests and the nature of human settlement patterns in the area, a buffer zone is recognised immediately outside the forest to act as an 'external buffer' to the 'core area' and for management interventions that will help conserve the latter. Thus the inner boundary of the buffer zone is the outer boundary of the Sinharaja Reserve, the area of which corresponds with the Core Area of a biosphere reserve. There is no legally defined outer boundary for the buffer zone which is conceptual, and it is kept flexible to accommodate villages that have

formed CBOs which actively participate in forest conservation. Consequently the buffer zone comprises a belt of varying width surrounding the reserve and is "determined by the extent of influence and benefit to the Protected area".

The main land use types in the buffer zone are the Forest Department managed *Pinus* plantations, home gardens and associated tea small holdings and the larger private and state owned tea plantations. There are also a few private holdings of wild cardamom and rubber and some paddy fields worked by the villages.



The *Pinus* plantations in some parts of the northern boundary of the reserve provide an effective buffer against external encroachment, as do the state owned (LRC) plantations along its eastern perimeter.<sup>12</sup>

*Pinus* is, however, no longer planted to rehabilitate degraded lands in the buffer zones of wet zone forests. The buffer zone along the highly populated southern boundary of the Sinharaja reserve contains many private lands as do some parts of the northern boundary. A range of buffer zone management activities have been carried out since the 1990s for sustainable socio-economic development with the aim of reducing adverse forest use and the introduction of benign land use practices. This aspect is now considered an important component of managing the Sinharaja forest and is being fine-tuned through a pilot project covering 11 selected buffer zone villages along the southern boundary of the reserve. The success of the community participation programme in these villages, and the long-term viability of the management approach so established, is imperative to ensure the effective functioning of these areas as a buffer zone.

**Prohibited actions in the buffer zone:**

Timber depots are not permitted within 1 km of the reserve boundary through a gazette notification.<sup>12</sup> Normal procedures requiring an Environmental Impact Assessment (EIA) for prescribed development projects under the National Environmental Act No. 56 of 1988 is applicable to the Sinharaja buffer zone. Among the 53 projects listed by generic description as 'prescribed' are river basin development and irrigation projects; construction of energy based electricity generating stations exceeding 50 MW; thermal power plants exceeding 25 MW; holiday resorts or hotel projects of over 99 rooms or spread over 40 ha; projects involving the involuntary resettlement of more than 100 families - except under emergency situations; construction of highways of more than 10 km, railway lines, etc.

- Where necessary, in order to preserve the core area, re-plan the buffer and transition zones according to sustainable development criteria

**Indicator 3.4.7: Boundary of zones defined to meet conservation objectives and sustainable development**

The Core Zone (i.e. the Conservation Area) has been increased several times in the past by annexing natural forests contiguous with the reserve (from 8,864 ha to 11,187 ha) to better serve long-term goals of conservation, particularly for biodiversity conservation. At the same time, heavily encroached lands in the periphery have been excluded from the core area to meet management needs.

In the 1990s, the boundary of the Sinharaja Reserve was defined with permanent concrete posts, after which encroachment into the reserve is perceived as greatly reduced by the Forest Department and local communities. However, some parts of the present boundary have been established in privately held non-forest lands with the aim of acquiring them. As this was subsequently deemed impractical, and those areas were never acquired, some boundary markers (concrete posts) of the reserve are in reality placed in private lands. Such anomalies are now being resolved by the Forest Department through boundary redefinition with new concrete posts. As the Sinharaja forest is a National Heritage Wilderness Area, the boundary survey and supervision of re-demarcation is done by the Survey Department. However, this is being preceded with consensual boundary re-definition by the Forest Department and the local people to prevent conflicts and future encroachments in areas where villages abut the forest.

The boundary re-demarcation is ongoing and is funded by the ADB funded Forestry Resources Management Project (FRMP) spanning 2001 to 2007.

- identify and map the different zones of the BR and define their respective status

**Indicator 3.4.8: Biosphere reserve mapped showing zonation\***

The map of the biosphere reserve (Figure 1) indicates the peripheral villages in the buffer zone. The location of villages and footpaths have been checked with community and Forest Department participation at the review workshops. The outer boundary of the buffer zone, though conceptual, was identified as at present by the local people and the forest officials according to their perception.

It is recommended that a new map of the Sinharaja IBR will be prepared after the boundary re-demarcation is completed, indicating land use of the core area and buffer zone.

**Article 4.6:** Organisational arrangements should be provided for the involvement and participation of a suitable range of inter-alla public authorities, local communities, and private interests in the design and carrying out of the functions of a biosphere reserve.

**Article 4.7:** In addition mechanisms should be made for:

[a]: mechanisms to manage human use and activities in the buffer zone or zones; .

### **3.5 MECHANISMS TO MANAGE, COORDINATE AND INTEGRATE THE BIOSPHERE RESERVE PROGRAMMES AND ACTIVITIES**

#### **● Integrating community participation with forest conservation**

**Indicator 3.5.1: Forest policy is consonant with community participation in forest management**

There has been a discernible change in forest policy during the past decade in terms of interaction with peripheral communities - as opposed to the top down approach of the 1980s. In the 1980s and the early 1990s, the Forest Department Policy decreed that extraction of any forest products without permission and all use of forest resources other than for forest conservation, research, education and recreation were illegal. Consequently local people were unwilling to cooperate with the Forest Department. The situation started changing in the mid 1990s with the recommendations of the Sinharaja Conservation Management Plan of 1993 and the current forest policy of 1995 which states that:

- (a) "the traditional rights, cultural values and religious beliefs of people living within or adjacent to forest areas will be recognised and respected."
- (b) although natural forests will be primarily allocated for conservation, "the state will, where appropriate form partnerships with local people, rural communities, and other stakeholders, and introduce appropriate tenurial arrangements."

The 1993 Sinharaja Management Plan accepts that complete restriction of the use of forest resources by local people is counter-productive for conserving the forest and its biodiversity. This has resulted in the current management approach which is seeking to facilitate opportunities for local communities to play a more meaningful role in conserving and managing the forest.

The present managers of the reserve (from Headquarters to field staff) appreciate the support required at the grassroots level to stem the loss of forest area and resources through encroachment and unsustainable extraction of forest resources. Consequently rapport is being built between communities and the Forest Department through various initiatives, mainly through the setting up of Community Based Organisations (CBOs).

During this review, over 90% of people participating in the community workshops largely/totally agreed that the participatory management approach by the Forest Department has helped forest conservation. About 81% felt it was largely/totally true that communities now had a voice in conserving/managing the Sinharaja forest; 19% agreed, but were less positive; none disagreed.

**Goal II:**

**Objective II.2**

• establish a local consultative framework in which the reserve's economic and social stakeholders are represented including the full range of interests (agriculture/ forestry/ hunting/ extraction/ water and energy supply/ fisheries/ tourism/ recreation/ research).

**Indicator 3.5.2: Local consultative framework in place\***

**Working through CBOs:**

A framework for local consultation in forest conservation and management exists through village level societies termed 'Friends of Sinharaja' (or *Sinharaja Sumituro*). These were established in the 1990s by the Forest Department to increase community participation for conserving the Sinharaja reserve.

These societies serve as a mechanism for the Forest Department to (a) have dialogue with communities and introduce confidence building measures, (b) identify the underlying causes of adverse forest practices and take cognisance of local people's needs, (c) involve the community in forest conservation measures, and (d) identify needs for social upliftment in the buffer zone to reduce adverse forest practices.

By 1998 a total of 36 'Friends of Sinharaja' voluntary societies (CBOs) had been formed by the Forest Department in villages within the reserve's buffer zone.<sup>48</sup> Although all are not equally active at present, the CBOs established around the reserve have contributed in varying degrees to conservation and management of the forest, and almost all have led to the creation of a local consultative base to assist the Forest Department manage the reserve.

**Links to district administration:**

At the district level, the three District Forest Officers (i.e. as the Sinharaja IBR lies in three administrative districts) involved with the management of the Sinharaja reserve are represented in the District Coordinating Committees (DCCs). This ensures a consultative forum for regional decisions pertaining to the management of the Sinharaja forest as and when required.

**Indicator 3.5.3: Community participation management model identified and adopted**

**Where the participatory management model is functional:**

A viable participatory management model is now being pilot tested under the GEF/UNDP funded Southwest Rainforest Conservation Project of the Forest Department. This is currently functional in nine buffer zone villages along the reserve's southern perimeter (Figure 1). This has permitted the mobilisation and formal registering of existing CBOs set up by the Forest Department in these villages. Two more villages (Pitadeniya and Lankagama) have been identified for inclusion in the programme. The approach adopted has taken into account the forest's conservation status (i.e. as a National Heritage Wilderness Area, a World

Heritage Site and a MAB Reserve), the level and type of forest dependency among local people and national forest policy. The communities consulted during the review were in general agreement (88%) about the validity of site selection for this pilot project.

The model is one in which the overall control of forest resources remains vested in the Forest Department, with the communities having a recognisable role in planning and managing the Sinharaja Biosphere Reserve so that they remain committed stakeholders in the process.

The model appears to be working well in all nine villages where it is being piloted. It appears particularly successful in the four villages of the Matara District where 76% of local people consulted during the review felt that it was working well with the reserve's managers doing a good job.

#### How the model works:

- Community mobilisation is carried out by project staff supported by members of CBOs (Friends of Sinharaja Societies) who have been trained through the project.
- The CBOs assist the Forest Department to work out appropriate systems for delivery of assistance (for each village) as deemed required for social upliftment and to reduce forest dependency (including encroachment) by improving local livelihoods.
- The CBOs are helped to become self-reliant in the long-term once the project ends through the establishment of Community Trust Funds (CTFs) for which seed money is initially provided via the Forest Department.
- The CBOs are registered so that they can operate the CTFs and a bank account. The CTFs provide soft loans at very low interest rates (1-3%) for CBO members to engage in activities that will enhance cash incomes and reduce forest dependency. This is targeted at alleviating the need to expand tea small holdings into the reserve.
- The selection of beneficiaries of the loans is by a loan committee comprising CBO members to which written proposals have to be submitted. There are also formal loan request forms and legally binding promissory notes/agreements that have to be completed for receipt of a loan with the support of two guarantors. Working rules of the CBOs are annexed (Annex 7).
- The CBO members are trained through the project to write proposals seeking funds, and office bearers are trained to keep accounts and carry out the CBO activities.
- The CBO members are also assisted in developing technical and entrepreneurial skills by the Forest Department for enhancing their cash incomes, thereby reducing the need to encroach into the reserve to expand tea holdings. The required training programmes and the members to receive the training are also selected by the CBOs.
- The community becomes more aware of the value of the forest due to effective social mobilization, and there is dialogue between the community and the Forest Department on management decisions regarding the forest. This has generated greater local commitment towards conservation of the reserve. The project also provides tangible benefits for CBO members, thereby promoting continued support for forest conservation.
- The Forest Department which initially facilitated the formation of these



Community mobilisation for buffer zone management

voluntary CBOs has now moved into an advisory and monitoring role; the CBOs are run entirely by community members.

- Capacity building for community participation has received special attention in terms of staff training and community awareness through the S/W Rainforest Conservation Project (Table 3).

**Indicator 3.5.4: Local community is involved in planning and managing the reserve\***

(Goal IV:  
Objective IV.1)  
▪ Ensure that the local communities participate in planning and management of BRs.

All CBOs around the reserve have been subject to continual awareness programmes by the Forest Department for several years. This has:

- resulted in local appreciation of conserving the reserve,
- served to facilitate the Forest Department's buffer zone social upliftment programmes aimed at reducing forest dependency - mainly targeted at encroachment to expand tea cultivations and illicit timber felling, and
- considerably helped confidence building between the reserve's managers and the local people.

Active community participation in forest management is functional in nine CBOs of the Galle and Matara Districts where adequate social mobilisation and setting up of CTFs has been possible through the S/W Rainforest Conservation Project. The pilot sites located along the southern perimeter of the reserve are the villages closest to the reserve and where possibility for encroachment is most pronounced. Thus, the participatory approach is contributing positively to stemming encroachment into the reserve - perceived as the most major threat to the forest at present.

The setting up of functionally independent CTFs has yet to be introduced to CBOs along the northern periphery of Sinharaja due to lack of funds. However, about 70% of the community consulted in these areas during the review responded that the reserve's managers were making a real effort for participatory management although it was not fully functional in some areas as yet.

Overall 60% of all community members questioned were largely/totally confident that the Forest Department will communicate to them major decisions regarding the Sinharaja forest and consult them on necessary action; of the 26% that disagreed, all were from outside the nine participatory management pilot sites.

It is accepted in principle that the Forest Department will introduce the participatory management model developed (at the pilot sites) to the other villages in the Sinharaja buffer zone, but this is constrained due to the lack of funds. A national level NGO (*Sevalanka*) is also promoting a similar concept of participatory management in the buffer zone with emphasis on social mobilisation and social upliftment to decrease dependency on tea as an income earner. Most of the villages selected by them are located along the reserve's northern boundary, and they hope to work through the CBOs established by the Forest Department. Collaboration between the Forest Department and this NGO can perhaps ease the problem of funds required for social mobilisation and re-activation of existing CBOs in the northern buffer zone villages to introduce the participatory management approach developed in the Galle and Matara Districts. Discussions between the two parties during this review indicated that this aspect may be considered by the reserve's managers. Some collaborative work has already begun in respect of awareness creation programmes.

Of some concern is that the large privately owned tea plantations and state (LRC) owned tea plantations contribute very little to the participatory management process or assist with social upliftment in the Sinharaja buffer zone. This may be prompted by concerns that lands under their ownership or jurisdiction will be acquired for expanding the reserve. The current decision by the Forest Department not to annex any lands under cash crops (particularly tea, but also any other permanent crop) may to some extent alleviate these fears. Some form of collaborative action to involve them in the participatory management of the reserve's buffer zone should be attempted.

**Indicator 3.5.4 (a): Community participation obtained for management planning**

The preparation of the 1993 Management Plan involved planning workshops to consult communities (including women and youth) about their perceptions on the proposed management interventions. This had helped to obtain their views and suggestions on important local issues and to determine the level and nature of community participation in the Forest Department's Sinharaja conservation and management programme.

**Indicator 3.5.4 (b): Peoples' participation obtained for boundary definition**

The previous boundary demarcation in the 1990s with concrete markers has used community labour on a paid basis as a part of participatory buffer zone management activities. However, no real consensus had been reached between the managers and local people regarding the boundary. Consequently there are (a) private lands earmarked for acquisition within the 1994 boundary which are not a part of the reserve, and (b) some new encroachments by local people into the reserve.

On principle it is now accepted by the Forest Department that the ongoing boundary re-definition of the reserve should be with the active participation of local communities (on a voluntary basis), prior to the boundary survey by the Survey Department and establishment of concrete markers. This involves negotiations through consensus with local communities and other stakeholders to take back newly encroached lands into the reserve and to exclude privately owned areas which will not be acquired.

Overall about 70% of the community around the reserve (i.e. in areas where demarcation had taken place) accepted that boundary demarcation was largely/entirely carried out through a consultative process.

It was apparent during the review that boundary definition along the reserve's southern perimeter in the Matara District had been on a consultative basis to the satisfaction of both managers and the local people. The latter were largely certain that this would preclude further encroachment. The boundary demarcation in some areas of the Galle District appeared to have had lower consensus, although the local people had been apprised of the proposed demarcation and how it would be done. Consequently those affected were less satisfied with the process and had low confidence in the boundary as final. Participatory boundary definition is pending along the northern and eastern boundary, and it is to be hoped that this will be done in full consultation with the local people and other stakeholders.

**Indicator 3.5.4 (c): CBOs participate in buffer zone management**

CBO members around the reserve assist in buffer zone management in various ways. Examples are:

- enrichment planting for restoration in degraded areas of the buffer zone and re-forestation activities in the buffer zone through paid labour.
- establishment of agroforestry plots.
- CBO members trained through the S/W Rainforest Conservation Project help with providing advisory services for tea small holders and extension services in agroforestry to the local communities.
- greater attention is paid to soil conservation in the villages where the participatory pilot project is in operation.
- CBOs have helped to identify delivery of assistance for socio-economic upliftment in the buffer zone aimed at reducing the need for encroachment and to enhance local participation in forest conservation.

Overall 84% of those questioned during the review largely/totally agreed that joining the CBOs (Friends of Sinharaja Societies) has benefited the local people; the 14% that disagreed with this were from areas outside the pilot sites in the southern buffer zone.

● **Management strategies in the buffer zone of the Sinharaja Biosphere Reserve in Sri Lanka**

The Sinharaja International Biosphere Reserve of Sri Lanka is exceptionally high in endemic species and genetic diversity. Efforts to conserve this forest include several management strategies adopted in its buffer zone for: (a) local people's awareness on conservation, (b) increasing publicity about Sinharaja, (c) community support for enhancing village-level educational facilities, (d) improving local people's access to health care and enhancing the infrastructure of villages, (e) promoting adaptive research (i.e. monoculture of *Pinus* enriched with multiple use and highly demanding forest species), (f) providing alternative income generation and capacity enhancement of local people for greater agricultural productivity, (g) reducing dependency on forests for timber and other forest products through cultivation practices in the buffer zone, and (h) promoting non-destructive collection of non-timber forest products.

*Source: Gunatilleke and Wijesooriya, 2002<sup>27</sup>.*

**Indicator 3.5.4 (d): Community participation has helped to conserve the forest and its resources**

CBOs in the Matara District have formed Vigilance Committees (VS) to assist the Forest Department staff in forest protection. Most instances of illegal extractions are thus reported confidentially to the Forest Department. Minor offences by local people are tackled by VS members who visit the offenders and advise them to desist from such practices. Action is taken by the Forest Department against major offences such as timber felling. According to both VS members and forest field staff this serves as a deterrent for timber felling and other destructive extractions (by outsiders as well as villagers) and encroachment.

There are no formal vigilance societies within the other CBOs, but personal contacts formed between CBO members with the Forest Department over the years serve a similar function to stem illegal timber extraction. About 80% of field forest officials and 94% of the community questioned during the review felt that large scale timber felling in the reserve for commercial purposes had ceased in their areas. Local people felt that community collaboration with the

Forest Department was vital to halt illegal timber felling. Consequently there was some concern among communities in the Galle District about the vulnerability of the western boundary of the reserve (between Kosmulla and Ihala Giguruwa (Figure 1)) which had so far received less attention for social mobilisation and awareness creation than the other areas. The formation of formal vigilance societies in the Galle and Ratnapura Districts is also desirable to enable a more regular form of assistance to the reserve's managers for forest protection.

**Indicator 3.5.5: Number of forest officers trained in community participation techniques**

Table 3: Training for community participation in forest management through The S/W Rainforest Conservation Project

Type of training	Recipients of training
Orientation to the project, project planning, implementation and management	Project staff and Forest Department field staff
Introduction to the S/W Rainforest Conservation Project	CBO members
Present status of forest resources and forest biodiversity conservation	CBO members
Biodiversity conservation and participatory management	Forest Department officials
Social mobilization, leadership and community development	Project staff and CBO members
Forestry and social mobilisation	Project staff, Forest Department staff, social mobilisers and CBO members
Participatory rural appraisal and preparation of micro-plans and activity plans	Project staff
Communication principles, extension techniques and tools	Project staff and Forest Department field staff
Extension principles and socio-economic surveys	Project staff
Participatory rural appraisal techniques and tools and preparation of activity plans	Project staff and Forest Department field staff
Rural development and project planning	CBO members
Enterprise Development and keeping accounts	CBO members
Small credit programmes	CBO members

**Goal II:**  
Utilize biosphere reserves as models of land management and of approaches to sustainable development.

**Objective II.1**  
Secure the support and involvement of local people

- Survey of interests of the various stakeholders and fully involve them in planning and decision-making regarding management and use of the reserve.

- Evaluate the natural products/services of the reserve, and use these evaluations to promote environmentally sound and economically sustainable income opportunities for local people.

**Article 3ii:** Development – foster economic and human development which is socio-culturally and ecologically sustainable.

### 3.6 PROMOTING SUSTAINABLE DEVELOPMENT

#### ● Measures taken to understand threats and stakeholder needs

##### **Indicator 3.6.1: Survey made of stakeholder interests<sup>4</sup>**

###### **Stakeholder surveys since 1990:**

Several socio-anthropological surveys at Sinharaja on the interaction of people living around the reserve and the forest have been carried out since 1990:

- surveys for preparation of the 1993 Management Plan.
- participatory rural appraisal in a randomly selected sample of villages (1998/1999) to collect socio-economic data. This has been used to gauge perception and views of villagers on forest conservation and related issues for preparation of the project proposal for the ongoing GEF funded S/W Rainforest Conservation Project.
- survey of six villages in and around the Sinharaja reserve (i.e. Illumbakanda, Denuwakanda, Pelawatta, Penikoladeniya, Watugala and Kosmulla) to ascertain methods of income generation and levels of dependency on forest products through participatory rural appraisal.<sup>2</sup>
- assessment of individual time preferences and forest resource harvesting from the Sinharaja forest.<sup>49</sup>
- ongoing survey by the Forest Department to gauge forest dependency, perception of CBOs on community participation, etc. in the villages targeted by the S/W Rainforest Conservation Project.
- ongoing survey of visitor impacts, satisfaction and needs by the Forest Department at all three conservation centres.

##### **Indicator 3.6.2: Survey made of natural products/uses/services of the reserve<sup>5</sup>**

The forest products extracted from the reserve have been identified and listed prior to preparation of the 1993 Management Plan for conservation and management of the Sinharaja forest.

A collation of research data by Gunatilleke and Gunatilleke (ongoing) shows that 179 forest species, of which 33% are endemic, provide forest products gathered by villagers from the Sinharaja and surrounding forests.<sup>3</sup> These include species such as wild cardamom, kitul, weniwel and rattans.<sup>39</sup>

There are many other studies on the natural products and services of the reserve to date. These include:

- A survey of folk knowledge of the uses of different forest products in two villages: Denuwakanda and Illumbakanda bordering the Sinharaja forest (Manikrama, 1993).<sup>3</sup>

- An economic assessment of non-timber forest products extracted from Sinharaja (Werahera, 1993).<sup>3</sup>
- Studies on the use of medicinal plants of Sinharaja (by Dr W Wanigasundara).
- Studies on the performance of selected forest species providing non-timber forest products in the Sinharaja MAB reserve (Kathriarachchi, 2002).<sup>3</sup>
- Economic evaluation of non-traditional forest products of the Sinharaja reserve (by Prof. Piyasena Abeygunawardena).
- A survey of forest products extracted in six villages peripheral to the reserve.<sup>2</sup>
- An ongoing survey in eleven villages (under the S/W Rainforest Conservation Project) in the Sinharaja buffer zone by the Forest Department for management purposes.

A comparison of responses to the same questionnaire by community members and Forest Department field staff during this review indicates that there is good understanding of local forest use and peoples' needs by the reserve's managers. These needs are being addressed through buffer zone management.

- Identify and address factors that led to degradation and unsustainable use of biological resources.

**Indicator 3.6.3: Factors leading to environmental degradation and unsustainable use are identified**

There has been a discernible effort to understand the underlying and proximate causes of forest loss and threats to the reserve. Prescriptions for their alleviation are given in the 1993 Management Plan. Threats to the forest have been well researched and documented by many people.

A comparison of responses to the same questionnaire by community members and Forest Department field staff during this review indicates that the reserve's managers understand the threats to the reserve. The major threat at present is encroachment into the forest by people living along the forest periphery, mainly for tea cultivation. This has been recognised and the buffer zone management activities of the Forest Department have addressed this issue since the mid 1990s.

Incidents of illicit timber felling and encroachment are also identified continually through the Friends of Sinharaja CBOs which report back to the Forest Department. This appears especially effective where there are Vigilance Societies. Extraction of plant food items and medicinal plants which occur at a low level were not perceived as factors causing environmental degradation and unsustainable use by either the forest field staff or the local communities.

Of concern is that hunting appears to be fairly common in the peripheral areas of the reserve along the southern boundary, particularly in the Galle District. Among the species identified as hunted in the reserve (i.e. wild pig, porcupine, giant squirrel, purple-faced monkey, palm civet, mouse deer, toque monkey and pangolin) by local people contacted during this review, most are protected species. Frequent gun shot sounds in this area were reported by a researcher (interviewed during this review) as well, but there was no certainty whether it was from within the reserve or the buffer zone. There are also reliable reports of trap guns in the forest periphery and some unconfirmed reports that hunting occurs in the eastern side of the reserve by people who enter it through the state and privately owned estates.

This is an aspect that the forest managers should investigate and curtail before it becomes a major problem.

**Goal II:**  
**Objective II.2**

**Action at the national level:**

• Develop means to identifying incompatibility between the conservation and sustainable use functions of BRs and take measures to ensure an appropriate balance between these functions is maintained.

● **Measures taken to arrest environmental degradation and unsustainable use**

**Indicator 3.6.4: Areas of incompatibility recognized and addressed**

The stringent conservation measures required for Sinharaja - as a National Wilderness Heritage Site and a World Heritage Site - have caused people living in the buffer zone of the reserve to lose access to some resources they used previously. The areas of conflict of interest have been identified over the years,<sup>1,2,3, 11,12,19</sup> and are addressed in the 1993 management plan for conserving the Sinharaja forest and through subsequent management initiatives.

**Creation of greater awareness about the need to conserve the reserve:**

One of the key achievements over the years has been the considerable success of concerted efforts by the Forest Department for confidence building among local communities who were unwilling to cooperate with the Department in the 1980s. There have been continuous awareness creation initiatives by field officers which have resulted in a much greater appreciation of the need to conserve the reserve by local communities and also greater acceptance of the previously enjoyed benefits which they now have to forego. Timber felling for construction, extraction of rattan for commercial use, and *deniya* cultivation in the forest are some of the uses that are now prohibited to local people.

Despite this, discussions with communities and the administering of a questionnaire during the review showed that:

- as much as 86% felt that people have now accepted the fact that timber felling, encroachment or other harmful extractions from the reserve should be stopped for its conservation; 74% felt that people understood the need to do so.
- 73% felt that, due to various initiatives of the Forest Department in the past, communities now understand that conserving the Sinharaja forest is in their best interests; a further 11% thought this was mildly true.
- over 80% felt that at least 75% of people around the reserve were committed to conserving the forest.
- over 75% felt that there was a good understanding between the communities and the Forest Department; the balance (all of whom were from areas where the participatory management model had not been introduced) were less positive, but none felt that there was no understanding.

**Extraction of timber for domestic needs:**

Timber harvesting from the reserve is illegal, and there is overall agreement on this through awareness creation of adverse impacts among peripheral communities.

The Forest Department reports do not indicate serious illegal extraction of timber from the reserve in 2002. This was corroborated by 94% of the community members consulted who felt that illicit timber extraction does not occur on a scale that would affect the forest. The isolated incidents of felling are generally brought to the notice of the reserve's managers by the communities. For example there was one

incident where CBO members had come a considerable distance in a three wheeler (at their own cost) in the night to inform the field officers of illicit felling of a tree in the reserve.

**Encroachments:**

Encroachment by villagers engaged in tea cultivation in small holdings is perceived as the main threat to the reserve at present. The underlying cause of illegal encroachments is identified as the villagers' endeavour to enhance cash income from tea holdings beset with poor soils by expanding the land area for cultivation. This is being addressed in two ways.

"soil fertility in a majority of the lands appear to be poor, and deteriorating further."

*Source: The 1993 Management Plan for Conservation of the Sinharaja forest.*

One approach has been to provide buffer zone villages with technical assistance to increase tea yields from existing land holdings while also providing alternate income generating opportunities. Encroachment for tea cultivation has happened along the reserve's northern

and southern boundaries, but the southern border appears more vulnerable as many villages directly abut the forest. This threat has been recognised and is addressed by the Forest Department through the S/W Rainforest Conservation Project, as well as through previous more ad hoc initiatives. The 11 villages selected for the S/W Rainforest Conservation Project are in close proximity to the forest, and are areas where encroachment is most probable.

Consultations during this review indicate that about 86% (in both the northern and southern buffer zone of the reserve) think that illegal encroachments by villagers for agriculture and other land uses have been stopped/reduced largely due to the participatory management approach adopted by the Forest Department. Forest officials also claim a marked drop in encroachments in recent years.<sup>2,12</sup>

Definition of the boundary with permanent concrete posts in the 1990s has also helped to curtail encroachment. However, the present boundary has not been fully effective, particularly along the reserve's southern perimeter for the reasons explained earlier. There is good indication that boundary re-definition in the Matara District in consultation with local people will halt encroachment in this area. A similar consultative approach along the other populated sections of the boundary is of crucial importance to prevent future encroachments which, though small scale and gradual, can have adverse impacts on the forest in the long-term.

**Impact of poor land use in lands abutting the reserve:**

During the review, this was perceived as a threat to the reserve by 61% of community members consulted and by 50% of the Forest Department field staff.

Repeated measures have been taken to instil soil conservation and good land management - particularly in tea small holdings - through training programmes in many buffer zone villages. For instance, there have been training initiatives on soil conservation and management in tea holdings with the assistance of the Tea Small Holders' Authority and the Agriculture Department. However only 38% of the community agreed that there was better land management in adjacent private lands/tea cultivations in the buffer zone due to participatory forest management; of the 33% that disagreed outright with this, all were from areas outside the pilot study sites.

When questioned whether they perceived the impact of the recent floods as being greater in areas where tea has replaced natural vegetation and/or where the forest adjoined opened up areas such as roads, about 55% thought this was largely or wholly true, 17% thought it was mildly true, but 26% largely or completely disagreed with this interpretation.

**Kitul (fishtail palm) tapping:**



Photo © Jimie Deka

Kitul tapping to produce treacle and jaggery (a candy-like local sweetener) has been a predominant forest use in the environs of the Sinharaja forest for a long period of time. Individuals may claim traditional rights to tap a particular kitul palm or a grove of kitul palms. While this is not a destructive practice, related actions such as camping within the forest and lighting fires to prepare treacle may induce adverse impacts on forests (e.g. hunting for food, cutting trees for fuelwood, etc). To prevent this, the Forest Department issues permits for tapping kitul trees in state forests on condition that tappers desist from destructive practices such as lighting fires in forests, camping in the forest or other destructive practices. There is also a tacit understanding that tappers report any illegal

activity seen in the forest to the Forest Officers.

During this review 74% of local people in the buffer zone and 83% of forest field officials consulted agreed that kitul tapping was the major forest based activity in this area. Much of the kitul tapping around the Sinharaja reserve is today confined to other forest patches in the buffer zone, but there are a few kitul trees/groves within the reserve which are currently being tapped.

Some villagers consulted during the review were of the opinion that kitul tapping in the reserve serves a patrolling function, while the permit system reduces damage to the forest vegetation from fire and large scale cutting of wood to fuel these fires. Seventy four percent of community members questioned during the review felt that obtaining a permit for kitul tapping from the Forest Department was not difficult. There are, however, several instances of kitul trees being tapped illegally in the reserve as the tappers do not want to obtain a permit, even though the fee is nominal. There is no overt action taken against this as it has low impact and the tappers take care not to cause damage for fear that they may lose access to the forest.

Kitul tapping is not a popular activity among the younger generation due to its low social status, even though it brings in a good income.

**Collection of non-timber resources:**

Although any form of collection from a National Heritage Wilderness Area is illegal, the review showed that no prohibitive action is taken by the reserve's managers against collection of food items and other non-timber resources when collection is non-destructive and small scale. Collection is not legalised, however, due to concern that it may encourage an exodus of people engaged in destructive forest practices. There is also understanding in some areas (in the southern sector) that any harmful activity seen by local people who enter the

forest will be reported to the forest officers. This relaxation of rules as a part of the current participatory management approach appears to have had a positive impact on building understanding between the local people and forest officials.

During community discussions for the review, 78% felt clearly that people are not unduly persecuted by the Forest Department for extraction of non-timber resources if it is not a threat to the forest, and a further 5% felt this was mildly true. Of the 17% who felt there was restriction, all were from the northern area of the buffer zone where the participatory model being piloted in the south is yet to be introduced.

- 73% of people consulted during the review felt that forest products (other than kitul sap) contributed less than 25% of the monthly income of the buffer zone villagers; 80% felt that such forest products rarely or never exceeded half the monthly cash income.
- 76% agreed that it was largely or totally accurate that young people around the forest are not interested in extracting forest resources for subsistence or livelihood.

Hence collection of non-timber resources from the reserve appears to be at a low level, and decreasing over the years.

Collection of food items: Overall 81% of local people and 83% of forest officials consulted during the review felt that it was mildly true that people continue to collect plant food items from the forest. Although a large number of villagers continue this practices, it is at a very low level, mainly for domestic use, and not on a regular basis. For instance many people collect the seasonal fruit of beraliya (*Shorea worthingtonii*) and goraka (*Garcinia zeylanica*) for domestic use - but this is only for a limited period of time (i.e. in the fruiting season) and it does not involve destructive practices. On the whole, most people do not have time to regularly engage in food collection from the forest for their sustenance as they are heavily involved with tea cultivation. Consequently they buy most of their vegetables from the local markets.

A few people continue to collect mushrooms and wild cardamom (*ensal*) from the forest for sale in addition to subsistence use. But this is considered within sustainable levels and involves no destructive practices. Apparently, very few people know where to collect edible mushrooms, and this limits the amount collected and the number of collectors.

Collection of medicinal plants: Many people collect bark, leaves, fruits or other plant parts of woody trees, lianas and herbs from the reserve for medicinal use at some point in time. The review revealed over 15 species commonly extracted from the reserve, while detailed studies have revealed about 27 species extracted from the reserve and the buffer zone areas.<sup>28</sup> However, collection is sporadic and at a low level, as villagers depend more on western medication than on traditional medicine which requires medicinal plants. There is a tacit understanding between the reserve's managers and the local people to allow small scale collection for domestic medicinal purposes. A native physician interviewed during this review stated that a good understanding with the Forest Department and active participation in CBO activities enables him as an accredited and responsible practitioner of traditional medicine to collect herbs from the forest for treatment of local people. Ayurvedic physicians who dispense oils (*thel*), pastes (*pattu*) and decoctions (*kasaya*) for curative purposes in the buffer zone areas are usually elderly people with an inherent love and respect for the forest and its resources, and they dispense medicines and medication for humanitarian rather than commercial purposes. Few

among the younger generation seem willing to take up this occupation due to the low financial returns from it, so that the knowledge associated with this practice appears to be gradually dying out.

**Collection of roofing material:** *Beru* leaves which comprised the main roofing material in the past for the Sinharaja buffer zone homesteads is almost wholly replaced by tiles or asbestos. A few households, however, collect and use this item. This is, however, not perceived as a destructive practice.

**Extraction of rattans:** The large scale and unsustainable extraction of rattan for basket weaving and production of cane goods has ceased since the reserve became a National Heritage Wilderness Area. The loss of raw material and a shift of the rural economy toward tea in this region may have been responsible for this change. At present rattan is occasionally obtained from the periphery of the reserve for binding purposes.

In addition, the Forest Department awards permits to harvest specified quantities of rattan - based on sustainable levels - from other forest patches in the Sinharaja buffer zone. However, these permits are usually supplied to rattan workers' societies, which sell the raw material to large scale commercial cane workers who can no longer obtain rattan from local people near wet zone Conservation Forests.<sup>12</sup>

Rattan is also under-planted in some buffer zone *Pinus* plantations and these are now ready for harvesting.<sup>12</sup> During this review, the Forest Department received a request from a local entrepreneur making cane artefacts to provide her with rattan harvested from one such cultivation. It was understood that the Forest Department would consider a formal request positively, though understandably sustainable harvest rates would have to be fixed first. Such an arrangement will certainly reinforce the participatory management approach being adopted by yielding tangible benefits for the local people.

**Extracting poles and posts from the forest:**

Removing poles and posts from the forest is illegal, but people often require poles and posts to construct temporary sheds for village gatherings and functions. The Forest Department has tried to address this problem by providing prefabricated mobile aluminium sheds to Friends of Sinharaja societies (CBOs) in the buffer zone, which in turn are supposed to rent them out at a nominal price to the villagers and remit the charge to the CBOs. Over thirty CBOs have been provided with mobile sheds up to now.<sup>50, 51, 52</sup>

Unfortunately this system is not in operation in some CBOs that are no longer active in the northern area of the buffer zone, and the tents are either given out free of charge or used at the sole discretion of the office bearers. These matters are expected to be rectified in the near future with the introduction of the community participation model being piloted in the south to other areas of the buffer zone.

**Villages in the forest:**

Currently there are two villages (Indigaswila and Warukandeniya) and two families at Kohilarambe living within the reserve boundary. In view of the high legal status of the reserve as a National Heritage Wilderness Area and a WHS, these villages were originally earmarked for relocation. However, in consideration of the disruption of social patterns this would entail and the current management approach followed by the reserve's managers, these villages are being retained on the proviso that people living in them are subject

to the same conditions that apply to all buffer zone villages. Thus no further encroachments into the forest is permitted, and illegal extractions are prohibited. Consensus has been achieved on these aspects with the villagers.

During the review over 90% of local people consulted agreed that communities in villages within the forest boundary largely/fully understand the need to desist from activities that threaten the forest. Some were also of the view that these villagers were vigilant to prevent forest damage in their areas by outsiders as they would be held responsible, but 19% of the community and 16% of forest officials consulted felt that there was some threat to the forest from these villages.

**Over visitation:**

The awareness created about the Sinharaja forest has fired the enthusiasm of many people to visit it and experience it. Consequently, the number of visitors to the reserve has grown over the years (see public education under 3.9 logistic support and Figures 2 and 3). To minimise visitor impact, vehicles are not permitted into the biosphere reserve, except for research purposes. All visitors into the forest have to be accompanied by a guide provided by the Forest Department and keep to the skid trails or the designated nature trails. Removal of any material from the forest and littering is prohibited.

Much of the visitors to Sinharaja enter through the Kudawa entrance which accounts for about 93% of all visitor earnings from the Sinharaja reserve. For example, in 2001 a total of 27,470 of visitors to the reserve were from the Kudawa entrance.<sup>52</sup> This underscores the threat of over visitation to the forest in this area.

There are already signs of visitor impact along some trails accessed through the Kudawa entrance (e.g. trail to the giant *navada* tree)<sup>12,47</sup> due to the large groups of people that use these trails on a daily basis, especially school children. Community consultation during this review revealed that around 53% regard over visitation as a considerable threat to the reserve as did 66% of the field forest officials who were contacted.

The threat of over-visitation through Kudawa is addressed by enhancing accommodation and other visitor facilities at Pitadeniya (located in lowland rainforest) and Morningside (located in sub-montane forest). The absence of information and education centres at Pitadeniya and Morningside may still make some visitors, especially school children, favour the Kudawa area which is located close to the Sinharaja Education and Information Centre. However, a large information centre is under construction at the Pitadeniya Conservation Centre (PCC) complete with a lecture hall and library. Construction has been delayed due to funding constraints which have now been resolved.

The damage to the Sinhagala trail at Sinharaja due to the earthslips after the floods may also reduce visitors to the Kudawa entrance, though on the other hand it may result in greater use of the Mulawella and Giant Nawada tree trails which are even now the most popular, particularly with the school groups.

A visitor impact survey is currently being carried out by the Agriculture Faculty of the University of Peradeniya in collaboration with the Forest Department<sup>12,47</sup> with the aim of reducing adverse impacts.

**Goal II:**  
**Objective II.1**

• Develop incentives for conservation and sustainable use of natural resources, and develop alternative means of livelihood for local people when existing activities are limited or prohibited within the BR.

● **Measures taken to introduce sustainable use practices**

**Indicator 3.6.5: Incentives identified to promote sustainable use by local populations\***

Buffer zone management around the Sinharaja Reserve through the S/W Rainforest Conservation Project includes many participatory activities to help improve local livelihoods, provide alternative employment opportunities to reduce need for adverse use of forest land and forest resources and to support rural development. The details are given below.

**Training in social mobilization:**

Selected members of communities in the buffer zone and the pilot project staff have been trained in social mobilisation, including personality development and development of leadership skills in the community, particularly among the youth (Table 3).<sup>12</sup>

**New enterprises developed by communities:**

Priming funds provided to CBO members through Community Trust Funds (CTFs) in the nine villages of the S/W Rainforest Conservation Project have helped to initiate resource enhancement and enterprise development in the buffer zone. The CTFs are used to give small loans to CBO members at low interest rates (1%-3%), which are recovered and credited back to the CTFs. A range of small enterprises have been assisted by these loans. Some examples are given in Table 4.

Table 4: Selected enterprises assisted through community trust funds

Enterprises developed
<ul style="list-style-type: none"> <li>• enhancing a traditional medicines clinic</li> <li>• enhancing tea cultivation and tea land development</li> <li>• establishing a manioc cultivation</li> <li>• establishing tea nurseries</li> <li>• manufacture of cement blocks (for construction)</li> <li>• centre for purchase of tea leaves from small holders</li> <li>• setting up a sales outlet for household linen embellished with fabric painting and embroidery</li> <li>• setting up a poultry farm to supply to the villagers</li> <li>• setting up a banana and pepper cultivation</li> <li>• establishing a motor cycle repair shop</li> <li>• establishing a carpentry shop</li> <li>• establishing a radio and electrical equipment repair shop</li> <li>• setting up a franchise grocery store</li> <li>• setting up a confectionary business</li> </ul>

**Training and assistance for income enhancement and entrepreneurial skills development:**

There have been many attempts for training in entrepreneurial skills for income enhancement in buffer zone village communities since the early 1990s through projects funded by donor agencies such as NORAD and the World Bank. Their aim was to decrease forest dependency, particularly the impetus for encroachment. These early programmes were based on needs assessments through community consultation via CBOs, and covered training for livestock development; poultry

Photos: Jinie Dela



Three young entrepreneurs trained in fabric painting and embroidery through the S/W Rainforest Conservation Project have now got funds from the village CT to set up a shop to sell their products



through the village CTs



A traditional medicines physician Mr Gamage sometimes has to collect rare medicinal plants such as this one from the forest, but is careful not to damage the plants or the forest environment through extensive knowledge of herbal medication which spans many generations. Assistance from the CT funds has helped him develop his clinic which is run for humanitarian reasons as his main cash income is from tea cultivation. Although, none of his children will follow his footsteps his wife helps him with the preparation of medicinal oils and pastes which is dispensed to the villages.



There is new hope for Pathmanandan who has started a franchise shop to sell goods to the village assisted with CT funds. In return he is an active member of the local Vigilance Committee to assist the forest staff conserve the Sinharaja reserve

Community participation in Forest management is fostered systematically through the S/W Rainforest Conservation Project in the Southern buffer zone of the Sinharaja Reserve.

farming and agriculture; tea cultivation and floriculture. Seedlings of spices (i.e. pepper), fruit and timber species were provided to communities through the Forest Department along with the required technical advice. A key deficiency was that much of these efforts were ad hoc in terms of area and duration of assistance, as they were project driven and had limited funding.

In contrast, a more systematic approach to training for entrepreneurial skills development is adopted through the Forest Department's buffer zone management programme under the ongoing S/W Rainforest Conservation Project. Examples of training provided are in Table 5. The required training programmes, and the community members to be trained, are selected by the CBOs.

Table 5: Examples of training provided for entrepreneurial skills development through the Forest Department's Sinharaja buffer zone management programme\*

Training provided for CBOs for enhancing livelihoods
<ul style="list-style-type: none"> <li>• Beauty culture</li> <li>• Carpentry</li> <li>• Computer programming</li> <li>• Confectionary</li> <li>• Cultivation of export agricultural crops</li> <li>• Cultivation of mushrooms</li> <li>• Cultivation of paddy</li> <li>• Cultivation of pepper in tea lands</li> <li>• Driving heavy vehicles</li> <li>• Fabric painting</li> <li>• Floriculture</li> <li>• Handicrafts</li> <li>• Homestead development and paddy cultivation</li> <li>• Masonry</li> <li>• Preparing jaggery and treacle from kitul</li> <li>• Production of leather goods</li> <li>• Soil conservation in tea small holdings</li> <li>• Soil testing and fertiliser application</li> <li>• Tea cultivation and management</li> <li>• Tour guiding (for the reserve)</li> <li>• T.V and radio repairing</li> </ul>

\* Under the S/W Rainforest Conservation Project

Visits during the review to small scale business enterprises assisted by loans from the CTFs showed that in several instances the training provided through the project had directly benefited business /agricultural development.

These training programmes are provided with the collaboration of other government organisations such as the Tourist Board, Tea Small Holdings Authority, Export Crops Development Authority for appropriate vocational skills and agricultural practices. Training is also provided through CBOs for cultivation of minor export crops in the buffer zone in collaboration with the Department of Minor Export Crops.<sup>12</sup>

A study of the problems encountered by 38 randomly selected small holder tea growers, from three villages, Lankagama, West Batuangala and Kudawe, around Sinharaja indicated that about 40% of these small holders had not received information from the Tea Small Holding Development Authority; but soil erosion in most tea gardens was very little or low, and their productivity was significantly higher than the national average.

Source: Wanigasundara et al. (2001) cited in Gunatilleke and Gunatilleke document in preparation.<sup>3</sup>

**Assistance to increase production from existing agriculture in the buffer zone:**

In view of the fact that low yields in tea small holdings promote encroachment into forest lands, there have been numerous attempts by the Forest Department since the 1990s to assist local people to increase yields from agriculture. This has been by way of providing training and assistance for fertiliser application in tea lands, soil conservation measures, and multi-cropping with other cash crops. Recent studies suggest that such initiatives may have had some impact on improving soil fertility.

In the Galle District, funds have been obtained from CTFs (established through the S/W RCP) mainly to increase yields from existing tea lands. Some funds have been provided in the Matara District for this purpose as well. Projects assisted through the CTFs visited during the review indicated that the goodwill created had caused some tea growers to plant forest species provided by the Forest Department in a part of their tea lands.

**Enrichment planting and under-planting in degraded forest lands in the buffer zone:**

Enrichment planting of degraded forest lands and under-planting *Pinus* with non-timber crops has been practised in the Sinharaja buffer zone since the early 1990s.

● **Forest Department efforts for under-planting and enrichment planting in the Sinharaja buffer zone.**

1993: underplanting 200 ha of *Pinus* stands with cane and 25 ha with indigenous species (bamboo).

1994: underplanting 20 ha of *Pinus* stands with cane

1995: planting forest species in Kosmulla and Lankagama

1996: raising timber, fruit and fuelwood in buffer zone nurseries through the Participatory Forestry Project

1999: 30 ha of enrichment planting in Kekiliyapitiya and Polgahakanda.

2001: enrichment planting for 20 ha of buffer zone forests in Denuwakanda and Suduwelipota.<sup>12</sup>

Source: Forest Department Annual Reports of 1993,<sup>53</sup> 1994,<sup>54</sup> 1995,<sup>55</sup> 1996,<sup>56</sup> 1999<sup>51</sup> 2001<sup>52</sup> corroborated by field staff during the review

**Agroforestry projects in the buffer zone:**

Agro-forestry programmes have been carried out by the Forest Department in the buffer zone. One is the Farmer's Woodlot Project where chilli and vegetables were grown along with primary forest timber and non-timber species. The understanding is that the farmers are paid through the project for three years to maintain the agroforestry plots, after which time they continue to care for the plots until they can harvest the trees. Trials have also been done for under-planting *Pinus* stands in the buffer zone with spice crops and coffee amongst other species such as rattan and kitul.

**General assistance for social upliftment:**

General assistance by the Forest Department for social upliftment in buffer zone villages has been the focus of buffer zone management since 1993 with the prime objective of confidence building between the Department and local people to secure community participation in forest conservation. These activities range from much appreciated health camps and clinics in buffer zone areas beset by poor access to western medical health care (e.g. in 1990, 1994, 1995, 1999, 2001); assistance for enhancing the water supply, road repair, enhancing facilities in schools (including provision of school books) and providing awareness about the value of conserving the Sinharaja forest. Links have been also formed by the Forest Department with the Education Department for teacher training on conservation in the local village schools.<sup>12</sup>

While these activities have helped to bridge the gap between the reserve's managers and the people, the early efforts in the 1990s were somewhat ad hoc and heavily dependant on external project funding. In contrast, the participatory model being tested in nine villages in the Sinharaja buffer zone (under the S/W Rainforest Conservation Project) is now addressing social upliftment on a more long-term basis for reducing practices with adverse impacts on the forest.

Flood relief assistance this year (2003) also appears to have strengthened community - Forestry Department bonds as indicated during the review visit to buffer zone villages in the Matara District.

**Indicator 3.6.6: Non-timber forest products propagated for sustainable use**

"The NTF species most often used are rattans, the medicinal vine *Coscinium fenestratum*, the palm *Caryota urens* from which the sugary sap is tapped from the inflorescence, and wild cardamom used both as a spice and as a medicine. Some of the canopy Dipterocarps viz., *Shorea megistophylla*, *Shorea distica*, *Shorea cordifolia* and *Vateria copallifera*, provide a source of carbohydrate from their cotyledons, which also have medicinal properties. Some of these species also yielded resin."  
Source: Gunatilleke and Gunatilleke, 2003 in prep.<sup>3</sup>

Pilot studies by researchers in the Sinharaja buffer zone have helped underscore the potential for growing non-timber forest species (NTF) in agroforestry systems to reduce pressure on the undisturbed forest from where it was traditionally gathered in the past. The first pilot project for under-planting *Pinus* used species such as coffee, pepper, kitul, cinnamon and mahogany (an exotic) in a 2 ha plot. Since then

other products such as cardamom and timber species such as *Dipterocarpus zeylanicus* (hora) and Nedun (*Pericopsis mooniana*) have been successfully under-planted in *Pinus* plantations. The Forest Department has also established a 12 ha pilot study plot and demonstration site where *Pinus* is underplanted successfully with rattan, hora (*Dipterocarpus zeylanicus*), thiniya (*Shorea congestiflora*), hal (*Vateria copallifera*), kurumbettiya (*Syzygium* sp), pehimbiya (*Filicium decipiens*) and weniwel (*Coscinium fenestratum*). The rattan is now ready for harvesting.<sup>12</sup> Paid labour from the communities have been used for these trials, which in turn appears to help create a sense of ownership and conservation consciousness in the local people involved.

A further 15.5 ha of forest in the buffer zone is to be under-planted with rattan.<sup>12</sup> There are no formal programmes for communities to propagate kitul in the buffer zone at present, but it is cultivated by local people in their tea

small holdings.<sup>2, 39,46</sup>

There are also plans by an NGO (*Sevalanka*) to help villagers propagate kitul in the Sinharaja buffer zone to assist the rural economy and reduce the need to enter the reserve for kitul tapping.<sup>58</sup>

**Indicator 3.6.7: CBOs encouraged to form links with other state institutions for sustainable use**

The CBOs mobilised through the S/W Rainforest Conservation Project have been encouraged to establish links with a large number of government institutions other than the Forest Department. Communities are now making contact with several institutions such as the Tea Small Holder's Authority, The Minor Export Crops Department and the Agriculture Department on their own, for agricultural development and to benefit from subsidy schemes.

**Indicator 3.6.8: Private land owners near the reserve are encouraged to establish and maintain environmentally and socially sustainable activities**

Soil conservation measures have been promoted for many years in tea small holdings adjacent to the reserve through training programmes in collaboration with the Tea Smallholder's Authority as part of the Forest Department's buffer zone development programmes. However, such measures are actively followed at present only in the villages where the S/W Rainforest Conservation project is operative. This highlights the importance of applying the participatory model developed in southern Sinharaja to the other peripheral villages.

- Ensure that benefits derived from natural resources are equitably shared with stakeholders, by such means as sharing of entrance fees, sale of natural products/handicrafts, use of local construction techniques and labour, and development of sustainable activities (e.g., forestry/agriculture, etc)

The Forest Department has also provided home garden owners in the buffer zone seedlings of fruit and fuelwood species and planting advice through its Participatory Forestry Project.

**Indicator 3.6.9: Mechanisms are present to share benefits from the reserve with the local community**

Sharing benefits accruing from forest reserves with local people and other stakeholders is a relatively new concept for managing Sri Lanka's protected areas. However, it is now receiving acceptance as a part of management strategy for the Sinharaja Reserve.

Several initiatives for some form of benefit sharing are in operation:

- A community run sales outlet set up at the Pitadeniya Conservation Centre (PCC) (southern Sinharaja) for sale of products to visitors. Unfortunately this building has been completely destroyed in the recent floods, but it is due to be re-established. It is also accepted in principle that such a facility should be provided at the Kudawa Conservation Centre (KCC).
- Twenty five young people (15 at Kudawa and 10 at Pitadeniya) from buffer zone villages work as guides to visitors. Employment opportunities are given based on education and adequate knowledge of English to provide services for foreign visitors.

A perceivable drawback is that there is no policy decision by government to enable the Forest Department to retain at least a part of the revenue received from visitors

to the Sinharaja Biosphere Reserve to promote benefit sharing with the community and maintenance of visitor facilities.

**Goal 1:**  
**Objective 1.2.**  
Integrate biosphere reserves into conservation planning

**National level:**  
• Integrate biosphere reserves in strategies for biodiversity conservation and sustainable use in plans for protected areas, and in the national biodiversity strategies and action plans provided for Article 6 of the CBD

### 3.7 INTEGRATION OF BIOSPHERE RESERVES INTO CONSERVATION PLANNING

#### ● Using biosphere reserve experience for conservation/management approaches

##### **Indicator 3.7.1: Management experience integrated into national planning**

The concept of managing forests based on customised management plans, involving local stakeholders in forest conservation and management are now an integral part of national forest and biodiversity conservation/management plans and programmes. For example:

- the national Biodiversity Conservation Action Plan of 1999 recommends:
  - completing the preparation of management plans for all protected areas; and to “ ensure that such plans continue to recognize the participatory role of communities living in proximity to the areas under protection and adequately address the conservation and sustainable use of biodiversity “ (Action 4, p50).<sup>10</sup>
  - giving adequate attention to buffer zone activities involving the peripheral communities of Protected Areas (Action 5, p50).<sup>10</sup>
- The Forestry Sector Master Plan of 1995, the current Forest Policy (of 1995) and the Wildlife Policy (of 2002) accept participatory management and stakeholder consultation as an intrinsic part of forest/wildlife area management and forest biodiversity conservation.

These concepts were first piloted tested in the Sinharaja IBR/WHS/NHWA.

##### **Indicator 3.7.2: Reserve is used as a pilot site for management planning and implementation**

The Sinharaja Management Plan of 1986, followed by an updated plan in 1993, were the first management plans prepared for any Protected Area in Sri Lanka. This planning exercise and the management interventions that followed were used as the prototype for management planning in the forestry sector in 14 other forests (i.e. 13 wet zone forests and one intermediate zone forest) subsequently. The lessons learned from the Sinharaja experience have helped to develop a resource-based zoning system for these forests which includes a protected core zone, traditional use zone, recovery zone, cultural zone (where relevant), and an external buffer zone which is to be managed to benefit the communities living in these areas and to obtain their involvement in forest management. These management plans set out prescriptions for the setting up of Village Forest Participatory Management Committees (VFPMCs) and Community Trust Funds (CTFs) to facilitate the process of community participation in forest management

**Indicator 3.7.3: Reserve is used as a pilot site for community participation in forest management**

● Pilot projects to develop community participation in forest management

The first pilot project at Sinharaja for community participation in forest biodiversity conservation and management was established in the mid 1990s at Koskulana, a village in the Sinharaja buffer zone. While a truly participatory approach to forest management did not evolve through the project, it (a) helped to recognise local people's rights to some form of benefit from the forest, (b) encouraged local people in the buffer zone to participate in forest conservation, and (c) helped build confidence among local people to collaborate with the Forest Department to meet this end. This was done by demonstrating associated benefits for social upliftment in the community. A key lesson learnt from this was that communities should be made self-reliant for reduced forest dependency rather than continued reliance on government hand-outs which are driven by externally funded projects.

This experience is recognised in the ongoing pilot project in the Sinharaja buffer zone to protect rainforest ecosystems via community co-management through the S/W Rainforest Conservation Project. A replicable model for a viable community based participatory form of forest management has been developed and communities are helped to become self-reliant. This project is expected to have considerable outreach, and the experience is spread to other forests in Sri Lanka by training forest managers in other wet zone Conservation Forests.

The first efforts at community participation in forest management in Sri Lanka commenced as pilot projects in the buffer zone of the Sinharaja forest. These aimed to:

- (a) develop a viable model for community participation in managing wet zone forests, and
- (b) build institutional capacity within the Forest Department for this process to mainstream it into the department's regular work programme.

The Sinharaja experience in community participation for managing protected areas has been the base for introducing this concept to other forests (i.e. the Kanneliya and the Knuckles forests).

- Link biosphere reserves with each other, and with other Protected Areas, through green corridors and in other ways to enhance biodiversity conservation.

**Indicator 3.7.4: Forest links established with other reserves**

The Sinharaja Biosphere Reserve is a part of a group of 13 contiguous forests (including the biodiversity rich Dellawa and Diyadawa forests). This group is one of eight contiguous forests prioritised for biodiversity conservation in Sri Lanka.<sup>6</sup> Other forests contiguous with the Sinharaja biosphere reserve are Delgoda, Wattalgoda and Morapitiya - Runakanda forest reserves.<sup>2</sup> Maintaining forest linkages is important for conservation of faunal species in the reserve, especially the mammalian macrofauna.

The Reserve's manages have prepared a range of educational material covering posters, brochures and booklets on the Sinharaja Forest as visitor information



A special brochure on the Sinharaja MAB Reserve



Greeting cards



Trail guides to be updated

**Visitor information on the Sinharaja Biosphere Reserve/World Heritage Site/National Heritage Wilderness Area**

- Use of BRs for in

*situ* conservation of genetic resources including wild relatives of cultivated/ and domesticated species, and consider using the reserve as rehabilitation/re-introduction sites, and link them as appropriate with *ex-situ* conservation and use programmes

- When applicable, include projects to strengthen and develop biosphere reserves in programmes to be initiated and funded under the Convention on Biological Diversity and other multilateral conventions.

**Indicator 3.7.5: Links developed with *ex-situ* conservation facilities**

The role of the reserve as a repository of genetic resources has been described (under indicators 3.2.3 and 3.2.6).

A collection of herbarium specimens of the Sinharaja flora prepared by the National Herbarium is housed in the National Herbarium in the Royal Botanical Gardens at Peradeniya. A duplicate set has been lodged in the Sri Lanka Forestry Institute for use by its students.

Similar links are lacking with the Plant Genetic Resources Centre (PGRC)- the premier *ex-situ* conservation facility for Sri Lanka's indigenous germplasm. There are no collections from the Sinharaja Reserve among the 10,600 accessions in Sri Lanka's Plant Genetic Resources Centre.<sup>41</sup> This is attributed to past forest policy which caused a cessation of all collections from the Sinharaja forest when it was declared a World Heritage Site shortly after the PGRC was set up in 1989.<sup>40</sup> In view of the collections made by the PGRC in the buffer zone, the reserve promises to be of high value for *ex-situ* conservation of crop germplasm. The PGRC is also currently equipped to conserve indigenous plant germplasm other than crops.<sup>40</sup> Consequently there is much possibility for inter-institutional collaboration in this sphere to promote national development in keeping with the biosphere reserve concept. This has been addressed through discussions facilitated by the findings of this review and there are positive signs of a future collaborative programme between the Forest Department and the PGRC.

● **Integration of biosphere reserves into global conservation programmes linked to the CBD**

**Indicator 3.7.6: Projects connected with implementing the CBD and other conventions established**

The ongoing Global Environmental Facility (GEF) funded project for conservation of the unique biodiversity of the threatened rainforests of southwest Sri Lanka covering the Kanneliya, Dediagalā-Nakiyadeniya and Sinharaja forests (2000-2005)<sup>58</sup> aims to develop a replicable model for participatory management of forests with communities to establish a system of conservation forests that represent a refuge for globally important species.<sup>57</sup>

The project addresses key provisions of the Convention on Biological Diversity (CBD), particularly Article 8 (c), (d) and (e) which deal with conservation and sustainable use of biological resources in protected areas.<sup>57</sup>



Goal II  
Objective II.3  
Integrate BRs in regional planning.

National level  
▪ include BRs into regional development policies and regional land use projects.

▪ encourage major land use sectors near each BR to adopt practices favouring sustainable land use.

Reserve level  
▪ organise forums and set up demonstration sites for the examination of socio-economic and environmental problems in the region and for sustainable use of biological resources important for the region.

**Article 4.3:** It [a biosphere reserve] should provide an opportunity to explore and demonstrate approaches to sustainable development on a regional scale

### 3.8. INTEGRATION OF BIOSPHERE RESERVE INTO REGIONAL PLANNING

#### **Indicator 3.8.1: Regional demonstration sites established\***

There are several demonstration plots in the Sinharaja buffer zone. Examples are:

- A demonstration plot set up by the Forest Department for cultivation of endemic forest species in the Sinharaja Forest Reserve at Monerakekilla (adjacent to the Education and Information Centre).
- Successful trials for under-planting *Pinus* stands with cane and other species in the Sinharaja buffer zone which will spread to other wet zone forests, such as the buffer zone of the Kanneliya Forest Reserve.
- Demonstration trials established for under-planting *Pinus* in the buffer zone with NTFPs using organic farming techniques sans chemical fertiliser.<sup>39</sup>



Demonstration plots of *Pinus* under-planted with timber, rattan and other non-timber crops

Despite these initiatives, considerable development oriented research work and pilot testing of participatory management in the reserve, the role of Sinharaja as a regional demonstration site for the examination of socio-economic and environmental problems and for sustainable use of biological resources is rather weak. This is mainly because there has been poor dissemination of experiences from pilot projects and lessons learned from reserve management to other institutions and organisations outside the forestry sector. However, the Sinharaja Biosphere reserve offers enormous potential as a regional (or even national) demonstration

site. For example, the lessons learned from the ongoing participatory forest management project would undoubtedly benefit similar initiatives being undertaken by other government and non-governmental organisations for natural resources management. Opportunities should therefore be provided for government sector officials and NGOs to visit these pilot sites, talk to the project staff and the communities, and benefit from the participatory management model being tested. As it is, the review revealed that CBOs along the northern perimeter of the Sinharaja IBR were unaware of the activities in the south for community mobilisation and participatory management. It is understood that arrangements are now being made for interaction between the northern CBOs with the S/W Rainforest Conservation Project in the early part of next year.

Similarly, the successful under-planting of *Pinus* with forest and other economic species, and its role as a nurse crop for forest regeneration will be of interest nationally as well as to other developing countries in the Asian region. What is necessary is to showcase and promote these initiatives through effective communication.

**Goal III:**  
Use biosphere reserves for research, monitoring, education and training.

**Objective III.1**  
Improve knowledge of the interactions between humans and the biosphere reserves

- Use BRs for basic and applied research particularly on projects that focus on local issues; interdisciplinary projects incorporating both the natural and the social sciences, and projects involving the rehabilitation of degraded ecosystems, the conservation of soils and water and sustainable use of natural resources.

**Article 3 III:** Logistic support - support for demonstrative projects, environmental education and training, research and monitoring related to local, regional, national and global issues of conservation and sustainable development.

**Article 4.7:** ... mechanisms should be made for:  
d) programmes for research, monitoring, education and training.

### 3.9 LOGISTIC SUPPORT

#### ● Research

##### **Indicator 3.9.1: Coordinated research and monitoring implemented\***

Research in the Sinharaja forest is screened, coordinated and approved by the Forest Department's Forestry Sector Research Committee. A functional research station is located within the forest (at Halmandiya) with lodging facilities for researchers who have permits for research from the Forest Department.

The reserve has been the focus of much interdisciplinary research incorporating both the natural and the social sciences during the period 1993 to 2003. These cover:

- a range of floral studies including studies on the phytosociology of tree flora;
- ecology of birds, small mammals and amphibians;
- restoration and regeneration ecology;
- soil biology and nutrient cycling;
- climate;
- reproductive biology and genetic diversity of under-utilized species;
- long-term forest dynamics;
- rural sociology and resource economics;
- economic evaluation and resource use;
- studies on non-timber products, and
- socio-cultural studies and documentation of folk knowledge in the Sinharaja buffer zone.<sup>20</sup>

Some of this research has focussed on local issues, such as the rehabilitation of degraded ecosystems and sustainable use of natural resources which have a bearing on management practice. Under-planting in *Pinus* plantations established in degraded areas of the buffer zone include trials with primary forest timber species, non-timber forest species (such as cane) and agricultural export species such as domesticated cardamom, pepper, cinnamon and coffee.<sup>3</sup> Studies have also been carried out on non-timber forest products (NTFPs) to understand their potential for domestication in the Sinharaja buffer zone in order to reduce the need to harvest such products from the undisturbed forest.<sup>3</sup>

Selected publications on research carried out in Sinharaja are given in Annex 8. Selected research at the Sinharaja IBR from 1993 to present are given in Table 6.

**Some recent research findings with a conservation focus at Sinharaja**

Silviculture trials during the past decade in *Pinus* plantations established in degraded areas of the buffer zone have shown that with proper management indigenous wet zone broad-leaved species can be inter-planted successfully with *Pinus* which acts as a nurse crop when adequately thinned.

(Source: C.V.S Gunatilleke, long-term researcher at Sinharaja)

A study of small mammals in the Sinharaja Biosphere Reserve shows greater vulnerability of endemics to anthropogenic habitat disturbances; an important fact for conservation planning in the biologically rich, but small and fragmented, wet zone forests of Sri Lanka.

(Source: M. Wijesinghe, researcher)

A socio-economic research study of two peripheral villages have shown that almost all were dependant on tea as their main source of cash income, nearly half of the households had home-gardens less than half hectare; about a third of the households extracted resources from the forest.

(Source : Kathriarachchi, 2002 cited in Gunatilleke and Gunatilleke, document in prep.)

**Research on sustainable use:**

Many research projects that support sustainable use have been carried out in the reserve. Some examples are:

- Study of the performance of selected forest species providing non-timber forest products in the Sinharaja MAB reserve (Kathriarachchi, 2002).<sup>3</sup>
- Study of the factors affecting the sustainable management of tea lands in the Sinharaja periphery which has a bearing on encroachments into the reserve (Wanigasundara, *et al* 2001).<sup>3</sup>
- Study of possibilities for conversion of *Pinus* plantations in the buffer zone of the Sinharaja MAB reserve into rain forest analogs (Sunil *et al* 1999).<sup>3</sup>

**Action at International level:**

• Use the BRs to conduct environmental and socio-economic research including long-term research

**Long-term research projects during 1993-2003 (environmental and socio-economic):**

The Sinharaja IBR is the site of several research projects with a long-term commitment by university-based researchers. Examples are:

- The Tropical Soil Biology and Fertility programme of UNESCO/IUBS (one of ten programme sites) which is now being reactivated.<sup>3,39</sup>
- The Long-term Forest Dynamics Programme across the tropics launched by

that will require decades to complete.

the Centre for Tropical Forest Science of the Smithsonian Tropical Research Institute (one of several sites worldwide).<sup>3,39</sup>

- A long-term study (in progress since 1980) of different aspects of mixed species flock feeding which has generated the largest number of observations (476) on flocks in the world so far. The study also focuses on the feeding ranges of different flocks, their manner of assembly and vocalisations.<sup>32</sup>

Table 6: Selected research at the Sinharaja Biosphere Reserve from 1993 to present

Research Projects	Year of commencement
Quantitative sampling in a 25 ha plot to monitor long-term dynamics of structure and function in the Sinharaja primary forest	1993
Growth performance of selected canopy species under different light, soil and moisture regimes	
The history and diversity of the Sinharaja rainforest	1993
An evaluation of the sustainability of forest use among village communities around the Sinharaja forest	1994
Census of mixed species bird flocks in Sinharaja - Phase I	1996
Diversity, ecology and abundance of amphibians	1996
Habitat selection of endemic small mammals	1998
Economic importance of medicinal plants in home gardens of the Sinharaja forest buffer zone	2000
Preliminary surveys of birds in and around the Sinharaja forest	2000
Composition and behaviour of mixed species flocks in the Sinharaja forest - Phase II	2001
Darwin Initiative project on Sri Lankan land snail diversity	2001
Patterns of faunal diversity in Sri Lankan natural forest Remnants	2001
Understanding the ecophysiology and performance of pioneer species in Sinharaja: acclimation to light and potential use in forest restoration in Sri Lanka	2002
Phylogeny and historical bio-geography of Phyllanthaceae (Euphorbiaceae)	2002
Ecology, systematics, reproductive biology and conservation of the Annonaceae	2002
Restoration of plant and economic diversity in monoculture <i>Pinus</i> plantations in Sri Lanka	2003

Source: Forest Department Research Division. A more detailed indication of the magnitude and quantity of research in the reserve during the past decade can be gained from Annex 8

#### International research programmes in BR during 1993-2003:

Collaborative research at Sinharaja has been developed with overseas institutions (e.g. Smithsonian Tropical Research Institute, Darwin Initiative, etc.). Contacts made through such initiatives have facilitated overseas training of post-graduate students and for students of silvicultural techniques from Sri Lanka. For example research contacts made with the Smithsonian Tropical Research Programme and ATREE (an NGO in India) by Professors Nimal and Savitri Gunatilleke have led to exchange programmes for training of professionals in biodiversity conservation in Malaysia and India. Five persons have benefited this way during the past two years, including M.Sc. students.<sup>39</sup>

- Use BRs for international research programmes on biological diversity, desertification, water cycles, ethnobiology, and global change.

**Objective III.2**  
Improve monitoring activities

- use biosphere reserves to make inventories of fauna and flora, collecting ecological and socio-economic data, making meteorological and hydrological observations, studying the effects of pollution, etc. for scientific purposes and as the basis for sound management.

## ● Monitoring

### **Indicator 3.9.2: Periodical forest resources inventory made**

A fairly comprehensive floral inventory of woody plants of the Sinharaja forest was made through the National Conservation Review when almost all (i.e. 204) natural and near natural forests in the country were surveyed from 1991-1996. The survey of the Sinharaja forest consisted of gradsect sampling along 7 line transects covering 46 plots of 100x 5m.

There are also many other initiatives for sampling of woody species by various researchers resulting in constant updating of the woody species recorded in the reserve.<sup>3</sup>

The NCR has also recorded mammals, reptiles, amphibians and birds as well as butterflies and molluscs,<sup>6</sup> but this inventory is somewhat deficient due to the goals of the study and the methods used which favoured the sampling of flora. These data are supplemented, however, by subsequent studies made of selected faunal species (e.g. avifauna, small mammals, amphibians and snails) by various researchers,<sup>3,30,32,34</sup> including a comprehensive inventory of all groups of vertebrate species in the forest as well as butterflies and molluscs.<sup>29</sup> The latter inventory will be published in the Sri Lanka Forester (i.e. the Journal of the Forest Department).

The inventory of herbaceous plants, fungi and invertebrates is, however, deficient as in all Sri Lanka's natural forests.

### **Indicator 3.9.3: Socio-economic data gathered**

The Forest Department is currently gathering socio-economic data in connection with a survey of the use of non-timber forest products by local communities in 11 villages of the Sinharaja buffer zone. (See also Annex 8 for indication of socio-economic data collected during 1993-2003.

### **Indicator 3.9.4: Meteorological data records maintained**

Meteorological records for the Sinharaja forest have been maintained since the mid 1980s by the Field Research Station at Sinharaja. The annual, seasonal and monthly variations of temperature, rainfall and dry days from 1984-2000 have been analysed in the light of *El Nino* and *La Nina* events and climate change.<sup>15</sup>

### **Indicator 3.9.5: Mechanisms developed for monitoring use of the reserve's resources**

Some mechanisms for valuation of the reserve's resources have been tested through research studies. Examples are:

- the travel cost method involving the sampling of visitors coming from nine districts to the reserve has been tested to assess its scenic beauty, recreational, educational and scientific value (Abeygunawardana, 1993; Senaratne and Abeygunawardana, 1993; Abeygunawardana and Senaratne 1993).<sup>3</sup>

- Development of contingent valuation based on the willingness to pay for resource conservation by rural and urban communities. (Ekanayake and Abeygunawardana).<sup>3</sup>

▪ Develop a functional system of data management for rational use of research and monitoring results in the management of the biosphere reserve.

**Indicator 3.9.6: Data gathered are used for management of the reserve**

The socio-economic and ecological data gathered in the early 1990s have been used for compilation of the present management plan of 1993, and subsequent data gathered have been used in the development of a conservation management programme and a community participation model.

The ongoing socio-economic survey along the southern border of the reserve through the S/W Rainforest Project in 11 villages as well as the ongoing visitor use survey will be directly used for management purposes.

**Indicator 3.9.7: Functional data management system implemented\***

A database on forest biodiversity has been set up in the Forest Department, which includes data on the Sinharaja reserve. However, this needs to be updated and made more functional, and to include socio-economic data.

**Objective III.3**  
Improve education, public awareness and involvement

● **Education and awareness**

**Indicator 3.9.8: Contribution made to conservation concepts in school and university curricula**

**National level action:**  
▪ include information on conservation and sustainable use, as practiced in biosphere reserves, in school programmes and teaching manuals, and in media efforts.

The Sinharaja forest is used to promote conservation education by its inclusion in the ecology curricula for secondary schools, university and postgraduate courses. Questions on Sinharaja are included in examinations for secondary school and university students.

Field trips to Sinharaja are organised annually for graduate and postgraduate students from the Departments of Botany and Zoology of the University of Colombo, the Department of Botany of the University of Peradeniya and the Faculty of Agricultural Biology of the University of Peradeniya, etc.

Schools from all over the island also organise visits to the Sinharaja reserve and, as a result, a large numbers of school children visit it annually.

**Indicator 3.9.9: The biosphere reserve is used for public education on forest conservation**

**Public awareness:**

The Sinharaja IBR is periodically featured in the local press, and in radio and TV programmes. This fact, as well as its inclusion in school and university curricula have greatly contributed to its popularity among the general public, and has generated widespread understanding about its importance both nationally and internationally.

**Visitors to Sinharaja:**

In response to efforts by the Forest Department, NGOs and the mass media for awareness about the Sinharaja forest, the number of visitors to the forest (both local and foreign) has grown considerably during the past decade (Figures 3 and 4). About half the number of annual visitors to Sinharaja are school children.

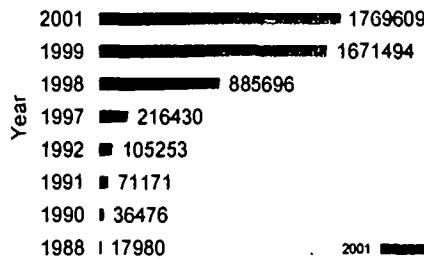


Figure 3

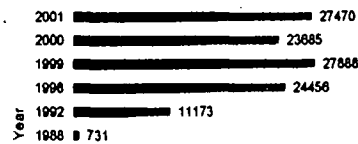


Figure 4

Educational programmes are organised for groups of foreign students from European countries on a regular basis (e.g. Austria) to visit and learn about the reserve.<sup>39</sup>

**Figure 3: Revenue from visitors to the Sinharaja Biosphere Reserve in selected years (both domestic and foreign)**

**Figure 4: Visitors to the Sinharaja Biosphere Reserve in selected years (both domestic and foreign)**

- promote the development of ecology field centres within individual reserves as facilities for contributing to the education of school children and other stakeholder groups.

**Indicator 3.9.10: Ecology field centres developed at the biosphere reserve**

Figure 2 shows the three conservation centres, education and information centre and the research centre in the Sinharaja Biosphere Reserve.

**The education and information centre:**

There is an attractively built Information and Education Centre (IEC) for visitors entering Sinharaja through the Kudawa (north western) entrance. This has interpretative facilities such as a model of the reserve, posters and exhibits, herbarium specimens and preserved animal specimens.

- The existing posters and animal and plant exhibits at the centre

The Education Centre accessed through Kudawa needs to be enhanced further



need to be replaced. This has been partly addressed by the Forest Department through collaboration with the University of Peradeniya. Herbarium specimens and a new set of attractive and informative poster and photographic exhibits on the fauna and flora of the reserve and its ecology have been prepared by undergraduate students of the Peradeniya University. These were inspected during this review. They have been prepared as a part of the botany undergraduate course work under the guidance of Professors Nimal and Savithri

Gunatilleke of the Department of Botany. The placement of these exhibits in the EIC has been delayed due to the recent floods and the closure of the reserve to visitors for some time.

- The faunal specimens are old and disintegrating and should also be replaced. This too could be done through collaboration with a university or an NGO.
- The EIC provides lectures and film shows in the daytime to visitors on request and can accommodate a considerable number at a given time. The overhead projector and video player are shared with the KCC - but this is not perceived as a problem.

#### **The Kudawa Conservation Centre:**

The KCC offers lectures by the field staff and film shows for overnight visitors on request. It has an overhead projector and video player (shared with the EIC) and a TV.

#### **The Pitadeniya Conservation Centre:**

The PCC at the southern boundary of the forest is equipped with a small lecture hall and currently offers short awareness programmes to visitors including school children. Some of these programmes are held outdoors in scenic surroundings. A larger lecture hall, information centre and library are under construction. Work on this has been delayed due to funding constraints, but this has been resolved and construction is due to recommence.

Until this building is completed, a room has been allocated for information display in the Pitadeniya ticket office which is located some distance away from the PCC. Understandably this too has been delayed as the building went under water during the recent floods, but some exhibits using existing posters and maps should be set up as soon as possible. Preparation of exhibits could be done on a similar basis as at the Kudawa EIC, either in collaboration with a university or a conservation NGO.

#### **The Morningside Conservation Centre (MCC):**

The MCC has yet to offer lecture/education facilities, and has received less attention due to the relatively low numbers that visit this area as yet. However, a small information corner and sales counter could be set up at no extra cost within the MCC.

#### **General remarks on the conservation centres:**

All three conservation centres are run by motivated staff. The KCC is the largest and has two dormitories, several cabins and a separate guest house (with a cook) at a very nominal rate. Its advantage is that a large number of visitors can be accommodated at a given time. The PCC has one lodge and a dormitory, and offers excellent accommodation facilities in scenic and peaceful surroundings. Its only disadvantage at present is that there is no motorable access to it as the access road has been damaged during the floods. This is being repaired and is expected to become functional very soon.

Accommodation facilities are basic at the Morningside bungalow, but this is compensated by a splendid view of the sub-montane forest ecosystem. Although relatively few people can be accommodated here, this would be an advantage for serious nature lovers and eco-tourists. All conservation centres use ecofriendly sources of energy. Micro-hydropower is used at the KCC and solar power at the MCC.

- produce visitor information about the reserve, its importance for conservation and sustainable use of biodiversity, its socio-cultural aspects, and its educational recreational programmes and resources.

The PCC has a generator at present but is due to adopt mini-hydropower shortly.

**Indicator 3.9.11: Visitor information and promotional materials developed for the biosphere reserve \***

A wide range of informative material has been prepared on the Sinharaja reserve by the Forest Department. These include:

- a colourful information brochure and map with instructions to visitors (in English),
- a 45 page booklet on the forest (in Sinhala) for children,
- a booklet (in Sinhala) on Sinharaja the World Heritage Site forest,
- a special leaflet (in Sinhala) on the Sinharaja MAB Reserve explaining MAB concepts,
- a leaflet in English titled "Sinharaja our heritage",
- book marks and greeting cards,
- a guide to the birds of Sinharaja with information on the location of nature trails,
- a photographic poster on Sinharaja,
- guides to the Waturawa and Moulawella nature trails. These should however be revised. Guides for the other trails would also be useful for visitors, and
- a book on Sinharaja in Sinhala titled 'Sinharaja - a world heritage' is in print.

Other institutions have also prepared materials on the reserve such as

- an informative poster on the Sinharaja forest - especially aimed at GCE 'O' level students - prepared by the National Science Foundation.

Visitors can purchase educational material on the reserve from the KCC sales outlet or from the Forest Department headquarters. The sales centre at the Pitadeniya Conservation Centre has been destroyed during the recent floods, and is due to be rebuilt.

- There are two videos on the Sinharaja Forest (in Sinhala) produced by the Forest Department for educational purposes. Overnight visitors can view these films on request at the KCC.
- The entrance ticket to the Sinharaja IBR/WHS/NHWA carries a colour photo of the forest and serves as a souvenir.

**Promoting Sinharaja as a Biosphere Reserve:**

One deficiency in promoting the Sinharaja forest as a UNESCO International Biosphere Reserve is that this fact is not mentioned in the notice boards set up at any of the three entrances. This was brought to the notice of the Forest Department during the review and I have been informed that the omission will be rectified, and that the UNESCO MAB logo will be included in all the notice boards. However, all brochures and booklets on the reserve mention its status as a biosphere reserve.

**Indicator 3.9.12: Guided nature trails established**

There are a host of nature trails of varying length and nature established by the Forest Department to enable different types of visitors gain firsthand experience of the forest environment (Figure 2). These include:

- Four trails for visitors from the Kudawa entrance, namely the fairly long trails from Kudawa-Waturawa - Mulawella, the two long trails to the Sinhagala peak

and the *Gallen yaya* (rock caves), and a short and easy trail to the giant *nawada* tree. The Sinhagala and Gallneyaya trails have been affected by land slides after the recent floods and are currently closed to visitors.

- Four trails have been established in the southern sector for visitors to Pitadeniya, the most popular being the Rock Wall Trail. Part of the forest strip along the main trail from the ticket office to the PCC has been destroyed by the recent floods, but the adjacent trail remains unaffected.
- There are two newly established trails of 5.5 km and 8 km from the environs of the MCC (i.e. MCC to bathing pool and MCC to *Duwili ella* [water fall]). Both afford excellent contact with the sub-montane forest and grassland habitats, and are particularly suitable for serious trekkers. Another trail from Denuwakanda to Illumbakanda on the northeastern side of the reserve is to be connected to the *Duwili ella* nature trail (Figure 2).

- encourage involvement of local communities, school children, and other stake holders in education and training programmes and in research and monitoring activities within biosphere reserves.

- encourage appropriate training and employment of local people and other stakeholders to allow their full participation in inventory, monitoring and research programmes in BRs.

#### Guiding facilities:

All visitors to the reserve have to be accompanied by guides provided by the Forest Department. These guides are youth from peripheral villages who are provided with job opportunities as a part of the participatory forest management programme. There are currently 25 guides in service, 15 at Kudawa and 10 at Pitadeniya. They are called upon to accompany the visitors on a roster basis, and are paid for by the visitors.

The guiding facilities provided by the KCC are of a high standard as the guides are well experienced having worked there for many years. All these guides are proficient in English and some in German as well. In contrast, the guides at Pitadeniya have been appointed recently and need time to get the required experience, especially to cater to foreign tourists. As such, some foreign visitors are said to prefer being accompanied by outside more experienced tour guides as indicated during this review.<sup>59</sup> While this needs further conformation, such a situation is not desirable as the local guides (a) also act as guards to prevent unwanted extractions, etc, and (b) are discouraged to continue in the service when overlooked by visitors.<sup>60</sup> I understand that action has been taken since the review visit by the Forest Department to address this by (a) making it strictly mandatory that Forest Department registered guides accompany all visitors - even if an outside guide is present, and (b) absorbing a few of the experienced outside guides with credibility into the regular guiding service.

There are as yet no guides attached to the MCC as the trails are newly established and visitors are few. Visitors are therefore allowed to use the trails on their own, but it is expected that guides will be appointed to this area in the near future. In addition, a Forest Field Assistant accompanies visitors who specifically request for a guide. It may be that at Morningside the low visitor traffic may render the establishment of a local guide service on a roster basis (as at Kudawa and Pitadeniya) economically impractical, necessitating another approach.

**Indicator 3.9.13: Local stakeholders are included in education, training, research and monitoring programmes\***

#### Training for visitor guides:

- Although guides drawn from the youth in peripheral villages have natural first hand knowledge of the forest and its fauna and flora, they are provided with a formal training through workshops organised by the Forest Department in

collaboration with the universities and the Ceylon Tourist Board. They are also provided with English language lessons to help them communicate with foreign visitors. Some of the visitor guides at Kudawa have also been involved as Field Assistants in long-term research projects within the reserve.

#### **Awareness for local people:**

- Awareness programmes via lectures targeting local communities and schools are regularly organised by the Forest Department. Such programmes are also provided in connection with CBO meetings and help with buffer zone management.
- Lectures by reserve staff and video films are available to local schools and communities in the buffer zone villages, and this has helped to create awareness on the reserve. Other initiatives such as art competitions, etc. are regularly organised by the Forest Department field staff in connection with their annual educational activities.

#### **Objective III.4**

Improve training for specialists and managers

- encourage training programmes for local communities and other local agents (such as decision-makers, local leaders and agents working in production, technology transfer, and community development programmes to allow their full participation in the planning, management, and monitoring processes of biosphere reserves.

- use the reserve for on-site training and for national, regional, and local seminars.

### ● Training

#### **Indicator 3.9.14: A local educational and training centre is in place**

The KCC at Sinharaja is frequently used as a site for training programmes conducted by government and private institutions as well as NGOs. For example, the centre was used by the Red Cross to train social workers for the Northern Province during the field visit for this review. There are several state institutions that have annual bookings at the KCC for their institutional training programmes. Often participants of these programmes request lectures and films on the reserve from the KCC field staff. This serves to facilitate awareness about the reserve and its potential among the general public.

Project staff and Forest Department staff (field and regional) and all social mobilisers in the S/W Rainforest conservation project have been provided training on ecotourism. Workshops have been held for national media personal at the reserve.

Training facilities are available at the KCC and PCC as well as at the Kudawa Education and Information Centre. The use of the PCC as a training venue is rather hampered at present as it cannot be accessed by vehicle due to road damage after the floods, but this is soon to be rectified.

#### **Indicator 3.9.15: The reserve is used for on-site training activities\***

The Forest Department regularly holds training programmes for school teachers at the KCC, and at least two training programmes have been held annually from 1993 to 2002. This includes training programmes for Master Teachers on biodiversity conservation. The KCC and PCC are also used for training and awareness workshops for university students and school children.

#### **Indicator 3.9.16: Local stakeholders are included in on-site training programmes**

The KCC has been used in the past for entrepreneurial training on income enhancement for local communities. Among these are training programmes for income generation through animal husbandry, mushroom cultivation and bee

keeping. Local CBO members have also been provided workshops on biodiversity conservation and bird watching.<sup>12</sup>

## 4.0 RECOMMENDATIONS FOR ENHANCING THE RESERVE

Several recommendations have been given in the text of the reserve for enhancing the role of the Sinharaja reserve as an IBR. Some key recommendations are reiterated below. The report as well as all recommendations are provided in the context of the present management of the reserve.

### 4.1 ENHANCING DEVELOPMENT FUNCTIONS

#### ● Enhancing participatory management

1. The participatory management model piloted in the southern buffer zone of the Sinharaja IBR appears to be working well and should be introduced to other villages in the buffer zone. If there are financial constraints to do so, the Forest Department could consider collaborating with an NGO or other relevant stakeholder. For example, there is an ongoing project on the same lines by a national level development NGO (*Sevalanka*) which is seeking to assist with the socio-economic development of villages in the Sinharaja buffer zone to reduce reliance on tea cultivation, and thereby reduce the threat of encroachment into the reserve. This group envisages mobilising the now inactive *Sinharaja Sumithuro* Societies in the northern part of the buffer zone. Discussions held with representative of this NGO revealed that they are keen to work with the Forest Department. A collaborative effort with a common agenda will also eliminate conflicts that may arise if there are two separate initiatives for buffer zone development in the same villages.
2. Formulate a feasible mechanism to bring in the large plantations (both private and state owned) into the participatory management process in a manner best suited for conservation of the reserve. Although these plantations are not perceived as a major threat to the reserve in terms of encroachment or timber extraction, the review meetings with the community indicated that plantation staff extracts forest products, and there have been incidents of damming waterways into the forest which were stopped by the Forest Department. Further, hunting within these plantations (particularly in the eastern sector) can affect animals in the reserve which range into the buffer zone. There is also some concern that the forest patches in these plantations which are contiguous with the reserve serve could serve as access points for hunting and other illegal activity within the reserve.
3. Formulate a mechanism for a strong facilitating and monitoring role for the Forest Department after the S/W Rainforest Conservation Project ceases to ensure that CBOs continue to contribute positively towards participatory management of the reserve. Self reliance for socio-economic development of communities through registered CBOs as promoted through this project to reduce reliance on tea cultivation (and encroachment) is commendable. However, there is danger that with time these CBOs could lose track of

their original objectives: assisting with participatory conservation and management of the Sinharaja reserve. The need for continued presence of the Forest Department was stressed by some community members in the Galle District during this review.

4. Actively promote the formation of Vigilance Committees within all CBOs mobilised through the S/W Rainforest Conservation Project (and also in the other CBOs when they are re-convened).
5. Formulate an independent evaluating mechanism of the participatory management process through the national MAB Committee on a periodic basis. This could be linked to an award for the CBO which contributes most towards forest management as an impetus for communities to participate actively in forest conservation and management. The award need not be monetary - it can be training for CBO members, assistance to the local school, etc.
6. Enhance capacity of CBOs to undertake entrepreneurial development. At present entrepreneurial development through the CBOs mobilised by the S/W Rainforest Conservation Project is by providing low interest funds to members on an individual basis and by identifying training and other development assistance to the local people. The CBOs can expand their role to assist with linking its members to product markets and assist with the sale of goods produced by its members. In turn, some funds from the sales could be remitted to the CBO. For example, inquiries made during this review revealed that Laksala provides training at the village level for product development and purchases the goods produced if they are of the required standard. The Forest Department could identify such markets and provide opportunities for links between them and the CBOs. Where possible goods so produced could also be sold at sales outlets in the Forest Department Conservation Centres.
7. Identify material that is most often obtained from the forest through the CBOs and initiate programmes for their propagation in home gardens by introducing the Kandyan home garden concept to the buffer zone villages where appropriate. For example, community consultations revealed that in some villages plant parts from rare medicinal species are sometimes obtained from just one tree within the reserve. Species such as this can be cultivated in home gardens. Other popular species from which collections are made such as hadawaka (for firewood), keena stems, bandura creepers etc. could also be considered for cultivation in the buffer zone through consultation with the communities. Some damage is done when dorana trees are tapped for their exudates.
8. Explore the need and potential to propagate kitul in the buffer zone for development of the local treacle and jaggery industry through the CBOs which can also help market the product. This is already on the agenda of an NGO active in the buffer zone (*Sevalanka*) and could be supported if considered viable by the local people.

9. Assess sustainable harvest rates of rattan and other species propagated through pilot studies for under-planting *Pinus* in the buffer zone with NTFPs and make arrangements to provide them to local people for entrepreneurial development through CBOs. Under-planting more *Pinus* areas with species for which there is a demand can also be initiated through the CBOs in collaboration with the Forest Department.

## ● Contributing to national development

10. Promote inter-institutional collaboration with the Plant Genetic Resources Centre for ex-situ conservation of the reserve's genetic resources, particularly species important as crops or for crop enhancement and endemic plant species.
11. Instigate measures to disseminate results of pilot studies that have been carried out in the reserve to other state institutions outside the forestry sector, including the private sector. Examples to be showcased are the research on under-planting in *Pinus* stands, participatory community management, etc. This could be done with assistance from the National MAB Committee.
12. Give consideration to developing the Sinharaja Biosphere Reserve as a site to promote traditional practices that are dying out in the buffer zone areas after consultation with local communities. This review as well as other studies reveal that traditional medical practitioners and people with expertise in local customs and rituals are very few in the buffer zone as the younger generation is not interested in such knowledge, mainly due to the low profile of, and/or poor economic remuneration from, such practices. The reserve could be used to promote some of these activities/practices by demonstrating them to visitors and by highlighting their importance. Some suggested activities are: (a) disseminating knowledge of medical plants and traditional rituals and customs among the youth of the area and interested members of the public through discussion meetings and demonstrations by village elders and traditional practitioners; (b) setting up a demonstration of kitul tapping and treacle making by CBO members for visitors at the Kudawa Conservation Centre, (c) setting up an exhibit of a traditional medicine clinic at the Pitadeniya Conservation Centre where native physicians from the area could be in attendance for consultation purposes on a rotational basis. This can be done with the help of local CBOs, and (d) making available local food for sale in a local setting for visitors run by CBOs under the supervision by the Forest Department to ensure quality control. Cultural centres could be established along with the education and information centres.
13. Facilitate formation of CBOs and social mobilisation in the villages north of Kosmulla up to Pitakale.

## 4.2 ENHANCING LOGISTIC FUNCTIONS

### ● Education and visitor use

14. The reserve serves the function as a centre for education and training quite adequately. However, further enhancement of these functions could be done through a strategic planning exercise which specifically identifies what needs to be done at each conservation centre/education and information centre, taking into consideration the visitor traffic, type of visitor and the required interpretive facilities based on visitor needs. The ongoing visitor survey of the Forest Department can be used for this exercise. The assistance of NGOs, university students and members of IUCN's Commission on Education and Communication in Sri Lanka could be got to enhance education and communication functions of the reserve.
15. Organise for forest guides at Pitadeniya to work with their Kudawa counterparts at Kudawa on a rotational basis for training purposes. The guides provided at the KCC are well experienced, knowledgeable and able to provide a very satisfactory service to both local and foreign visitors. A request could also be made for volunteers among the Kudawa guides to work at Pitadeniya as trainers. English language proficiency should be enhanced for the Pitadeniya guides as this appears to be a problem. There was also a request to learn basic spoken German by the Kudawa guides as there are many German tourists to the reserve. While many are sufficiently proficient in the language to explain about the forest and the nature trails, they are unable to respond to general questions due to their limited knowledge of the language.
16. Concentrate on ecotourism at the Morningside Conservation Centre and cater to associated visitor needs rather than on the more conventional nature tourism as at the other two CCs. All future tourism development at the reserve should be ecologically and culturally acceptable.
17. Facilitate a mechanism for sponsorship among the private sector to enhance facilities at the three conservation centres and information centres on a yearly or biannual basis. The management of the CCs would rest entirely with the Forest Department, while the sponsor could have benefit of using a Sinharaja logo for their advertisements to denote their ecofriendly role, etc.

### ● Research

18. Facilitate better understanding between researchers and reserve staff by organising "research days" at the Kudawa Conservation Centre for researchers to apprise the staff and interested members of the community of what they are doing and the implications of their research for conserving the reserve. Providing the reserve staff copies of project proposals for research projects

and permits provided to the researchers (i.e. for collections) would also be beneficial to facilitate greater understanding between the reserve staff and the researchers.

19. Seek funds for enhancing and expanding facilities at the research centre and for its maintenance.

### **4.3 ENHANCING CONSERVATION AND MANAGEMENT**

20. Ensure that the boundary re-definition survey is carried out through a participatory process that can achieve consensus with local communities through consultation and negotiation.
21. Prepare a new map of the Sinharaja IBR after the boundary re-demarcation is completed, indicating forest types in the core area, visitor centres, education and information centres, nature trails and land use in the buffer zone.
22. Maintain links with other contiguous forests to provide adequate refugia for the larger faunal species, especially the endemics and the mammalian macrofauna.
23. Consider the possibility of including the adjacent Handapanella Plains within the reserve to enhance biodiversity conservation as recommended by field biologists during this review.
24. Address the problem of unauthorised visitors to the reserve to view the *Duwili ella* waterfall near Kosmulla on the south-western boundary of the reserve. Reportedly some visitors remove plants etc.
25. Address the problem of hunting which seems to be on the rise in the peripheral areas of the reserve in the Galle District and eastern Sinharaja. This may be due to the absence of a Forest Department office near the Sinharaja Reserve in this area. The reserve boundary north of Kosmulla to Pitakale was also identified by communities in the Galle District as particularly vulnerable to encroachment and illicit felling as there has been no or low social mobilisation in this area.
26. Investigate the reports of the rise in invasive species (e.g. *Alstonia* and *Clidemia*<sup>29</sup>) in the reserve by researchers and communities.

### **4.4 PROMOTING THE SINHARAJA FOREST AS AN IBR**

27. Organise a seminar on the Sinharaja forest to showcase it as a biosphere reserve by demonstrating its conservation, development and logistic functions preferably

at one of the conservation centres. This can also be used to identify how best to enhance the role of this forest as an IBR and to address the gaps perceived through the review process.

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## Annex 1 Indicators for the review

**Seville Strategy**  
**GOAL 1:** Use biosphere reserves to conserve natural and cultural diversity.

**Objective 1.1**  
Improve the coverage of natural and cultural biodiversity by means of the World Network of Biosphere Reserves.

**Action at national level**

- ... establish, strengthen or extend biosphere reserves as necessary, giving special attention to fragmented habitats, threatened ecosystems, fragile and vulnerable environments, both natural and cultural.

**Article 3.(a):** [unctions of a biosphere reserve]  
**Conservation – contributes to conservation of landscapes, ecosystems, species and genetic variation.**

**Article 4.1:**  
It [a biosphere reserve] **should encompass a mosaic of ecological systems representative of major biogeographic regions, including a gradation of human interventions.**

### 3.1 SIGNIFICANCE FOR REPRESENTATIVE AND CONSERVATION VALUE

#### ● Global significance

**Indicator 3.1.1: Representation of key global vegetation and ecosystem type/biogeographic region**

**Indicator 3.1.2: Globally recognised conservation value**

#### ● National significance

**Indicator 3.1.3: State recognition of conservation value**

**Indicator 3.1.4: Contribution to national forest cover**

**Indicator 3.1.5: Recognised historical/cultural value**

**Indicator 3.1.6: Contribution for watershed protection**

**Indicator 3.1.7: Vulnerability to human population pressure**

**Article 4.2.** It [a biosphere reserve] **should be significant for biodiversity conservation.**

### 3.2 SIGNIFICANCE FOR BIODIVERSITY CONSERVATION

#### ● Species

**Indicator 3.2.1: Species diversity**

**Indicator 3.2.2: Importance as a habitat for endemics**

**Indicator 3.2.3: Contribution to agro-biodiversity**

## ● Ecosystems, habitats and landscapes

**Indicator 3.2.4: Presence of diverse ecological systems/habitats**

**Indicator 3.2.5: Changes in ecosystem health**

## ● Genetic resources

**Indicator 3.2.6: Potential as a gene reservoir**

## ● Bioregion represented

**Indicator 3.2.7: Significance of bioregion for biodiversity conservation**

GOAL I:  
Objective I.1

Action at national level:

- Prepare a biogeographical analysis of the country as a basis, *inter alia*, for assessing coverage of the world network of BRs.

**Article 4.4:** It [a biosphere reserve] should have an appropriate size to serve the functions of a biosphere reserve as set out in Article 3. (Article 3a. for Conservation; Article 3.b. for Development; Article 3c. for logistic support).

### 3.3 SIZE OF BIOSPHERE RESERVE

**Indicator 3.3.1: Change in size after declaration as a biosphere reserve**

Seville Strategy Goal IV:  
Implement the Biosphere Reserve concept

**Indicator 3.3.2: Adequacy for biodiversity conservation**

Objective IV.1  
Integrate the functions of BRs.

**Article 4.7:** In addition mechanisms should be made for:  
**[b]: a management policy or plan for the area as a biosphere**  
**[c]: a designated authority or mechanism to implement the policy or plan.**

Reserve level:

- Prepare, implement and monitor an overall management plan or policy that includes all zones of BRs.

### 3.4 MANAGEMENT OF THE BIOSPHERE RESERVE

**Indicator 3.4.1: Management plan prepared for the reserve**

**Indicator 3.4.2: Authority defined for management plan implementation**

- Define and establish institutional mechanisms to manage, coordinate and integrate the reserve's programmes and activities.

**Article 4.5:** It should include these functions [of a biosphere reserve], through appropriate zonation, recognising:

- [a]. a legally constituted core area devoted to long-term protection, according to the conservation objectives of the biosphere reserve, and of sufficient size to meet these;
- [b]. a buffer zone or zones clearly identified and surrounding or contiguous to the core areas, where only activities compatible with conservation objectives can take place;
- [c]. an outer transition zone where sustainable resource management practices are promoted and developed.

**Indicator 3.4.3:** Management plan recognises zones consonant with the biosphere reserve concepts

**Indicator 3.4.4:** Management zones include a core area of adequate size devoted to long-term protection,

**Indicator 3.4.5:** The core zone is legally constituted

**Indicator 3.4.6:** Buffer zone promotes sustainable development of the reserve and preserves the core zone\*

**Indicator 3.4.7:** Boundary of zones defined to meet conservation objectives and sustainable development

**Indicator 3.4.8:** Biosphere reserve mapped showing zonation

- Where necessary, in order to preserve the core area - re-plan the buffer and transition zones according to sustainable development criteria

- identify and map the different zones of the BR and define their respective status

**Article 4.6:** Organisational arrangements should be provided for the involvement and participation of a suitable range of inter-alia public authorities, local communities, and private interests in the design and carrying out of the functions of a biosphere reserve.

**Article 4.7:** In addition mechanisms should be made for:

- [a]: mechanisms to manage human use and activities in the buffer zone or zones.

**Goal II:**

**Objective II.2**

- establish a local consultative framework in which the reserve's economic and social stakeholders are represented including the full range of interests (agriculture/ forestry/ hunting/ extraction/water and energy supply/fisheries/ tourism/recreation/ research).

### **3.5 MECHANISMS TO MANAGE, COORDINATE AND INTEGRATE THE BIOSPHERE RESERVE PROGRAMMES AND ACTIVITIES**

#### **● Integrating community participation with forest conservation**

**Indicator 3.5.1:** Forest policy is consonant with community participation in forest management

**Indicator 3.5.2:** Local consultative framework in place \*

**Indicator 3.5.3:** Community participation management model identified and adopted

Goal IV:  
Objective IV.1)

▪ Ensure that the local communities participate in planning and management of BRs.

**Indicator 3.5.4: Local community is involved in planning and managing the reserve\***

**Indicator 3.5.4 (a): Community participation obtained for management planning**

**Indicator 3.5.4(b): Peoples' participation obtained for boundary definition**

**Indicator 3.5.4 (c): CBOs participate in buffer zone management**

**Indicator 3.5.4 (d): Community participation has helped to conserve the forest and its resources**

**Indicator 3.5.5: Number of forest officers trained in community participation techniques**

Goal II:  
Utilize biosphere reserves as models of land management and of approaches to sustainable development.

**Objective II.1**  
Secure the support and involvement of local people

▪ Survey of interests of the various stakeholders and fully involve them in planning and decision-making regarding management and use of the reserve.

▪ Evaluate the natural products/services of the reserve, and use these evaluations to promote environmentally sound and economically sustainable income opportunities for local people.

▪ Identify and address factors that led to degradation and unsustainable use of biological resources.

**Article 3II. Development – foster economic and human development which is socio-culturally and ecologically sustainable.**

### **3.6 PROMOTING SUSTAINABLE DEVELOPMENT**

#### **● Measures taken to understand threats and stakeholder needs**

**Indicator 3.6.1: Survey made of stakeholder interests\***

**Indicator 3.6.2: Survey made of natural products/uses/services of the reserve\***

**Indicator 3.6.3: Factors leading to environmental degradation and unsustainable use are identified**

Goal II:  
Objective II.2  
Action at the  
national  
level:

+ Develop  
means to identifying  
incompatibility  
between the  
conservation and  
sustainable use  
functions of BRs and  
take measures to  
ensure an  
appropriate balance  
between these  
functions is  
maintained.

## ● Measures taken to arrest environmental degradation and unsustainable use

**Indicator 3.6.4: Areas of incompatibility recognized and addressed**

Goal II:  
Objective II.1

▪ Develop  
incentives for  
conservation and  
sustainable use of  
natural resources,  
and develop  
alternative means of  
livelihood for local  
people when existing  
activities are limited  
or prohibited within  
the BR.

▪ Ensure that  
benefits derived from  
natural resources are  
equitably shared with  
stakeholders, by  
such means as  
sharing of entrance  
fees, sale of natural  
products/handicrafts,  
use of local  
construction  
techniques and  
labour, and  
development of  
sustainable activities  
(e.g.,  
forestry/agriculture.  
etc)

## ● Measures taken to introduce sustainable use practices

**Indicator 3.6.5: Incentives identified to promote sustainable use by local populations\***

**Indicator 3.6.6: Non-timber forest products propagated for sustainable use**

**Indicator 3.6.7: CBOs encouraged to form links with other state institutions**

**Indicator 3.6.8: Private land owners near the reserve are encouraged to establish and maintain environmentally and socially sustainable activities**

**Indicator 3.6.9: Mechanisms are present to share benefits from the reserve with the local community**

**Goal 1:**

**Objective 1.2.**

Integrate biosphere reserves into conservation planning

**National level:**

- Integrate biosphere reserves in strategies for biodiversity conservation and sustainable use in plans for protected areas, and in the national biodiversity strategies and action plans provided for Article 6 of the CBD

- Link biosphere reserves with each other, and with other Protected Areas, through green corridors and in other ways to enhance biodiversity conservation.

- Use of BRs for *in situ* conservation of genetic resources including wild relatives of cultivated/ and domesticated species, and consider using the reserve as rehabilitation/re-introduction sites, and link them as appropriate with *ex-situ* conservation and use programmes

- When applicable, include projects to strengthen and develop biosphere reserves in programmes to be initiated and funded

## 3.7 INTEGRATION OF BIOSPHERE RESERVES INTO CONSERVATION PLANNING

### ● Using biosphere reserve experience for conservation/management approaches

**Indicator 3.7.1: Management experience integrated into national planning**

**Indicator 3.7.2: Reserve is used as a pilot site for management planning and implementation**

**Indicator 3.7.3: Reserve is used as a pilot site for community participation in forest management**

**Indicator 3.7.4: Forest links established with other reserves**

**Indicator 3.7.5: Links developed with *ex-situ* conservation facilities**

### ● Integration of biosphere reserves into global conservation programmes linked to the CBD

**Indicator 3.7.6: Projects connected with implementing the CBD and other conventions established**

under the Convention on Biological Diversity and other multilateral conventions.

**Goal II**

**Objective II.3**  
Integrate BRs in regional planning.

**National level**

- include BRs into regional development policies and regional land use projects.
- encourage major land use sectors to near each BR to adopt practices favouring sustainable land use.

**Reserve level**

- organise forums and set up demonstration sites for the examination of socio-economic and environmental problems in the region and for sustainable use of biological resources important for the region.).

**Goal III:**

**Use biosphere reserves for research, monitoring, education and training.**

**Objective III.1**

Improve knowledge of the interactions between humans and the biosphere reserves

- Use BRs for basic and applied research particularly on projects that focus on

**Article 4.3:** It [ a biosphere reserve] should provide an opportunity to explore and demonstrate approaches to sustainable development on a regional scale

### **3.8. INTEGRATION OF BIOSPHERE RESERVE INTO REGIONAL PLANNING**

**Indicator 3.8.1: Regional demonstration sites established\***

**Article 3 [iii]:** Logistic support - support for demonstrative projects, environmental education and training, research and monitoring related to local, regional, national and global issues of conservation and sustainable development.

**Article 4.7:** ... mechanisms should be made for:  
d) programmes for research, monitoring, education and training.

### **3.9 LOGISTIC SUPPORT**

#### **● Research**

local issues; interdisciplinary projects incorporating both the natural and the social sciences, and projects involving the rehabilitation of degraded ecosystems, the conservation of soils and water and sustainable use of natural resources.

**Action at International level:**

- Use the BRs to conduct environmental and socio-economic research including long-term research that will require decades to complete.
- Use BRs for international research programmes on biological diversity, desertification, water cycles, ethnobiology, and global change.

**Objective III.2**  
Improve monitoring activities

- use reserve to make inventories of fauna and flora, collecting ecological and socio-economic data, making meteorological and hydrological observations, studying the effects of pollution, etc. for scientific purposes and as the basis for sound management.

- Develop a functional system of data management for rational use of

● **Monitoring**

**Indicator 3.9.1: Coordinated research and monitoring implemented\***

**Indicator 3.9.2: Periodical forest resources inventory made**

**Indicator 3.9.3: Socio-economic data gathered**

**Indicator 3.9.4: Meteorological data records maintained**

**Indicator 3.9.5: Mechanisms developed for monitoring use of the reserve's resources**

**Indicator 3.9.6: Data gathered are used for management of the reserve**

**Indicator 3.9.7: Functional data management system implemented\***

research and monitoring results in the management of the biosphere reserve.

**Objective III.3**

Improve education, public awareness and involvement

**National level action:**

- include information on conservation and sustainable use, as practiced in biosphere reserves, in school programmes and teaching manuals, and in media efforts.
- promote the development of ecology field centres within individual reserves as facilities for contributing to the education of school children and other stakeholder groups.
- produce visitor information about the reserve, its importance for conservation and sustainable use of biodiversity, its socio-cultural aspects, and its educational recreational programmes and resources.
- encourage involvement of local communities, school children, and other stakeholders in education and training programmes and in research and monitoring activities within biosphere

● **Education and awareness**

**Indicator 3.9.8: Contribution made to conservation concepts in school and university curricula**

**Indicator 3.9.9: The biosphere reserve is used for public education on forest conservation**

**Indicator 3.9.10: Ecology field centres developed at the biosphere reserve\***

**Indicator 3.9.11: Visitor information and promotional materials developed for the biosphere reserve\***

**Indicator 3.9.12: Guided nature trails established**

**Indicator 3.9.13: Local stakeholders are included in education, training, research and monitoring programmes\***

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reserves.

- encourage appropriate training and employment of local people and other stakeholders to allow their full participation in inventory, monitoring and research programmes in BRs.

**Objective III.4**

Improve training for specialists and managers

- use the reserve for on-site training and for national, regional, and local seminars.

- encourage training programmes for local communities and other local agents (such as decision-makers, local leaders and agents working in production, technology transfer, and community development programmes to allow their full participation in the planning, management, and monitoring processes of biosphere reserves.

## ● Training

**Indicator 3.9.14: A local educational and training centre is in place**

**Indicator 3.9.15: The reserve is used for on-site training activities\***

**Indicator 3.9.16: Local stakeholders are included in on-site training programmes**

**Indicators included in the Seville Strategy at reserve level**

Indicators prepared for the National Man and Biosphere Committee by J D S Dela

Annex 2 The questionnaire given to communities (at community consultation workshops) and to field forest officials (individually) to gauge forest uses and threats (Translation).

*UNESCO/MAB Review of the Sinharaja Biosphere Reserve*

(1) Please read the following statements and indicate how you perceive them in relation to the current situation at the Sinharaja NHTA/WHS/IBR by selecting a response number from 1-6 or X.

1. *largely disagree*
2. *mildly disagree*
3. *mildly agree*
4. *largely agree*
5. *totally agree*
- X. *don't know the current situation*

a. Timber supposed to be extracted from private natural forests adjacent to the Sinharaja forest, actually comes from the Sinharaja forest.	1	2	3	4	5	6	X
b. The use of forest footpaths widen tracks.	1	2	3	4	5	6	X
c. The boundaries of estates keep moving toward the forest.	1	2	3	4	5	6	X
d. Estate staff remove poles, trees, canes and lianas from the forest. (underline what is most relevant in terms of removal if you agree)	1	2	3	4	5	6	X
e. Estate staff dam streams that enter the forest.	1	2	3	4	5	6	X
f. There are illegal encroachments by villagers for agriculture and other land uses.	1	2	3	4	5	6	X
g. Deniya cultivation occurs in the forest.	1	2	3	4	5	6	X
h. Exotics ( <i>Alstonia</i> in the periphery and Mahogany planted in mechanically logged areas) threaten the forest.	1	2	3	4	5	6	X
i. Poor land management in adjacent private lands affect the forest.	1	2	3	4	5	6	X
j. Excess visitors are a threat to the forest.	1	2	3	4	5	6	X
k. Villages located within the forest boundary are a threat to conservation of the forest.	1	2	3	4	5	6	X
l. People still collect food items from the forest.	1	2	3	4	5	6	X
m. Extraction of non-timber resources is a problem for conservation of the forest.	1	2	3	4	5	6	X
n. Illicit timber extraction continues on a scale that would affect conservation of the forest.	1	2	3	4	5	6	X
o. Collection of firewood from the forest is still common.	1	2	3	4	5	6	X
p. Slender stems of keena are used to construct ladders and as handles for domestic and agricultural utensils.	1	2	3	4	5	6	X
q. Bandura or other lianas are extracted to form circular footholds on kitul palms, to facilitate climbing.	1	2	3	4	5	6	X

If you have agreed to (l) above please state what food items are commonly collected.

(2) Please indicate below how often you think the following forest resources were extracted by local people during the past year by selecting a response number from 1-6.

1. never
2. hardly ever
3. sometimes
4. often
5. very often
6. don't know current situation

a. Rattan and bamboo	1	2	3	4	5	6
b. Plant food items	1	2	3	4	5	6
c. Animal food items	1	2	3	4	5	6
d. <i>Beru</i> leaves for roofing	1	2	3	4	5	6
e. Dried wild cardamom (if yes, is it for sale or consumption? underline correct)	1	2	3	4	5	6
f. Firewood from <i>hadawaka</i>	1	2	3	4	5	6
g. Resinous exudates from <i>nawada</i> or other	1	2	3	4	5	6
h. Resin from <i>kekuna</i>	1	2	3	4	5	6
i. Ayurvedic medicine	1	2	3	4	5	6
j. Arecanut	1	2	3	4	5	6
k. Keena stems	1	2	3	4	5	6
l. Lianas	1	2	3	4	5	6
m. Kitul sap	1	2	3	4	5	6
n. Timber (for house construction, and sheds for weddings, funerals, etc.)	1	2	3	4	5	6
Please state if there are other extractions that score 3, 4, or 5 .....			3	4	5	
.....			3	4	5	

(3) If you have scored 3, 4, or 5 for b, c or i above, please state what medicinal plants/plant/animal food were/are collected by local people/others.

(4) How would you rate the accuracy of the following considerations in connection with the Sinharaja forest? Selecting a response number from 1-5.

1. totally inaccurate
2. accuracy low
3. quite accurate
4. totally accurate
5. not sure

a. people in villages around Sinharaja obtain approximately <u>less than a quarter</u> of their monthly cash income from forest resources (excluding kitul tapping).	1	2	3	4	5
b. people in villages around Sinharaja obtain approximately <u>more than half</u> their monthly cash income from forest resources. (excluding kitul tapping).	1	2	3	4	5
c. Young people around the forest are not interested in extracting forest resources for subsistence or livelihood.	1	2	3	4	5
d. People around Sinharaja depend mainly on tea cultivation for their monthly cash income.	1	2	3	4	5
e. Old people in the adjoining villages value the forest more than young people do.	1	2	3	4	5
f. Kitul tapping <u>in the forest</u> is the main forest based activity in this forest.	1	2	3	4	5

**Annex 3 The questionnaire used to gauge community participation in forest management at the community consultation workshops (Translation)**

(1) Which do you feel is the most appropriate response about the participatory management of Sinharaja by local communities: It is:

1. working very well in our area. The Forest Department is doing a good job.
2. working well in other areas but not in our area.
3. not working well at all anywhere to our knowledge.
4. it is a good thing but it needs more effort by the authorities to achieve success.
5. It is not working well, but the Forest Department is making a real effort.
6. Other: state.

(2) Please read the following statements and indicate how you perceive them in relation to the current situation at the Sinharaja NHWA/WHS/IBR by selecting the number of the response (from 1-7) which best corresponds to your view.

- |                     |                  |  |
|---------------------|------------------|--|
| 1. totally disagree | 4. mildly agree  | 7. I don't know or care what this is all about |
| 2. largely disagree | 5. largely agree |  |
| 3. mildly disagree  | 6. totally agree |  |

a. Communities now have a voice in conserving/managing the Sinharaja forest	1	2	3	4	5	6	X
b. Communities are confident that the Forest Department will communicate to them major decisions regarding the Sinharaja forest and consult on necessary action.	1	2	3	4	5	6	X
c. Communities now understand that conserving the forest is in their best interests due to action taken by the Forest Department in the past.	1	2	3	4	5	6	X
d. A valid basis has been used for selection of villages for assistance through the SW/Rainforest Conservation Project (to be answered for Galle/Matara Districts only).	1	2	3	4	5	6	X
e. The CBO Trust Funds of the Friends of Sinharaja societies are managed by the community with no adverse interference from government (to be answered for Galle/Matara Districts only).	1	2	3	4	5	6	X
f. The participatory management approach by the Forest Department has helped forest conservation.	1	2	3	4	5	6	X
g. Illegal encroachment by villagers for agriculture and other land uses has been stopped/reduced due to the participatory management initiated by the forest department.	1	2	3	4	5	6	X
h. Illegal encroachment by villagers for agriculture and other land uses has been stopped/reduced, but this is not due to the participatory management initiated by the Forest Department.	1	2	3	4	5	6	X
i. People are willing to accept that timber felling, encroachment or other harmful extractions from the reserve have to stop for its conservation.	1	2	3	4	5	6	X

j.	There is better land management in adjacent private lands/tea cultivations due to participatory forest management.	1	2	3	4	5	6	X
k.	Villages located within the forest boundary understand the need for not engaging in activities that are a threat to the forest.	1	2	3	4	5	6	X
l.	People are not persecuted by the Forest Department for extraction of non-timber resources when it is not a threat to the forest.	1	2	3	4	5	6	X
m.	Obtaining permits for kitul tapping from the Forest Department is not a problem.	1	2	3	4	5	6	X
n.	Communities were consulted/are being consulted during the recent/present boundary demarcation.	1	2	3	4	5	6	X
o.	It is agreed that joining the CBOs (Friends of Sinharaja societies) has benefited the local people.	1	2	3	4	5	6	X
p.	At least 75% of people around the Sinharaja reserve are committed to conserving the forest.	1	2	3	4	5	6	X
q.	There is good understanding between the Forest Department and the local people.	1	2	3	4	5	6	X
r.	Members never miss CBO meetings if possible.	1	2	3	4	5	6	X
s.	The impact of the recent floods were greater in areas where tea has replaced natural vegetation and/or areas of Sinharaja which adjoin opened up roads.	1	2	3	4	5	6	X

**Annex 4 People consulted during the review through informal interviews and community workshops.**

**Forest management and other related information:**

Mr Sarath Fernando - Conservator General of Forests  
Mr H G Gunawardena - Deputy Conservator of Forests (Environmental Division-Head Office)  
Mr S A A Sathurusinghe - Deputy Conservator of Forests (Social Forestry and Extension -Head Office)  
Mr Ananda Wijesooriya - Deputy Conservator of Forests (Forest Inventory and Management-Head office)  
Ms R.H.M P Abeykoon - Assistant Conservator of Forests (Environmental Division- Head office)  
Staff of the Forest Department GIS unit and the research division at Headquarters  
Mr Gamini Atapattu - RFO S/W Rainforest Conservation, GEF Project  
Mr G L Somathileke - RFO Deniyaya  
Mr Ananda Brahmana - FO- Ratnapura  
Mr A A Wijithapala - BFO.Morningside  
Mr Ranjith Hakmananayake - Field officer, GEF Project Thawalama  
Mr. Upul Ranaweera - Field officer, GEF Project Neluwa  
Mr K H Wijesinghe - RFO Neluwa  
Mr F A Samaraweera - BFO Pitadeniya  
Mr E J M J K Ekanayake - RFO Sinharaja  
Mr Sunil Ranaweera - RFO Sinharaja  
Mr Karunasena Hendawithrana - Field Assistant, Morningside

**Research aspects, biodiversity and forest condition: (In order of citation in the text)**

Dr Magden Jayasuriya - Director Plant Genetic Resources Centre, Gannoruwa  
Mr A S U Liyanage - Research Officer Plant Genetic Resources Centre, Gannoruwa  
Prof I A U N Gunatilleke - Department of Botany University of Peradeniya  
Prof. CVS Gunatilleke - Senior lecturer, Department of Botany, University of Peradeniya  
Prof. S W Kotagama - Senior Lecturer, Department of Zoology, University of Colombo  
Dr M R Wijesinghe - Senior Lecturer, Department of Zoology, University of Colombo  
Dr D K N G Pushpakumara - Senior lecturer, Department of Crop Sciences, University of Peradeniya  
Dr I P Wickremasinghe - Senior lecturer, Department of Agricultural Biology, University of Peradeniya  
Prof. Deepthi Bandara - Head Department of Agricultural Biology, University of Peradeniya  
Dr B M P Singhakumara - Senior lecturer, Department of Botany, University of Sri Jayawardenapura  
Ms Dinarzarde Raheem - researcher at the reserve  
Dr Channa Bambaradeniya - Head Biodiversity, IUCN Sri Lanka  
Prasanjith Caldera - Field Assistant (based at the Sinharaja Research Centre)

**Socio-economic and cultural aspects**

Mr. Dayananda Kariyawasam - Project Director, Protected Area Management and Wildlife Conservation Project (PAM&WCP)  
Dr Wijaya Jayatilleke -Senior Lecturer, Faculty of Agriculture, University of Peradeniya

**Community members consulted at workshops and informal interviews**

**Matara District**

Mr H A Saman Buddhika	Mr Anura Rathnayake
Mr K. G. Ranjith	Mr Lasantha Seneviratne
Mr M.A. Chandra Rathnawela	Mr Lathif Seneviratne
Ms D.G. Subhashini Seneviratne	Mr Krishan Dhanushka
Ms Deepthi Rathnayake	Mr Sudath Priyantha Weerasinghe

Mr G.K. Sumathipala  
Ms W.P. Surangika  
Ms Malani Gamage  
Mr Samarasena Ranepura  
Ms W.K. Anuradha  
Mr Y.G. Pathmananda  
Mr K.G. Yasapala  
Mr R.L. Sarath Weerasinghe  
Ms K.G. Premalatha

Mr K. G. Piyasena  
Ms Prdeepthi Asingi  
Ms Latha Gamage  
Ms Manjula Sriyanie  
Ms Rohinie Gamage  
Mr Gamage (Ayurvedic physician)  
Mr T. Pintheris  
Mr Bertie: School Prinicipal, Keeriwelgama  
Deniyaya Pallegama K/Vidyalaya H.A.

**Galle District**

Ms M.G. Hemamali Subadra  
Ms Wimala Gamage  
Mr M.G. Premathilaka  
Mr Rohana Munasinghe

Mr P.V. Kelum Chandraranga  
Mr G.V. Dharmasena  
Mr W.A. Sirisena  
Mr K.T.G. Ranjith  
Mr M.K. Wasantha

**Ratnapura District**

Mr L.H. Ruwan Chamara  
Mr H. Nihal Abeyrathna  
Mr T.H. Amila Sampath  
Mr H. Sunil  
Ms Thushari Anuruddhika  
Ms A.B. Miyuri  
Ms P.P. Kusumawathi  
Ms W.K. Piyawathi  
Mr Mangala Janaka Kumara  
Mr S.H. Senasomasiri

Mr S. Karunasena  
Ms A. Asilin  
Mr B.D.S. Sisira Kumara  
Ms K.G. Sirilatha  
Ms A.B. Chamila Indu Kumari  
Mr K.L. Gunasinghe  
Mr B. Siripala  
Mr Ranjith Premasiri  
Mr G. Rathnasiri

**Buffer zone NGOs**

Mr Bandula Rajapakse - Coordinator Sevalanka project in the Sinharaja buffer zone  
Ms Pushpa Kumari Gunasinghe - Field officer Sevalanka project in the Sinharaja buffer zone

**Projects funded by CTFs inspected during the review**

**Dehigampola**

- A franchise boutique set up by Mr Y Pathmananda
- A confectionary business

**Keeriwelgama**

- Tea leaf purchasing centre - Ms K.G. Premalatha (The small holders sell tea leaves to her, and they get credit at her boutique. Assistance from CTF received to set up business after the floods)
- Increasing yields from intensive tea cultivation - Mr K. G. Piyasena
- Tailoring establishment and sales point for readymade garmets set up by Ms Prdeepthi Asingi
- A sales outlet for household linen and clothing embellished with fabric painting and embroidery by Ms Latha Gamage, Ms Manjula Sriyanie and Ms Rohinie Gamage (recipients of embroidery and fabric painting training)
- Improved medicinal clinic - Mr Gamage Ayurvedic Physician.
- Manioc holding set up in the school premises - Mr T. Pintheris

## Annex 5 Sources of information

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2. Kariyawasam, D. Social Dynamics at the forest edge: a challenge frontier in the national heritage of Sri Lanka (Ph D thesis in prep).
3. Gunatilleke, C.V.S. and Gunatilleke, I.A.U.N. Research and education in the Sinharaja forest (document in prep.).
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**Annex 6 Terms of Reference for the Periodic Review of The Sinharaja Biosphere Reserve  
for the review consultant (Review duration: two months)**

1. Identify, in collaboration with the Forest Department, indicators/criteria and methods suitable and feasible for a review of the present status of the Sinharaja Biosphere Reserve in terms of requirements, functions and criteria according to Article 3 and 4 of the Statutory Framework of the World Network of Biosphere Reserves.
2. Using the above requirements, and in keeping with the available time frame, carry out a review of the Sinharaja Biosphere Reserve using secondary data supported by field visits for discussions with local communities and review of forest conservation measures.
3. Participate in two field visits arranged by the Forest Department for meetings with local community based organisations and a few informal meetings/interviews with local people as deemed required to review how the biosphere reserve serves conservation needs and satisfies the needs of local people in an ecologically sustainable manner.
4. Assess status of forest conservation measures implemented by the Forest Department and the educational value of the reserve through the above field visits and use of secondary information.
5. Meet with individual key researchers and Forest Department personnel as feasible to gather secondary data to gauge the present status of biodiversity in the forest as compared with the past decade.
6. Preparation of a draft report for review by the national MAB Committee and assisting with finalisation of the final review report for submission to UNESCO.

## Annex 7 Working Orders

### Short term loans

1. The maximum loan that can be granted in accordance with the nature of the project shall be Rs.10,000.00.
2. Percentage of monthly interest is 1%
3. The entire loan (installments of loan) together with the interest should be fully paid within 6 months inclusive of the period of grace
4. On approval of the project, the Committee will decide the period of grace to be allowed on the nature of the project
5. Interest on the loan should be paid within the period of grace

### Long term loans

1. The maximum loan that can be granted in accordance with the nature of the project shall be Rs.10,000.00
2. Percentage of monthly interest is 2%
3. The entire loan (number of installments) together with the interest should be fully paid within 12 months inclusive of the period of grace.
4. Period of grace will be decided by the Committee according to the nature of the project.
5. Interest on the loan should be paid within the period of grace.

### Matters to be considered in granting loans to applicants by the committee

1. Availability of a business plan approved by the Committee
2. Recommendation of the Financial Committee
3. Participation in Social Vitality entrepreneurship development training
4. Participation in general meetings (whether the applicant has completed three months membership at least, should be looked into)
5. Participation in training programmes provided by the Society
6. Participation in common activities organized by the Society
7. Importance of the planned project
8. Particulars of loans obtained from other sources
9. Interest in security deposits and savings
10. Application and promissory note duly completed
11. Those who obtained loans from the .....(name of society) and who have properly developed their projects with such loans and who have properly settled their loans may be given priority when they apply for loans again.

### Action on delaying payment of instalments or defaulting of repayment of loan

Instances of delaying and defaulting payment of loan installments should be brought to the notice of the Committee by the Treasurer and a reasonable fine will be charged from such persons as decided by the Committee and such fines will be credited to the Society Fund. The society is entitled to take legal action against such defaulters.

## Annex 8 Selected publications based on research at Sinharaja (1993-2002)

(all except\* are from Part 1: Research and education in the Sinharaja rain forest being compiled by Gunatilleke and Gunatilleke, 2003)\*

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#### CULTURAL AND SOCIAL ASPECTS

\* Documentation of folk knowledge in peripheral communities by Dr Wijaya Jayatilleke.

\* Use of medicinal plants of Sinharaja by Dr W Wanigasundara.

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