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Government of Cuba

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Project Title: A landscape approach to the conservation of threatened mountain ecosystems.

Brief Description

This project will make a paradigm shift in biodiversity conservation and protected area management in Cuba, from a site based approach to a landscape approach that integrates PAs into the surrounding areas. This is necessary in order to protect core refugia for biodiversity, while addressing fragmentation from production practices in the landscape as a whole, and countering threats such as fire and pollution which have their origins in the practices employed in the production landscape. Hence, the strategic landscape approach supported through this project will constitute an innovative approach and contribute to strengthen the management effectiveness of the PA system.

The project will focus on threatened mountain ecosystems located in the principal mountain ranges of the country, which are legally considered as Special Sustainable Development Regions (REDS) and managed by Mountain Organisms. It will work across altitudinal gradients reaching from mountain ridges to foothills in order to maintain functional connectivity.

The project will take a combined BD SO 1 and SO 2 approach, to strengthen the management of PAs, expand PA coverage and ensure the compatibility of PA management with the conservation of BD in production sectors and landscapes.

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List of abbreviations

Abbreviation	Meaning
ACPA	Cuban Association for Animal Production
ACTAF	Cuban Association of Agricultural and Forestry Technicians
AMA	Environment Agency
ANAP	National Association of Small Farmers
APR	Annual Project Review
BD	Biodiversity
BIOECO	Eastern Centre for Ecosystems and Biodiversity
CCS	Credit and Service Cooperatives
CDR	Committee for the Defence of the Revolution
CEDEL	Centre for Local and Community Development
CESAM	Centre for Environmental Studies in Villa Clara
CFV	Félix Varela Centre
CISAT	Centre for Environmental and Technological Research and Services of Holguín
CITMA	Ministry of Science, Technology and the Environment
CNAP	National Centre for Protected Areas
CO	Country Office
EFI	Integrated Forest Enterprises
ENPFF	National Enterprise for the Protection of Flora and Fauna
FSP	Full Sized Project
IDO	Institute of Oceanology
IES	Institute of Ecology and Systematics
IGT	Institute of Tropical Geography
INAF	Institute for Agroforestry Research
IR	Inception Report
IS	Soils Institute
IW	Inception Workshop
M&E	Monitoring and evaluation
MES	Ministry of Higher Education
METT	Management Effectiveness Tracking Tool
MINAG	Ministry of Agriculture
MINCEX	Ministry of External Trade and Foreign Investment
MINED	Ministry of Education
MINTUR	Ministry of Tourism
MNHN	National Museum of Natural History
NGO	Non-Governmental Organization
NP	National Park
OADIM	Órganisms for the integral development of mountain zones
PA	Protected area
PIF	Project Identification Form
PIR	Project Implementation Review
PPG	Project Preparation Grant
RCU	Regional Coordination Unit
SFS	State Forest Service
SGP	Small Grants Programme
SNAP	National System of Protected Areas
SOCUBOT	Cuban Botanical Society

Abbreviation	Meaning
SOCZOO	Cubana Zoological Society
TPR	Tripartite Review

SECTION I: ELABORATION OF THE NARRATIVE

PART I. SITUATION ANALYSIS

IA: CONTEXT

Geography, Demography and Economy

Biodiversity in Cuba

1. With a total area of 109,886km^2, Cuba is the largest and biologically richest archipelago in the Caribbean basin. The country contains a wide diversity of ecosystems, ranging from semi deserts and dry forests to tropical rainforest. Cuba is classified as a biogeographical province and contains the global centres of diversity of a number of plant and animal taxa. 997 species of vascular flora in Cuba (around 14% of the total) are listed as Critically Endangered (CR), Endangered (EN) or Vulnerable (VU) on the IUCN Red List; there are 1089 known endemic vascular plant species of which 817 (75%) are Endangered; and there are 21 mono-specific genera. There are an estimated 11,690 taxa of fauna, including 4,825 endemics.

Biodiversity in mountain areas

2. Areas which still retain their main natural biotic resources, with ecosystems and landscapes showing a high degree of naturalness and representativeness, make up around 10% of the national territory, and are principally located in mountain areas and wetlands. Mountains and foothills account for around 35% of the national territory. The country's five mountain ranges are critical repositories of globally significant biodiversity, with around 2,000 species of vascular plants, of which 778 are classified as being under some form of threat (30 Critically Threatened, 41 Endangered, 2 Extinct, 9 Least Concern, 5 Near Threatened, 1 Rare and 49 Vulnerable[1]), and 457 are endemic. They play a vital role in terms of island biogeography, functioning as refuges whose isolation has led to the formation of large numbers of endemic species[2]. Rodríguez et al 2010, for example, has shown the importance of the mountain ranges of eastern Cuba (corresponding to the Sierra Maestra and Nipe-Sagua-Baracoa areas) as refugia for the *Eleutherodactylus auriculatus* species group of frogs, facilitating their diversification (four out of the five species in this group are endemic to these eastern mountains – these species are very sensitive to microclimatic changes and are therefore valuable indicators of climate change). Cuban forests are extremely important wintering areas for Neotropical species, equal to the richest sites that have been surveyed elsewhere in the Caribbean and Mexico. The Turquino-Bayamesa Important Bird Area, for example, is important for migrants such as *Dendroica caerulescens, D. fusca, D. coronata, D. magnolia, D. tigrina, Mniotilta varia, Setophaga ruticilla, Parula americana* and *Seiurus motacilla*[3].

3. Critically threatened endemic species include the following:

- Nipe – Sagua – Baracoa massif: *Juniperus saxicola* Britton & P. Wilson (Cupressaceae), *Annona nipensis* Alain (Annonaceae), *Aristolochia baracoensis* R. Rankin (Aristolochiaceae)
- Guamuhaya massif: *Aralia rex* (Ekman) J. Wen (Araliaceae); *Anastraphia intertexta* C. Wright ex Griseb. (Asteraceae);

[1] IUCN categories

[2] Biogeographic origin and radiation of Cuban *Eleutherodactylus* frogs of the *auriculatus* species group, inferred from mitochondrial and nuclear gene sequences. Rodríguez A, Vences M, Nevado B, Machordom A and Verheyen E (2010), Molecular Phylogenetics and Evolution 54 (2010) 179–186

[3] http://www.birdlife.org/datazone/sitefactsheet.php?id=19802

- Guániguanico massif: *Maytenus cajalbanica* (Borhidi & O. Muñiz) Borhidi & O. Muñiz (Celastraceae);
- Bamburanao massif: *Gaussia spirituana* Moya & Leiva (Arecaceae).

4. The mountain areas to be targeted by the project have some of the richest diversity of invertebrate fauna in the country, with a total of 1,769 insect species and 650 terrestrial molluscs, many of which are strictly endemic to the massifs. There are at least 36 species under threat of extinction, most of which have distributions limited to woody and karstic patches that are subject to severe anthropic pressures. To date 375 species of terrestrial vertebrates have also been recorded in the target areas, of which 34% are national endemics. There are also significant numbers of local endemics: there are 19, 11 and 10 species of amphibians and reptiles that are endemic to Nipe-Sagua-Baracoa, Guamuhaya and Guaniguanico massifs respectively.

5. The natural and semi-natural vegetation of the areas has been subject to moderate to high levels of fragmentation, resulting in patches ranging in size from 10 to 100km^2. The ecosystems and landscapes with most limited coverage include mountain scrub (sub-páramo and cool forests), cloud forests and pine forests, with fragments of less than 100km^2 in size; as well as forests and xeromorphic scrub in areas with serpentine bedrock and "*mogote*" complexes[4], with fragments up to 500km^2 in size. The ecosystems with greatest representation and best conservation status are evergreen and semi-deciduous forests and pine forest, with fragments ranging in size from 500 to as much as 1,000-2,000km^2 in size.

6. The most important formations in the massifs include gallery forests and the associated hydro-regulatory belt. Typical species of this formation, which play fundamentally important ecological roles, include: *Bucida buceras* (júcaro), *Calophyllum antillanum* (ocuje), *Guarea guidonia* (yamagua), *Tabebuia angustata* (roble blanco), *T. leptoneura* (roble blanco), *Lonchocarpus sericeus* var. *glabrescens* (guama de soga), *Crescentia cujete* (güira), *Annona glabra* (baga), *Calypthronoma plumierii* (palma manaca), *Erythroxylum confusum* (arabo colorado), *Roystonea regia* (palma real), *Geoffroea inermes* (yaba), *Rheedia aristata* (manajú), and *Piscidia piscipula* (guama candelón). There are also large numbers of epiphytes, including bromeliads, orchids and ferns.

7. In the evergreen forests, the most important species include *Taliparitì elatum* (majagua), *Alchornia latifolia* (aguacatillo), *Prunus occidentalis* (cuajani-almendro), *Clusia rosea* (copey), *Trophis racemosa* (ramón de caballos), *Trichilia havanensis* (siguaraya), *Pseudolmedia spuria* (macagua), *Protium cubense* (copal), *Buchenavia capitata* (júcaro amarillo-j. mastelero), *Guibourtia hymenifolia* (caguairan), *Junglans insulares* (nogal del país), *Nectandra antillana* (boniatillo-aguacatillo), *Cinnamomun montanum* (boniato del pinar), *Licaria triandra* (leviza) and *Cojoba arborea* (moruro rojo, moruro prieto).

8. The most important species in the evergreen forests include *Bursera simaruba* (almacigo), *Gerascanthus gerascantoides* (varía-baría), *Cordia collococca* (ateje), C. nitida (ateje de costa, a, cimarrón), *Sideroxylon foetidissimum* subsp. *foetidissimum* (jocuma), *Ceiba pentandra* (ceiba/seiba), *Swietenia mahogani* (caoba antillana), *Cedrela odorata* (cedro), *Oxandra lanceolada* (yaya), *Calycophyllum candidissimum* (dagame), *Lonchocarpus pentaphyllus* (guamá de costa), *Sideroxylon salicifolium* (almendrillo/cuyá), *Lysiloma sabicú* (sabicú-jigüe), *Chrysophyllum oliviforme* (caimitillo), *Nectandra coriacea* (cigua, sigua), *Gastrococcus crispa* (corojo), *Spondias mombin* (jobo), *Ehretia tinifolia* (roble prieto, r. guayo), *Trichilia hirta* (cabo de hacha), *Genipa americana* (jagua), *Zanthoxylum martinicense* (ayúa, ayúa macho) and *Cupania glabra* (guara, guárana, guara de costa).

[4] Isolated, steep-sided, residual, hills, composed of either limestone, marble or dolomite and surrounded by nearly flat alluvial plains.

9. Over 50 different species of fish use Cuba's freshwater habitats, and as many as half may be endemic. The dominant family Poeciliidae includes the genus Girardinus, which has seven endemic species, and Gambusia, which has four endemics. Lesser but still dominant families are Bythitidae, whose genus Lucifuga includes four species, all of which are endemic; and the Rivulidae, genus Rivulus, which has three species, two of which are endemic. Lucifuga is a troglobitic genus with species inhabiting flooded caves and connect through cenotes, sinkholes, and other natural wells (Trajano 2001)[5].

10. There are important interactions between the management of the mountain massifs and the conditions in the coastal and marine habitats into which they drain. The coastal and marine area into which the hydrological network of the Guamuhaya massif drains includes the coral reefs of Guajimico, an area which is proposed for declaration as a Protected Natural Area. The coral reefs are of the fringing and platform edge type, with predominance in shallow areas of *Acropora palmate*; they run for the length of the proposed PA. There is also a segment of reef crest, which is discontinuous and located close to the coast. A large proportion of the coral colonies are dead or strongly affected by erosion. This zone has a high degree of ecological value, as a habitat, feeding and refuge area for a number of species including commercially important fish and lobsters. It is also of key importance for the transport of energy and other inputs into marine ecosystems. The reef crest segment furthermore helps to buffer the coastline against wave impacts. Due to the proximity of mountains and the existence of rivers draining into the area, there are significant levels of terrestrial sediment inputs, which affect the transparency of the waters, although levels of contamination and sedimentation are not excessive. The area located between Cienfuegos Bay and the mouth of the Guajimico River contains two well defined marine terraces. Due to the level of wave activity in this area there is little or no seagrass development, and mangroves are also limited in extent, in part due to anthropogenic elimination.

Protected areas in Cuba

11. The first protected area in Cuba was established in 1930. In 1959, the process of PA establishment was given a major boost through the approval of Law 239/59, which had the aim, through the Department of Forest Repopulation, of conserving, protecting and promoting forest resources and also created nine national parks throughout the country, prohibiting the destruction of their vegetation and fauna. The concept of a national system of protected areas was first proposed in 1974, and in 1981 Law 33 on the Protection of the Environment and the Rational Use of Natural Resources established the legal basis for a national network of PAs; the National Centre for Protected Areas was formed in 1995, as the lead entity for the planning and integrated management of the National Protected Areas System (NPAS). In 1999, Law 201/99 on the National Protected Areas System established the legal regime for the management and control of the system, management categories and processes for the proposal and declaration of PAs.

12. In 2003 and 2008 respectively, Strategic Plans for the NPAS were developed through participatory processes for the periods 2003-2008 and 2009-2013. A new Strategic Plan is currently under development for the period 2014-2020. In the course of the implementation of the existing strategic plans, the legal framework has been strengthened, a planning system has been created and technical/methodological instruments have been developed for its application, including personnel training. Mechanisms have been strengthened for the coordination of policies, strategies and actions, and of the institutions directly involved in the conservation of biodiversity at national, provincial and local levels, as well as the implementation of a system of monitoring and control of the management of the NPAS and its constituent PAs. The main results of the process of implementation of these strategic plans include the following:

[5] http://www.feow.org/ecoregions/details/cuba_cayman_islands

- The preparation of methodological instruments for planning and management of PAs.
- The generation of resolutions by CITMA approving the 2009-2013 Strategic Plan, the methodology for management plan preparation, and the creation and consolidation of the National Coordination Board for the NPAS, as well as 16 Provincial Coordination Boards.
- Between 2008 and 2012, 70 PAs have been legally recognized, bringing the total number to 103.
- Improvement in the planning (identification, delimitation, zoning etc.) and planning of marine PAs, and gap analyses of terrestrial and marine values.
- The participatory preparation and implementation of management plans and operational plans in the PAs.
- Application of the Methodology for the Evaluation of Management Effectiveness, and the development of 10 protocols for the monitoring of species and ecosystems.
- The implementation of a nationwide communication system linking the individual PAs with the coordination of the NPAS at provincial and national levels.
- The implementation of a system of cooperative control of the management of the NPAS, in which national and territorial level entities participate actively (such as the State Forest Service the Forest Guard Corps, Frontier Guards, ONIP, OPIP and Environmental Units), and its insertion into the Environmental System of CITMA.

13. Today, Cuba's National Protected Areas System (NPAS), includes 263 sites (155 terrestrial and 108 marine and coastal), encompassing approximately 22% of the national territory. The NPAS is coordinated by the National Council of Protected Areas (CNAP), a dependency of the Ministry of Science, Technology and Environment (CITMA). The CNAP is supported at the national level by a NPAS Coordinating Body, which is composed of numerous agencies: the National Office of the Environment (DMA), the Center for Environmental Inspection (CICA), the Ministry of Science, Technology and Environment (CITMA), the National Service for the Protection of Flora and Fauna (ENPFF), the State Forest Service (SEF), the Ministry of Agriculture (MINAG), the Park Rangers Corps (CGB), the Ministry of the Interior (MININT), the National Offices of Fisheries Regulation and Inspection (ONIP and ORP), and the Ministry of Fishing.

14. A ministerial resolution has been issued to declare large parts of each of the 4 target areas identified in Table 1 as 'Special Regions for Sustainable Development' (REDS). Each REDS is managed by a group of three institutions known as the Organo de Montaña ("Mountain Organism"): The three institutions are: CITMA, MINAG and MINFAR. These form part of the NPAS, and are defined in PA legislation[6] as "extensive regions where, due to the fragility of ecosystems and their economic and social importance, structural measures are to be taken at national level in pursuit of the objectives of conservation and sustainable development". The protected areas law allows for REDS to contain conventional PAs of other categories within their boundaries (this is the case in the areas targeted by this project, see Table 1), and for them to include buffer zones, depending on their specific values and objectives. The specific objectives of REDS include the following: a) to make local production practices rational and sustainable; b) to improve the conditions of life of the rural population; c) to protect soils, controlling the activities or process that cause erosion, sedimentation and other degradation processes; d) to conserve water resources; e) increasing reforestation and the use of non-timber forest products; f) to protect flora and fauna, ecosystems and landscapes, conserving biodiversity in general; g) to promote sites with historical and cultural values; h) to enable and promote environmental education and interpretation; i) to enable and promote recreation and tourism; and j) to protect coasts against processes of erosion and other factors related to global climate change.

[6] Decree-Law 201 (http://www.magon.cu/websites/umass/Contenido/Legislacion/Decreto%20Ley/Decreto%20Ley%20201.pdf)

15. The Council of Ministers (or its Executive Committee) is responsible for approving declarations or modifications of protected areas and their buffer zones, as proposed by CITMA[7]. Prior to developing such proposals, CITMA is required to ensure compatibility between the actions of the different organs, organisms and other entities carrying out activities in the areas at present or in the future or with responsibilities for the areas (especially in relation to defence and land use planning), landowners, and the institutional administrators of the areas. Other entities may also request CITMA to present proposals to the Council of Ministers for other areas of environmental interest, or the modification or change of category of areas that have already been declared.

16. When presenting a proposal to the Council of Ministers, CITMA is required to:

a) Base it on scientific evaluations, specifying the magnitude and significance of the values and natural resources of the area in question, its biological diversity, its level of naturalness, the environmental impacts affecting it (including economic and social impacts), the proposed objectives and priorities of management, the presence, significance and degree of conservation of its cultural and historical values, its limits, its buffer zones and its management category.
b) Specify the hierarchical level of the protected area (i.e. whether of national or local significance)
c) Justify how the declaration of the area as a PA will contribute to the conservation, protection, recovery, restoration and rational use of the natural resources and other values on which its declaration and category are based;
d) Define which will be the entity responsible for its administration.

17. The administrator of each PA is required to develop a management plan, or failing that an operational plan, and to present it to CITMA for approval, within 2 years from the date of creation of the area. The management plan is required to include economic studies for the conservation, sustainable use or recovery of the natural resources of the area. Provisionally, the management plan can be substituted by an Operational Plan with duration of up to 2 years. Management plans are required to be implemented through operational plans that contain the indicators of the National Economic Plan that are developed for the area. Management plans must be made compatible, in harmonized and environmentally sustainable manner, with land use planning, in conformity with the categories and objectives of the areas. Compliance with the management plan and operational plan is subject to oversight by the administrator of the area and by CITMA, without affecting the attributes and functions of other organs and organisms of State. There is no specific provision in the law for participation in PA management by other public, private or civil society actors.

Productive sectors

18. In the target mountain massifs, the principal productive sectors are forestry, coffee, cocoa, extensive grazing and vegetable production, as well as minor activities such as beekeeping.

19. The forest estate in the massifs is principally composed of natural forests, including pines, as shown in Table 1.

Table 1. Forest estate in the target massifs

Massif	Natural forest (ha)	Plantations (ha)	Total forest area (ha)	Deforested area	Total area (ha)
Guaniguanico	180,330	92,290	272,620	22,910	**295,540**
Guamuhaya	40,270	11,130	51,400	27,870	**79,270**
Bamburanao	19,624	2,948	22,572	656	**23,228**

[7] Ditto

Massif	Natural forest (ha)	Plantations (ha)	Total forest area (ha)	Deforested area	Total area (ha)
Nipe-Sagua-Baracoa	259,760	68,990	328,750	36,230	**364,980**
Total	**499,984**	**175,358**	**675,342**	**87,666**	**763,018**
%	65	23	88	11	**100**

20. In accordance with Government policy, the volumes of timber extracted from the mountain areas has reduced in recent years, although a certain level is still maintained, especially of valuable broadleaved species and hardwoods. There is a high demand in the tobacco industry for *Cedrela* (cigar box cedar) trees that are extracted from coffee plantations as a consequence of shade regulation activities. Reforestation is principally based on autochthonous species, including three native pine species (*Pinus caribaea*; *P. tropicalis* and *P. cubensis*), cigar box cedar or *cedro* (*Cedrela odorata*), majagua (*Hibiscus tiliaceus*), Antillean mahogany (*Swietenia mahogani*), najesí (*Carapa guianensis*), yamagua (*Guarea guidonia*), cabo de hacha (*Trichilia hirta*) and jocuma (*Sideroxylon foetidissimum*), as well as exotics such as *Acacia mangium*, *Casuarina equisetifolia* and *Eucalyptus* spp.

21. Forestry activities are carried out by State-owned Integrated Forest Enterprises, which are responsible for the entire range of activities ranging from the establishment and protection of forests through to harvesting. Integrated Forest Farms (IFFs) constitute a new model for sustainable forest management (see paragraph 190).

22. In Nipe Sagua Baracoa massif, for the last 20 years investments have been made in restoring areas affecte by opencast mining (laterite extraction) for nickel and cobalt. These recovery practices have mainly used autochthonous tree species such as *Pinus cubensis* and grasses, and in some cases where topsoil is lacking *Casuarina equisetifolia* has been used as a pioneer species capable of forming soils through its contribution of organic matter. To date 2,976.82ha have been restored.

23. Coffee is one of the main economic activities in the Nipe-Sagua-Baracoa and Guamuhaya massifs: production there accounts for around 64% of the national total. Almost all of the coffee cultivated in the massifs is produced under shade, with different species being used in different areas: in Nipe-Sagua Baracao, the predominant species are Bucaré (*Erythrina* spp.) rain tree (*Albizia saman*[8]) and cigarbox cedar (*Cedrela odorata*); in Guamuhaya *Albizzia falcata* and to a lesser degree *A. saman*; and in Guaniguanico *Gliricidia sepium*. National coffee purchasing companies provide economic incentives for organic production and for high quality grains, which have stimulated production.

24. Food crop production in the massifs is largely for local consumption, with limited application of soil conservation practices, leading to increases in erosion rates and reductions in soil fertility and productivity. Traditional practices of slash and burn farming are practised on a small scale. In recent years production of food crops from the mountain areas has stood at around 500,000t/year of rootcrops and vegetables, 180,000t/year of plantains, and 190,000t/year of citrus and fruit crops.

25. The livestock herd in the massifs has declined in recent years by around 80,500 head to an estimated 323,300 head at the end of 2010, and by 2010 milk production had fallen by around 5.3 million litres from a level of 29.6 million litres in 1996.

26. In the target areas there are 55 State-owned businesses, 42 farms, 171 Agricultural Production Cooperatives (CPA), 222 Basic Cooperative Production Units (UBPCs), 400 Credit and Service Cooperatives (CCS) and 4742 private producers. The CPA, UBPC and CCS belong to the National

[8] Previously termed *Samanea saman*

Association of Small Farmers (ANAP), an NGO. Individual and associated farmers produce under contracts, which define proportion of their production is destined for social ends and that which is left over for their own consumption and for them to market directly.

Institutional framework

27. The Ministry of Science, Technology and the Environment (CITMA) and the Environment Agency (AMA) were established in 1994 as a result of a process of reorganization of the Organisms of the Central Administration of the State, followed in 1995 by the National Centre for Protected Areas (CNAP), which has lead responsibility for the planning and integrated management of the NPAS, guaranteeing its direction, control and functioning. This process contributed the institutional consolidation of the NPAS. In the same period, a number of other entities were created which have major importance for PA management, namely the National Forestry Directorate and the State Forest Service (SEF), attached to MINAG, which are charged with directing and controlling the country's forest policy; the Forest Guard Corps (CGB) of the Ministry of the Interior (MININT); the National Office of Fisheries Inspections (ONIP) and the National Office of Fisheries Regulations (ONIR), now attached to the Ministry of Food Industry (MINAL).

28. Environmental regulation, supervision and fiscalization are the responsibility of the Centre for Environmental Inspection and Control of CITMA, the Forest Guard Corps of MININT and the Office for Marine Control and Regulation of MINAL. In the case of the mountain massifs, these are organized into "Mountain Organs", which include representatives of all of the provincial and municipal governments present in the areas.

Legal, planning, policy and incentive framework

29. Law 33 of 1981 on the Protection of the Environment and the Rational Use of Natural Resources established the legal basis for a national network of PAs. Law 201/99 of 1999, on the National Protected Areas System established the legal regime for the management and control of the system, management categories and processes for the proposal and declaration of PAs.

30. The National Environment Strategy (NES) provides for the application of an ecosystem-based approach to environmental management, with particular emphasis on the relations between watershed management and coastal zones. Cuba is currently executing the National Biodiversity Strategy and Action Plan (NBSAP) 2006-2010 and is in the process of developing an updated NBSAP for the period 2011-2015. Both the NES and the NBSAP propose the establishment of action plans for the conservation and sustainable use of priority ecosystems, the development of methodologies and instruments for the evaluation and economic valuation of BD, the integrated management of BD, the implementation of the National System of Environmental Monitoring, the filling in of information gaps, and the improvement of environmental education and communication regarding BD, all of which are areas that will be addressed in this project.

31. The National Forestry Programme (NFP), of the Ministry of Agriculture (MINAG) provides for the Government to continue updating forestry inventory and planning to cover 29.4% of the country's forested land by 2015, and the establishment of 872,000ha of plantations with a survival rate of at least 85%, through its National Forest Development Fund (FONADEF).

32. The Turquino Plan is conceived as a Programme for the Sustainable Development of Mountains, through which CITMA will promote sustainable use practices, the development and protection of forests, soil conservation, the recycling of wastes and the application of agrosilvopastoral practices in order to increase food production and achieve the sustainability of local communities.

33. The National Programme for Soil Improvement and Conservation of MINAG will support the reduction of soil degradation and the rehabilitation of soils (especially in areas prioritized for water catchment and with priority crops), and the updating of the inventory of areas affected by degradation and to train farmers.

Territorial and environmental land use planning

34. Environmental land use planning is not a novelty in Cuba; there have been various experiences that have individually contributed to the development of this approach. The Faculty of Geography of the University of Havana has taken the lead with this approach, through initiatives such as the "Environmental Sustainability in Havana Province" (CAESAR) project, which was based on two aspects: functional zoning and environmental zoning. The Institute of Tropical Geography (IGT) of AMA has also played a leading role in this regard, carrying out environmental zoning processes in mountainous and coastal zones, and drainage basins. Despite this, environmental zoning is yet to be established as a continuous process linked to the development of the territory in general.

35. Within the context of the National Environmental Strategy (2007-2010), the Executive Committee of the Council of Ministers made CITMA responsible for establishing targets and actions relating to environmental zoning, in accordance with Law 81 on the Environment. Consequently AMA, through the IGT, developed a methodological guidance document for technical studies in support of environmental zoning in the country, which sought to standardize environmental zoning processes.

36. According to IGT, environmental zoning is to be expressed as a model that includes the zoning of territory into environmental units, the definition of environmental guidelines (the goal or desired state in each zone), and environmental strategies that are to be considered in territorial land use plans. The following levels are defined for models of environmental zoning:

1) National: covering the country as a whole, and including regionalization of national territory with the identification of environmental units in accordance with their functions, diagnosis of the characteristics, availability and demand for natural resources and the environmental context, as well as broad guidelines and ecological strategies for the protection, restoration and sustainable use of natural resources, and prevention of the deterioration of ecosystems of importance for national development. It is intended that it will be obligatory for these elements to be incorporated into the National Physical Plan of territorial land use planning.

2) Regional: carried out for specific political/administrative units (provinces and municipalities), and regions that do not necessarily coincide with political/administrative boundaries but which due to their physical and socioeconomic characteristics need to be planned in an integrated manner (ecosystems, drainage basins, ecological regions, tourism development hubs). The objective at this level is to carry out diagnoses of environmental and socioeconomic conditions with the aim of protecting the environment and preserving, restoring and carrying out sustainable use of natural resources; it includes the determination of environmental units, the description of their abiotic, biotic and socioeconomic resources, the definition of environmental conditions, and the definition of ecological criteria for the sustainable use of natural resources, productive activities and human settlements.

3) Local/community level: an instrument for planning the use of ecosystems, which can be used in territorial units below the level of municipality (Popular Councils, Communities, local Protected Areas, Cooperatives etc.), as part of a strategy for the management of the territory and natural resources located there.

4) Marine-coastal: defines guidelines and strategies for the preservation, protection, restoration and sustainable use of the resources of the marine platform, as well as the regulation of productive

activities and works with potential to affect marine and coastal ecosystems. This category of planning is applied to the country's exclusive economic zone, territorial seas and adjacent cays.

37. Environmental planning in the Cuban context aims to:

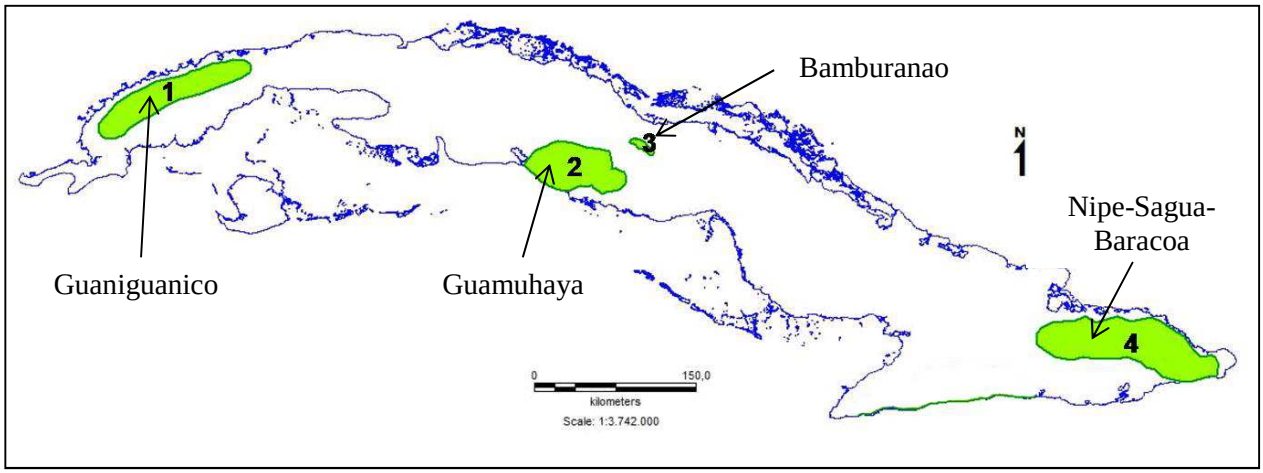
- Locate or relocate activities towards less affected areas or those with greater carrying capacity.
- Eradication or reduction of activities that generate major impacts
- Mitigation of impacts or degrading processes that cannot be eradicated.
- Rehabilitation of degraded environments.
- Restriction of the introduction of new activities with potential to cause impacts, and the regulation of existing activities.
- Protection of natural and heritage values.
- Incorporation of new activities that are compatible with the environment, and allow the maintenance of spatial stability.

38. The process of the introduction of environmental planning is set out in the document "Proposal for the organization of the process of generation, approval and implementation of environmental planning and its integration into territorial land use planning". The validation of these proposals has commenced with the determination of the model of environmental planning in the municipality of Yaguajay, in Sancti Spíritus province, followed by technical studies in the provinces of Camagüey (Nuevitas), Villa Clara (Caibarién), La Habana (Playas del Este), Pinar del Río (Los Palacios) and Ciego de Ávila.

Target sites

39. The project will promote a landscape approach to the conservation of threatened ecosystems that will benefit all the mountain ranges of the country. It will specifically promote field interventions in 4 landscapes (see Figure 1): 1) the Guaniguanico Massif in the extreme west of the country; 2) the Guamuhaya Massif and 3) the Bamburanao Mountains in the centre; and 4) the Nipe-Sagua-Baracoa Range in the east. These areas have been identified as containing particularly high levels of biodiversity of global importance, generating environmental goods and services of national importance, and being vulnerable to a number of threats of both anthropic and natural origin. Each of these areas contains a wide diversity of ecosystems, stretching from the coast up to the summits of the country's most important mountain ranges. Between them, these areas cover around 13% of the national territory, span 8 provinces, and are home to around 878,842 people or approximately 8% of the national population. They also include around 70% of the country's endemic species (the most important areas in this regard being the Nipe Sagua Baracoa range), 500,035ha of natural forest cover (around 20,5% of the national total) and 175,928 ha of forest plantations (around 25,2% of the national total), and they coincide with six of the nine most important water catchments in the country, covering a total of 9,225km^2. These areas are also of major importance for coffee production, which constitutes the mainstay of the local economy.

Figure 1. Target massifs



1. Guaniguanico Massif

40. This massif stretches in an ENE-WSW direction for most of the extent of Pinar del Río Province and part of Artemisa Province. It includes diverse combinations of mountains, table lands, mogotes and valleys, which determine the landscape and climate of the area; these are determined by horst and graben features and ovethrusts. The two main tectonic blocks in the massif are the Sierra del Rosario and Sierra de los Órganos mountain ranges, which are separated to the north by the Rio Puercos drainage basin and to the south by the Rio San Diego basin.

41. Due to its location in the northwest Caribbean, the mountain range is affected by variable calm winds with seasonal continental influences, with a humid tropical climate and year-round rains (although there is a drier season between November and April and a wetter season between May and October). The average number of days per year with more than 1mm of rain is 140, and total annual rainfall ranges from 1,600 to 1,900mm. The average temperature recorded in the "Amistad" Forestry Hydrology Station is 23.8^{o}C, ranging from a minimum of 13.1^{o}C between January and February and 32^{o}C between July and August. The climate of the area is classified as Sub-Types 2 and 3 (mountain climate with high and stable humidity, low evaporation and cool temperatures.

Table 2. Climatic conditions in mountainous areas of Guaniguanico massif.

Climatic variable	Indicator	Range	
		Sub-type 2	Sub-type 3
Rainfall	Annual average (mm)	1901-2500	1600-1900
	Annual coefficient of variation	< 0,2	0,22-,0,22
	% of rain in rainy period (May-October)	60-80	75-80
	Annual average days with ≥1mm rainfall	100-140	90-120
Evaporation	Annual average (mm)	1400-1600	1600-1900
Temperature	Annual average (^{0}C)	22-23	23-24
	January (^{0}C)	18-20	20-21
	July (^{0}C)	24-26	26-27
Wind	Speed of predominant wind (m/s)	3,6-4,2	3,3-3,9

42. Generally, the highest wind speeds in this mountain range are associated with frontal systems, extratropical low pressure systems, tropical storms, cyclonic disturbances and hurricanes.

43. The massif has four reservoirs and four micro-reservoirs with a total volume of 125.48 m^3 x 10^6, four of which are used for human wáter supply, as well as for irrigation of food crops, tobacco and livestock, and also generate an annual average of 115t of fish per year. The drainage network has a density of 0.5-1.0 km/km², and the runoff levels are among the highest in the western part of the country, at between 400-1,000mm/year; solid runoff ranges from 100-300 t/km^2/year, reflecting high rates of soil erosion. The pedology of the massif is dominated by groupings of alitic, ferralitic, ferritic, fersialitic, sialitic and poorly developed soils.

Table 3. Soil types in Guaniguanico massif

Grouping	Area (ha)	%	Type	Area (ha)	%	Sub-type	Area (ha)	%
Alitic	12,956.61	5.63	Red silty alitic with low activity	4,882.26	2.12	Typical	2,878.69	1.25
						Ochric	2,003.57	0.87
			Red/yellow silty alitic with low activity	4,744.08	2.06	Typical	3,108.99	1.35
						Ochric	1,635.09	0.71
			Red/yellow silty alitic with high activity	3,339.27	1.45	Typical	2,118.71	0.92
						Ochric	1,220.56	0.53
Ferritic	21,170.00	9.19	Dark red ferritic	21,170.00	9.19	Typical	8,590.00	3.73
						Saturated humic	6,540.38	2.84
						Unsaturated humic	4,306.52	1.87
						Petroferric	1,733.10	0.75
Ferralitic	36,478.73	15.84	Red ferralitic	2,878.69	1.25	Typical	2,878.69	1.25
			Leached red ferralitic	18,101.19	7.86	Typical	11,998.37	5.21
						Humic	6,102.82	2.65
			Leached yellow-red ferralitic	15,498.85	6.73	Typical	7,254.29	3.15
						Unsaturated humic	5,411.93	2.35
						Ochric	2,832.63	1.23
Fersialitic	49,605.54	21.54	Ruddy pardo fersialitic	41,660.36	18.09	Mullid	22,845.26	9.92
						Ochric	18,815.10	8.17
			Red fersialitic	7,945.18	3.45	Mullid	4,790.14	2.08
						Ochric	3,155.04	1.37
Brown sialitic	64,160.19	27.86	Brown	64,160.19	27.86	Mullid	35,004.84	15.20
						Ochric	29,155.35	12.66
Humic sialitic	4,306.52	1.87	Humic Calcimorphic	806.03	0.35	Typical	806.03	0.35
			Rendzina	3,500.49	1.52	Black	1,473.89	0.64
						Red	2,026.60	0.88
Fluvisal	2,049.63	0.89	Fluvisal	2 049.63	0,89	Arenic	2,049.63	0.89
Poorly developed	39,558.78	17.18	Lithosol	39,558.78	17,18	Eutric	11,071.29	4.81
						Distric	28,487.49	12.37
TOTAL STUDY AREA: 230,295 ha								

44. The flora of the region is very rich, with 835 endemic species in Pinar del Río Province (of which 105 are strict endemics) and 255 threatened species. The mogote vegetation, developed on karstic hills, is particularly distinctive of this area. The three main forest types of the area are: sub-evergreen, which grows in humid hilly areas, between the mogotes; semi-deciduous, which occurs in rocky areas; and the mogotes themselves, which are low, open and contain a number of deciduous species, such as the endemic tree *Bombacopsis cubensis.* Emergent species include *Trinax punctulata* Becc., *Ekmanianthe actinophylla* (Griseb.) Urb., and the critically endangered paleoendemic *Mycrocycas calocoma* Miq. The surrounding and intramontane valleys are principally occupied by crops, especially tobacco, fruit trees, pastures and rice, as well as secondary scrub and palms along the edges of water courses. To the north and south of the Sierra de los Órganos range, there are tropical conifer forests dominated by *Pinus caribaea* and *P. tropicalis*, as well as monospecific pine plantations, natural secondary forests and herbaceous communities. Between 400 and 800m.a.s.l., there are evergreen tropical broadleaved forests and semideciduous mesophyll forests. In the eastern part of the range, as much of 34% of the flora is endemic, due in part to the soil conditions. The plant species of the area have a high level of use value for local communities: as many as 40% have medicinal uses (e.g. *Pinus caribaea, Erythrina cubensis Piper ossanum, Fleuyra cuneata, Platygyne hexandra, Costus spiralis* and *Diodia lippioides*).

45. The hydrophyllous fauna of the semideciduous and mesophytic forests and pine forests includes the endemic butterfly *Parides gundlachianus* (Cuban cattleheart), the endemic mammal *Capromys pilorides* (Desmarest's hutia) and the endemic bats *Stenoderma falcatum* and *Phyllonycteris poeyi*; as well as the reptiles *Anolis vermicalatus, Chamaleolis barbatus pinareño, A. vermiculatus and Peltophryne fustiger*. Terrestrial molluscs include *Alcadia rotunda, Liguus blainnianus, Zachysia guanensi, Emoda sagraia, Viana regina* and *Zachrysia rangelina*. The avifauna includes *Accipiter striatus fringilloides, A. gundlachi, Buteo platypterus cubanensis, Amazona leucocephala leucocephala, Chlorostilbon ricordii ricordii, Priotelus temnurus, Colaptes fernandinae, Myadestes elisabeth, Starnoenas cyanocephala* and *Teretistris fernandinae.*

46. There are 17 existing or proposed protected areas in the massif, covering 18.2% of its area (see Table 18). These include Sierra del Rosario, which is the first Biosphere Reserve in the country.

47. The economic of the área is dominated by primary production, such as agriculture and related activities (coffee, vegetables, forestry, grazing and beekeeping) as well as mining, local industries and tourism. The coffee plantations here account for 4.47% of the national coffee estate, and are principally located in higher areas of the Sierra del Rosario and the intramontane valleys of the Sierra de los Organos. Coffee is grown by a range of state and private actors, including two farms of the Juvenile Work Army (EJT), ten Basic Agricultural Coffee and Cocoa Units, two New Type Farms and 22 cooperatives, as well as 355 independent farmers and 259 usufruct holders. There are three companies that collect and sell coffee, eight depulping units, one processing unit and 22 drying plants. The vegetables grown in the area are principally composed of rootcrops, which make up 74% of the total.

48. Forestry plantations cover 2,859ha, equivalent to 24% of the total plantation area in the Turquino-Manatí plan; of this, dendroenergy plantations account for 31.2ha. The main objective of the plantations is timber production. 21.4% of the plantations are of fruit trees and 24% of mellifeous trees. Plantation management and sawmilling activities are carried out by three companies, with a total of 7,332 workers.

49. Conditions oblige the area's beekeepers to move their hives in search of flowering areas, for example to mangrove areas in April, May and June and to pre-montane areas in the rest of the year, where they take advantage of the flowering of species such as *Syzygium jambos, Gouania polygama, Eucaluptus* spp., *Turbina corimbosa, Ipomoea triloba, Gliricidia sepium* and *Matayba apetala*. Beekeeping is carried out by four Basic Production Units, two Agricultural Production Cooperatives and 34 independent producers. Beekeeping has been affected in recent years by diseases which have led to bee mortality.

50. There is a great diversity of mining deposits in the area, due to the presence of rock such as limestone, argillitic aleurolites, sandstones and schists, and the metamorphic pressures to which these have been exposed. Of the 39 industrial deposits, 36% are of limestone, of which more than half are currently being exploited.

51. With the exception of the Viñales Valley, tourism activity in the massif is scattered, with isolated hotels. In 2000, there were 98,322 rooms available for rent on a daily basis, and visitors contributed the equivalent of US$3,829,000 to the economy of the area. The different modalities of tourism in the area include ecotourism, hiking, traditional tourism, camping, birdwatching and health tourism in the area's thermal springs.

52. The massif has a total of 87,322 inhabitants, with an approximate population density of 23.4 inhabitants/km^2. There are 113 urban centres, with a population of 28,299 inhabitants.

2. Guamuhaya Massif

53. The Guamuhaya orographic group is located in the central portion of Cuba, between Santa Clara mountains to the north, Zaza River to the east, the Arimao River valet to the west and the Caribbean Sea to the south. It occupies 1,948 km^2 (approximately 11% of the mountain area of Cuba). The altitude of the area ranges mostly between 700 and 900 m.a.s.l., with some areas above 1,000m. Around these central high areas are lower hills reaching 500-800m.a.s.l. The relief of the area is strongly depending on the underlying lithology and the structural characteristics of the massif. In areas of metamorphic schists, the drainage network is deeply incised, forming mountainous and premontane chains with sharp crests and steep slopes, and intense erosive processes; the valleys are narrow, with small alluvial plains. Towards the south of the mountain system there is a series of abrasive karstic terraces, sloping gradually towards the sea and dissected by the drainage network.

54. The complex and pronounced relief of this region limits the suitability of most of its area to forestry and coffee, in many cases with measures to control erosion. There are however some areas such as valley bottoms, intermontane depressions and plateau fragments, which can be used for diversified agriculture. At present more than 50% of the area is affected to some degree by erosion: this is in turn leading to sediment buildup in water bodies downstream, such as the Hanabanilla-Jibacoa reservoir. The Institute of Geography has detected rates of gully expansion of around 13cm/year and, in the upper catchments, up to 26cm/year. In addition, the area is affected by the contamination of runoff waters by agricultural chemicals, which affect populations of aquatic species. These processes are attributable to a large degree to poor watershed management practices, limited awareness of the structural and functional limitations of the area, absence of an effective scheme for protection of the sub-catchments, as well as inappropriate design of engineering works.

55. The climate of the area is classified as montane sub-type 2 and 3 (see Table X), with high and stable levels of moisture, low levels of evaporation and low temperatures, and sub-types 4 and 5 with seasonal but relatively stable rainfall, high temperature and high evaporation.

Table 4. Climatic conditions in mountainous areas of Guamuhaya.

Variables	Climate category	
	2	3
Mean annual rainfall (mm)	1800-2200	1800-2200
Coefficient of variation of annual rainfall	< 0,2	< 0,2
Rainfall in rainy season (%)	60-80	60-80
Rainy days/year (>1mm)	100-140	100-140
Mean annual evaporation (mm)	1400-1800	1400-1800
Annual temperature range (^{o}C)	16-20	16-20

Winter temperature range (^{o}C)	<16-20	<16-20
Summer temperature range (^{o}C)	<20-24	<20-24
Predominant wind speed (ms^{-1})	3,6-4,2	3,6-4,2

56. The area coincides with a number of water catchment basins of national and provincial importance. The Hanabanilla catchment covers 287.47km^2, has a human population of 14,872 inhabitants, and includes the nationally important Hanabanilla-Zaza sub-catchment where the Hanabanilla reservoir is located: this provides water to the cities of Santa Clara and Cienfuegos, and generates 45MW of electricity in the Hanabanilla hydroelectric plant. The Hanabanilla-Damují sub-catchment is considered to be of national and provincial importance, and the Agabama catchment of provincial importance.

57. The soils of the massif are closely determined by the underlying lithologu, relief and climate. The main soil types are poorly developed latosols, typical and humified tropical brown soils, red and brown limestone soils, tropical gleys and mountain soils (typical red/yellow soils). The limestone soils predominate (covering 1,309km^2 or 56.7% of the area of the massif). These soils are shallow and rocky, and are suitable for minor agricultural crops, as well as plantains, citrus and other fruit trees. The mountain soils, which occupy 15% of the area, are mainly suited for forestry and coffee.

Table 5. Predominant soil types in the Guamuhaya massif

Category	Soil type	Area (km^2)	%	Agricultural suitability
Latosols (II)	Poorly developed	110	4.7	High productivity: sugar cane, citrus, coffee, plantains and minor fruits
Tropical brown soils (IV)	Typical and humified	500	21.6	Good fertility: pasture and minor crops (maize, cassava etc.); deeper soils can be used for sugar cane.
Limestone soils (VI)	Brown and red	1,309	56.7	Citrus and fruit trees, minor crops (chilli, tomato, cassava, maize etc.), plantains
Tropical gleys (VIII)	Typical	42	1.8	Not recommended for agriculture
Mountain soils (SA)	Red-yellow typical mountain soils	347	15.03	Forestry and (depending on altitude) coffee

58. The vascular flora of the massif includes 159 families, 765 genera and 1,693 species, representing 24.1% of the vascular flora of the country as a whole. Only 306 species (18% of the total) are national endemics, and 14% are strictly endemic to the area. The main vegetation types present are semideciduous and evergreen mesophyll forests, montane rainforest, gallery forest and *mogote* complexes. Pioneer, ruderal and segetal vegetation formations have increased in importance, including species from the families Poaceae, Cyperacae and Asteraceae with high dispersion potential, resulting in the fragmentation of natural ecosystems by anthropogenic open spaces. The semi-natural vegetation of the área is largely made up of remnants of forest strata (16%), shrubs (29%), pioneer species and climbers (11%). In the scrub areas there are dispersed trees, abundant shrubs and climbers. Pastures cover around 1,518km^2 (around 65% of the area as a whole). Coffee is principally found in the south-east of the Trinidad range, associated with sub-montane and typical mesophyllous forests, secondary vegetation, pastures and minor crops. The forestry plantations of the area are mostly composed of *Pinus caribaea, Eucalyptus spp*., *Hisbiscus elatus* and *Casuarina equisetifolia*, in some cases associated with coffee.

59. The invertebrate fauna consists of 1,547 species, including 1,476 arthropods and 59 molluscs, and 159 endemics. The vertebrate fauna consists of 178 species, of which 62 are endemic. The area is home to the endemic mammals, Desmarest's hutia (*Capromys pilorides*) and the prehensile-tailed hutia (*Mysateles prehensilis*), as well as the Cuban flower bat (*Phyllonycteris poeyi*). The endemic avifauna includes the Cuban tody *Todus multicolor*, the Cuban trogon *Priotelus temnurus*, the IUCN Vulnerable Cuban parakeet *Aratinga euops*, the Cuban pygmy owl *Glaucidium siju*, the Cuban screech owl *Gymnoglaux lawrencii*. The Endangered Blue-headed quail dove *Starnoenas cyanocephala*, and the Endangered Gundlach's hawk *Accipiter gundlachi.*

60. Guamuhaya is the massif where fewest protected areas have been proposed in the country (10, covering 414.95km^2 or only 25.8% of the massif). Existing and proposed protected areas in the massif are shown in Table 18.

61. This is the massif which has been most affected by poor natural resource management, especially during the 1960s, when the forests of the area were overexploited, large areas were deforested for grazing and much of the natural forest was converted to coffee plantations. The most important socioeconomic activities of the area are coffee, forestry, nature tourism, beekeeping, ranching, agriculture and aviculture. Coffee production is the principal economic activity of the population, and has been subject to significant investments in renewal, promotion and rehabilitation of plantations. Forestry activity is focused on silvicultural management and thinnings of natural forests and plantations for economic use. The structure of the livestock sector in the massif is summarized in Table 6.

Table 6. Area under livestock use in Guamuhaya massif

Province	Area under livestock use (ha)	Area suitable for grazing (ha)	%
Villa Clara	6,885.16	3,281.06	47.65
Cienfuegos	7,318.36	1,119.52	15.29
Sancti Spíritus	22,431.15	6,969.75	31.07
Total	**36,634.67**	**11,370.33**	**31.03**

Table 7. Distribution of livestock farms in the Guamuhaya massif

Province	Farm size (ha)			
	< 26.8	>26.8 < 67	>67	n (farms evaluated)
Cienfuegos	44.11%	8.8%	47.0%	34
Villa Clara	61.00%	11.00%	28.00%	18
Santi Espíritus	51.00%	15.80%	33.20%	37
Total	**50.50%**	**9.00%**	**40.50%**	**89**

62. Nature tourism is of some importance in the Guamuhaya massif. Topes de Collantes National Park in Sancti Spiritus Province is the main tourism destination, and other destinations include El Nicho (Hanabanilla, Villa Clara) and Lomas de Banao Ecological Reserve in Sancti Spiritus.

Table 8. Population in the target areas

Variable	Province			
	Villa Clara	Cienfuegos	Sancti Spíritus	Macizo
Area (km^2)	309	400	878.09	1,586.09
Centres of population	23	32	35	90
Inhabitants	8,126	6,469	6,118	20,713

Population density (inhabitants/km^2)	26.29	16.17	7.0	13.06

3. Bamburanao Massif

63. The Bamburanao Massif includes areas of the Provinces of Villa Clara, Sancti Spíritus and Ciego de Ávila, and the following upland features: Loma de Guajabana, Lomas de Buena Vista, Lomas de Las Tasajeras, Sierra de Bamburanao, Sierra de Meneses y Cueto, Lomas de La Canoa and Sierra de Jatibonico. It constitutes a mountain range divided into sectors, which face the northern coast of the central region of the country. The total area of the Massif is 782.16km^2.

64. The Massif is made up of stepped horst features, associated with moderate and phased neotectonic uplift. It includes some moderately undulating and dissected karstic plateaux. The climate is characterized by high levels of evaporation, with an annual average air temperature of 24.5^{o}C (ranging from 20-22^{o}C in January to 24-28^{o}C in July), average annual rainfall of between 1,200 and 1,800mm, and annual evaporation of 2,000-2,200mm (in the Jatibonico Range). Prevailing winds are from the north and northeast. Due to the karstic nature of the area, there is abundant subterranean water but surface flows are intermittent and strongly dependent on rainfall.

65. The predominant soils of the area are red and black rendzinas, and where rocky outcrops occur there are reddish ferralitic soils. Drainage ranges from deficient to good and depth ranges from moderately deep to deep. There is a wide diversity of rocks and lithological types overlying the limestone. The vascular flora of the area includes 455 species, of which 55 are endemic and 13 threatened. There is only one strict endemic, the palm *Gaussia spirituana*; one of its largest populations (with around 180 individuals) is seriously threatened by mining in Florencia Municipality. The vegetation of the area is dominated by semi-deciduous forest, gallery forest and *mogote* vegetation complexes, as well as areas of secondary forest and scrub that have been partially affected by invasive species. The disturbed vegetation of the area has been determined by the presence of pastures, anthropogenic savannahs and forest plantations. There are an estimated 465 species of fauna, including 201 species of insects and 110 species of birds. The large number of fauna species is in part a function of the rockiness and inaccessibility of much of the area.

66. In the Bamburanao Special Region for Sustainable Development (REDS), the first PA (Jobo Rosado) was established in the 1980s. Present and proposed PAs in the area are shown in Table 18.

67. The levels of socioeconomic development achieved to date in this area are to a large extent a function of programmes carried out within the context of the Turquino-Manatí Plan: this was created in the year 2005, with the aim of linking the different stakeholders of the region and contributing to sustainable development. The principal economic activities in the areas are livestock, forestry, agriculture, apiculture, mining, aquaculture and tourism. They are carried out by a range of State and private entities, including Livestock Companies, Agricultural Companies, the Provincial Company for the Protection of Flora and Fauna, Provincial Companies for Construction Materials, the Aquaculture Company, AZCuba, the Food Industry (Preserves Factory and Wheat Mills), Apiculture Companies, Integral Forestry Companies, Pig Production Companies, associated and independent farmers. As shown in Table 9, the predominant land use is in the REDS is grazing.

Table 9. Land use by province in Bamburanao REDS (ha)

Province	Various crops	Sugar cane	Forestry	Grazing	Tobacco	Total
Villa Clara	189	1,926	5,241	8,544	---	15,900
Sancti Spiritus	2,525	1,700	12,837.07	9,458.93	---	26,521

Ciego de Avila	13,188	---	5,826.9	15,842	939	35,795
Total	15,902	3,626	23,904.97	33,844.93	939	78,216

68. Grazing is carried out by private, cooperative and State actors. It is dominated by natural pastures, although in recent years there has been a proliferation of thickets of species such as marabou (*Dichrostachys cinerea*), which has resulted in overstocking of unaffected areas (with around 134 head/ha). The livestock companies in the area propose in the future to maintain livestock only in those areas with suitable conditions (covering 25,856ha), excluding areas with thickets of invasive species or with erosion problems.

69. Forestry activity in the area is carried out by a number of entities, including the National Flora and Fauna Company, the Integral Forestry Company (which is structured internally into State farms) and to a lesser degree CPAs and CCSs. Most of the area is composed of water and soil protection forests. There are 2,083ha of deforested area classified as being suitable for the establishment and development of plantations, which it is proposed to reforest in various stages with the objective of creating forest cover to protect water and soil resources, taking into account the rolling and mountainous conditions of relief in the area. The non-forested parts of the area (covering 978ha) consist of natural pastures, rivers, creeks, roads, firebreaks, infrastructure and subsistence farms.

Table 10. Breakdown of forest area in Bamburanao REDS (ha)

Province	Natural Forests	Plantations	Deforested	Unforested	Total Area
Villa Clara	5,241.0	648.25	523.20	--	6,412.45
Sancti Spiritus	13,668.05	893.67	926.81	441.38	15,929.91
Ciego de Avila	3,279.2	1,377.6	632.7	536.4	5,825.9
Total	22,188.25	2,919.52	2,082.71	977.78	28,168.26

70. Agricultural food crop production is principally carried out by the private sector with subsistence aims, including CPAs and CCSs; in addition the State is represented by Agriculture/Livestock and Crop Companies. The principal crops are plantain, rootcrops (taro, yams, sweet potato and cassava), vegetables, fruits and cereals. Apiculture is carried out by the Florencia Apicultural Company, the UBPC N0 5 "La Abeja Reina" in Yaguajay, and the private sector, with a total of 4,295 hives. This activity is dependent on the presence of melliferous trees that flower in a range of different seasons, and is currently affected by deforestation, scarcity of melliferous species, lack of access roads, and fires. Aquaculture is carried out only in the area belonging to the province of Ciego de Ávila, in the reservoirs of Cañada Blanca and Chambas 2. It is expected that this activity will expand in the future, with increases in the populations of tilapias y cyprinids, and the development of investments for fish freezing. There are 7 mining deposits (for limestone, sand and medicinal water) in the area, all but one of which are in operation.

71. Bamburanao REDS has 45,493 inhabitants (58.1/km^2) and 18,319 dwellings, giving an average of 2.4 inhabitants per dwelling. It has 22 Popular Councils and one Special Circumscription.

4. Nipe-Sagua-Baracoa

72. The Nipe-Sagua-Baracoa Massif if located into the extreme east of Cuba, from the Nipe tectonic basin in the west to Punta Maisi in the east, and the Guantánamo tectonic basin in the south. It stretches for 187km and at its widest measures 85km. Its maximum altitude is 1,231m.a.s.l., and its total area is 8,076km^2. Although the complexity of the area makes it difficult to divide it clearly into regions, the following divisions may be tentatively proposed: 1. Sierra de Nipe; 2. Alturas del Segundo Frente; 3.Sierra del Cristal; 4. Alturas y Sierras de Sagua de Tánamo; 5. Great Tableland of Guantánamo; 6.

Alturas de Moa; 7. Cuchillas del Toa; 8. Cuchillas y Mesas de Baracoa-Imías; 9. Great Karstic Tableland of Baracoa; 10. Coastal terraces of Guantánamo-Cajobabo; and 11. Coastal lowlands of Yaguaneque-Baracoa.

73. The principal rock types of this subregion are peridotites and serpentinites of the Sierra del Cristal; in the north there are Cretaceous limestones; between Moa and the Río Yumurí basin there are serpentinites, with large extensions of igneous rocks and smaller areas of Eocene limestones; in the east the emergent terraces of Maisí are made up of Miocene limestones, which also cover the south coast as far as Guantánamo Bay, whose basin is bordered by older paleogenic limestones.

74. There are two distinct rainfall regimes in the area: one with more than 1,200 mm/year (including the wettest part of Cuba, with more than 3,500mm/year) and another with less than 600 mm/year. The principal hydrographic basins in the area are Mayarí (1,231 km^2), Sagua (1,174 km^2) and Toa (1,053 km^2). The Toa basin makes up around 70 % of the Cuchillas del Toa Biosphere Reserve, which is one of the most important localities of Cuba and the Caribbean in terms of its high biodiversity, landscape variety, ecosystem uniqueness and high floral and faunal endemism, constituting the oldest refuge and speciation centre in the country.

75. The predominant soils in the massif are red and black rendzinas; in areas with rock outcrops, there are brown/red ferralitic soils, carbonate-free brown soils and in some areas over carbonates, humic carbonated soils. Brown carbonate soils are developed on areas with calcareous substrate, with flat or rolling topography; drainage varies from deficient to good, and soil depth from moderate to deep.

76. This region is considered as the greatest centre of diversification in Cuba and the principal centre of serpentine and broadleaved flora in the country. It is also considered a centre of diversification of the Rubiaceae family and of the genera *Buxus*, *Purdiaea* and *Schmidtottia*. The autochthonous and allochthonous vascular flora of the massif is made up of 1,964 species, of which 1,299 are endemic and 363 are strict endemics; there are three endemic genera (*Bembicidium*, *Kodalyodendron* and *Feddea*) and 305 threatened species. The vegetation formations present are: low altitude and sub-montane rainforests on metamorphic complexes, low altitude and submontane rainforests on ophiolytes, submontane rainforests on poorly drained soils, microphyllous calciphobic evergreen forests, submontane mesophyllous evergreen forest, semideciduous forest, mogote complex, sub-spiny xeromorphic vegetation (*charrascales*), semi-desert scrub and mangroves. The most extensive vegetation type is rain forest, followed by pines (*Pinus cubensis*).

77. There are 942 invertebrate taxa in the massif, including 497 species of insects, 223 species of molluscs and 202 species of arachnids. There are 260 species of vertebrates, of which 94 are endemic and 40 threatened.

78. Existing and proposed protected areas in this massif are shown in Table 18.

79. The main economic activities in the massif are agricultural (coffee, cocoa, coconuts, vegetables), forestry, grazing, beekeeping, mining and tourism. More than 51% of the national coffee production comes from this area; there are 11 coffee-producing companies, 135 depulping plants, 507 drying facilities and 13 hulling plants, with a total of 13,528 workers. Although there is no formal certification of organic coffee, all coffee production is carried out using organic fertilizer and green mulch, together with biological control of pests and diseases. The massif is also the source of 80% of the national production of cocoa. There are five forestry companies operating in the massif, which carry out clear felling as well as selective harvesting, producing 22,000m^3 of sawn timber annually. There are large plantations of coconut, producing oil for use in the chemical, food and other industries.

80. There are important mineral deposits in the massif, associated with ultrabasic and lateritic formations. Mining activity in the area commenced at the end of the 19th century, and in the 20th century intensified with the exploitation of ferro-nickel deposits.

81. Tourism in the area is largely related to natural and historical/cultural resources, associated in particular with protected areas, especially the Cuchillas del Toa Biosphere Reserve.

82. The area has a total of 331,600 inhabitants, with a population density of 41 inhabitants/km^2.

IB: BASELINE SITUATION

Threats

83. The destruction and fragmentation of natural habitats is the main cause of biodiversity loss in Cuba. In the 16th century, between 88 and 92% of the island was covered with forest: at the beginning of the 20th century, forest cover had reduced to 41% and by the 1970s, due largely to the expansion of the sugar sector, 85% of the island had been deforested. This tendency has been reversed in recent years: between 1990 and 2005 forest cover increased to 24.7% and, while most of this increase consisted of forest plantations, the area of natural forests also increased by 2.4% (FAO, 2007).

84. The biodiversity of the target areas of the project, and their capacity to generate environmental services, are in particular subject to a wide range of threats. These threats are likely to be non-static in nature and magnitude in coming years, due to the probable, but uncertain, changes that are expected in the climatic, demographic, economic and productive conditions of the target areas. The target mountain landscapes are likely to be particularly vulnerable to such changes due to their inherently fragile nature, which is a function of their steep slopes, thin soils and degraded vegetation.

85. **Uncontrolled fires** set by farmers, in order to clear vegetation and clear weeds and pests in pastures, lead to the degradation of the structure of ecosystems and the reduction of their value as habitat for globally important species, particularly in dry ecosystems such as the xerophytic coastal scrub of Guamahuya and the *Pinus caribaea* forests of Guaniguanico. In the period between 2003 and 2012, there were 3,765 fires nationwide, affecting an area of 90,513.92ha. The period of highest risk is between February and May, when on average 83% of fires occur. The areas of highest risk are natural forests and forestry plantations in the mountain massifs, particularly in the territories of Pinar del Río, Cienfuegos, Villa Clara, Sancti Spíritus, Holguín, Granma, Santiago de Cuba and the Isle of Youth Special Municipality. Of the 95% of fires for which causes can be attributed, around 86% are due to human activity (79% unintentional and 7% intentional) and 8% are due to natural causes. The human causes include smokers (34%), agricultural and other fires (24%), vehicles (14%) and and fires set by fishers and hunters (16%). Fire is used for agricultural clearance because it saves labour and is cheaper than manual or mechanical methods; it is principally used by farmers and usufruct holders, and increasingly by ranchers for the elimination of pests and the rejuvenation of pasture grasses.

86. The freshwater ecosystems of the mountain areas, and the coastal and marine ecosystems into which they drain, are subject to **contamination** from a range of sources, including organic wastes from coffee depulping plants. This is the case, for example, in Toa basin in Nipe-Sagua-Baracoa, where 33 foci of contamination have been identified, the most significant of which in terms of their volume and impacts are the coffee depulping plants, which release an estimated 672.9t/year of BOD. The eight depulping plants in Guaniguanico have also generated negative environmental impacts through the discharge of waste waters. Other sources include pig production units (2 in Guaniguanico and 2 in Guamahuya), sugar mills, and domestic sewage systems.

87. The application of **inappropriate agricultural and ranching practices** in steep areas, without the application of adequate measures for soil protection, is leading to soil erosion and the generation of high levels of sediment load in watercourses, which in turn affect the health of the coral reefs in the coastal areas into which they drain (a total area of 234,426ha is affected by severe erosion, and erosion rates in some areas is as high as 70t/ha/year). These practices include the alignment of crop furrows perpendicular to the contours, the grazing of cattle on steep and fragile slopes, the elimination of trees within fields and the degradation of streamside vegetation. These poor soil and vegetation management practices also result in reduced levels of water infiltration in mountain catchments, affecting the availability and reliability of the hydrological flows on which downstream populations depend for consumption and irrigation.

88. The technological advances that have been achieved to date by institutions such as the National Institute of Agricultural Sciences (INCA) and the Central Station for Coffee and Cocoa Research (ECICC) have contributed to the productivity of the coffee sector, but the modifications promoted may not necessarily be compatible with the habitat and connectivity value of the production systems. Of particular significance in this regard is the predominance of mono-specific shade (of species such as *Gliricidia sepium*) and the promotion of reduced-shade or full-sun coffee, which has markedly lower habitat and connectivity values than traditional shade with high levels of structural and compositional diversity. In some areas, such as Guaniguanico, forestry plantations have been established without adequate provision for biodiversity in the choice of their location, species composition and silviculture.

89. Furthermore, in the Nipe-Sagua-Baracoa area **open-cast mining** has led to the destruction and fragmentation of natural ecosystems. There are still important deposits remaining to be exploited, on parts of which mining concessions have been approved by the State: these do not affect the main centres of biodiversity in PAs, but their landscape-wide impacts on biodiversity and connectivity are uncertain. A number of these mines have closed in recent years: the Ocujal mine ceased operation in 1980 and was subjected to a process of rehabilitation, with its lands passing to form part of the national forest estate; the Martí mine closed in 2008 and is currently in the process of being phased out, which will involve the rehabilitation of the mined areas and the removal of infrastructure; and the Pinares mine closed in 2012 due to the lack of capacity of its processing plant. In Nipe-Sagua-Baracoa, these mines cover an area of 3,420ha, of which 2,172ha have been subjected to rehabilitation and 1,248ha are pending rehabilitation. The environmental mitigation measures taken by the mining companies (which are joint ventures between the State and foreign companies), in the form of the establishment of forest plantations, have not as yet been adequate to restore ecological functions and connectivity in these areas.

90. These threats are compounded by changes over time in the significance of a number of natural phenomena, related to **human-induced climate change**. Cuba is moving towards climatic conditions similar to those projected by the IPCC under a scenario of intensified greenhouse gas effect, particularly in relation to increases in surface level air temperatures, reductions in daily temperature ranges, increased frequency of long and severe droughts, especially in the dry season, and increases in the total amounts of rainfall associated with major precipitation events in the wet season.

91. Ample evidence has been generated by Cuban institutions and others regarding climate change and variability to date, and the corresponding vulnerability of human populations. Studies of circulation patterns in the Caribbean suggest that the structure and influence of the Azores/Bermuda High Pressure System on the region have undergone changes at a multi-decade scale (Naranjo y Centella, 1997). A significant warming of the lower troposphere of the region was detected in the 1970s, which is consistent with overall climate change and is in accordance with the significant patterns detected in circulation patterns in the Pacific/North American sector (Trenberth and Shea, 1997).

92. The El Niño-Southern Oscillation (ENSO) has a strong influence on climatic vulnerability in Cuba. This is reflected in increases in precipitation and the frequency of extreme weather events during the rainy

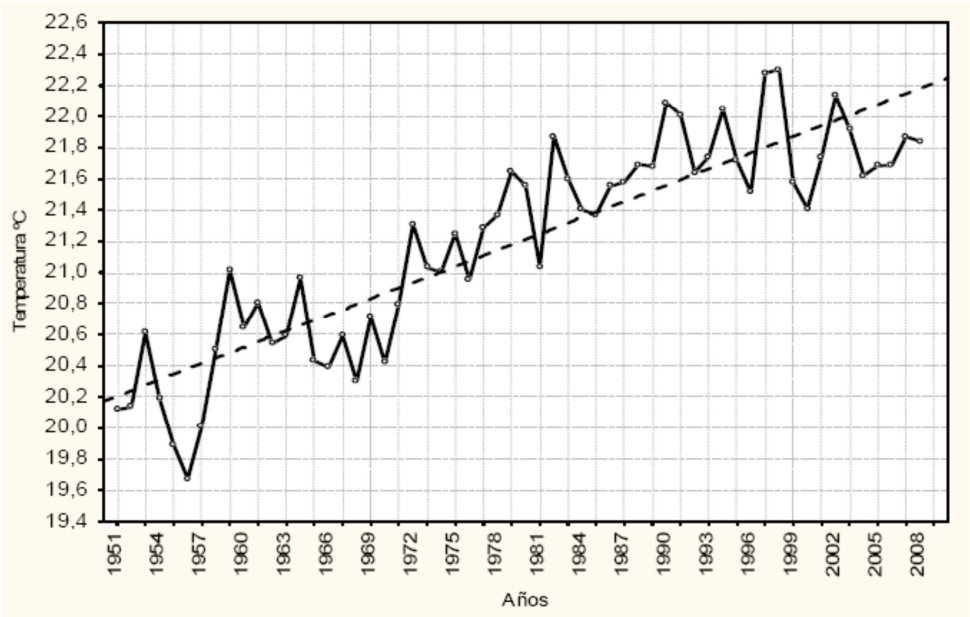
season (Cárdenas y Naranjo 1996; Alfonso 1995). Although the influence of the ENSO has not been consistent over time, Naranjo and Centella (1997) suggest that its impact in the Caribbean has increased since the 1970s, and that this is related to underlying changes in climatic conditions since that time.

93. There has been an increase in anticyclonic influence in Cuba, which has resulted in a predominant effect of ocean currents from the east and descending vertical movements. This coincides with the tendency observed in the pattern of teleconnection of the Eastern Atlantic, one of the most important modes of variation of atmospheric circulation in the Atlantic Ocean. This pattern has maintained a statistically significant tendency of linear increase over the period 1951-2008. This tendency is a consequence of the marked multi-decade variation that has been shown, with a prevailing negative phase between 1951 and 1976 and a positive phase from 1977 to the present. During this latter phase, the 1996-2010 period stands out, in which the positive trend has been very strong and persistent, coinciding with a greater increase in sea surface temperature in the tropical Atlantic ocean,

94. It is probable that a close link exists between the patterns in anticylonic activity, observed variations in teleconnection patterns of the Pacific-North America región, North Atlantic Oscillation (NAO) and Eastern Atlantic (EA), with the observed fluctuations of temperature and precipitation. Increases in the frequency and intensity of droughts appear to be linked to these processes.

95. The most recent evaluation of climatic variation and change in Cuba, carried out by the Meteorological Institute of CITMA (R. Pérez et al. 2009), provides observation-based evidence which clearly indicates that the climate in Cuba has become warmer. Since the middle of the last century, the median annual temperature has increased by almost.9°C. The last two decades stand out as the hottest registered to date. Associated with this trend, there has been a very marked increase in mínimum temperatures, the monthly average values of which have increased by around 1.9°C. There have been no corresponding statistically significant trends in maximum temperatures, meaning that median daily temperature fluctuations have reduced by almost 2°C.

Figure 2. Trends in annual median values of minimum temperature in Cuba, 1951-2008 (Pérez et al, 2009)



96. The same evaluation found no statistically significant trends in rainfall totals in the country. The most important phenomenon has been the reduction in wet season (May-October) rainfall in the east of the country: in the 1990s, this region showed significant deficits in cumulative rainfall levels. Another interesting aspect with regard to precipitation levels is an increase in dry season (November-April) rainfall, related to a reduction in the magnitude of negative anomalies from the 1970s to the 2000s.

97. The significant increase in drought events that has been registered in the periods 1961-1990 and 1931-1960 continued into the 1990s, as shown by the persistent drought events that affected the east of the country since the beginning of that decade, culminating in the severe event that stretched from May 2003 to 2005, which progressively extended to affect the whole of the country. This behaviour is linked to the strengthening of anticylonic influences over Cuba at medium and high levels, which in turn is linked to a strong increase in descending vertical movements in the atmosphere.

98. Hurricanes and extreme rainfall events result periodically in major peaks of erosion and run-off, with negative impacts for example on coral reefs; the loss of forest cover, particularly in upper catchments, is increasing the vulnerability of the areas to such events. Changes in temperature and rainfall regimes have direct impacts on the conservation status of natural ecosystems, modifying their ecology and geographical extent, and on specific species, with amphibians being particularly sensitive. Drought events, meanwhile, increase the vulnerability of natural ecosystems and forest plantations to fire; while the loss of soil organic matter due to poor soil and vegetation management is increasing the vulnerability of natural ecosystems and agricultural production systems to moisture stress during such events.

99. Mountain ecosystems in Cuba are also significantly affected by species of **invasive fauna** such as rats, dogs, cats and mongooses, which pose threats to small reptiles, amphibians, birds (and their nests), hutias and the critically endangered strict endemic Cuban solenodon or almiqui (*Solenodon cubanus*).

Baseline analysis

100. The project will add value to a solid baseline of existing programes and related initiatives by incorporating a landscape-wide and inter-sector approach to the management of PAs and of natural resources in mountain areas, in which the diverse issues addressed by the baseline investments will be addressed in an integrated manner. The total value of baseline investments of relevance to the project is estimated at around US$120 million over the life of the project.

Component 1: Systemic landscape management framework

101. There is a strong baseline of landscape-wide and sector-based planning in Cuba in general and in the target areas in particular. The Turquino Plan is conceived as a Programme for the Sustainable Development of Mountains, through which CITMA will promote sustainable use practices, the development and protection of forests, soil conservation, the recycling of wastes and the application of agrosilvopastoral practices in order to increase food production and achieve the sustainability of local communities (the Turquino Plan does not manage its own budget, but rather coordinates and channels actions financed by the Government in mountain areas). The National Environment Plan recently launched its 9th call for proposals, for the year 2014, for projects whose activities focus on the solution of specific environmental problems highlighted in the National Environment Strategy, with an emphasis on those of an integrated nature that address soils, reforestation, benefits for food production, the reduction of pollution by solid or liquid wastes, the reduction of CO_2 emissions and energy efficiency. The Plan is directed by a Multi-Sector Board headed by DINAMA; its funded is aimed at promoting and strengthening environmental aspects in provinces. As with the Turquino Plan, the NEP does not have its own budget but rather coordinates and channels actions financed by the Government.

102. The EU-funded project "Environmental bases for local food security" (BASAL) is also of relevance to the systemic aspects of the project and specifically its proposed influence on planning instruments related to production sectors; its aims to reduce vulnerabilities to climate change in the agricultural sector in Cuba through the inclusion of climate change adaptation measures in local and national agricultural development plans. The value of this baseline investment over the life of the project is estimated at US$14,150,000.

103. A key element of the baseline for the project's proposed investments in environmental eduction and awareness raising is the "Perfecting the National Education System" Programme, which has among its specific objectives the promotion of environmental education for the sustainable development of Cuban society. Its duration is 5 years, from 2013, with a total budget of US$500,000/year and US$70,000 for each project that is presented. Missing from this and other related ongoing initiatives is the incorporation of fully integrated approaches to environmental issues, including the relations between conservation and production (PAs and production landscapes and their respective/joint contributions to conservation and connectivity) and the specific environmental issues and challenges in vulnerable mountain areas.

Component 2: Management effectiveness for core PAs within the context of fragile mountain landscapes

The Strategic Plan for the SNAP for the 2014-2020 period foresees the following:

1. Consolidation of the institutional and functional integration of the SNAP in all directions.
2. Consolidation of the management of PAs as the Basic Units of the System.
3. Increase the effectiveness of the planning processes of conservation in harmony with sustainable development.
4. Development of the priorities identified in the programmes of the strategic plan of the SNAP.
5. Implementation of the strategy for financial sustainability of the SNAP.
6. Implementation of risk management to mitigate the vulnerability of the SNAP to disasters, with emphasis on climate change.
7. Insertion of the SNAP in the process of integrated sustainable development.
8. Improvement of the prevention, control and management of invasive alien species in the SNAP.
9. Diversification of the work of productive sectors in the SNAP.
10. Strengthening of international cooperation.

104. Enforcement and fire control by the Forest Guard Corps (CGB): the CGB, working in collaboration with other institutions, is responsible for controlling illicit activities affecting natural ecosystems and for reducing the frequency and impacts of fires, through organization, training and equipment of fire control brigades, as well as teams to investigate the causes of fires and awareness raising activities. The annual budget dedicated to these activities is estimated at US$9,302,882.

105. The "Climate Change in Cuba: impacts, mitigation and adaptation" programme responds to the National Priority aimed at the "development of the scientific and technological basis for the environmental context, in particular relation to climate change and the conservation of Cuban biodiversity". Its general objective is to estimate future climatic and environmental scenarios, with the aim of offering scientifically-based alternatives for the timely adoption of mitigation and adaptation measures, that in the most economical, objective and efficient way reduce the adverse impacts of climate change on the environment, ecosystems, biodiversity, natural resources, priority productive sectors and human well-being; furthering the establishment of appropriate policies to ensure sustainable development as well as supporting international efforts and the commitments undertaken by Cuba on these issues. This programme includes the project "current and future potential distribution of the flora and fauna of Cuba: exploring the effects of climate change on terrestrial biota", which will be executed between 2014 and 2017 with a total budget of

US$700,900. Its general objective is to evaluate the effect of anthropogenic climate change on the distribution of terrestrial species of flora and fauna.

Component 3: Conservation compatible production systems in threatened mountain ecosystems and conservation corridors leading down to the coast

106. There is a large baseline of investment in agricultural, grazing and forestry production systems in the target areas, as listed below. The main deficiency of these baseline investments is the lack of inter-sector integration between these different programmes, which is a necessary requirement for addressing landscape-wide and inter-sector threats effectively and taking into account the integrated nature of farmers' production systems with which conservation initiatives need to be made compatible in order to be successful.

107. Under the National Forestry Programme (NFP), the Government will continue updating forestry inventory and plans to cover 29.4% of the country's forested land by 2015, and the establishment of 872,000ha of plantations with a survival rate of at least 85%, through its National Forest Development Fund (FONADEF), which has an annual funding allocation of US$200 million. In the target areas, the NPF aims to reforest around 87,000ha over the next 10 years, using native species and applying a landscape approach, including practices such as silvopastoral systems, windbreaks, Integrated Forest Farms and Hydroregulatory Forest Belts. This will imply an estimated investment of 5,000 Cuban pesos and US$300 per hectare. The total annual investment in this programme is currently US$6,302,882.

108. Through the National Programme for Soil Improvement and Conservation, MINAG will support the reduction of soil degradation and the rehabilitation of soils (especially in areas prioritized for water catchment and with priority crops), and the updating of the inventory of areas affected by degradation and to train farmers." This programme currently invests around US$2,000,000 per year to combat soil degradation, the management and protection of forests and the management of wáter resources.

109. The Animal Food Production Programme aims to generate, validate and evaluation knowledge, processes and technologies for the development and introduction of processes related to the appropriate use of the soil, water and energy in order to optimize the production of animal feeds. The programme lasts from 2013 to 2020 and finances up to $12,000,000 per year for each project.

110. The Human Food Programme contributes to the achievement of the objectives identified in the national strategies for science and innovation and of the different sectors involved, which are centred on the development of the scientific and technical bases for food production, to contribute to the satisfaction of national food security needs and to the sustainable management of resources and ecosystems. The guiding framework for research, development and innovation in this programme contemplates the systemic and process-oriented approach, and the focus of research is centred on value chains for the production of human foods. The programme responds to the priorities of science and technological innovation for the coming years, which are focused on:

- Increasing the contribution to the satisfaction of food security and the substitution of foods imports (rice, maize, beans, milk, beef, buffalo meat and pork)
- Commercialization in foreign exchange, diversification of products and services and increase of exports (ciruts, fruit, coffee, cocoa and honey)
- Environmental protection (soil, water, plant and animal genetic resources) and sustainable development (bio-production and renewable energy)

111. The specific objectives of the programme are:

- Contribution to the development of sustainable agriculture in harmony with the environment through the efficient use of genetic resources of plants, microorganisms and animals, of species of current or potential economic importance.
- Contribution to the development and improvement of the production and certification of seed of high genetic, physiological and sanitary value for value chains for the production of animal- and plant-based foodstuffs.
- Contribution to the development of the programme of municipal food self-sufficiency through the improvement of production systems in urban and sub-urban agriculture.
- Contribution to the sustainable management and efficient use of natural resources and alternative energy sources, for use in value chains for the production of foodstuffs of animal and plant origin.

112. The programme has an annual budget of US$20,000,000 and a maximum budget of US$4,000,000 per project.

113. The "Social determinants, risks and disease prevention in vulnerable groups" programme has among its specific objectives strengthening community work with a scientific approach that allows a sustainable design of activities at this level related to health, mental health and education. This programme includes the project "components of biological diversity used by the Cuban population in natural and traditional medicine", which aims to carry out inventories of BD elements used in natural and traditional medicine, and their forms of use; determine the geographical distribution, phenology and germination requirements of the most used plant species; propose measures to allow the sustainable use of the most vulnerable plant species; contribute to the implementation of the CEPA initiative on communication, environmental education and awareness raising in *campesino* communities,to allow the development of activities for the conservation and sustainable use of BD. This project will work with urban and rural families in the west, centre and east of the country, prioritizing REDS and other regions of greatest interest in terms of economic importance and the conservation of BD, namely Nipe-Sagua–Baracoa, Sierra Maestra, Escambray, Bamburanao y Guaniguanico. The budget of the project over the 2014-2018 period is US$3,272.70.

Long-term solution

114. The baseline projects are not sufficient to achieve the **long-term solution** to the threats affecting the biodiversity of priority mountainous areas in Cuba, which will involve a paradigm shift from a site based approach to a landscape- and ecosystem-based approach that integrates PAs into the surrounding areas, protecting core refugia while addressing fragmentation from production practices in the landscape as a whole, and promoting connectivity at landscape level. Further details of the approaches to be applied in each of the target areas are provided in the Strategy section below.

Barriers to achieving the solution

Barrier 1. Inadequate management framework for mountain ecosystems.

1.1 Limited access to information for landscape-level planning

115. Maps, databases and geographical information systems exist covering a range of variables. Despite this, the institutions responsible for the planning and management of the natural resources in the target areas do not have access to the complete, reliable, updated and integrated information on the biophysical and social characteristics of their ecosystems that they require to carry out their mandates effectively, taking into landscape level processes, ecosystem functions and the interactions between productive, social and environmental factors. Much of the information, in the form of maps, databases and research results is dispersed between different sector institutions. The geographical coverage of some maps and databases is incomplete and the information on certain variables, such as soils and vegetation types, is in many cases obsolete. The mapping of ecosystem fragmentation carried out at national level by the Institute of Ecology

and Systematics (IES) did not directly address the issue of biological connectivity, making it difficult to prioritize and plan in an objective manner the location, design and management of biological corridors. There are also some specific gaps in knowledge, for example regarding micro- and mesofauna, the population dynamics of priority species and fire ecology, which hinder the development of appropriate resource management strategies.

116. Furthermore, the technicians in many institutions lack the technical knowledge required to allow them to use the information available to support management decisions.

1.2 Limited development and application of environmental land use planning

117. The Institute of Physical Planning has carried out a comprehensive nationwide programme of land use zoning (*ordenamiento territorial*), defining for example lands which are suitable for agricultural or forestry use on the basis of soil and topographical conditions; this zoning is legally binding. It remains, however, "broad brush" in nature and only includes a limited number of variables: to date the more detailed process of "environmental land use planning" (*ordenamiento ambiental*), developed by the Environment Agency (AMA) of Ministry of Environment (CITMA), remains to be widely applied, resulting in some cases in the sub-optimal location of productive activities in relation to environmental variables such as biodiversity and connectivity. *Ordenamiento territorial* and *ordenamiento ambiental* in the Cuban context are explained in more detail in paragraphs 34-37. Although a guidance document ("Proposal for the organization of the process of generation, approval and implementation of environmental planning and its integration into territorial land use planning") has been produced and is currently being validated, to date environmental planning has been carried inconsistently in different parts of the country, using a range of different methodologies. One of the most significant factors limiting the nationwide application of environmental planning is the shortage of material and financial resources.

118. Likewise, the INAF has made major advances in silvicultural research, but the criteria for the selection of sites for reforestation, and the corresponding species to be established, do not as yet adequately take into account edaphic parameters such as the physical, hydrophysical and chemical properties of soils, relief and climate. The following factors are impediments to improving the criteria for the selection of forestry soils and sites, in support of the establishment and management of forest areas able to contribute to connectivity:

- Although there is much experience with studies into the relation between soil type and forestry/fruit tree species in reforestation, forest inventory and planning, and the establishment of permanent sample plots, the number of species studied for reforestation is very limited in relation to the total tree flora of the target areas.
- There are limited numbers of personal in the institutions in question (EEA of INAF, municipal SEFs and Integrated Forestry Enterprises) with the required capacities in relation to the development and application of the selection criteria.
- There is a shortage of the manuals and text books needed to allow rapid access to information on these issues.
- The equipment available to the soil and foliar analysis laboratory of INAF is mostly obsolete, and, while its staff members are highly experienced, there is a shortage of younger staff with the capacities necessary to ensure institutional sustainability.

1.3 Limited focus of extension support

119. Diverse entities of the Government (such as MINAG, MES and CITMA) provide producers with high levels of extension support, of excellent quality. In relation to mountain areas, in the 1980s the Turquino Plan initiated processes of extension, environmental education and training; these resulted in the establishment of demonstration areas and the development of a series of technical training materials for each productive sector, which were applied through a range of training approaches including short courses,

workshops and seminars. This system largely collapsed in the 1990s, due to the economic difficulties faced by the country, but was revived in 2005, with support from FAO; to date, however, the extension system still presents a number of shortcomings. As a result, there is limited knowledge among directors, technicians, farmers and other members of the population regarding issues such as the integrated management of water basins, the importance of soil and wáter resources and strategies for their conservation, the consideration of biodiversity issues in the matching of forestry species to sites, the application of agroforestry systems, and the use of non-timber forest products.

120. A number of factors hinder the consolidation of the extension system and the effective incorporation into it of environmental dimensions. The Forestry Extension System (SEF) lacks consolidation and organization, and is inadequately integrated with the extension networks of other institutions working on environmental issues; it lacks a financial sustainability strategy; and the equipment and other technical resources available to forestry extensionists are inadequate.

121. A further consideration is that to date extension programmes have tended to focus principally on productive issues and to pay little attention to broader issues of environmental sustainability and resilience, the production of ecosystem goods and services and the compatibility of productive practices with BD conservation. This is due in part to the nature of the training that the extension agents themselves receive and in part due to the limited technical visions of the institutions for which they work. The implication of this is that producers in turn have limited awareness of the environmental implications of their productive systems or of the options that exist for modifying them. The National Forestry Programme recognizes the environmental and social implications of the poor management of forest resources, but does not specifically recognize the interactions between this and other factors such as the spread of invasive species and the implications of climate change. This situation has been compounded by limited commitment on the part of technicians and directors to the reforestation of generally degraded pastures, and the scarcity of material resources in institutions such as INAF and its network of EEAF.

1.4 Limited experience with multi-stakeholder participation and institutional coordination in landscape level processes

122. The relevance, effectiveness and sustainability of the application of the landscape-wide approach proposed under the project is also dependent on effective local participation: while mechanisms already exist for participation of actors at village level in decisions related to natural resource management (for example through Local Organisms of Popular Power, Councils of Municipal Administration and Popular Councils), there is as yet little experience or technical capacity at this level in addressing broader environmental and landscape-wide issues.

123. Internal analyses carried out by CNAP have highlighted inadequate levels of coordination between organisms and entities responsible for environmental control, between the different institutional actors of the environmental system at national, provincial and municipal levels, and between the NPAS and other actors outside of the system itself (for example Watershed Councils, the Reforestation Commission and the Turquino Plan). This situation is particularly evident in regional-level management units, such as REDS, Biosphere Reserves and PAs that cover more than one province. There are also insufficient levels of interaction between technicians in the CNAP/NPAS and the entities that manage the PAs in practice. Insufficient coordination between different actors within the environmental sector results, for example, in the inadequate application of the measures provided for in environmental impact studies and environmental licences in relation to management activities carried out within PAs.

Barrier 2. Limitations in design and management effectiveness of PAs.

2.1 Design and management planning of PAs do not make adequate provision for landscape level considerations

124. The effective conservation of biodiversity in threatened mountainous ecosystems requires that management practices in the production landscapes are complemented by core zones, with a higher protection status, that will function as refugia. The target areas include a wide diversity of PA categories, some of which permit high levels of productive activity within their boundaries and others of which entail strict protection. Although all of the PAs in the project intervention areas have management plans, developed on the basis of biophysical and socioeconomic studies, the design of the PAs (including their external boundaries and their internal zoning) and the provisions of their management plans do not necessarily take into account larger-scale considerations of connectivity and ecosystem services, and this limits their effectiveness as refugia complementing conservation efforts in the broader landscape. The CNAP has identified the main deficiencies of the NPAS in relation to PA planning as being related to the definition of conservation priorities, and their application in practice in PA design, planning and management; the limited scope and functionality of the PA Management Information System (SIGAP); and the weak knowledge base for the classification of PAs according to the national or local importance.

125. There are also a number of deficiencies in core PA functions, as shown in Table 11. It is evident from this analysis that the strongest aspect of the PAs is the level of development of their regulatory, planning and management instruments, although CNAP has identified weaknesses in the quality of some of the management plans that have been developed to date, and deficiencies in the ways in which the available information is applied in planning and management. The PAs are generally weakest in terms of the capacity of PA staff to ensure effective application of laws, and in terms of the existence and application of mechanisms and facilities for visitors and for generating and managing income.

Table 11. METT ratings for existing (declared) PAs (in descending order of average METT score by parameter)[9]

Parameter	Protected area																			Av.	%
	1. Pan de Guajaibón	2. Mil Cumbres	3. Viñales	4. Rosario	5. San Marco	6. El Mulo	7. El Salón	8. Las Peladas	9. La Mensura	10. Baitiquiri	11. Yunque Baracoa	12. Jobo Rosado	13. Humboldt	14. Pico Cristal	15. Yumurí	16. Topes de Collantes	17. Lomas de Banao	18. Cuchillos del Toa	19. Yara Majayara		
1. Legal status	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	3	3	2	3	2.89	96.5
2. PA regulations	3	2	3	3	3	3	3	3	3	3	2	2	2	3	2	3	3	-	2	2.67	88.9
3 Application of laws	-	1	2	-	-	-	-	-	1	2	-	2	-	1	-	2	3	-	3	1.89	63.0
4. PA objectives	3	2	3	3	3	3	3	3	3	2	2	2	3	3	3	3	3	1	3	2.68	89.5
5. PA design	3	3	2	3	3	3	3	3	2	3	1	3	2	2	2	3	3	3	2	2.58	86.0
6 Demarcation	3	2	2	2	-	-	-	-	2	3	1	3	2	2	3	3	3	1	2	2.27	75.6
7. Management plan	3	5	6	6	3	6	6	6	5	6	5	6	5	6	5	6	6	5	5	5.32	88.6
8. Work plan	2	1	2	2	2	2	2	2	2	3	2	2	2	2	2	3	3	1	2	2.05	68.4
9. Resource inventory	2	2	2	2	2	2	2	2	2	3	1	3	1	2	2	3	3	2	1	2.05	68.4
10 Protection systems	-	2	1	2	2	2	-	-	1	3	1	2	1	1	2	2	3	-	1	1.73	57.8
11. Research	3	1	2	3	3	3	3	3	3	3	2	1	3	2	1	2	3	2	3	2.42	80.7
12 Resource management	2	1	3	2	-	2	2	2	1	3	2	2	2	1	2	2	3	1	2	1.94	64.8
13 Number of personnel	2	1	3	2	2	2	2	2	2	2	2	2	1	2	2	2	3	-	1	1.94	64.8
14 Staff training	2	1	2	2	2	2	2	2	2	2	1	1	2	2	1	2	2	-	2	1.78	59.3
15. Current budget	3	1	2	3	3	3	3	3	2	2	1	1	1	2	2	2	2	-	1	2.06	68.5
16 Budget security	2	1	2	2	2	2	2	2	3	2	1	1	1	2	3	3	2	-	1	1.89	63.0
17 Budget management	2	2	3	2	2	2	2	2	2	2	1	2	1	2	2	2	3	-	1	1.94	64.8
18 Equipment	2	1	2	2	2	2	2	2	1	2	-	1	1	1	1	3	2	-	0	1.59	52.9
19 Equipment maintenance	1	1	2	1	1	1	1	1	3	3	-	2	2	2	1	3	2	-	0	1.59	52.9
20. Education/awareness raising	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	3	3	1	2	2.11	70.2

[9] See METT matrices for identities of PAs

Parameter	Protected area																			Av.	%
	1. Pan de Guajaibón	2 . Mil Cumbres	3 . Viñales	4 . Rosario	5. San Marco	6. El Mulo	7. El Salón	8. Las Peladas	9. La Mensura	10. Baitiquiri	11. Yunque Baracoa	12. Jobo Rosado	13. Humboldt	14. Pico Cristal	15. Yumurí	16. Topes de Collantes	17. Lomas de Banao	18. Cuchillos del Toa	19. Yara Majayara		
21 Soil and water use planning	6	3	4	-	5	-	-	-	5	6	4	2	2	5	1	4	5	1	1	3.60	60.0
22. Relations with neighbours	3	2	3	3	3	3	3	3	1	3	1	2	2	3	1	3	3	1	2	2.37	78.9
23 Indigenous peoples	-	2	2	-	-	-	-	-	1	3	1	-	2	1	2	3	2	1	2	1.83	61.1
24 Local communities	3	5	5	-	-	-	-	-	3	6	3	-	5	3	4	5	5	2	3	4.00	66.7
25 Economic benefits	2	1	2	-	2	-	-	-	2	2	-	-	1	3	2	2	3	-	1	1.92	63.9
26. Evaluation and supervision	3	2	3	3	3	3	3	3	2	3	2	2	3	2	3	2	3	1	3	2.58	86.0
27 Visitor installations	-	2	2	-	-	-	-	-	2	2	1	2	1	2	2	3	3	-	0	1.83	61.1
28 Tourism operators	-	2	2	-	-	-	-	-	2	2	1	2	2	-	3	3	3	-	0	2.00	66.7
29 Contribution of entry fees	-	1	1	-	-	-	-	-	1	2	1	1	1	1	2	3	3	-	1	1.50	50.0
30. Status of values	4	5	5	6	6	6	6	6	5	6	1	5	5	5	5	6	6	6	5	5.21	86.8

2.2 Inadequate provisions for connectivity across the landscape

126. Although the concept of REDS (see paragraph 14) does recognize and permit the presence of PAs within their boundaries, and includes among its objectives "the protection of flora and fauna, ecosystems and landscapes, conserving biodiversity in general", it does not make specific provision for designing and managing the REDS in such a way as to promote effective biological connectivity. Despte the existence of high levels of technical capacity in Cuba in relation to specific aspects of biology and PA management, conceptual considerations related to biological connectivity are yet to be adequately mainstreamed among PA institutions at central or regional levels, or integrated into PA planning and management. During the PPG phase, indicative proposals were developed for the design of 'ecological connectivity networks' in each of the target mountain areas; however the capacities and analyses required to develop these proposals further in such a way as to maximize their contribution to biological connectivity and the conservation status of the target species are still lacking.

2.3 Inadequate training of PA staff

127. The training received PA staff at present is not adequate to meet needs, especially in relation to the broader conceptual focus of this project, which addresses the integration of PAs with the landscapes that surround them, as well as issues of ecosystem vulnerability. This is due to a number of factors, including the following:

- Inadequate attention to undertaking local level evaluations of personnel training needs;
- Inadequate facilities for carrying out training at local level in the PAs themselves, which would be the ideal setting for learning and validation;
- The trainers are not necessarily specialized in the specific issues on which training is required;
- There is inadequate harmonization of the key conceptual issues presented in the training programmes, between sites
- Training is not necessarily carried out in a consistent manner, but rather when funds become available.

Barrier 3. Farmers do not have access to productive practices that are compatible with biodiversity conservation

3.1 Inadequate technical capacities among producers

128. The institutions responsible for forestry and agricultural extension under the umbrella of MINAG, such as the Institute for Agroforestry Research and the Soils Institute, have a tendency to focus predominantly on technical issues in their extension messages, failing to take adequately into account the interactions between technical, social and environmental aspects such as the impacts of agricultural production on livelihood sustainability and biodiversity, or the importance of social and biological factors in underpinning productive sustainability.

129. The acceptance of the messages of these institutions at local level is further limited by the fact that they are typically developed and transmitted in a highly vertical manner, with limit levels of real participation by local people. This contrasts with the approach of CNAP, which has made major advances in promoting local participation in the planning and management of protected areas.

3.2 Limited institutional capacities for ensuring compliance

130. Capacities are limited within Government agencies for ensuring that productive sector activities are in compliance with environmental regulations and land use plans. Key areas of weakness include the monitoring of land use changes, due to limited access to tools for remote sensing and information management (GIS), and collaboration between Government institutions and community-based organizations in monitoring and enforcement.

3.3 Inadequate institutional capacities for fire management

131. The effective detection of fires in vulnerable mountain ecosystems is hindered by the inoperative status of the Early Warning Network, due to technical limitations of the information systems and computer hardware on which this depends, as well as an inadequate number of observation towers and a shortage of radio communication and GPS equipment. Furthermore, the current fire risk index system is out of date: this deficiency is becoming increasingly significant as the vulnerability and response of ecosystems to fire is being affected by climate change, while the nature and implications of these changes are still inadequately understood, a situation which impedes the formulation and application of appropriate responses.

132. The effective prevention and management of fires are also hindered by a number of factors, including inadequate communication and coordination at regional level between authorities and land managers; inadequate availability of specialized tools and equipment; inadequate mechanisms and equipment for training, communication and awareness raising, and consequent limitations in the awareness of local stakeholders regarding the implications of fires (in environmental, financial and social terms) and how to prevent and manage them.

Stakeholder analysis

133. The principal stakeholders who will be involved in the implementation of the Project will be the Ministry of Science and Technology (CITMA) through its Environment Agency (AMA), the Institute of Ecology and Systematics (IES), the National Centre for Protected Areas (CNAP), the Institute of Tropical Geography (IGT) and the the Institute of Oceanology; the Ministry of Agriculture (MINAGRI), with its mountain production units, the Institute for Agroforestry Research (INAF), the Flora and Fauna Protection Enterprise (EPFF) and the Mountain Organs; and the Local Development Centre, local governments and the population of the target centres and their respective organizations.

134. Local stakeholders are represented through community-level organizations such as Popular Councils and Committees for the Defence of the Revolution. The main other civil society organization in the areas is the National Association of Small Farmers (ANAP), which represents the interests of small farmers, including those who do not belong to State-managed enterprises or other organized models of production such as Basic Production Units (UBPC).

Table 12. Summary of principal stakeholders related to the project

Stakeholders	Project Implementation Role
Ministry of Science, Technology and the Environment (CITMA)	GEF focal point and environmental sector head. Responsible for directing, executing and controlling environmental policy, furthering its contribution to sustainable development.
Ministry of Agriculture (MINAG) and its provincial delegations.	Organism responsible for directing, executing and controlling State and Government policy in relation to the use, conservation and improvement of soils, the conservation, management, rational use of the forest estate and the conservation of wild fauna and flora.
Institute of Ecology and Systematics – dependency of CITMA	Project proponent: contributes to biodiversity knowledge through systematic and ecological studies.
National Centre for Protected Areas (CNAP) – dependency of CITMA	Project proponent: lead Entity regarding the planning of Protected Areas in Cuba, including Special Regions for Sustainable Development (REDS).
Institute for Agroforestry Research (INAF) – dependency of MINAG	Project proponent: responsible for forestry and agroforestry research and for the promotion of Integrated Forest Farms.

Stakeholders	Project Implementation Role
Environment Agency (AMA) – dependency of CITMA	Responsible for developing the scientific and technological bases for environmental management and generating integrated solutions that guarantee the sustainable management of natural resources. Responsible for the development and application of environmental land use planning" (*ordenamiento ambiental*).
Museo Nacional de Historia Natural (MNHN)	Provision of human and material resoucees for environmental education activities, dissemination and the management of data and information on the environment.
National Forestry Directorate and offices of Forestry Services at provincial and municipal levels (MINAG)	Responsible for ensuring compliance with the Forestry Law (#85) and its regulations, ensure the appropriate use of FONADEF, approve projects submitted to FONADEF for the forestry estate and wildlife and carry out certifications of resource holders in forests and protected areas.
State Forest Service (MINAG)	Promotion of the sustainable use of forest resources and the conservation of ecosystems and biodiversity.
Environment Units. Provincial Delegations of CITMA.	Control and supervision of environmental management in the provinces. Coordinators of Provincial steering committees. Methodological control, coordination and supervisión of provincial protected area systems.
Representatives of local government (Local Organisms of Popular Power: Councils of Municipal Administration; Popular Councils)	Control and administer resources at local level: will play a vital role in the definition of priorities for local development and the validation of proposals of natural resource management strategies within their areas of jurisdiction.
National Association of Small Farmers (ANAP)	Represents small farmers: will participate in the definition of the productive options to be promoted and will act as a channel for extension messages to small farmers.

135. The principal stakeholders at local level expected to receive socioeconomic benefits from the project are summarized in Table 13.

Table 13. Stakeholders receiving socioeconomic benefits at local level

Stakeholder description	Type of socioeconomic benefit	Estimated number of beneficiaries
Farmers in Integrated Forest Farms	Increase and stability of agricultural production, increased Access to training	40 farmers
Families of farmers in IFFs	Increased incentives from FONADEF (up to 30% recovery of production costs) for increases in forest cover	Around 240 people in 40 families
Families of coffee farmers	Access to other goods and services and pilot level payments for environmental services	3 families in the demonstration farms (experimental level))
Producers in other farms adopting practices demonstrated in IFFs	Training in practices demostrated in IFFs for BD-friendly production systems	53 farmers in 53 IFFs covering 2120ha

Stakeholder description	Type of socioeconomic benefit	Estimated number of beneficiaries
Workers in agricultural companies with Mountain Medicinal Farms (MMFs)	Training in the use of native species with medicinal properties.	Workers of 11 MMFs
Population in general in the target municipalities	Increased access to environmental goods (e.g. timber and non-timber forest/tree products including natural medicines) and services (increased access to clean water, reduced exposure to the impacts of extreme climatic events and pollution). Increased employment opportunities (for example in natural medicine production).	574,463 inhabitants of the 26 municipalities covered by the project.
Productive entities and individual farmers in the project's implementation areas in the four massifs (Integrated Forest Farms, CCSF, CPA, UBPC, livestock companies, coffee depulping plants and pig production units)	Increase and stability of agricultural production, increased training in BD-friendly agricultural practices, increased access to clean production practices.	Workers in 30 coffee depulping plants and 43 pig production units.

STRATEGY

Project rationale

136. This project will make a paradigm shift in biodiversity conservation and protected area management in Cuba, from a site based approach to a landscape approach that integrates PAs into the surrounding areas. This is necessary in order to protect core refugia for biodiversity, while addressing fragmentation from production practices in the landscape as a whole, and countering threats such as fire and pollution which have their origins in the practices employed in the production landscape. Hence, the strategic landscape approach supported through this project will constitute an innovative approach and contribute to strengthen the management effectiveness of the PA system. The project will focus on threatened mountain ecosystems located in the principal mountain ranges of the country, which are legally considered as Special Sustainable Development Regions (REDS) and managed by Mountain Organisms (multi-institutional entities directed by a Tripartite Commission composed by the Ministry of Agriculture MINAG, the Ministry of Science, Technology and Environment CITMA, and the Ministry of the Armed Forces (MINFAR). It will work across altitudinal gradients reaching from mountain ridges to foothills in order to maintain functional connectivity.

Design principles and strategic considerations

137. This project will make a paradigm shift in biodiversity conservation and protected area management in Cuba, from a site based approach to a landscape approach that integrates PAs into the surrounding areas. This is necessary in order to protect core refugia for biodiversity, while addressing fragmentation from production practices in the landscape as a whole, and countering threats such as fire and pollution which have their origins in the practices employed in the production landscape. Hence, the strategic landscape approach supported through this project will constitute an innovative approach and contribute to strengthen the management effectiveness of the PA system. The project will focus on threatened mountain ecosystems located in the principal mountain ranges of the country, which are legally considered as Special Sustainable Development Regions (REDS) and managed by Mountain Organisms (multi-institutional entities directed by a Tripartite Commission composed by the Ministry of Agriculture MINAG, the Ministry of Science, Technology and Environment CITMA, and the Ministry of the Armed Forces (MINFAR). It will work across altitudinal gradients reaching from mountain ridges to foothills in order to maintain functional connectivity.

138. This support to be provided by the project is particularly timely as it coincides with processes of discussion at policy level in the country of alternative economic and institutional modalities, with potential positive implications for the feasibility and sustainability of natural resource management and conservation strategies. In addition to the overall conceptual model promoted by the project, this awareness raising will address specific strategic options such as environmental service payment schemes (building on the initial systematization processes carried out by the GEF/UNDP Sabana Camaguey project) and market-based instruments such as coffee certification.

139. The ultimate measure of the effectiveness of the project will be its impacts on the conservation status of key elements of threatened biodiversity. The project differs, however, from conventional BD1 or BD2 projects inasmuch as it incorporates the concept of resilience. In the context of this project, resilience is understood to refer to the following aspects:

- Capacity of the target elements of biodiversity to sustain themselves in the face of changing anthropogenic pressures
- Capacity of the target elements of biodiversity to sustain themselves in the face of climate change, and extreme climatic events, implying that conservation strategies must take into account

possible alterations in the ecological conditions and spatial limits of the target ecosystems, and changes in the phenology, reproductive cycles and distribution of target species

- Relations of synergy between the resilience of biodiversity and of the production and livelihood support systems of the local population, whereby on one hand natural ecosystems provide services to the population, reducing their vulnerability to the effects of climate change and, on the other diverse and healthy production systems contribute to the status of biodiversity and at the same time to the stability and resilience of local livelihoods. It is this synergy, in terms of mutual benefits between biodiversity and adaptation, that distinguishes this project from those focused specifically on adaptation, in which ecosystems are considered as instruments for adaptation rather than objects of conservation in their own right.

Table 14. Details of project target landscapes

Mountainous massifs	Area (ha)	Existing protected areas		Globally important biodiversity
		Number	Area (ha)	
1. Guaniguanico	375,500	8	53,441	**Ecosystems:** Evergreen and semideciduous mesophyllous forest, Mogotes vegetation complex (featuring the endemic *Bombacopsis cubensis*), *Pinus caribaea* forests, xerophytic thorn scrub, *P. tropicalis* forests on white sands, and white sand savannas. **Globally important species:** 1,098 known endemic species and 181 strict endemics, including the IUCN CR cycad *Microcycas callocoma* (estimated total population around 600 individuals), and the CR amphibian *Eleutherodactylus symingtoni* (estimated total population around 250 individuals.
2. Guamuhaya	157,650	2	26,226	**Ecosystems:** Montane rainforest, microphyllous evergreen vegetation, cloud forest, xerophytic coastal scrub, Mogotes vegetation complex. **Globally important species:** 325 endemic and 83 strict endemic flora species, 61 endemic vertebrate species and 249 endemic invertebrates. Bird species include *Accipiter gundlachi* (EN) and *Geotrygon caniceps* and *Aratinga euops* (both VU).
3. Bamburanao	78,216	1	4,181	**Ecosystems:** Fragments of mesophyllous semi-deciduous forest and the Mogotes vegetation complex. **Globally important species:** Endemics including *Hemithrinax ekmaniana* and *Aralia rex (both CR), Philodendrom scaberulum, Comocladia platyphylla, Tabernaemontana amblyocarpa, Cassia insularis, Dyospiros halesioides, Jacquinia aculeata, Ateleia apetala, Hebestigma cubense.*
4. Nipe-Sagua-Baracoa	807,600	8	226,285	**Ecosystems:** Tropical rainforest, *P. cubensis* pine forest and sub-thorny xerophytic scrub. **Globally important species:** Greatest reptile diversity in the country and greatest floristic richness of the insular Caribbean, with 1,951 endemic and 479 strict endemic species. 95 endemic vertebrate species and 189 endemic invertebrates.

Specific strategies to be applied per area

140. As explained in the barrier analysis above, the design and implementation of natural resource management strategies capable of delivering landscape-wide BD benefits in the target mountain areas is hindered by the inadequacy of the knowledge base regarding the biology of many of the target species and ecosystems, particularly in terms of their needs for connectivity. During the PPG phase, international expertise was enlisted to work with the national institutions in developing initial "broad brush" proposals of management strategies, corridors and associated protected areas. The outcome of this process was the tentative definition of "ecological connectivity networks", which area defined as spatial structures that serve to link core areas, the configuration of which is defined by the routes that generate the least possible friction to the movement of organisms (Ramos & Finegan 2007). These tentative configurations will be confirmed during the implementation phase of the project, once the deficiencies in the required capacities have been corrected with project support.

141. The provisional design of the ecological connectivity networks in each of the target areas during the PPG phase was carried out through a GIS-based process, the principal elements of which were as follows:

1) Identification of principal sites of interest for conservation in each target massif. In each case these consisted as the priority PAs in each area, in recognition of the importance of these as core refugia within the context of island biogeography.
2) Definition of biophysical, ecological and social criteria for the delimitation of the connectivity areas (e.g. diverse relief, diverse, endemic and/or threatened species, forest fragments, production practices with potential for environmental improvement, commitment among local communities)
3) Identification of priority core areas for the reestablishment and maintenance of connectivity in the defined areas, within the framework an "ecological connectivity area".
4) Definition of the objective of each ecological connectivity area (in all of the areas, the main objective is to promote biological connectivity between core refuge areas).
5) Assignment of weightings to landscape units (e.g. fragment size, form index, distance from roads, settlements and rivers, and number of vegetation types per fragment)
6) Assignment of "friction values" for each land use type, ranging from 1 for natural forest to 11 for settlements.

142. This initial GIS-based definition does not at this stage differentiate between the specific connectivity and habitat requrements of the different priority species present in the target areas; the proposals will be fine-tuned to take these into account during the implementation phase of the project. The ecological and connectivity requirements of selected priority species in the target areas are shown in Table 9: it is clear from this that the country (and especially the target mountain massifs) is home to a number of highly threatened and/or endemic species whose conservation status depends on their highly specific habitat requirements being met. The main elements of the landscape-level conservation strategies to be applied by the project will be as follows:

- Conserving the intact core refugia to which many of these species are largely restricted and on which some are highly dependent for the satisfaction of their habitat requirements;
- Promoting connectivity in order to limit the extinction risks associated with the fragmentation of populations into small, isolated and vulnerable populations by facilitating genetic interchange and recolonisation, in accordance with the principles of island biogeography;
- Permitting maintenance or increases in population numbers by ensuring the availability of suitable habitat both inside and outside of PAs, paying careful attention to the specific requirements of each target species in terms of ecological conditions and species assemblages (some species, such as *Mormopterus minutus* and *Aratinga euops*, are dependent on very specific plant species for feeding and nesting).

Table 15. Ecological requirements of selected priority species

Species	Ecological requirements/threats
Guaniguanico	
Cuban Long-nosed Toad (*Bufo longinasus*): endemic, IUCN endangered.	Subtropical or tropical moist lowland forests, rivers, intermittent rivers, and freshwater marshes. Area of occupancy probably less than 500km^2, with severely fragmented distribution, and the extent of its upland forest habitat in Cuba is declining.
Blue-headed Quail-Dove (*Starnoenas cyanocephala*): endemic, IUCN endangered.	Swamps and moist forests. Extremely rare, with a very small population with extremely small subpopulations, and numbers are continuing to decline in response to hunting and habitat loss.
Giant Kingbird (*Tyrannus cubensis*): endemic, IUCN endangered.	The precise reasons for this species's decline are unclear, but habitat loss, and especially loss of large trees suitable for nesting, from logging and agricultural conversion is presumably at least a contributory factor[10].
Eleutherodactylus symingtoni (frog): endemic, IUCN critically endangered	Inhabits rocky areas and caves in lowland, mesic closed-canopy broadleaf forest. It has not been recorded outside forest habitat[11].
Gundlach's Hawk (*Accipiter gundlachi*): endemic, IUCN endangered	Found up to 800 m in a variety of wooded habitats including humid, dry and pine forests. Habitat loss and disturbance as a result of logging and agricultural conversion, and human persecution (because it preys on poultry) have been the chief causes of its decline[12].
Guamuhaya	
Bufo longinasus	See above
Accipiter gundlachi	See above
Cuban parakeet (*Aratinga euops*): endemic, IUCN vulnerable	Semi-deciduous woodland, palm-savanna habitat, trees on cultivated land and the edges of woodland. Nests in tree-cavities or holes in arboreal termite nests, and mostly restricted to dead royal palms (*Roystonea regia*) and sabal palms (*Sabal palviflora*) (Snyder et al. 2000). Breeds in late April or early May, coinciding with maximum fruit availability, and runs through to August. Ranges widely in search of food[13].
Bamburanao	
Starnoenas cyanocephala	See above
Little goblin bat (*Mormopterus minutus*): endemic, IUCN vulnerable	Continuing decline in the extent and quality of forest habitat. Uses human made structures. Obligate on only one palm tree species for its persistence[14]
West Indian Whistling Duck (*Dendrocygna arborea*): IUCN vulnerable	Mostly nocturnal and secretive, inhabiting wooded swamps and mangroves, where it roosts and feeds on plant food including the fruit of the Royal Palm.
White-Crowned Pigeon (*Patagioenas leucocephala*): IUCN near threatened.	Classified as Near Threatened because although it has quite a wide range, it is restricted to low-lying areas where deforestation and habitat degradation are most intense. Together with hunting pressure, this is thought to be causing a moderately rapid population reduction[15].
Nipe-Sagua-Baracoa	
Cuban solenodon or almiqui (*Solenodon cubanus*) (mammal): endemic, IUCN	Found in dense, humid forests and brush country. Small frogs, insects and spiders, found in soil and in leaf litter form most of its diet. All individuals are in fewer than five locations, and there is continuing decline in the extent and quality

[10] http://www.birdlife.org/datazone/speciesfactsheet.php?id=4418
[11] http://www.iucnredlist.org/details/56988/0
[12] http://www.iucnredlist.org/details/106003462/0
[13] http://www.iucnredlist.org/details/106001570/0
[14] http://www.iucnredlist.org/details/13884/0
[15] http://www.iucnredlist.org/details/106002475/0

Species	Ecological requirements/threats
endangered.	of its habitat. Feral dogs and cats are probably its greatest threat; habitat loss is also a factor contributing to its rarity[16].
Ivory-billed woodpecker (*Campephilus principalis bairdii*): IUCN critically endangered (possibly extinct: no confirmed records since 1987 despite many searches).	Originally found in both bottomland hardwood and montane (pine, mixed and broadleaf) forests: very large home range and low densities, so suggesting that large contiguous tracts of mature woodland would be required to support a viable population. Extensive habitat loss and degradation in the lowlands mean that any remaining population may be restricted to intact montane *Pinus cubensis* forests. The primary requirement is for dead trees, which harbour wood-boring beetle larvae, its preferred food source[17].
Cuban Kite (*Chondrohierax wilsonii*): endemic, IUCN critically endangered.	Confined to montane gallery forest, feeding chiefly on tree snails Polymita and slugs in the understorey. Historically inhabited xerophytic vegetation and montane forest. Its decline is mainly attributed to habitat destruction and alteration caused by logging and agricultural conversion. Persecuted by farmers because they mistakenly believe it preys on poultry[18].

143. The principal aims of the project in promoting reforestation and agroforestry systems are as follows:

- Creation of favourable conditions for target species, thereby increasing the total area of habitat available to them and in this way permitting increases in their population sizes, and facilitating their movement across the landscape in order to maximize the genetic viability of remnant populations and reduce the risk of local extinctions;
- Reduction of negative impacts on freshwater, coastal and marine aquatic ecosystems resulting from erosion-related sediment runoff;
- Promotion of the sustainability and resilience of production systems (especially agriculture, grazing and coffee) in ecological and productive terms, thereby helping to stabilize and reduce processes of anthropogenic landscape change, as well as conferring social benefits on local communities.

144. To this end, the project will support the establishment of compositionally and structurally diverse assemblages of native tree species, for example in plantations, agroforestry and silvopastoral systems, and shaded coffee and cocoa plantations. Plantations will be multi-purpose in nature: as well as contributing to habitat and connectivity, they will be managed (as appropriate) for the sustainable extraction of timber and non-timber products, and the generation of environmental services including soil and water protection and resources, as well as pollen and nectar to support the regions' apiculture industries. Species will be chosen on a site-specific basis, taking into account not only their compatibility with soil conditions but their value as food and habitat for target biodiversity (for example fruit for endangered bird species such as *Aratinga euops* in Guamuhaya); evergreen and moisture-loving species will be established in the vicinities of water courses to contribute to the development of conditions typical of gallery forests, in order to benefit native and endemic ichthyofauna and species such as *Chondrohierax wilsonii*, which are largely limited to this forest type.

145. Wherever possible, use will be made of assisted natural regeneration, rather than plantations *per se*, as this will favour the development of biologically rich and diverse ecosystems including both common and rare or threatened tree and shrub species, together with their associated native fauna and their ability to provide ecosystem services. In addition to trees with recognized potential for multiple uses and services

[16] http://www.iucnredlist.org/details/20320/0
[17] http://www.iucnredlist.org/details/100600719/0
[18] http://www.birdlife.org/datazone/speciesfactsheet.php?id=30037

(including apiculture, medicine, ornamental use and consumption), other species which normally form part of the understorey will be promoted through natural regeneration, including *Hamelia patens*, *Erythroxylum havanense* Jacq., *Picramnia pentandra*, *Eugenia* spp., *Bourreria* spp., *Espadea amoena*, *Citharexylum spinosum* L., *Psychotria* spp., *Agave* spp., *Ficus* spp., *Copernicia* spp. and *Coccothrinax spp*.

146. Agroforestry and silvopastoral systems will similarly be designed and implemented in such a way as to promote habitat and connectivity value. Throughout Latin America and the Caribbean, trees in pastures have been found to generate a number of ecosystem benefits including increased soil water infiltration, and consequently reduced cross-surface runoff and soil erosion (Ríos et al. 2007), enhanced biodiversity (Sáenz et al. 2007), improved carbon capture (Ibrahim et al. 2007) and improved soil nutrient cycling (Sandoval 2005; Castro 2010). Dispersed trees in pastures also play and important role in animal production. Milk and beef production are estimated to increase by between 10 and 15% in pastures with high tree cover compared to those with low cover or without trees (Restrepo 2004). This is attributed to the effects of shade, which reduces heat stress, especially in the humid and sub-humid tropics. This is however offset to some extent by reductions in pasture production due to the effect of shade on pasture grasses, especially when tree cover exceeds 30%. An optimum level may be around 20%. Tree shade can be regulated by managing tree density and carrying out pruning and pollarding, depending on the type and size of the trees, their height, width, opacity and the form of their crowns.

147. In Cuba, the potential of agroforestry and silvopastoral systems has been widely demonstrated in settings such as those found in the target mountain massifs: here grazing has traditionally been carried out with low livestock loads, in extensively-managed and tree-poor pastures and with a reliance on natural pasture grasses as feed, resulting in low productivity and negative impacts on biological diversity and other natural resources, and agriculture has typically lacked adequate soil conservation measures. The introduction of these systems has permitted the diversification of production systems and the attainment of promising production levels, in the order of 0.8-1.0t/ha, 3.0-4.0t/ha and 5.0t/ha of grains, rootcrops and vegetables respectively; 240kg and 460kg/ha/year of mutton and beef respectively, and 10-20t/ha of fruit.

148. Live fences can make a significant contribution to biodiversity, especially those with high levels of tree species and structural diversity (Harvey et al. 2008). Multi-layer live fences show greater richness and abundances of bird and butterfly species than simple fences, and than pastures with high tree densities (>30/ha): in some cases their biodiversity may approach that of secondary forests or fallows (Sáenz et al. 2007; Tobar et al. 2007). Live fences can make an important contribution to biological connectivity in agricultural landscapes as they facilitate the movement of fauna (Chacón and Harvey, 2006); however effective biodiversity conservation depends on plant cover and diversity across the landscape as a whole (Enríquez et al. 2007). The diversification of existing live fences through the establishment of additional species results in a diversification of the products generated for farmers, including the generation of higher quality timber, and diverse types of fruit.

149. The degree of priority given to biodiversity considerations (habitat and connectivity) in the design and establishment of productive prescriptions will be determined by their location in relation to key areas of connectivity and core refuge sites; the specific management regimes and species to be applied will be recommended on the basis of site-specific research into available native tree species, their compatibility with the food, habitat and connectivity requirements of the target biota, and ongoing field research into the performance of different management systems and species combinations. In practice, the spatial differentiation of management regimes will be achieved, for example, through the selective application of criteria for the provision of incentive support, and the provision of spatially-differentiated extension messages.

150. Taking advantage of the lessons learnt through the EU-funded project “Environmental bases for local food security” (BASAL), the project will also seek to maximize the benefits of agroforestry and

silvopastoral systems in terms of productive resilience and ecosystem-based adaptation to climate change. Agroforestry systems in general tend to have the potential to maintain relatively stable micro-climates and soil humidity, which can be particularly important for sensitive species under conditions of climate change, as well as buffering production systems against conditions of variable precipitation and evapotranspiration; they can help to buffer crops against extreme weather events such as hurricanes, by providing physical barriers; and their relatively high specific diversity facilitates their adaptation to changing conditions, increasing the likelihood that species with specific roles (such as pollinators) can be substituted by others in the event of them becoming locally extinct due to climate change.

Table 16. Summary of alternatives to be put in place to counter threats to biodiversity

Current practices	Alternatives to be put in place by the project, and corresponding outputs supporting their application	Expected global benefits
Inappropriate agricultural and ranching practices, including conversion of fallow land in mountain areas to annual crops, and grazing and cultivation on slopes without adequate soil conservation measures	**Output 3.1a:** - Agroforestry and silvo-pastoral systems, motivated by their potential to increase productivity and profitability, the provision of direct support in the form of agricultural inputs, training and extension support. **Output 3.1b:** - Forestry and shade coffee, promoted through price support to coffee, direct incentives for forestry through FONADEF, and income generation opportunities such as eco- and agricultural tourism **Output 3.2:** - Improved enforcement through the provision of training and equipment to the responsible authorities and improved collaboration with local communities.	Increased biological connectivity, habitat value and provision of environmental services such as water supply and the reduction of soil erosion, and increased resilience to climate change
Uncontrolled fires set by farmers, in order to clear vegetation and clear weeds and pests in pastures	**Output 3.3:** - Integrated fire management plans - Strengthening of institutional capacities for prediction, detection and control - Collaboration with local communities	Reduced degradation of ecosystem structure and habitat value, particularly in dry ecosystems
Contamination due to discharges of organic wastes and waste water from pig rearing units, sugar cane mills and coffee depulping facilities into streams, affecting aquatic biodiversity.	**Output 3.1c:** - Conversion of organic wastes from pig production units into biogas in order to reduce water contamination, motivated by economic benefits in terms of energy generation and facilitated through the provision of technical and financial support. - Ecological coffee depulping facilities which reduce water use and convert pulp into compost, with financial support in the form of donations or loans, technical assistance, and motivated by the possibility of gaining access to premium markets for environmentally-friendly coffee (through national or international certification schemes).	Reduced impacts on aquatic biodiversity in freshwater and coastal habitats
Open-cast mining	**Output 1.1d:** - Spatial planning to minimize impacts on ecologically sensitive areas **Output 3.2:** - Improvements in regulatory capacities	Reductions in the destruction and fragmentation of natural ecosystems

Table 17. Specific land management practices and associated environmental benefits

Practice	Global Benefits	Local/National Benefits
Establishment of compositionally and structurally diverse assemblages of native tree species in plantations, agroforestry and silvopastoral systems, including increased numbers of trees in pastures (up to around 20% shade, managed by regulating tree density, pruning and pollarding)	- Establishment of evergreen and moisture-loving species in the vicinities of water courses contributes to the development of conditions typical of gallery forests, in order to benefit native and endemic ichthyofauna and species such as *Chondrohierax wilsonii*, which are largely limited to this forest type. - Individual native tree species will provide food and habitat for specific elements of target biodiversity (for example fruit for endangered bird species such as *Aratinga euops* in Guamuhaya) - Use of assisted natural regeneration will favour the development of biologically rich and diverse ecosystems (see paragraph 145) including rare and threatened tree and shrub species, together with their associated native fauna - Increased soil water infiltration, and consequently reduced cross-surface runoff and soil erosion, enhanced biodiversity, improved carbon capture and improved soil nutrient cycling.	- Protection of hydrological flows by gallery forests - Provision of ecosystem services (e.g. apiculture, medicine, ornamental use and consumption) by compositionally diverse ecosystems resulting from assisted natural regeneration - Improved milk and beef production due to reduced heat stress (optimum level of shade is around 20%),
Live fences with high levels of tree species and structural diversity	- Multi-layer live fences show greater richness and abundances of bird and butterfly species than simple fences, and than pastures with high tree densities - Live fences can make an important contribution to biological connectivity in agricultural landscapes as they facilitate the movement of fauna (subject to conditions of plant cover and diversity across the landscape as a whole)	- Diversification of the products generated for farmers, including the generation of higher quality timber, and diverse types of fruit.
Maintenance of areas under shade coffee	- Structural diversity (compared to single storey sun coffee) improves soil protection against erosion and mass movement, resulting in reduced levels of sediment load affecting downstream, ecosystems - Biological connectivity and habitat (subject to location and management)	- Improved nutrient status and crop health compared to sun coffee - Tree products (firewood, timber and fruit) from the pruning of shade trees
Treatment of liquid wastes from coffee pulping and pig production units	- Reduction in levels of biological oxygen demand and consequent improvements in health of aquatic ecosystems into which the wastes drain,	- Improved access to water of usable quality - Improved availability of aquatic fauna for consumption

Project objective, outcomes and outputs/activities

151. The activities of the project, aimed at removing these barriers, will be structured within the following three components.

Component 1: Systemic landscape management framework.

152. Activities under this component will focus on making the REDS (comprising the PAs and the landscapes that surround them) operational, through the establishment of a supportive institutional framework, effective decision-making structures and mechanisms for engaging communities in sustainable natural resource management.

Output 1.1: Decision making tools for planning and enforcement.

153. The project will ensure that natural resource management in the project areas is subject to a coherent planning framework that is guided by solid science and permits the application of an integrated landscape-wide, inter-sector and interinstitutional approach. To this end, it will support the strengthening of the information bases and information management systems of each of the collaborating institutions, where necessary updating the information that is available, and developing systems for interinstitutional collaboration that will ensure that staff of different sector institutions have access to information on the full range of variables needed to guide their planning processes in a coherent and integrated manner.

a) Strategic Environmental Assessment

154. The project will also support the realization of Strategic Environmental Assessments of the impacts of programmes of infrastructural or productive development, and the development of lasting institutional capacities to carry out SEA in the future. In this regard, the project will build upon the experiences gained with SEA in Sabana Camaguey (with GEF/UNDP support), which is one of the few cases in which SEA has been applied in Cuba to date. The project will follow the methodological guidance developed by the Institute of Tropical Geography for the use of SEA in land use planning and sustainable development[19]

b) Models of implications of climate change for biodiversity and ecosystem resilience

155. As recommended in the STAP review of this project, the design of the project gives consideration to the interface between the observable and potential impacts of climate change in terms of maximizing options for enhancing ecosystem resilience. Natural events such as hurricanes, drought and extreme rainfall events are likely to increase in terms of their impact, considering the location of the project and mountainous context. The National Report to the Convention on Biological Diversity identifies climate change as one of the major threats to diversity in the country[20]; however, although a number of studies have been carried out into this issue, few of them have explored the possible changes in the distributions of terrestrial flora and fauna as a result of climate change.

156. As an essential requirement for the zoning and management planning of the target mountain areas, the project will develop and apply tools for modeling these potential impacts of climate change on biodiversity. In order to maximize the cost-effectiveness and immediacy of the results, these processes will focus principally on reviewing and systematizing existing knowledge on the current distributions and ecological characteristics of target species and ecosystems (particularly the relations between these factors and climatic variables); and then integrating these data with climate change models (see paragraphs 90-98) in order to predict future trends in their spatial distributions and conservation status. This will allow issues such as the following to be addressed:

- The upward movement of isotherms due to climatic warming, resulting in possible increases in the fragmentation of mountain-top ecosystems and the corresponding need for the compensatory establishment of corridors;

[19] Marrero, Martínez and Quintana (2012): "La Evaluation Ambiental Estratégica como herramienta para el ordenamiento ambiental y el desarrollo sostenible en Cuba. Propuesta metodológica." Revista Cubana de Geografía No.1, Edit. Instituto de Geografía Tropical, 2012.

[20] CITMA, 2009

- Drying of ecosystems as a result of changes in rainfall and temperature regimes, resulting in increased needs for investment in fire prevention, and basin management practices to compensate reduced runoff;
- Climate-related changes in the phenology of plant species on which ecosystem function and the ecology of target fauna may depend;
- Increased needs for "climate-proofing" production systems against increasing climatic extremes, such as prolonged droughts and increasingly frequent storm events;
- Changes in the susceptibility of natural ecosystems to invasive alien species.

157. National specialists in different taxonomic groups will select groups of species which meet the following non-exclusive criteria: endemic of threatened species with well known taxonomy, with key functional importance (e.g. primary species, seed dispersers, pollinators and predators). The analyses will include reports of the presence of the selected species, based on observations, as well as published data, PA management plans, collections of national zoos and herbaria, and on line databases of museums and international collections (e.g. Global Biodiversity Information Facility, http://data.gbif.org). Each locality with a reported occurence will be georefenced. The potential distribution or ecological niche of each species will be modelled through the application of climatic and geographic variables; climatic variables will be taken from the list of 19 included in the World-Clim database for Cuba[21], for the definition of geographical variables the digital elevation model developed for the Topographical Radar Mission will be used[22], together with soil variables obtained from ISRIC (http://www.isric.org). Each of the predictive variables will be applied at a resolution of 0.8 km^2). In addition to these World-Clim climatic variables, layers of climatic and geographic data generated in Cuba will be used as independent variables. Maxent[23] and GARP[24] modeling algorithms will be applied. The climate predictions will use the different scenarios generated by the IPCC, based on models of general atmospheric circulation[25].

c) Maps, databases and integrated inter-institutional geographical information systems

158. The Institute of Tropical Geography, as lead institution in AMA with responsibility for environmental information management, will implement an Environmental Information System (EIS) as a tool for information management, for the communication of the results of monitoring (of biophysical and socioeconomic variables at programme and project levels), and for supporting decision-making. To this end, it will complement, integrate and redimension the existing INFOGEO network. This geographical information system will initially be implemented within the context of the project, and serve for the management of project-related information, but will in the process by fully institutionalized as a permanent product of the project. This process will involve the following:

- Diagnosis, design, implementation and strengthening of information/communication technologies for the administration of central and secondary information nodes;
- Training of specialists in the central and secondary nodes for the installation and administration of information and communication equipment;
- Diagnosis, design and complementary implementation of the network, with an increase in bandwidth in the central and secondary nodes;
- Diagnosis, design and implementation of the Information Management System, together with training of specialists in the central and secondary nodes, and external users of the system.

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21 Hijmans et al., 2005

22 ftp://e0srp01u.ecs.nasa.gov/srtm/version2/SRTM30

23 Phillips et al. 2006; http://www.cs.princeton.edu/~schapire/maxent/

24 Stockwell y Peters, 1999; http://www.nhm.ku.edu/desktopgarp/Download.html

25 Capote R, Mitrani I, Suárez AG. 2011. Conservation de la biodiversidad cubana y cambio climático en el Archipiélago cubano. Revista de Anales de la Academia de Ciencias de Cuba 1(1): 1-25.

- Diagnosis, design and implementation of desktop and web services and applications for the management of spatial information and the protection of geospatial data, including training of specialists and users;
- Design and implementation of a website.

159. The information management system will bring together data generated by a range of institutions, on diverse variables. The monitoring programmes to be established within the context of the project, for biological and physical variables, are proposed in Section II. In addition to supporting the design of these programmes, the project will contribute to the development of the human and logistical resources required for their effective functioning and sustainability. To this end, training centres will be established, with the necessary technical equipment. In these centres, technicians will be trained in a locally-contextualized manner in order to maximize the local relevance and applicability of their capacities. This will be backed up by the provision of selected equipment essential for biological monitoring (such as camera traps and acoustic monitoring devices), as well as laboratory equipment for *ex situ* studies.

d) Landscape-level land use plans

160. As a complement to the land use planning processes carried out by the Institute of Physical Planning (which has the legal prerogative for defining land use categories), the project will support the Environment Ministry CITMA in defining environmental land use plans (*planes de ordenamiento ambiental*), using methodologies that have already been tried and tested in Cuba (see paragraphs 34-38). Under this Project, these plans will be developed in each of the target mountain massifs. This will correspond to the 'Regional' level of environmental land use planning (see paragraph 36), the objective of which is "to carry out diagnoses of environmental and socioeconomic conditions with the aim of protecting the environment and preserving, restoring and carrying out sustainable use of natural resources; it includes the determination of environmental units, the description of their abiotic, biotic and socioeconomic resources, the definition of environmental conditions, and the definition of ecological criteria for the sustainable use of natural resources, productive activities and human settlements". The value added of the project in this regard will be the incorporation of an integrated approach to ecosystem resilience and biological connectivity, defining priority areas for conservation and connectivity and the range of specific uses and management regimes appropriate to different site types. This will integrate the proposals for expansion and consolidation of PAs, together with their corresponding internal zoning and management regimes, with the proposed zoning and management regimes for the production landscapes that occupy the rest of the REDS, between and around the PAs (to be developed and applied under Components 2 and 3 respectively).

161. Existing criteria for the spatial planning of natural resource management will be reviewed and fine tuned in order to ensure that land uses and management practices are compatible with biophysical and socioeconomic conditions at local level. The project will also support improvements to the planning of forestry and agroforestry initiatives, in order to maximize their potential to contribute to the habitat connectivity and value of the landscape, for example through review and refinement of the criteria used for the selection of sites and species used for reforestation and the definition of appropriate silvicultural prescriptions. In addition to matching species and management regimes to conditions of soil type (e.g. drainage, texture and pH) and slope, in order to maximize tree survival and soil conservation benefits, the project will support the inclusion of further criteria related to biodiversity and ecosystem resilience, such as location in relation to key connectivity areas, and the potential of different tree species and forestry/agroforestry management regimes to satisfy the food, habitat and connectivity requirements of key biota.

162. As an input to these landscape level planning processes, forest inventories and assessments will be carried out over an area of 700,000ha of the target mountain systems. This will involve the completion and

consolidation of national and regional forest planning units, in order to allow the implementation of new methods of forestry inventory and planning that will maximize the reliability of the resulting data.

e) Community-based environmental plans

163. Community involvement will be promoted through the generation of community-based environmental plans derived from participatory analyses of resource management options and zoning options (see paragraph 36). Depending on the social and organizational conditions in each site (see Stakeholder Analysis section, to be be defined in more detail through participatory diagnoses during the implementation phase), these may be developed by any one of the social structures existing at sub-municipal levels in the target areas, including Popular Councils, Communities, local Protected Area committees and Cooperatives, each of of which defined geographical areas of operation and constituencies. These plans will take into account the landscape-wide provisions of the regional level of environmental planning proposed under Output 1.1c above, but will include more site-specific provisions, which will be reflected for example in the annual and multi-year production plans of cooperatives and other socially-based productive entities.

164. Initially it is proposed to commence the process of community-based environmental land use planning in two pilot locations in the Bamburanao massif: Florencia settlement and Rincón de Mabuy, on the southern and northern sides respectively of the Jatibonico Range. The northern part of Florencia settlement is located within the limits of the Buenavista Biosphere Reserve, and both municipalities include parts of the proposed Boquerón Outstanding Natural Element PA. The population of both municipalities have prior awareness of the concept and processes of environmental land use planning, and the local government of Florencia in particular has prioritized sustainable economic development.

f) Proscriptions of land uses and practices in sensitive areas

165. Additionally, the project will support the definition of proscriptions of certain land uses in sensitive areas, based on analyses of the biological characteristics of the areas and the likely impacts on them of alternative land uses. These proscriptions will be incorporated into the regulations of municipal authorities; agencies of central Government with responsibilities for promoting, overseeing and regulating productive activities and environmental management, such as CITMA, MINAG (including the State Forest Service) and their respective delegations at provincial levels; and the internal regulations of the production entities (e.g. cooperatives and UBPCs) themselves. Subject to case-by-case confirmation based on site-specific analyses of production systems and environmental considerations, these proscriptions are likely to cover practices such as the use of fire for site preparation and pest control, the application of agricultural chemicals (ranging from possible outright prohibitions in some cases to restrictions on the list of permissible chemicals in others) and the management and discharge of liquid wastes from processing facilities such as coffee depulping plants (specifying how wastes are to be treated prior to discharge, the permissible locations of discharge points, and the biochemical parameters of allowable discharges).

g) System for early warning of fires and for planning of fire management and control

166. Over the coming years, the Government will continue to prioritize actions aimed at the prevention and control of forest fires, in recognition of the fact that the frequency of these has reached levels which are outside the levels of tolerance of natural ecosystems, leading to deforestation, soil degradation and loss of biological diversity. Systems will be developed for providing early warning of fires, and for planning management and control responses in the case of outbreaks occurring. Management responses to fire outbreaks will be defined, and resources allocated, in advance on the basis of characterizations of the relative levels of susceptibility of different ecosystems to fire (determined by factors such vegetation type and proximity to agricultural areas, settlements and roads) and their vulnerability and responses to its effects (determined by their ecological characteristics).

Output 1.2: Extension support system, to guide land holders/ users to adapt production practices.

167. Integrated training modules will be developed and delivered for extension agents, resulting in more effective and participatory delivery of extension services and the incorporation into extension messages of environmental issues including sustainability, resilience, production of ecosystem goods and services and the compatibility of productive practices with BD conservation. These training modules will be aimed at extensionists in a range of institutions, such as the Soils Institute, the State Forest Service, the National Institute for Hydrological Resources (INRH) and their respective provincial-level dependencies, as well as the the State-owned companies (dependencies of MINAGRI), with which farmer cooperatives enter into production contracts and which constitute their main source of extension support.

168. In keeping with the integrated, multi-sector approach of the project, one of its priorities will be to ensure that the extension approaches applied by these different institutions are harmonized and incorporate integrated, rather than sector-specific messages. These will stress, for example, the interdependence between ecosystem diversity and function, soil health, hydrological and nutrient cycles and the resilience of production systems. In this regard, the project will learn from and build upon the processes of capacity development for extension carried out within the context of Project 1 of the Country Pilot Partnership on Land Degradation (GEF ID 3578 "CPP Cuba: Capacity Building for Planning, Decision Making and Regulatory Systems & Awareness Building/Sustainable Land Management in Severely Degraded Ecosystems").

169. This system-level guidance and capacity development, aimed at 'training the trainers', will be paralleled by site level activities under Output 3.1 aimed at directly strengthening capacities for technology development and transfer, including the development of training modules for farmers, the provision of support to Integrated Forest Farms and the establishment of demonstration farms and other production units.

Output 1.3: Mechanisms for cross sectoral awareness-raising, institutional support and participation in planning, implementation, enforcement and monitoring.

a) Awareness –raising, environmental education and communication programme

170. The model proposed by the project assumes the integration and reconciliation of productive sector and environmental issues, and therefore collaboration between the diverse institutions with responsibilities for these issues. To this end, the project will raise awareness among national stakeholders regarding the integrated, inter-institutional and landscape-wide approach that is proposed, and assist them to work together on its implementation. This will result in concrete benefits in terms of the nature and magnitude of the impacts generated by these institutions at field level. This awareness raising is of fundamental importance given the novelty of the approach proposed, which contrasts with the sector-based and vertical approaches that have tended to dominate to date.

171. Particular attention will be paid to raising awareness of the goods and services provided by sustainable production systems. The results of the project in terms of increased forest cover (including gallery forests), forest enrichment, and increased extent of agroforestry and silvopastoral systems) will be translated into assumed increases in the levels of environmental goods and services, through the application of conversion factors related to the relative levels of soil erosion, infiltration/runoff and carbon storage under alternative land uses, and the resulting figures will be presented to decision-makers in order to bolster political support for the proposed productive changes, as well as increasing commitment to incentive schemes such as FONADEF. These assumptions will be backed up by specific studies to confirm their validity, using an experimental approach comparing intervention areas in the target massifs with control localities.

172. The programme will involve a wide range of actors, including a central coordination group made up of IES, INAF, CNAP, MNHN and MINAG, together with a range of other actors which will participate in the implementation of the programme by functioning as channels for the messages to be transmitted, including the mass media, educators, environmental and cultural promoters, community leaders, MINED and MES. The target audiences for the programme will include local communities (landowners and usufruct holders), students and local governments, as well as key decision-makers in institutions including MININT, MINFAR, MINAG, Energy and Mines, IPF, MINTUR, MINCONS, CITMA, MINSAP and INRH.

173. The programme will include the following elements:

- *Training*, in order to development knowledge, capacities and values allowing active participation in the conservation and sustainable use of biodiversity. This will be achieved through a range of approaches including video-debates, seminars, courses, 'green libraries', 'green maps', 'schoolyard ecology', citizen science, training of parlamentarians, and interchanges of experiences.
- *Institutional communication*, including the design of the graphic identity of the project, the development and implementation of a communication campaign and associated materials (e.g. radio spots, posters and leaflets)
- *Communication of public goods*, including the design of acultural education programme (e.g. through fixed and travelling exhibitions), the creation of a website, and other communication tools such as multimedia, videos, photos, books and pamphlets.

174. The programme will be governed by the following principles:

- *Interdisciplinary approach*: integration of different disciplines and fields of knowledge, in order to explain how different threats affecting biodiversity interact, and apply psychopedagogic and communication tools for raising awareness and seeking solutions;
- *Participatory nature*: it will aim at allowing individuals to participate actively in the conservation of biodiversity, on the basis of a collective identification of the problems affecting them and of the corresponding solutions;
- *Promotion of gender equity:* this implies decision-making being based on an analysis of the gender relations within which the educational actions are carried out; it allows the visualization and recognition of the different ways in which men and women interact with biodiversity, as well as their respective opportunities for contributing to countering threats to biodiversity.

b) Incorporation of integrated approach into strategic planning documents of key institutions

175. The adoption of the approach by the institutions in question (including MININT, MINFAR, MINAG, MINBAS, MINTUR, MINCONS and CITMA), and their commitment to inter-institutional collaboration, will be formalized by ensuring that this is incorporated into their strategic planning documents, which constitute multi-annual frameworks for their institutional actions. This will be complemented by more specific training of local and technical staff of these institutions on how to put the concepts promoted by the project into practice.

c) Platforms for joint planning and action

176. Concrete mechanisms will be established for putting these commitments to communication and collaboration into practice, in the form of platforms or committees for the joint planning of institutional actions in key areas such as monitoring and enforcement. Key actors to be involved in these mechanisms will include INAF, the Forest Service, the Soils Institute, the IES and INRH. These will result in the establishment of integrated interinstitutional programmes for monitoring and evaluation and for

enforcement that will pool resources, and link and harmonize the existing programmes of each of the major institutions involved, particularly CITMA and MINAG.

Output 1.4: Local participation mechanisms

177. The project will promote the role and capacities of existing village level participation mechanisms (Popular Councils) in the design and implementation of plans and programmes on the conservation and sustainable use of BD and the solution of priority environmental programmes, in order to maximize the relevance, local acceptance and therefore social sustainability of these. These Popular Councils are long-established and well-tested as platforms for the representation and discussion of stakeholder interests, and for community-level decision making. They will play a major role in coordinating community-level activities related to the project, including the establishment of control and feedback mechanisms regarding progress with project activities, through regular meetings. They will also play a vital role in facilitating communication between local communities and municipal governments. They have the potential to mobilize other local organizations, namely the Union of Young Communists, Committees for the Defence of the Revolution and the Federation of Cuban Women, for the educational and awareness raising activities of the project.

Output 1.5: Strategies for developing market-based mechanisms for conservation

178. Conditions for introducing market-based mechanisms for conservation are currently favourable, in terms of openness among policy makers (in fact the Government already supports the production of shade coffee that conforms to norms on species composition and structure). The project will support the realization of detailed analyses of the feasibility of taking these existing schemes further, so that they provide specific price premiums and/or preferential market access for coffee produced under diverse, BD-friendly shade. The end product of the project in this regard will be specific strategy recommendations for decision-makers in Government, covering aspects such as national and international market options, alternative certification schemes and their criteria, needs for technical support, and messages for decision-makers regarding the potential benefits of such schemes at local, national and global levels.

Component 2: Management effectiveness for core PAs within the context of fragile mountain landscapes

179. The existence of well-functioning PAs is a central element of the model to be promoted by the project. These will act as core refugia for metapopulations of species of high global conservation priority, from and between which the species will be able to migrate and interact across the landscape as a whole, taking advantage of the increasing hospitability and connectivity of the landscape that will result from the project's interventions under Components 1 and 3.

Output 2.1: Institutional capacities for PA management functions.

180. CNAP has already defined the locations of the PAs that are required within the target areas, taking into account biological and socioeconomic considerations (see Output 2.1 below). The project will complement this by supporting the validation of their design (their external boundaries and internal zoning) and their management and financial plans, in order to ensure that they adequately take into account landscape-wide considerations of connectivity and flows of environmental goods and services, allocate resources correspondingly and make appropriate provision for financial sustainability, and by supporting the development and implementation of systems and equipment for monitoring, surveillance, enforcement and reporting.

Output 2.2: Expansion of PAs to encompass threatened unprotected ecosystems.

181. In addition to the consolidation of existing PAs, the project will support CNAP in establishing additional 8 PAs (covering 13,812ha) in prioritized connectivity zones, in order to fill in ecosystem coverage gaps. Project resources will be used for the development of management plans for these PAs, which will take into account their interactions with the broader landscapes that surround them, for the

administrative processes leading to their formal gazettal, and for the installation of the infrastructure and equipment required for their effective management.

Table 18. Existing and proposed PAs within the target massifs

Existing PAs		Proposed PAs			
		To be declared with project support		Others	
Name	**ha**	**Name**	**ha**	**Name**	**ha**
Guaniguanico					
Viñales	11,120	Mogote Soroa	42	Sierra Preluda-Cuabales de Cajálbana	1,413
Mil Cumbres	15,644	Cañón del Río Santa Cruz	409	Sierra de Guane - Paso Real de Guane	480
Las Peladas	214			Sierra de San Carlos	2,845
El Mulo	281			Gramales - Cabeza - La Peña	3,366
El Salón	582			Cerro de Cabras	2,607
RB Sierra del Rosario	24,504			Sierra de Contadores - Cayo Ratones	1,781
Pan de Guajabón	837			Mogote La Mina	70
Reserva de San Marcos	259				
Sub total	53,441	Sub total	451	Sub total	13,658
Bamburanao					
Jobo Rosado	4,181	La Chucha	233	Loma La Tasajera	248
		Boquerón	3,190		
Sub total	4,181	Sub total	3,423	Sub total	248
Guamuhaya					
Lomas de Banao	6,091	Cueva de Martín Infierno	246	Aguacate - Boca de Carreras	1,294
Topes de Collantes	20,135	Pico San Juan	2,945	El Purial	17
		Hanabanilla	1,302		
Sub total	26,226	Sub total	4,493	Sub total	1,311
Nipe-Sagua-Baracoa					
Pico Cristal	18,540	Maisí-Yumurí	5,445	La Caoba	927
Mensura-Piloto	8,486			Charrascales de Micara	1,530
Alejandro de Humboldt	70,680			Parnaso-Los Montes	9,091
Yunque de Baracoa	2,145			Resolladero del Río Cuzco	200
Yara Majayara	1,763			Monte Verde	2,000
Cañón del Yurumí	911			Pinares de Montecristo	76
Baitiquiri	4,424			Pico Galán	437
Cuchillas del Toa	119,336			Alto de las Canas	3,012
				Maisi - Caleta	7,516
				Esparto	2,401
				Tacre	2,328
				Pan de Azúcar	93
				Macambo	2,276
Sub total	226,285	Sub total	5,445	Sub total	31,887
GRAND TOTAL	**310,133**	**GRAND TOTAL**	**13,812**	**GRAND TOTAL**	**47,104**

Component 3: Conservation compatible production systems in threatened mountain ecosystems and conservation corridors leading down to the coast.

182. The support to be provided by the project under this component will be focused specifically in the 4 areas shown in Figure 1, and specifically the areas included in the 'ecological connectivity networks' shown in the attached Map Annex. The production systems to be promoted are described in paragraphs 144-149 above.

183. The project will result in a reforestation rate of 4,000ha per year in these target areas during its period of implementation (including agroforestry systems, windbreaks, Integrated Forest Farms and hydrological protection belts), supported by the national National Fund for Forest Development (FONADEF) incentive scheme. FONADEF is a long-standing and well-proven incentive scheme managed by the Forestry Service of MINAG; the conditions of institutional continuity in Cuba mean that Governmental incentive schemes such as this one constitute a highly reliable long-term source of funding for producers. The National Forest Law, which created the FONADEF, gives legal support to the Mechanism, as do the Water Law and the Environmental Law. The organization in charge of approving management plans for forested areas is the Forest Service; the National Institute of Hydraulic Resources is the other government organization in charge of the regulation of water resources. Administrative and monitoring costs are covered by the Forest Service.

184. FONADEF is not exclusively aimed at biodiversity conservation; however, the project will ensure that in practice it is applied in such a way as to promote biodiversity values, by (under Output 1.1d) mainstreaming biodiversity criteria into land use plans at regional and local levels, including the management plans for Integrated Forest Farms and other productive units within which the incentives will be applied.

Output 3.1: Institutional capabilities for technology development and transfer,

185. The project will seek to enable farmers to implement resource management practices that generate BD benefits ecosystem- and landscape-wide, with a focus on environmental issues including sustainability, resilience, production of ecosystem goods and services, and the compatibility of productive practices with BD conservation. The project will support the compilation of a menu of alternative BD-friendly productive options (based on, but not necessarily limited to, those propose in paragraphs 144-149 above), adapted to the range of biophysical, socioeconomic and productive conditions in the target areas, for promotion among producers and by extension agents.

186. A range of methods will be used to define these productive options, including systematization exercises involving members of institutions involved in agricultural development, natural resource management and conservation, as well as representatives of producer organizations, and reviews of academic and grey literature from both Cuba and overseas. These productive options may include, for example, diverse agroforestry and silvo-pastoral systems (including multi-storey perennial crops such as shade coffee and cocoa) that contribute to the stability and productivity of farming systems by fixing nitrogen, recycling nutrients, physically stabilizing soils, as well as generating multiple tree products and contributing to the habitat and connectivity value of the farming landscape; and ecotourism or agro-tourism, which have the potential to provide direct economic incentives to farmers for managing the land in ways that deliver environmental benefits.

a) Integrated training and extension modules for producers and decision-makers

187. The project will support the development of integrated training and extension modules for producers and decision-makers in cooperatives and other producer organizations, focusing on BD-friendly production practices such as those presented above and on environmental considerations in more general terms, to be delivered by the Soils Institute and the Institute of Agroforestry Research, which are responsible for agricultural and agroforestry extension. This support to producers will result in high levels of immediate

impact, and will complement the project's investments under Output 1.2 in mainstreaming biodiversity considerations into extension programmes at systemic level.

188. Working through the Forestry Extension System, the project will seek to:

- Develop capacities in the Mountain Agriculture Entrepreneurial Group (GEAM) and other particating entities in the sector to adapt their production systems to technological, economic, ecological, environmental and social developments;
- Develop capacities for self-analysis and management for the decentralized planning of Production Units;
- Integrate the actions of different actors involved in forestry and agroforestry production in order to promote processes of participatory innovation at local level;
- Transfer technologies and information of the quality required by producers and mountain communities;
- Contribute to increasing the level of management and capacity of producers, mountain communities and municipal popular councils.

189. To this end, it will develop capacities among extension agents, emphasizing their roles as facilitators of extension processes.

b) Integrated Forest Farms

190. Another key element of the project's strategy for ensuring the scaling up and sustainability of impact will be the consolidation and expansion of Integrated Forest Farms (IFFs) throughout the target areas: IFFs are a well-proven model in Cuba and the project will focus on developing them into foci for the demonstration and replication of BD-friendly productive options and integrated approaches to natural resource management, with clear and effective plans for training and outreach to the producers in their respective catchment areas. The IFFs will also deliver biodiversity benefits directly as they will be strategically located in relation to areas of importance for biological connectivity, to which they will contribute by virtue of their high concentrations of trees in fields and restored habitats.

Box 1. Integrated Forest Farms (IFFs)

The first IFFs were created in 1995, on the basis of experiences with agricultural farms, and were subsequently defined through Resolution #960/98 of the Ministry of Agriculture as the smallest unit of sustainable forest management withing the country's Forestry Business system. The programme has economic, ecological and social objectives. In the new context, the IFF Programme is intended to respond to food production needs and to the occurrence of extreme meteorological events. For the creation of IFFs, the Entrepreneurial Mountain Agriculture Group (GEAM) has established a contractual procedure consisting of three main documents: the official agreement or contract for formation of the IFF, the responsibility commitment and the farm management plan. The IFFs are categorized, depending on the type of forest where they are located, as production, protection and conservation farms.

As part of the forestry sector, IFFs are elegible for FONADEF funding for the following activities:

- Plantation of productive forests with a rotation of more than 7 years, including seed and pot inputs.
- Plantation of protection forests
- Silvicultural treatments and reestablishment or enrichment of forests, in cases where management costs are greater than the value of the timber produced.
- Forestry plantations in protection belts around reservoirs
- Measures for the protection and conservation of forest soils and forestry gene banks

- Payment for environmental services

In recognition of the environmental services generated by the IFFs, farmers receive the following economic benefits:

a) Salary for work carried out in accordance with the Management Plan of the farm
b) 80% of the value of non-timber forest products collected, stores and delivered by the farmer to the company (including wild fruit)
c) 80% of the value of the timber harvested, discounting costs of harvesting transport and forest taxes.
d) 75% of the contributions received by the company for eligible activities carried out by the farmer.

191. In order for the targets of reforestation with native species to be able to be met, the project will in parallel invest in the strengthening of the national system for the collection, handling, storage and processing of tree seeds, focusing in particular on trees of economic, ecological and silvicultural importance. This will result in increases in the availability and improvements in the quality and viability of seed for nursery and reforestation use, and will be accompanied by strengthening of nursery capacities, leading to improvements in the timely availability of seedlings and their post-establishment survival.

c) Demonstration farms/ production units

192. The project will in addition address specific environmental threats, such as those posed to water quality and aquatic biodiversity by the discharge of organic wastes from pig production and coffee depulping units, by supporting the establishment and management of model production systems in selected locations, for demonstration purposes. These will involve '*beneficios ecológicos*' for coffee depulping (in which coffee pulp is composted and the discharge of waste waters is avoided); and biogas production units in pig farms, to reduce aquatic pollution and methane emissions, while generating electricity, cooking gas (which in turn will reduce the impacts of firewood extraction on forest resources, and improve living conditions for women), and compost (which will facilitate the application of non-polluting organic agriculture). In all such cases, emphasis will be placed on demonstrating how to integrate these clean technologies into overall farm management systems and in relating them to specific environmental values and problems (such as high-value aquatic ecosystems currently affected by polluting discharges), rather than viewing them as stand-alone measures; this approach will maximize the demonstration impact of these initiatives.

Output 3.2: Institutional capabilities for ensuring compliance with the provisions of environmental regulations and land use plans.

193. The effective and sustained delivery of environmental benefits depends on the above strategies, related to decision-making, communication and technology transfer, being backed up by adequate provisions for enforcement.

194. The system-level mechanisms for joint planning and action proposed under Output 1.3c will be mirrored by local level platforms aimed at coordinating institutional efforts in relation to monitoring and enforcement, and thereby increasing effectiveness as well as the efficiency of the use of available resources. In addition to the provincial dependencies of the key Government entities listed under Output 1.3c, these platforms will involve local actors such as municipal governments, Popular Councils, CDRs, producer organizations such as ANAP, and representatives of productive entities such as cooperatives. These platforms will aim to maximize local participation in and ownership of environmental governance measures; to this end, the project will carry out training and awareness raising among their local members (especially community and producers groups) regarding the different types and implications of environmental infractions, and the procedures for monitoring, correcting and/or reporting them.

Output 3.3: Capacities for integrated fire management:

195. The project will support local capacities for integrated fire management through a balanced approach including the provision of training and equipment (such as pumps, mobile water tanks and watchtowers) to local local forest fire brigades, as well the development of conditions of "readiness", aimed at minimizing fire risk and ensuring rapid and effective response to fires that may occur. Readiness will be promoted through the development of farm-level plans, and the provision of technical support, training and awareness raising to land owners and managers, voluntary fire brigades and other members of the local population, covering issues such as species selection and silvicultural management to minimize fire risk, best practice for prescribed burning, and the location, design and management of firebreaks. The existing fire risk index will be updated, based on a detailed evaluation of the current outdated systems, taking into account the implications of climate change for the vulnerability and response of ecosystems to fire. The existing fire response system will be reviewed and improved, covering its different components (capture and processing of data, transmission of data and rapid response).

196. A participatory, interinstitutional approach will be adopted in relation to fire management and readiness. This will build on the current inter-sector frameworks overseen by the Forest Guard Corps: these include the State Forest Service and the owners and managers of the forest estate, including Integrated Forestry Enterprises with their respective silvicultural units, the Flora and Fauna Enterprise, Protected Areas, MINAZ, CPA, CCSF and local communities located near to or in forest areas, which are organized into voluntary fire brigades.

Incremental reasoning and expected global, national and local benefits

197. The project will generate major global environmental benefits over 4 mountainous massifs covering a combined area of 41,000km^2: the four areas on which the project will focus are among the most important, in terms of the numbers of globally rare and threatened species and ecosystems which they contain, in this highly biodiverse country (see paragraphs 140-149 for explanations of the benefits to be delivered through the strategies to be promoted by the project) .

198. The project will deliver BD benefits in the form of improvements in the conservation status of the numerous globally important and endangered species listed in paragraph 6, which include a large number of endemic species such as *Bombacopsis cubensis*, *Microcycas callocoma* (CR), *Eleutherodactylus symingtoni* (CR) and *Magnolia cubensis* (EN). The project will also result in effective conservation of the rare and high diversity ecosystems which contain these species, such as montane rainforest, microphyllous evergreen vegetation, cloud forest, xerophytic coastal scrub and the Mogotes vegetation complex, by addressing threats at landscape, rather than site-specific level. The support to be provided by the project to the design, planning and management of PAs within the REDS will result in improvements in their functioning as core refugia for biodiversity, in 17 locations covering 3,571km^2. The benefits generated through improved management and conservation of these ecosystems and the production landscapes that surround them will extend beyond the boundaries of the terrestrial and coastal areas where the project will work directly: reduced runoff of sediments and aquatic pollutants in the numerous water courses that drain from the target areas into the sea will result in improvements in the health of the country's coral reef system, on which fisheries resources of regional importance depend.

199. The project will also generate benefits for other GEF focal areas, including sustainable land management (by helping to maintain the productive potential and ecological functioning of anthropogenic ecosystems) and climate change (by contributing to increases in carbon stocks in restored ecosystems and reducing GHG emissions from pig production units). Of particular importance will be its contribution to the resilience of natural ecosystems to climate change by maintaining functional connectivity, allowing plants and animals to migrate and disperse and to thereby to adapt to the pressures of changing habitat conditions and climate.

200. In line with BD2 guidance, an essential feature of the project's approach is the integration of the objectives of biodiversity conservation and sustainable livelihood support. The productive practices to be promoted by the project will therefore be selected on the basis of criteria including their productive potential and their compatibility with the customs, needs and aspirations of farmers in the target areas. The promotion of agroforestry systems in particular has the potential to increase and diversify farm incomes and food security in the medium to long terms. Improved ecosystem management and restoration will furthermore contribute to the generation of stable flows of environmental goods and services, such as sustainably-harvested tree products and stabilized water flows from reforested catchments, and reduced levels of sediment impact on coral reefs and the economically important fisheries on which they depend. Increases in the extent and improvements in the quality of vegetation cover will also result in reductions in the vulnerability of the population to environmental shocks such as hurricanes and droughts. These changes will be accompanied by increased employment opportunities (particularly for women), improvements in human and social capital (for example strengthened individual capacities and awareness), improved living conditions and reductions in rural-urban migration. Cuba has favorable conditions with regard to gender equity; women participate strongly in social and productive areas, making up 50% of the labor force and 60% of technical personnel, including in the agricultural sector.

201. Table 13 summarizes the local socioeconomic benefits expected from the project, in terms of the numbers of stakeholders by the type of benefit received.

Key indicators, risks and assumptions

Risk	Rating	Risk Mitigation Strategy
Increase in projected threats above the anticipated levels, exceeding the coping range of the strategies	Medium	The project will promote implement an effective and wide-ranging monitoring system which will enable trends in threats to be detected, and will apply an adaptive management approach, featuring constant innovation and experimentation, which will allow the proposed strategies to be modified, expanded or complemented by others as necessary in the face of changing conditions or the recognition of flaws in underlying assumptions.
Conflicts of interest between productive and environmental sectors	Medium	The project will promote mechanisms for conflict resolution and will invest in education, training and awareness raising regarding the potential for synergies between productive and environmental considerations.
Institutional dynamics conflicting with paradigm shift promoted by project	Medium	The project will promote early on a multistakeholder dialogue where the need and priorities of all the actors involved will be identified and joint planning and problem solving will be encouraged. The project will also invest in training and awareness raising.
Extreme natural events	Medium	Emphasis on promoting the diversity and resilience of natural and productive ecosystems to extreme natural events.
Climate change undermines BD values	Medium	Generation of capacities and systems for taking into account, in planning instruments, the implications of alternative climate change scenarios for BD status, such spatial migration and fragmentation of ecosystems, changes in reproductive biology of target biota and increases in the frequency of forest fires.

Policy conformity

202. The project will take a combined BD SO 1 and SO 2 approach, to strengthen the management of PAs, expand PA coverage and ensure the compatibility of PA management with the conservation of BD in production sectors and landscapes.

203. The project will contribute to the following Aichi Biodiversity Targets[26]:

- *Strategic Goal A (address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society):* Target 4 on the implementation of plans for sustainable production and consumption.
- *Strategic Goal B (reduce the direct pressures on biodiversity and promote sustainable use):* Target 5 on reducing the rates of loss, degradation and fragmentation of natural habitats; Target 7 on sustainable management of agriculture and forestry, ensuring conservation of biodiversity; Target 8 on reduction of pollution; Target 9 on invasive alien species; and Target 10 on anthropogenic pressures on coral reefs.
- *Strategic Goal C (improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity):*
- Target 11 on conservation of terrestrial and inland waters through area-based conservation measures, and Target 12 on improving the conservation status of threatened species and preventing extinctions.
- *Strategic Goal D (enhance the benefits to all from biodiversity and ecosystem services)*: Target 14 on restoring and safeguarding ecosystems that provide essential services, and Target 15 on enhancing ecosystem resilience and the contribution of biodiversity to carbon stocks.

204. The project is also in line with 22 items of the 113 of the Guidelines for Economic and Social Policy of the Party and the Revolution, approved by the National Assembly on August 2011, which includes "[emphasis on] the conservation and rational use of natural resources such as soils, water, beaches, the atmosphere, forests and biodiversity, as well as the promotion of environmental education and local sustainable development.

205. It is also consistent with the National Environment Strategy (NES), the principles of which include the application of an ecosystem-based approach to environmental management, with particular emphasis on the relations between watershed management and coastal zones. Cuba is currently executing the National Biodiversity Strategy and Action Plan (NBSAP) 2006-2010 and is in the process of developing an updated NBSAP for the period 2011-2015. Both the NES and the NBSAP propose the establishment of action plans for the conservation and sustainable use of priority ecosystems, the development of methodologies and instruments for the evaluation and economic valuation of BD, the integrated management of BD, the implementation of the National System of Environmental Monitoring, the filling in of information gaps, and the improvement of environmental education and communication regarding BD, all of which are areas that will be addressed in this project. Specifically, the project contributes to Target 2 of the NBSAP, related to the integration of biodiversity values into processes of development planning in mountain ecosystems; Target 3, related to the reformulation of incentives (including the establishment of technical bases for intensifying the use of social and economic incentivos in support of the protection of biodiversity, the development of positive incentives for the conservation of wild species in silvopastoral and agroforestry plantations, and the implementation of environmental service schemes); and Target 4 on responsible consumption and production, including strategic environmental evaluations, environmental land use plans and forestry planning in the mountain massifs.

206. The project will also contribute to the goals of a number of programmes of the Ministry of Agriculture (MINAG), including the National Forestry Programme, which will continue updating forestry inventory and planning to cover 29.4% of the country's forested land by 2015, and the Turquino Plan, which is conceived as a Programme for the Sustainable Development of Mountains and aims to promote

[26] http://www.cbd.int/sp/targets/

sustainable use practices, the development and protection of forests, soil conservation, the recycling of wastes and the application of agrosilvopastoral practices in order to increase food production and achieve the sustainability of local communities. The project will help to implement actions of the Turquino Plan and strengthen the component of biodiversity and actions compatible with conservation, with a landscape focus.

Coordination with related initiatives

207. The project will coordinate with, complement and build upon and add value to a number of GEF initiatives that coincide geographically with its area of influence, including the following:

- The GEF-UNDP project "**Mainstreaming and Sustaining Biodiversity Conservation in Three Productive Sectors of the Sabana Camaguey Ecosystem**", from which lessons will be learnt regarding the incorporation of BD considerations into the agriculture, forestry and tourism sectors in landscapes characterized by ecological vulnerability and productive importance. The Sabana Camaguey project is also working on identifying and establishing biological corridors, which will be an important issue on which the two projects will interchange ideas, experiences.and tools.
- The GEF **Small Grants Programme (SGP)** which is managed by UNDP and from which lessons will be learnt on working with local communities in the management of globally important and fragile ecosystems.
- The GEF-UNDP **marine and coastal PA project**, which will generate data on coral reef health which will serve as indicators of the effectiveness of the present project in reducing the sediment load discharged into coastal waters (specifically, in the southern Pinar del Río, Tunas de Zaza Fauna Reserve and Turquino and Bayamesa National Parks). The project will also serve as a source of lessons with regard to financial planning and integrating conservation initiatives with productive sectors.
- The GEF-UNDP on "**Enhancing the Prevention, Control and Management of Invasive Alien Species in Vulnerable Ecosystems**", which will build capacity at the systemic level to prevent, detect, control, and manage the spread of IAS, which are a threat to BD and production systems in the target areas as well as in other areas of Cuba (this project coincides with two of the areas covered by the IAS project, the south coast of Cienfuegos-Zona de Trinidad and Topes de Collantes, and the Cauto Delta).
- The GEF-UNDP **Country Pilot Partnership (CPP) on Sustainable Land Management** (with which the Guamuhaya, Sierra Maestra and Nipe-Sagua-Baracoa target areas of this project overlap to some extent), which will generate practical models of land management capable of maintaining productive sustainability, while the present project will generate lessons for the CPP on mainstreaming BD considerations into productive systems. The actions proposed in the CPP areas that overlap with this project are focused on improved SLM techniques in pre-mountainous ecosystems, with emphasis on dry forest and livestock (Villa Clara); the sustainable management of dry forest resources, integrated forest farms and water management (Cauto); and halting land degradation and rehabilitating salinized and eroded areas in dry lands and xeric scrub regions (Guantánamo). Coordination between this project and the CPP will be facilitated by the fact that a number of key institutions are involved in both projects, such as the Ministry of Environment CITMA and its dependency CITMA, the Ministry of Agriculture and its dependencies the Institute of Soils and the Institute of Agroforestry Research, national and provincial coordinating authorities and the National Association of Small Producers (ANAP).

208. In addition the project will also coordinate with the following initiatives:

- The UNEP project on "**Creation of capacities for national planning for food security**", which aims to strengthen national capacities for identifying the ecosystem degradation and other environmental impacts associated with food production systems, in India and Cuba, and which will generate lessons in the Cuyaguateje and Hanabanilla National Priority Watersheds (both of which fall within the area of influence of this project) on the characterization and quantification of tradeoffs between food production and ecosystem services in terms of ecosystem resilience, economic development and human development.
- **Birdlife International projects** supporting Important Bird Areas and sustainable development in the Turquino y Bayamesa and Cauto Delta Wildlife Refuge in the Sierra Maestra Range, the results of which will constitute reference points for the current project in relation to the management and use of forest resources and the control of invasive species.

Country ownership: country eligibility and country drivenness

209. Cuba ratified the United Nations Convention on Biological Diversity on 3rd August 1994. The policy instruments and programmes described in paragraphs 29-33and 204-206 (including Law 33 of 1981 on the Protection of the Environment and the Rational Use of Natural Resources, the National Environment Strategy, the National Forestry Programme and National Forest Development Fund, the Turquino Plan and the National Programme for Soil Improvement and Conservation) are evidence of the country's drivenness in terms of the application of an integrated approach to reducing the vulnerability of mountain ecosystems.

Financial modality

Table 19. Total Project Budget per Outcome

Project Components	GEF Financing		Co-Financing		Total ($)
	($)	%	($)	%	
1. Systemic landscape management framework	1,425,129	11%	11,110,970	89%	12,526,099
2. Management effectiveness of core PAs in the context of fragile mountain landscapes	2,550,259	11%	19,883,009	89%	22,433,268
3. Conservation compatible production systems in threatened mountain ecosystems and conservation corridors leading down to the coast	3,150,259	11%	24,560,889	89%	27,711,148
Project Management Cost	356,297	11%	2,781,762	89%	3,138,059
Total Project Costs	7,481,944	11%	58,336,630	89%	65,818,574

Cost-effectiveness

210. The aspect of project design which most contributes to cost-effectiveness is the focus on working with and through existing Government institutions at central and local levels, which takes advantage of their installed capacities and their established relations with local communities, thereby avoiding the need to invest GEF funds in developing these relations.

Sustainability

211. Institutional sustainability will be ensured by the fact that the project will be implemented by well-established institutions of national Government, working in close collaboration with their counterparts and dependencies at provincial and municipal level and with well-developed farmer organizations with which they already have close institutional links. Project resources will be used to strengthen further the capacities of these institutions and to consolidate their abilities to give continuity to the impacts achieved

by the project. Those involved in the project will be in-house members of these institutions, a model which is much more favourable for institutional ownership and sustainability than the creation of a discrete project implementation unit.

212. Financial sustainability will be promoted through the provision of direct financial inputs to producers and local institutions from permanent incentive schemes such as FONADEF and Local Development Funds (which are managed at the discretion of local authorities and are intended to promote decentralized sustainable development). Furthermore (and subject to emerging policy guidance from central Government), the project will explore opportunities for promoting alternative market-based strategies for promoting the financial sustainability of environmentally sustainable and BD-friendly production, such as the certification of sustainably-produced crops and the introduction of schemes for the payment of environmental services. Finally the project will benefit from the larger baseline programmes such as the Turquino plan which are going to be complemented to better address biodiversity conservation needs.

Replicability

213. Although the project covers a large proportion of the mountain areas which have been identified as being of highest conservation priority and environmental vulnerability, there are still significant vulnerable areas of high conservation importance in the country that are not covered. The project will therefore give important consideration to the replication of its results to such other areas elsewhere in the country. Furthermore, within the target areas themselves the project will focus directly on supporting productive changes in selected Integrated Forest Farms: the overall impact of the project, however, will depend on the practices applied in the IFFs being replicated by other farmers elsewhere in the target areas.

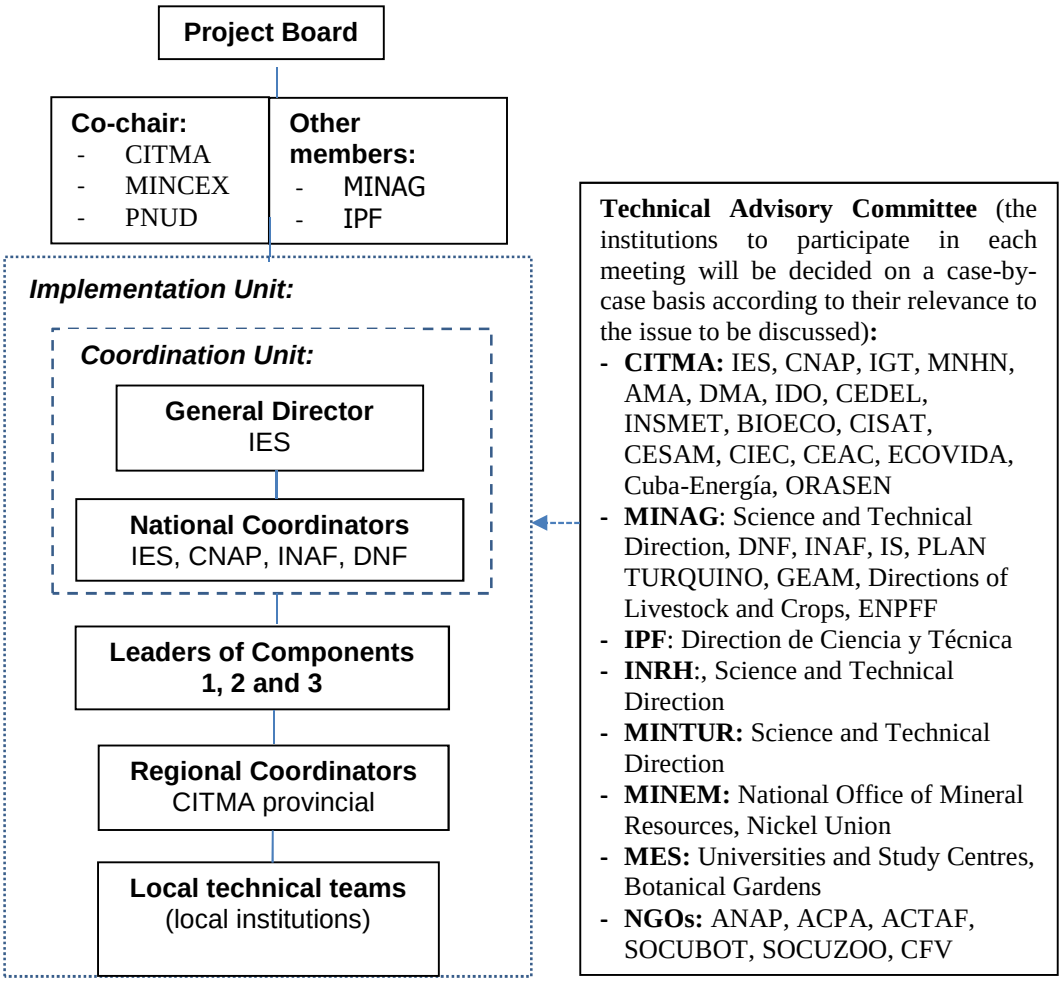
214. At one level, replication will be promoted by developing, under Component 1, the systemic capacities and instruments required for the widespread application of the approaches applied in the target areas under Components 1 and 2. Local level replication will be promoted by the use of the well-proven model of Integrated Forest Farms as centres for the local validation and demonstration of the proposed practices; by working closely with NGOs such as ANAP that bring together large numbers of small farmers, and through cooperatives and other productive enterprises that also have large coverages in terms of participating farmers and areas under management; and by strengthening the capacities of local extension agents who will be on the front line of the transfer and support of technologies among local farmers.

PART II. MANAGEMENT ARRANGEMENTS

Arrangements and responsibilities

215. This 8 year project will be executed by under the National Execution modality, according to the standards and regulations for UNDP cooperation in Cuba. The Implementing Partner (IP) of the project.

Figure 1. Organizational structure of the project



Project Board

216. The duration of the project will be 8 years. Implementation of the project will be carried out under the general guidance of a *Project Board* (Steering Committee), specifically formed for this purpose. The composition, responsibilities and rules of operation of the Board will be confirmed during its first meeting. Subject to the decision of this meeting, it is proposed that the Board will be responsible for approving the operational plans and annual reports of the project as well as the terms of reference and appointments of key members of staff, and will be composed of representatives of CITMA, MINCEX, UNDP, MINAG and IPF. The Board will meet at least two times per year and in addition could be convened extraordinarily by the Chair, on the request of individual members.

217. The Project Board will be responsible for making executive decisions for the project, in particular when guidance is required by the Project Coordinator. The Project Board will play a critical role in facilitating inter-ministerial coordination, project monitoring and evaluations by quality assuring these

processes and products, and using evaluations for performance improvement, accountability and learning. It will ensure that required resources are committed and will arbitrate on any conflicts within the project or negotiate a solution to any problems with external bodies. In addition, it will approve the appointment and responsibilities of the Project Manager and any delegation of its Project Assurance responsibilities. Based on the approved Annual Work Plan, the Project Board will also consider and approve the quarterly plans and will also approve any essential deviations from the original plans.

218. In order to ensure UNDP's ultimate accountability for the project results, Project Board decisions will be made in accordance to standards that shall ensure management for development results, best value for money, fairness, integrity, transparency and effective international competition. In case consensus cannot be reached within the Board, the final decision shall rest with the UNDP.

219. The Board will consist of the following members:

1) **The Executive**, who will chair the Board. This role will be shared between CITMA, MINCEX and UNDP.
2) A representative of the **Senior Supplier**, who will provide guidance regarding the technical feasibility of the project. This role will be filled by UNDP.
3) **Senior Beneficiaries,** who will represent the interests of those who will ultimately benefit from the project and ensure the realization of project results from the perspective of project beneficiaries. MINAG and IPF will be represented on the Project Board.

Project Implementation Unit

220. Project implementation will be the responsibility in practice of a *Project Implementation Unit* (PIU), led by a Coordination Unit consisting of a General Coordinator and National Coordinators from each of the main participating institutions (IES, CNAP, INAF, DNF).

General Project Director

221. The project will be under the overall leadership of a *General Director*, who will be a representative of IES. The General Director will:

- Be the signing authority of requests to UNDP for disbursements of project funds.
- Ensure the logistical, administrative and financial effectiveness of the IP in fulfilling its roles set out above
- To this end, provide monitoring, supervision and guidance to the technical teams based in the project areas

UNDP Support Services

222. UNDP will provide **Project Assurance**, supporting the Project Board Executive by carrying out objective and independent project oversight and monitoring functions.

Collaborative arrangements with related projects

223. As detailed in Part I, there are a number of other GEF-funded initiatives with which the project will coordinate, and this coordination will be facilitated to some extent by the fact that the lead institutions of most of these are different dependencies of the same Ministry, CITMA, as is the IES which leads this project. The interdisciplinary, interinstitutional nature of the present project means that its implementation team includes representatives of the lead institutions of most of the other GEF projects, which provides a further opportunity to promote its coordination with the other projects, in the interior of their institutions (as shown in the organogram presented above, the team includes National Coordinators from each of the

main participating institutions IES, CNAP, INAF and DNF). Coordination will further be facilitated by the existence of the Technical Advisory Group, which includes a total of 39 different institutions, whose representatives will have the opportunity to use the group to propose and arrange for coordination between their initiatives and those of this project.

Prior obligations and Prerequisites

N/A

Audit arrangements

224. The project will be audited according to UNDP Financial Regulations and Rules and applicable audit policies. The Government will provide the Resident Representative with certified periodic financial statements, and with an annual audit of the financial statements relating to the status of UNDP (including GEF) funds according to the established procedures set out in the Programming and Finance manuals. The Audit will be conducted by a special and certified audit firm. UNDP will be responsible for making audit arrangements for the project in communication with the Project Implementing Partner. UNDP and the project Implementing Partner will provide audit management responses and the Project Manager and project support team will address audit recommendations.

225. As a part of its oversight function, UNDP will conduct audit spot checks at least two times a year.

Agreement on intellectual property rights and use of logo on the project's deliverables

226. In order to accord proper acknowledgement to GEF for providing funding, a GEF logo should appear on all relevant GEF project publications, including among others, project hardware and vehicles purchased with GEF funds. Any citation on publications regarding projects funded by GEF should also accord proper acknowledgment to GEF.

PART III. MONITORING FRAMEWORK AND EVALUATION

227. The project will be monitored through the following M& E activities. The M& E budget is provided in the table below.

Project start:

228. A Project Inception Workshop will be held within the first 2 months of project start with those with assigned roles in the project organization structure, UNDP country office and where appropriate/feasible regional technical policy and programme advisors as well as other stakeholders. The Inception Workshop is crucial to building ownership for the project results and to plan the first year annual work plan.

229. The Inception Workshop should address a number of key issues including:

a) Assist all partners to fully understand and take ownership of the project. Detail the roles, support services and complementary responsibilities of UNDP CO and RCU staff vis à vis the project team. Discuss the roles, functions, and responsibilities within the project's decision-making structures, including reporting and communication lines, and conflict resolution mechanisms. The Terms of Reference for project staff will be discussed again as needed.
b) Based on the project results framework and the relevant GEF Tracking Tool if appropriate, finalize the first annual work plan. Review and agree on the indicators, targets and their means of verification, and recheck assumptions and risks.
c) Provide a detailed overview of reporting, monitoring and evaluation (M&E) requirements. The Monitoring and Evaluation work plan and budget should be agreed and scheduled.
d) Discuss financial reporting procedures and obligations, and arrangements for annual audit.
e) Plan and schedule Project Board meetings. Roles and responsibilities of all project organisation structures should be clarified and meetings planned. The first Project Board meeting should be held within the first 12 months following the inception workshop.

230. An Inception Workshop report is a key reference document and must be prepared and shared with participants to formalize various agreements and plans decided during the meeting.

Quarterly:

- Progress made shall be monitored in the UNDP Enhanced Results Based Managment Platform.
- Based on the initial risk analysis submitted, the risk log shall be regularly updated in ATLAS. Risks become critical when the impact and probability are high. Note that for UNDP GEF projects, all financial risks associated with financial instruments such as revolving funds, microfinance schemes, or capitalization of ESCOs are automatically classified as critical on the basis of their innovative nature (high impact and uncertainty due to no previous experience justifies classification as critical).
- Based on the information recorded in Atlas, a Project Progress Reports (PPR) can be generated in the Executive Snapshot.
- Other ATLAS logs can be used to monitor issues, lessons learned etc... The use of these functions is a key indicator in the UNDP Executive Balanced Scorecard.

Annually:

- Annual Project Review/Project Implementation Reports (APR/PIR): This key report is prepared by the Project Coordinator to monitor progress made since project start and in particular for the previous

reporting period (30 June to 1 July). The APR/PIR combines both UNDP and GEF reporting requirements.

231. The APR/PIR includes, but is not limited to, reporting on the following:

- Progress made toward project objective and project outcomes - each with indicators, baseline data and end-of-project targets (cumulative)
- Project outputs delivered per project outcome (annual).
- Lesson learned/good practice.
- AWP and other expenditure reports
- Risk and adaptive management
- ATLAS QPR
- Portfolio level indicators (i.e. GEF focal area tracking tools) are used by most focal areas on an annual basis as well.

Periodic Monitoring through site visits:

232. UNDP CO and the UNDP RCU will conduct visits to project sites based on the agreed schedule in the project's Inception Report/Annual Work Plan to assess first hand project progress. Other members of the Project Board may also join these visits. A Field Visit Report/BTOR will be prepared by the CO and UNDP RCU and will be circulated no less than one month after the visit to the project team and Project Board members.

Mid-term of project cycle:

233. The project will undergo an independent Mid-Term Evaluation at the mid-point of project implementation (insert date). The Mid-Term Evaluation will determine progress being made toward the achievement of outcomes and will identify course correction if needed. It will focus on the effectiveness, efficiency and timeliness of project implementation; will highlight issues requiring decisions and actions; and will present initial lessons learned about project design, implementation and management. Findings of this review will be incorporated as recommendations for enhanced implementation during the final half of the project's term. The organization, terms of reference and timing of the mid-term evaluation will be decided after consultation between the parties to the project document. The Terms of Reference for this Mid-term evaluation will be prepared by the UNDP CO based on guidance from the Regional Coordinating Unit and UNDP-GEF. The management response and the evaluation will be uploaded to UNDP corporate systems, in particular the UNDP Evaluation Office Evaluation Resource Center (ERC).

234. The relevant GEF Focal Area Tracking Tools will also be completed during the mid-term evaluation cycle.

End of Project:

235. An independent Final Evaluation will take place three months prior to the final Project Board meeting and will be undertaken in accordance with UNDP and GEF guidance. The final evaluation will focus on the delivery of the project's results as initially planned (and as corrected after the mid-term evaluation, if any such correction took place). The final evaluation will look at impact and sustainability of results, including the contribution to capacity development and the achievement of global environmental benefits/goals. The Terms of Reference for this evaluation will be prepared by the UNDP CO based on guidance from the Regional Coordinating Unit and UNDP-GEF.

236. The Terminal Evaluation should also provide recommendations for follow-up activities and requires a management response which should be uploaded to PIMS and to the UNDP Evaluation Office Evaluation Resource Center (ERC).

237. The relevant GEF Focal Area Tracking Tools will also be completed during the final evaluation.

238. During the last three months, the project team will prepare the Project Terminal Report. This comprehensive report will summarize the results achieved (objectives, outcomes, outputs), lessons learned, problems met and areas where results may not have been achieved. It will also lay out recommendations for any further steps that may need to be taken to ensure sustainability and replicability of the project's results.

Learning and knowledge sharing:

239. Results from the project will be disseminated within and beyond the project intervention zone through existing information sharing networks and forums.

240. The project will identify and participate, as relevant and appropriate, in scientific, policy-based and/or any other networks, which may be of benefit to project implementation though lessons learned. The project will identify, analyze, and share lessons learned that might be beneficial in the design and implementation of similar future projects.

241. Finally, there will be a two-way flow of information between this project and other projects of a similar focus.

M& E workplan and budget

Type of M&E activity	Responsible Parties	Budget US$ *Excluding project team staff time*	Time frame
Inception Workshop and Report	▪ Project Manager ▪ UNDP CO, UNDP GEF	Indicative cost: 3,000	Within first two months of project start up
Measurement of Means of Verification of project results.	▪ UNDP GEF RTA/Project Manager will oversee the hiring of specific studies and institutions, and delegate responsibilities to relevant team members.	To be finalized in Inception Phase and Workshop.	Start, mid and end of project (during evaluation cycle) and annually when required.
Measurement of Means of Verification for Project Progress on *output and implementation*	▪ Oversight by Project Manager ▪ Project team	To be determined as part of the Annual Work Plan's preparation.	Annually prior to ARR/PIR and to the definition of annual work plans
ARR/PIR	▪ Project manager and team ▪ UNDP CO ▪ UNDP RTA ▪ UNDP EEG	None	Annually
Periodic status/ progress reports	▪ Project manager and team	None	Quarterly
Mid-term Evaluation	▪ Project manager and team ▪ UNDP CO ▪ UNDP RCU ▪ External Consultants (i.e. evaluation team)	Indicative cost: 20,000	At the mid-point of project implementation.
Final Evaluation	▪ Project manager and team, ▪ UNDP CO ▪ UNDP RCU ▪ External Consultants (i.e. evaluation team)	Indicative cost : 20,000	At least three months before the end of project implementation
Project Terminal Report	▪ Project manager and team ▪ UNDP CO ▪ local consultant	0	At least three months before the end of the project
Audit	▪ UNDP CO ▪ Project manager and team	Indicative cost per year: 3,000. Total cost: 24,000	Yearly

Type of M&E activity	Responsible Parties	Budget US$ *Excluding project team staff time*	Time frame
Visits to field sites	▪ UNDP CO ▪ UNDP RCU (as appropriate) ▪ Government representatives	For GEF supported projects, paid from IA fees and operational budget	Yearly
TOTAL indicative COST Excluding project team staff time and UNDP staff and travel expenses		US$ 67,000	

Table 20. Impact Measurement Template

Key Impact Indicator	Target (Year 8)	Means of Verification	Sampling frequency	Location
O.1 Area of major vegetation types in the four target REDS	No net loss of any major vegetation type	Satellite images, with field verification	**Mid-term and end**	Four target REDS
O.2 Índex of ecosystem integrity in 19 priority PAs of importance as refuges in prioritized connectivity zones within the REDS	Indices remain stable due to increased effectiveness of PA management and combat of external threats affecting PAs	Sample plots	Mid-term and end	19 priority PAs
O.3 Indices of species diversity and abundance in prioritized connectivity zones of the 4 REDS, reflecting conditions of habitat/connectivity in these areas and ability of species to venture out of and travel between core refuges	15 new species of birds, mammals and/or insects are observed in key connectivity zones of each massif over the life of the project	Transects with spatial and temporal replications	Mid-term and end	Prioritized connectivity zones of the 4 REDS
O.4 Cumulative width of non-forest gaps separating habitat blocks in prioritized connectivity zones	Reduction of non-forest gaps, facilitating movement of species between habitat refuges (targets to be defined in PY1)	Satellite imagery	Mid-term and end	Prioritized connectivity zones of the 4 REDS

PART IV. LEGAL CONTEXT

242. This document together with the CPAP signed by the Government and UNDP which is incorporated by reference constitute together a Project Document as referred to in the SBAA [or other appropriate governing agreement] and all CPAP provisions apply to this document.

243. Consistent with the Article III of the Standard Basic Assistance Agreement, the responsibility for the safety and security of the implementing partner and its personnel and property, and of UNDP's property in the implementing partner's custody, rests with the implementing partner.

244. The implementing partner shall:

a) put in place an appropriate security plan and maintain the security plan, taking into account the security situation in the country where the project is being carried;

b) assume all risks and liabilities related to the implementing partner's security, and the full implementation of the security plan.

245. UNDP reserves the right to verify whether such a plan is in place, and to suggest modifications to the plan when necessary. Failure to maintain and implement an appropriate security plan as required hereunder shall be deemed a breach of this agreement.

246. The implementing partner agrees to undertake all reasonable efforts to ensure that none of the UNDP funds received pursuant to the Project Document are used to provide support to individuals or entities associated with terrorism and that the recipients of any amounts provided by UNDP hereunder do not appear on the list maintained by the Security Council Committee established pursuant to resolution 1267 (1999). The list can be accessed via http://www.un.org/Docs/sc/committees/1267/1267ListEng.htm. This provision must be included in all sub-contracts or sub-agreements entered into under this Project Document.

SIGNATURE PAGE

Country: Cuba

UNDAF/CPD Outcome(s):	Productive and services sectors strengthen the integration of environmental considerations, including energy and adaptation to climate change, into their development plans
Government:	Ministry of Foreign Trade and Investment (MINCEX)
National Executing Institution/ Implementing Partner	Ministry of Science, Technology and Environment (CITMA)

UNDP Strategic Plan Period:	2014-2017
UNDP Strategic Plan Output: Legal and regulatory frameworks, policies and institutions enabled to ensure the conservation, sustainable use and access and benefit sharing of natural resources, biodiversity and ecosystems, in line with international conventions and national legislation.	
Project Title: A landscape approach to the conservation of threatened mountain ecosystems	
Project ID:	00077748
Output ID:	00088374
PIMS #	4716
Project Duration:	8 years
Management Arrangements	NIM

Total Budget (USD):	$65,818,574
Total allocated resources (USD):	
○ GEF	$7,481,944
○ Government	$57,536,630
○ UNDP	$800,000

Agreed by
Government: María de la Luz B'Hamel — Directora DOEI — 30.10.2014
MINCEX — Name — Title — Signature — Date

Agreed by
Implementing Partner: [illegible] — [illegible] — 11.12.2014
CITMA — Name — Title — Signature — Date

Agreed by: Claudio Tomasi — Representante Residente Adjunto — 13/11/2014
UNDP — Name — Title — Signature — Dater

SECTION II: STRATEGIC RESULTS FRAMEWORK AND GEF INCREMENT

This project will contribute to achieving the following Country Programme Outcome as defined in CPAP or CPD: Productive and services sectors strengthen the integration of environmental considerations, including energy and adaptation to climate change, into their development plans
Country Programme Outcome Indicators: Investment expenditure in environmental protection activities in each environmental area and productive sector
Primary applicable Key Environment and Sustainable Development Key Result Area (same as that on the cover page, circle one): 1. Mainstreaming environment and energy: Technical and institutional capacities to promote environmental sustainability developed
Applicable GEF Strategic Objectives and Program: ▪ BD-1: Improve Sustainability of Protected Area Systems ▪ BD-2: Mainstream Biodiversity Conservation and Sustainable Use into Production Landscapes, Seascapes and Sectors
Applicable GEF Expected Outcomes: ▪ Outcome 1.1: Improved management effectiveness of existing and new protected areas (PAs) ▪ Outcome 2.1: Increase in sustainably managed landscapes and seascapes that integrate biodiversity conservation. ▪ Outcome 2.2: Measures to conserve and sustainably use biodiversity incorporated in policy and regulatory frameworks.
Applicable GEF Outcome Indicators: ▪ Output 1. New or strengthened protected areas (PAs) (27) and coverage (323,945 hectares) of unprotected ecosystems ▪ Output 2. New or strengthened PAs (27) and coverage (323,945 hectares) of unprotected threatened species (ca.450) ▪ Output 1: Policies and regulatory frameworks (3) for production sectors. ▪ Output 2: National and subnational land-use plans (4) that incorporate biodiversity and ecosystem services valuation. ▪ Output 3: Certified production landscapes and seascapes (6000hectares).

	Indicator	Baseline	Targets End of Project	Source of verification	Assumptions
Objective:	**Ecosystem diversity:**				
Biodiversity effectively buffered from current and future threats across mountain landscapes, from the foothills to the mountain ridges	O.1 Area of major vegetation types in the four target REDS[27]	Guaniguanico - Natural broadleaved 48,533ha - Planted broadleaved 2,995ha - Natural pine 8,194ha - Pine plantation 2,963ha - Xerophyll mogote complex 26,567ha Guamuhaya - Natural broadleaved 45,070ha - Planted broadleaved 654ha - Natural pine 26ha - Pine plantation 765ha - Xerophyll mogote complex 2,030ha Bamburanao - Natural broadleaved 18,684ha	No net loss of any major vegetation type	Satellite images, with field verification (mid-term and end)	The target areas are not affected by extreme climatic events or variability that exceeds the coping capacity of ecosystems

[27]REDS (Special Regions for Sustainable Development) equate to the entire areas of each of the 4 target mountain massifs

	Indicator	Baseline	Targets End of Project	Source of verification	Assumptions
		- Planted broadleaved 321ha - Natural pine 45ha - Pine plantation 517ha - Xerophyll mogote complex 355ha Nipe-Sagua-Baracoa - Natural broadleaved 168,785ha - Planted broadleaved 2,605ha - Natural pine 37,983ha - Pine plantation 9,178ha - Xerophyll mogote complex 5,847ha			
	Core refuges:				
	O.2 Índex of ecosystem integrity[28] in 6 of the priority PAs (covering 155,559ha) of importance as refuges in prioritized connectivity zones[29] within the REDS	Values to be defined in PY1 in each target PA	Indices remain stable due to increased effectiveness of PA management and combat of external threats affecting PAs	Sample plots (mid-term and end)	Governance conditions remain favourable for controlling threats to refuges
	Species diversity, status and connectivity				
	O.3 Indices of species diversity and abundance in prioritized connectivity zones of the 4 REDS, reflecting conditions of habitat/connectivity in these areas and ability of species to venture out of and travel between core refuges	Species lists and abundances to be compiled through sampling once detailed methodology is defined in Year 1 (species lists already exist for the core refuges in the 4 REDS[30]	15 new species are observed in key connectivity zones of each massif over the life of the project	Transects with spatial and temporal replications (mid-term and end)	Predominant production systems in landscapes are not significantly affected by economic and market pressures
	Landscape connectivity				
	O.4 Cumulative width of non-forest gaps separating habitat blocks in prioritized connectivity zones	Monitoring methodology and baseline values to be defined in PY1	Reduction of non-forest gaps, facilitating movement of species between habitat refuges (targets to be defined in PY1)	Satellite imagery (mid-term and end)	Predominant production systems in landscapes are not significantly affected by economic and

[28]Early on in the implementation phase, further analyses will be carried out to confirm the feasibility of using the methodology fpr evaluating ecological integrity applied by The Nature Conservancy (see e.g. whc.unesco.org/document/6970 and http://www.natureserve.org/publications/eia_wetland_032707.pdf). Initial methodological reviews carried out during the PPG phase made it clear that the data requirements of this approach would make its application unfeasible with the limited PPG resources available.

[29]"Prioritized connectivity zones" equate to the part of each REDS that has been prioritized for the promotion of connectivity on the basis of criteria including the high conservation value of the PAs, landscapes and/or species it contains, and the high connectivity needs of its constituent biota. Specific local biological corridors withing these overall connectivity zones will be defined during the first 4 years of the project.

[30] This is the pool of species that are expected to be observed in priority connectivity zones at Project end.

<table>
<tr><th></th><th>Indicator</th><th>Baseline</th><th>Targets
End of Project</th><th>Source of verification</th><th>Assumptions</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td>market pressures, and governance conditions remain favourable for controlling threats to habitat blocks</td></tr>
<tr><td>Outcome 1: Systemic landscape management framework</td><td colspan="5">Instruments and capacities for land use planning/zoning in support of ecosystem resilience and connectivity</td></tr>
<tr><td></td><td>1.1: Area in the target REDS that is covered by environmental land use plans that incorporate considerations of biological connectivity and ecosystem resilience</td><td>The entire project area is covered by IPF land use planning, with basic environmental issues addressed.

Environmental land use planning has only been carried out in Yaguajay municipality (Bamburanao), at 1:100,000 scale</td><td>Area covered by environmental land use plans at 1:250,000 scale:
- Guaniguanico 375,500ha
- Bamburanao 78,216ha (1: 100,000)
- Guamuhaya 157,600ha
- NSB 807,600ha.
Area also covered by environmental land use plans at 1:50,000 scale:
- Guaniguanico 81,500ha
- Bamburanao 24,152ha
- Guamuhaya 24,540ha
- NSB 86,703ha</td><td>Review of environmental land use plans (annual)</td><td>Economic and demographic pressures do not significantly marginalize connectivity and ecosystem resilience from the priorities of those developing land use plans</td></tr>
<tr><td></td><td>1.2: Number of institutions in each massif (IES, CNAP, territorial delegations of IPF, INAF, IGT, INRH, Mountain bodies, DNF, SEF, CITMA delegations and local authorities and NGOs) that effectively coordinate and integrate activities vis-a-vis the landscape approach, specifically in relation to the following factors:
(i) Sharing and facilitating access to information;
(ii) Monitoring activities
(iii) Research
(iv) Enforcement</td><td>Average scorecard rating for each factor (of 10 institutions in Guaniguanico, Guamuhaya and Bamburanao, and 11 in NSB)<table><tr><th>Factors</th><th colspan="5">Massifs</th></tr><tr><th></th><th>I</th><th>II</th><th>III</th><th>IV</th><th>Av.</th></tr><tr><td>(i)</td><td>1</td><td>2</td><td>2</td><td>2</td><td>1.75</td></tr><tr><td>(ii)</td><td>2</td><td>2</td><td>1</td><td>1</td><td>1.5</td></tr><tr><td>(iii)</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr><tr><td>(iv)</td><td>1</td><td>2</td><td>1</td><td>1</td><td>1.25</td></tr></table>Massifs:
I = Guaniguanico
II = Guamuhaya
III = Bamburanao
IV = Nipe-Sagua-Baracoa

See footnote for key to ratings[31].</td><td><table><tr><th>Factor</th><th>Average rating per massif</th></tr><tr><td>(i)</td><td>2.75</td></tr><tr><td>(ii)</td><td>2.5</td></tr><tr><td>(iii)</td><td>2</td></tr><tr><td>(iv)</td><td>2.25</td></tr></table></td><td>Interviews with representative of target institutions (mid-term and end)</td><td>Institutional structures in Government remain stable or evolve in a way that allows continuity of inter-institutional cooperation</td></tr>
</table>

[31] 0 = institution operates on a completely individual basis, resulting in significantly reduced effectiveness

	Indicator	Baseline	Targets End of Project	Source of verification	Assumptions
	Incentive instruments:				
	1.3 Environmental investment as recorded in the National Economy Plan that specifically promotes the landscape approach	There is no information about current environmental investment in the National Economy Plan that specifically promotes the landscape approach	At least 10% increase in environmental investments that promote the landscape approach (baseline and target to be determined by PY2)	National Economy Plan	Economic conditions remain favourable for the continued prioritization of the landscape approach in investment planning
Component 2: Management effectiveness for core PAs within the context of the landscape as a whole	**Strengthening existing core PA refuges**				
	2.1Average METT scores of declared target PAs in prioritized connectivity zones	Guaniguanico 60.9 Bamuranao 59.0 Guamuhaya 91.5 NSB 60.5 Overall 63.8	Guaniguanico 74.3 Bamuranao 88.0 Guamuhaya 95.0 NSB 82.2 Overall 81.1 Questions 21, 21, 24 and 25 for all PAs must have a score of at least 2	METT evaluations by PA staff (mid term and end)	Continued institutional capacity in SNAP and partner institutions
	Protecting and consolidating additional refuges				
	2.2: Area of new PAs declared in prioritized connectivity zones, facilitating biological connectivity between existing core refuge PAs	0	8, covering 13,812ha	CNAP records (annual)	Continued institutional capacity and commitment in SNAP and partner institutions
	2.3 Average METT scores of new PAs to be established in prioritized connectivity zones	Guaniguanico 7.0 Bamuranao 5.0 Guamuhaya 30.0 NSB 7.0 Overall 12.0	Guaniguanico 62.0 Bamuranao 75.0 Guamuhaya 81.0 NSB 79.0 Overall 74.0 Questions 21, 21, 24 and 25 for all PAs must have a score of 2 or 3	METT evaluations by PA staff (mid term and end)	
Component 3: Conservation compatible production systems in threatened	**Habitat and connectivity value of non-protected landscapes in prioritized connectivity zones, and environmental goods and services in REDS as a whole:**				
	3.1 Area of (i) forest plantations and (ii)water protection belts and (iii) enriched connectivity	**385,684**ha	- **19,560**haof forest established (of which **10,840**ha are in	Satellite images, with field verification (mid	The target areas are not affected by extreme climatic

1= institution communicates with others in relation to the issue in question, but does not coordinate in a way that significantly improves effectiveness
2 = institution coordinates actively with other institutions in relation to the issue in question, but this does not as yet translate into a fully integrated approach that takes advantage of opportunities for synergies and resulting increases in effectiveness.
3 = institution coordinates actively with other institutions in relation to the issue in question, resulting in a fully integrated approach that takes advantage of opportunities for synergies and resulting increases in effectiveness.

	Indicator	Baseline	Targets End of Project	Source of verification	Assumptions
mountain ecosystems and conservation corridors leading down to the coast	forests		prioritized connectivity zones) - 600ha in of water protection belt forest in prioritized connectivity zones) - 2,400 ha of enriched connectivity forests in prioritized connectivity zones	term and end) Annual forest cover data generated by National Forestry Directorate (DNF)	events or variability that exceeds the coping capacity of ecosystems Producers are convinced of the benefits of sustainable practices and willing to adopt them
	3.2 Area of agroforestry and silvopastoral systems with diverse structure and composition	93 integral forest farms in the target REDS, covering 3,720ha (number and area of these located in prioritized connectivity zones to be determined in PY1) Baseline values of the area of silvopastoral systems be determined: MINAG does not report officially information on hectares under "silvopastoral systems" but the project will support the establishment of a system for collecting information on silvopastoral systems.	- 1,600 ha of diverse agroforestry systems established in 40 existing integral forest farms (10 per target area), and 4,720 ha of diverse silvopastoral systems, promoting habitat and connectivity (target number and area of these located in prioritized connectivity zones to be determined in PY1) - 90,000ha of agroforestry and silvopastoral systems established in the REDS replicating the practices demonstrated in the Integrated Forest Farms.	MINAG records (procedures to be defined) (mid-term and end)	
	3.3 Area of coffee grown under shade	30,000ha of coffee under shade in the target REDS:	Maintenance of 30,000 ha of coffee grown under shade	MINAG records (procedures to be defined) (mid-term and end)	
	Reduction of impacts on aquatic ecosystems				
	3.5 Application of clean production practices in coffee and pig production units that limit contamination of aquatic ecosystems with emphasis on those located in priority	- **Guaniguanico**: 7 coffee production units, of which 2 are ecological; **Guamuhaya**: 7 coffee production units, of which 4 are ecological; **Bamburanao**: 48 pig production units without clean production	Demonstration units with clean technologies applied in pig production and coffee depulping units - **Guaniguanico**: 1 coffee production unit with clean	Annual field inspection. MINAG statistics bulletin	Managers of facilities are convinced of the benefits of clean production practices

	Indicator	Baseline	Targets End of Project	Source of verification	Assumptions
	connectivity zones	- **NSB**: 149 **coffee p**roduction units, of which 22 are ecological;	production - **Guamuhaya**: 1coffee production unit with clean production - **Bamburanao**: 5 of 48 pig production units with clean production, providing cooking gas specifically benefiting **25** women - **NSB**: 1 coffee production unit with clean production		
	Fire management and enforcement				
	3.6 Number and area of fires in target REDS	Annual average for 2011-13: - **Guaniguanico**: 32 fires/year (affecting 873ha in total, average 28ha/event) - **Guamuhaya**: 4.7 fires/year (affecting 11.8ha in total, 2.5ha/event) - Bamburanao: 0.7 fires/year (affecting 0.83ha in total, 1.25ha/event) - **NSB**: 20 fires/year (affecting 1,554ha in total, 76ha/event)	Annual average by year 8: - **Guaniguanico**: 27 fires/year, affecting 785ha in total, average 25ha/event (10% reduction in fire frequency and extent/fire) - **Guamuhaya**: 3.2 fires/year, affecting 9.8ha in total, average 2.0ha/event (15% reduction in fire frequency and extent/fire) - **Bamburanao**: 0.6 fires/year, affecting 0.7 ha in total, average 1.1ha/event (15% reduction in fire frequency and extent/fire - **NSB**: 18 fires/year, affecting 1,400ha in total, average 69 ha/event (10% reduction in fire frequency and extent/fire)	Annual records of Forest Guard Corps	Climate change and human behaviour do not push fire incidence and vulnerability beyond the coping limites of the responsible institutions
	3.7 Number of illegal activities registered per unit time of Forest Guard Corps patrols affecting the environment in the target areas	Baseline to be determined in each target area at project start	At least 40% reduction in the number of illegal activities registered per unit of time reflecting improved effectiveness of the Forest Guard Corps, improved coordination and synergies between institutions, and increased participation of	Reports of Forest Guard Corps	Maintenance of overall governance conditions in the target areas

	Indicator	Baseline	Targets End of Project	Source of verification	Assumptions
			local communities and their organizations		
	Socioeconomic benefits from sustainable production systems				
	3.8 Number of families recovering 30% of the costs of their investment in environmentally friendly production systems through FONADEF[32].	Families working in integral forest farms are typically only compensates for around 10-15% of their investments in environmentally friendly production systems.	40 families (10 of which are female-led) working in the 40 integral forest farms that the project will target recover no less than 30% of the farm expenses they incur for landscape management increasing forest cover with native species (targets in farms affected by replication effect to be determined)	Records of FONADEF	Continuity of FONADEF
	3.9 Gender equity of the distribution of project benefits	Baseline to be determined at startup	At least 40% of all project beneficiaries (from the goods and services provided by forests, agroforestry systems and silvopastoral systems, the incentives provided by FONADEF, and from the availability of cooking gas in pig production units) are women.	Surveys of beneficiary populations	

[32] FONADEF covers up to 30% of investment costs but currently few farmers receive this level of support. The remainder of the investment costs are covered by the farmers given that the production systems are economically viable in their own right; the incentive therefore serves to increase their attractiveness relative to other less environmentally-friendly options.

SECTION III: TOTAL BUDGET AND WORKPLAN

Award ID:	00077748	**Project ID(s):**	00088374
Award Title:	A landscape approach to the conservation of threatened mountain ecosystems		
Business Unit:	CUB10		
Project Title:	A landscape approach to the conservation of threatened mountain ecosystems		
PIMS no.	4716		
Implementing Partner (Executing Agency)	Ministry of Science, Technology and Environment (CITMA)		

GEF Outcome/ Atlas Activity	Respon-sible party	Source of funds	ERP/ATLAS Budget Description/ Input	Atlas Code	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Total	Note
					US$	US$	US$	US$	US$	US$	US$	US$	US$	
1		GEF	International Consultants	71200	10,000	10,000	12,000	10,000	12,000	12,000	9,000	11,000	86,000	1
			Travel	71600	8,000	7,200	8,000	8,000	7,000	8,000	7,250	7,250	60,700	2
			Contractual services - companies	72100	10,000	25,000	90,000	31,000	30,000	30,000	29,000	30,000	275,000	3
			Equipment and Furniture	72200	9,500	21,000	70,000	10,000	7,000	4,000	4,000	3,500	129,000	4
			Materials and Goods	72300	15,050	10,000	10,050	10,050	10,000	10,050	10,050	9,900	85,150	5
			Communication and audiovisual equipment	72400	2,000	5,000	5,500	6,000	5,000	6,000	5,000	4,000	38,500	6
			Supplies	72500	8,000	9,510	8,319	8,020	8,040	8,040	8,000	6,800	64,729	7
			Information and Technology Equipment	72800	33,400	38,700	37,700	34,000	32,700	29,600	26,700	10,500	243,300	8
			Rental and maintenance of information technology equipment	73300	11,200	2,400	2,400	2,400	2,400	2,000	1,000	3,000	26,800	9
			Rental and maintenance of other equipment	73400	18,000	9,100	9,100	9,100	7,100	8,500	8,000	9,000	77,900	10
			Professional Services	74100	-	12,000	13,000	12,000	13,000	12,000	10,000	13,000	85,000	11
			Audio Visual&Print Prod Costs	74200	5,550	22,000	24,000	24,000	24,000	24,000	20,000	11,500	155,050	12
			Miscellaneous	74500	2,000	3,000	3,000	3,000	3,000	3,000	3,000	2,000	22,000	13
			Training	75700	9,500	9,400	9,400	9,400	9,400	9,400	9,600	9,900	76,000	14
	GEF Subtotal Outcome 1				**142,200**	**184,310**	**302,469**	**176,970**	**170,640**	**166,590**	**150,600**	**131,350**	**1,425,129**	

			International Consultants	71200	15,250	8,000	10,000	8,000	10,000	8,000	8,000	12,000	79,250	15
			Travel	71600	7,600	10,000	11,000	15,000	15,000	15,000	10,000	12,000	95,600	16
			Contractual services - companies	72100	9,500	16,000	16,000	16,000	16,000	16,000	14,000	15,000	118,500	17
			Equipment and Furniture	72200	19,000	190,000	179,000	97,000	97,000	9,000	9,000	8,000	608,000	18
			Materials and Goods	72300	39,000	43,000	43,000	40,000	45,000	40,000	39,000	38,000	327,000	19
			Communication and audiovisual equipment	72400	1,000	2,050	3,550	2,050	3,050	3,000	3,050	2,559	20,309	20
			Supplies	72500	40,000	49,000	48,000	46,000	46,000	46,000	46,000	42,000	363,000	21
	2	GEF	Information and Technology Equipment	72800	24,350	32,700	35,000	33,000	30,000	30,000	29,000	18,000	232,050	22
			Rental and maintenance of information technology equipment	73300	16,000	1,500	1,500	1,500	1,500	1,500	1,500	1,500	26,500	23
			Rental and maintenance of other equipment	73400	20,800	12,000	12,000	12,000	12,000	12,000	9,000	8,000	97,800	24
			Professional Services	74100	9,000	10,000	10,000	12,000	10,000	12,000	10,000	10,000	83,000	25
			Audio Visual&Print Prod Costs	74200	10,900	13,500	14,500	14,500	14,500	13,500	13,500	10,850	105,750	26
			Miscellaneous	74500	3,000	3,500	3,500	3,500	3,500	3,500	3,500	4,500	28,500	27
			Training	75700	31,000	49,000	49,000	52,000	52,000	52,000	40,000	40,000	365,000	28
	GEF Subtotal Outcome 2				**246,400**	**440,250**	**436,050**	**352,550**	**355,550**	**261,500**	**235,550**	**222,409**	**2,550,259**	
			International Consultants	71200	20,000	25,000	25,000	30,000	28,000	25,000	18,000	12,000	183,000	29
			Travel	71600	9,400	20,100	20,100	20,100	20,100	20,000	20,000	19,259	149,059	30
			Contractual services - companies	72100	9,900	29,000	28,000	29,000	28,000	29,000	28,000	25,000	205,900	31
			Equipment and Furniture	72200	105,000	166,500	151,000	90,000	10,000	10,000	9,500	9,000	551,000	32
			Materials and Goods	72300	12,600	32,000	25,000	25,000	25,000	25,000	25,000	21,000	190,600	33
			Communication and audiovisual equipment	72400	3,050	6,000	5,500	5,000	4,000	5,000	4,950	3,000	36,500	34
3			Supplies	72500	45,800	138,000	127,000	120,000	125,000	123,000	105,000	100,000	883,800	35
			Information and Technology Equipment	72800	21,400	52,500	32,000	32,000	31,000	31,000	32,000	15,000	246,900	36
			Rental and maintenance of information technology equipment	73300	1,100	1,000	1,000	2,000	2,000	2,000	2,000	2,000	13,100	37
			Rental and maintenance of other equipment	73400	30,000	10,500	9,500	10,100	9,500	9,500	9,500	10,100	98,700	38
			Professional Services	74100	8,000	14,000	15,000	20,000	15,000	20,000	15,000	18,000	125,000	39

		Audio Visual&Print Prod Costs	74200	10,100	24,000	24,800	24,800	24,800	23,800	20,800	20,400	173,500	40
		Miscellaneous	74500	2,900	3,800	3,800	3,800	3,800	3,800	3,800	4,000	29,700	41
		Training	75700	18,500	35,000	35,000	35,000	35,000	35,000	35,000	35,000	263,500	42
	GEF subtotal Component 3			**297,750**	**557,400**	**502,700**	**446,800**	**361,200**	**362,100**	**328,550**	**293,759**	**3,150,259**	
		Equipment and Furniture	72200	10,000	85,000	0	0	5,000	0	0	0	100,000	43
		Supplies	72500	5,397	7,100	6,800	5,000	4,500	4,500	4,000	4,100	41,397	44
		Information and Technology Equipment	72800	8,400	7,500	6,000	5,000	4,000	4,000	3,000	3,000	40,900	45
		Rental and maintenance of other equipment	73400	8500	8500	8500	8500	8500	8500	8500	8500	68,000	46
		Professional Services	74100	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	24,000	47
		Miscellaneous	74500	8,800	10,500	10,500	10,500	10,500	10,500	10,500	10,200	82,000	48
	GEF subtotal project management			**44,097**	**121,600**	**34,800**	**32,000**	**35,500**	**30,500**	**29,000**	**28,800**	**356,297**	
Totals				**730,447**	**1,303,560**	**1,276,019**	**1,008,320**	**922,890**	**820,690**	**743,700**	**676,318**	**7,481,944**	

Summary by Atlas category

Atlas Budgetary Account Code	ERP/ATLAS Budget Description/ Input	Year 1 US$	Year 2 US$	Year 3 US$	Year 4 US$	Year 5 US$	Year 6 US$	Year 7 US$	Year 8 US$	Total US$
71200	International Consultants	45,250	43,000	47,000	48,000	50,000	45,000	35,000	35,000	**348,250**
71600	Travel	25,000	37,300	39,100	43,100	42,100	43,000	37,250	38,509	**305,359**
72100	Contractual services - companies	29,400	70,000	134,000	76,000	74,000	75,000	71,000	70,000	**599,400**
72200	Equipment and Furniture	143,500	462,500	400,000	197,000	119,000	23,000	22,500	20,500	**1,388,000**
72300	Materials and Goods	66,650	85,000	78,050	75,050	80,000	75,050	74,050	68,900	**602,750**
72400	Communication and audiovisual equipment	6,050	13,050	14,550	13,050	12,050	14,000	13,000	9,559	**95,309**
72500	Supplies	99,197	203,610	190,119	179,020	183,540	181,540	163,000	152,900	**1,352,926**
72800	Information and Technology Equipment	87,550	131,400	110,700	104,000	97,700	94,600	90,700	46,500	**763,150**
73300	Rental and maintenance of information technology equipment	28,300	4,900	4,900	5,900	5,900	5,500	4,500	6,500	**66,400**
73400	Rental and maintenance of other equipment	77,300	40,100	39,100	39,700	37,100	38,500	35,000	35,600	**342,400**
74100	Professional Services	20,000	39,000	41,000	47,000	41,000	47,000	38,000	44,000	317,000
74200	Audio Visual&Print Prod Costs	26,550	59,500	63,300	63,300	63,300	61,300	54,300	42,750	**434,300**
74500	Miscellaneous	16,700	20,800	20,800	20,800	20,800	20,800	20,800	20,700	162,200
75700	Training	59,000	93,400	93,400	96,400	96,400	96,400	84,600	84,900	**704,500**

	Total	**730,447**	**1,303,560**	**1,276,019**	**1,008,320**	**922,890**	**820,690**	**743,700**	**676,318**	**7,481,944**

Budget notes

Budget note	Details
Component I	
1	**International consultants US$86,000.** These consultants will provide expertise to support the national specialists in the delivery of the following products: 1.1: Provision of advice on information systems, systems for content management for the programmatic management of activities; information platform technology, systems for biophysical monitoring, modelling of responses of elements of biodiversity to different climate change scenarios; land use planning with a landscape focus, and metadata. 1.2: Provision of advice on extensión methodologies 1.3: Provision of advice on inter-sector governance mechanisms 1.4: Provision of advice on participatory environmental management.
2	**Travel:** US$60,700: Support to field visits (8 visits, two per massif in PY1 and PY2, in the other years 4 visits per year (one per massif). Travel costs of international consultants. National and international for training of Cuban specialists in relation to outputs 1.1, 1.2., 1.3 and 1.4.
3	**Contractual Services - Companies**; US$275,000: establishment of a communication system in the four target massifs to ensure that the key actors are communicated, and transport of participants to the territorial workshops related to this component.
4	**Equipment and Furniture:** US$129,000: Purchase of vehicles to allow technical personnel re reach the target sites, and furniture for national and provincial offices, in support of outputs 1.1, 1.2,1.3 and 1.4
5	**Materials and goods:** US$85,150 for office and field materials for the target areas, in support of field activities related to outputs 1.1, 1.2;1.3 ;1.4
6	**Communication and Audiovisual Equipment**: US$38,500 for editing equipment (outputs 1.1 and 1.2) and audiovisual equipment for the training centres under outputs 1.3 and 1.4
7	**Supplies:** US$64,729: Supplies for fieldwork related to outputs 1.1, 1.2.1.3 1.4 (e.g. toner, memory sticks, office supplies and fuel)
8	**Information Technology Equipment:** US$243,300 Specialized computer equipment in support of outputs 1.1, 1.2, 1.3 and 1.4, including the Project information system, with priority, provincial and field level nodes, permitting the processing of satellite imagery, automatized thematic mapping, and applications for Strategic Environmental Assessment and Environmental Planning at different scales, including site-specific Participatory Land Use Planning
9	**Rental and Maintenance of Information Technology Equipment:** US$26,800: rental and maintenance of computer equipment (required due to the length of the Project) in support of outputs 1.1, 1.2, 1.3 and 1. 4
10	**Rental & Maint of Other Equip:** U$77,900 cost of vehicle maintenance in support of outputs 1.1;1.2;1.3;1.4
11	**Professional Services:** US$85,000: Contracting of trained personnel for services of auditing and evaluation for the monitoring of outputs 1.1, 1.2.1.3 1.4
12	**Audio Visual&Print Prod Costs** US$155,050: publications related to governance and connecticity in support of outputs 1.1, 1.2.1.3 1.4, including leaflets, technical guidelines, and materials for the dissemination of scientific results in sipport of output 1.4.
13	**Miscellaneous Expenses:** US$22,000: contingencies related to possible fluctuations in Exchange rates and other ítems, including insurance for vehicles and other ítems, as well as possible fluctuations in the costs of communication services (internet) necessary for the interchange of information between the nodes of the project's information system and other nationa, regional and sector institutions involved in governance of the target regions.
14	**Training:** US$76,000: Workshops and training events: these are fundamental for the success of the environmental land use planning at different levels, in particular the participatory land use planning in selected localities, proposed under output 1.4. Workshops are also required to systematize the information gathered under outputs 1.1, 1.2 and y 1.3 and train participants in relation to the lessons learnt.
Component 2	
15	**International consultants:** US$79,250. These consultants will provide expertise to national experts for the delivery of the following outputs: 2.1: Advice on management of PAs with ecosystem approach, to increase their management effectiveness 2.2 Advice on the design, management and monitoring of biological corridors, analysis of the effectis of hábitat fragmentation, geographical information systems for

Budget note	Details
	field biologists and biodiversity managers; wildlife management, biodiversity monitoring and the selection of biological indicators.
16	**Travel:** US$95,600. This will allow the updating of the knowledge of Cuban specialists as well as their access to cutting edge technologies and new approaches related to outputs 2.1 and 2.2, as well as the dissemination of the results of the Project. Support to the field visits required for project activities (at least 40 visits to the project sites for the monitoring of biodiversity indicators)
17	**Contractual services:** US$118,500: provision of remote sensing images of the bioogical corridors and analysis of ecological integrity, for outputs 2.1 and 2.2.
18	**Equipment and Furniture:** US$608,000: Purchase of light vehicles for use in the target areas. Equipment for offices and biological collections of the executing institutions (IES and INAF); laboratory equipment for processing samples, optical equipment, passive monitoring equipment (e.g. cámara traps and Song Meters), Dataloggers (for microclimatic data), GPS, field equipment for data gathering and trapping (e.g. traps and mist nets), generators, night vision equipment, cameras, memory cards, printers and projectors in support of outputs 2,1 and 2.2
19	**Materials and goods:** US$327,000: Camping gear for expeditions necessary in support of outputs 2.1 and 2.2
20	**Communication and Audiovisual Equipment:** US$20,309: editing equipment, fixed and mobile telephones and projectors for outputs 2.1 and 2.2
21	**Supplies:** US$363,000. Fieldwork supplies and subscriptions to online database, inputs for laboratory analyses, fuel for field visits.
22	**Information Technology Equipment:** US$232,050: computer equipment and field equipment for the processing, storage and analysis of data related to outputs 2.1 and 2.2 (monitoring and ecological integrity). Software for modelling and analysis of spatial data, SIG (ArcGis), and analysis and processing of data from passive monitoring. Plotter for the production of maps.
23	**Rental & Maintenance-Premises:** US$26,500: Repair and rental of laboratory and information facilities.
24	**Rental & Maint of Other Equip:** US$97,800. Maintenance of vehicles and other equipment.
25	**Professional Services:** US$83,000. Contracting of trained personnel for services, auditing and evaluation in support of the monitorinng of products 2.1 and 2.2.
26	**Audio Visual&Print Prod Costs:** US$105,750. Production of publications on the biodiversity of the target areas, including methodologies for inventory and the monitoring of flora and fauna, as well as the analysis of ecological integrity in support of outputs 2.1 and 2.2, including leaflets, technical instructions and scientific documents aimed at dissemination.
27	**Miscellaneous Expenses:** US$28,500. Vehicle insurance and provision for exchange rate fluctuations.
28	**Training:** US$365,000: Workshops and training events in each of the target areas, on issues related to monitoring, biological corridors and the evaluation of ecological integrity, as well as training on methods for modeling and analysis of spatial data for the management of biodiversity, the design of studies, analysis and processing of data using passive monitoring. Training of analysis of remote sensing images for the analysis of habitat fragmentation. Workshops and other events for socializing the information collected.
Component 3	
29	**International consultants:** US$183,000. Provision of expertise to national experts, related to the strengthening of institutional capacities for technology generation and transfer, integrated training, extensión modules, development of capacities for fire management, development of models for the valuation of biodiversity goods and services, as well as proposals of models for the payment of ecosystem services, and monetary/non-monetary incentives.
30	**Travel:** US$149,059. Updating of the knowledge of Cuban specialists as well as access to cutting edge technologies and new approaches related to outputs 3.1 ; 3.2 and 3.3, as well the the socialization of project results.
31	**Contractual services – Companies:** US$205,900. Telephone services for communication with participating municipalities and other institutions at regional levels. Purchase of satellite imagery in support of output 3.3. Transport for regional workshops in support of outputs 3.1; 3.2;3.3
32	**Equipment and Furniture:** US$551,000. Purchase of ecological coffee depulpers and equipment for the transfer of clean technologies in support of output 3.1; equipment for fire prevention and control, and chainsaws (output 3.3); office equipment and light transport in support of Project activities under this component.
33	**Materials and goods:** US$190,600. Purchase of materials for productive sectors such as machetes, gloves, rakes and spades; camping gear such as tents, torches and boots; materials for measuring soil and seed humidity and wáter quality, as well as materiales for the collection, management, processing and storage of tree seed.
34	**Communication and audiovisual equipment:** US$36,500: walkie talkies, fixed and mobile telephones, projectors etc.
35	**Supplies:** US$883,800. Field and office supplies, including toner, memory sticks, nursery bags and root-trainers, and fuel.
36	**Information Technology Equipment:** US$246,900: Laser hypsometers, scanners, printers and digital cameras, and computers for the early detection of fires in the target areas.

Budget note	Details
37	**Rental & Maintenance-Premises.** US$13,100. Repair of laboratory, computing and fire management installations
38	**Rental & Maint of Other Equip:** US$98,700. Vehicle maintenance, and repair and maintenance of other equipment such as ecological coffee depulpers.
39	**Professional Services:** US$125,000. Staff trained in the areas of extension, ecosystem rehabilitation, environmental services in productive landscapes, clean production, forest fires, and evaluation.
40	**Audio Visual&Print Prod Costs:** US$173,500. Production and printing of a practical guide for the protection against forest fires; leaflets, technical instructions, dissemination materials and other publications related to biodiversity in production landscapes.
41	**Miscellaneous Expenses:** US$29,700 contingencies related to possible fluctuations in Exchange rates and other ítems, including insurance for vehicles and other ítems, as well as possible fluctuations in the costs of communication services (internet) necessary for the interchange of information between the nodes of the project's information system and other nationa, regional and sector institutions involved in governance of the target regions.
42	**Training:** US$263,500. Workshops for the socialization of the information gathered for the development of the different plans and programmes proposed under outputs 3.1, 3.2 and 3.3.
Project Management	
43	**Equipment and Furniture:** US$100,000: Purchase of office furniture for the project's coordination team, and light transport (car and minibus) for allowing mobility at national level for the efficient coordination of the Project.
44	**Supplies:** US$41,397: Supplies for the coordination of the Project including toner, external drives, office supplies etc., as well as fuel for transport at national level.
45	**Information and technology equipment:** US$40,900: Desktop and laptop computers, and other computing equipment, for the coordination team.
46	**Rental and maintenance of other equipment:** US$68,000. Fuel for national transport of the project coordination team to ensure effective control and oversight of results, as well as the maintenance of vehicles and other equipment.
47	**Professional services:** US$24,000 External financial audits
48	**Miscellaneous:** US$82,000: Vehicle insurance and flexibility due to possible Exchange rate fluctuations.

SECTION IV: ADDITIONAL INFORMATION

PART I. Endorsement Letter

CITMA

MINISTRY OF SCIENCE, TECHNOLOGY AND ENVIRONMENT

DEPARTMENT FOR INTERNATIONAL AFFAIRS

March 1, 2012

To: Mr. Yannick Glemarec
UNDP/GEF Executive Coordinator
304 East 45th Street
New York, USA

Subject: Endorsement for "A landscape approach to the conservation of threatened mountain ecosystems"

In my capacity as GEF Operational Focal Point for Cuba, I confirm that the above project proposal (a) is in accordance with my government's national priorities as defined in Cuba's environmental policy and our commitment to the relevant global environmental conventions; and (b) was discussed with relevant stakeholders, including the global environmental convention focal points.

I am pleased to endorse the preparation of the above project proposal with the support of the GEF Agency(ies) listed below. If approved, the proposal will be prepared and implemented the by the Institute of Ecology and Systematic of the Ministry of Science, Technology and Environment. I request the GEF Agency(ies) to provide a copy of the project document before it is submitted to the GEF Secretariat for CEO endorsement.

The total financing (from GEFTF, LDCF, SCCF and/or NPIF) being requested for this project is US$8,340,000, inclusive of project preparation grant (PPG), if any, and Agency fees for project cycle management services associated with the total GEF grant. The financing requested for Cuba is detailed in the table below.

Source of Funds	GEF Agency	Focal Area	Amount (in US$)			
			Project Preparation	Project	Fee	Total
			99,875	7,481,944	758,181	8,340,000
Total GEF Resources			**99,875**	**7,481,944**	**758,181**	**8,340,000**

I consent to the utilization of Cuba's allocations in GEF-5 as defined in the System for Transparent Allocation of Resources.

Sincerely,

Enrique Moret Hernández.

Director/Cuba.GEF Political and Operational Focal Point.

Copy to: Mr. Braulio Ferreira de Souza Dias/Executive Secretary for UNCBD.

PART II. Threatened and IUCN Red List species by massif

Flora[33]**:**

Key: BAM = Bamburanao, GUA = Guamuhaya, GUANI = Guaniguanico, NSB = Nipe-Sagua-Baracoa.

Species	Endemism	IUCN status	GUANI	BAM	GUA	NSB
Juniperus saxicola Britton & P. Wilson	End.	CR	-	-	-	+
Podocarpus angustifolius Griseb.	----	CR	-	-	+	+
Annona cristalensis (Alain) Borhidi & Moncada	End.	EN	-	-	-	+
Annona nipensis Alain	End.	CR	-	-	-	+
Plumeria clusioides Griseb.	End.	LC	-	-	+	+
Rauvolfia linearifolia Britton & P. Wilson	End.	VU	-	-	-	+
Aralia rex (Ekman) J. Wen	End.	CR	-	-	+	-
Aristolochia baracoensis R. Rankin	End.	CR	-	-	-	+
Aristolochia trichostoma Griseb.	End.	LC	-	-	-	+
Anastraphia ekmanii Urb.	End.	EN	+	-	-	-
Anastraphia gomezii León	End.	EN	-	-	-	+
Anastraphia intertexta C. Wright ex Griseb.	End.	CR	+	-	-	-
Anastraphia montana Britton	End.	VU	+	-	-	-
Anastraphia wilsonii Britton	End.	VU	-	-	+	-
Antillanthus carinatus (Greenm.) B. Nord.	End.	VU	-	-	-	+
Antillanthus moldenkei (Greenm. ex Alain) B. Nord.	End.	NT	-	-	-	+
Feddea cubensis Urb.	End.	NT	-	-	-	+
Harnackia bisecta Urb.	End.	CR	-	-	-	+
Heptanthus ranunculoides Griseb.	End.	EN	+	-	-	-
Koehneola repens (Griseb.) Urb.	End.	VU	-	-	-	+
Lescaillea equisetiformis Griseb.	End.	CR	+	-	-	-
Sachsia tricephala Griseb.	End.	CR	+	-	-	-
Salmea glaberrima C. Wright ex Griseb.	End.	EN	+	-	-	-
Salmea umbratilis B.L. Rob.	End.	CR	+	-	-	-
Begonia bissei J. Sierra	End.	VU	-	-	-	+
Begonia wrightiana A. DC.	End.	VU	-	-	-	+
Protium cubense (Rose) Urb.	End.	EN	+	-	-	+
Buxus revoluta (Britton) Mathou	End.	EN	-	-	-	+
Buxus rheedioides Urb.	End.	EN	-	-	-	+
Buxus vaccinioides (Britton) Urb.	End.	VU	-	-	-	+
Selenicereus grandiflorus (L.) Britton & Rose	----	LC	+	+	+	+
Maytenus cajalbanica (Borhidi & O. Muñiz) Borhidi & O. Muñiz	End.	CR	+	-	-	-
Salacia wrightii Urb.	End.	EN	-	-	-	+
Erythroxylum baracoense Borhidi	End.	VU	-	-	-	+

[33] Berazaín Iturralde, R. et al. 2005. Lista roja de la flora vascular cubana

Species	Endemism	IUCN status	GUANI	BAM	GUA	NSB
Erythroxylum clarense Borhidi	End.	VU	-	-	+	-
Erythroxylum dumosum Alain	End.	CR	-	-	-	+
Erythroxylum horridum Borhidi & Oviedo	End.	VU	-	-	-	+
Euphorbia cubensis Boiss.	End.	CR	+	-	-	-
Platygyna leonis Alain	End.	VU	-	-	-	+
Chamaecrista bucherae (Moldenke) H.S. Irwin & Barneby	End.	EN	-	-	-	+
Harpalyce acunae Borhidi & O. Muñiz	End.	VU	-	-	-	+
Piscidia havanensis (Britton & P. Wilson) Urb. & Ekman	End.	EN	-	-	-	+
Poitea gracilis (Griseb.) Lavin	End.	NT	-	-	+	+
Poitea immarginata (C. Wright) Lavin	End.	CR	+	-	-	-
Senna domingensis (Spreng.) H.S. Irwin & Barneby	----	VU	-	-	-	+
Gesneria lomensis Urb.	End.	CR	-	-	+	-
Gesneria rupincola Urb.	End.	EN	+	-	-	-
Gesneria wrightii Urb.	End.	VU	-	-	-	+
Callicarpa leonis Moldenke	End.	VU	-	-	-	+
Salvia scabrata Britton & P. Wilson	End.	VU	-	-	-	+
Byrsonima moensis Acuña & Roig	End.	VU	-	-	-	+
Pachira cubensis (A. Robyns) Fern. Alonso	End.	LC	+	-	-	-
Calycogonium acunanum Borhidi & O. Muñiz	End.	EN	-	-	-	+
Calycogonium ellipticum C. Wright	End.	EN	-	-	-	+
Calycogonium microphyllum C. Wright	End.	VU	+	-	-	-
Calycogonium plicatum Griseb.	End.	VU	-	-	-	+
Calycogonium rubens Borhidi	End.	VU	-	-	-	+
Calycogonium susannae Borhidi	End.	VU	-	-	-	+
Calyptranthes acunae Borhidi & O. Muñiz	End.	VU	-	-	-	+
Calyptranthes albicans Borhidi	End.	VU	-	-	-	+
Calyptranthes baracoensis Borhidi	End.	VU	-	-	-	+
Calyptranthes exasperata Borhidi	End.	VU	-	-	-	+
Calyptranthes linearis Alain	End.	VU	-	-	-	+
Calyptranthes mayarensis Borhidi	End.	VU	-	-	-	+
Calyptranthes minutiflora Borhidi	End.	VU	-	-	-	+
Calyptranthes pozasiana Urb.	End.	EN	+	-	-	-
Calyptranthes pseudomoaensis Borhidi & O. Muñiz	End.	VU	-	-	-	+
Calyptranthes rostrata Griseb.	End.	EN	-	-	-	+
Eugenia cajalbanica Borhidi & O. Muñiz	End.	CR	+	-	-	-
Eugenia excisa Urb.	End.	CR	-	-	-	+
Plinia acunae Borhidi & O. Muñiz	End.	VU	-	-	-	+
Plinia dermatodes Urb.	End.	CR	+	-	-	-
Plinia ramosissima (Urb.) Urb.	End.	VU	-	-	-	+
Plinia rupestris Ekman & Urb.	End.	CR	+	-	-	-

Species	Endemism	IUCN status	GUANI	BAM	GUA	NSB
Plinia stenophylla Urb.	End.	EN	-	-	-	+
Psidium celastroides Urb.	End.	EN	-	-	+	-
Psidium claraense Urb.	End.	CR	-	-	+	-
Psidium cymosum Urb.	End.	CR	+	-	-	-
Psidium scopulorum Ekman & Urb.	End.	EN	+	-	-	-
Piper baracoanum León	End.	CR	-	-	-	+
Piper perditum Trel.	End.	EN	+	+	+	-
Piper wrightii C. DC.	End.	EN	-	-	-	+
Polygala rhynchosperma S.F. Blake	End.	EN	-	-	-	+
Reynosia moaensis Borhidi & O. Muñiz	End.	VU	-	-	-	+
Reynosia revoluta (C. Wright) Urb.	End.	CR	+	-	-	-
Rhamnidium nipense Urb.	End.	EN	+	-	-	+
Rondeletia bicolor Britton	End.	CR	-	-	+	-
Rondeletia diplocalyx Urb.	End.	VU	-	-	-	+
Rondeletia leonii Britton	End.	CR	-	-	+	+
Rondeletia micarensis Urb.	End.	VU	-	-	-	+
Schmidtottia cucullata Borhidi & Bisse	End.	VU	-	-	-	+
Schmidtottia marmorata Urb.	End.	EN	-	-	-	+
Schmidtottia monticola Borhidi	End.	VU	-	-	-	+
Schmidtottia scabra Borhidi & Acuña	End.	VU	-	-	-	+
Schmidtottia sessilifolia (Britton) Urb.	End.	VU	-	-	-	+
Shaferocharis cubensis Urb.	End.	VU	-	-	-	+
Shaferocharis multiflora Borhidi & O. Muñiz	End.	VU	-	-	-	+
Shaferocharis villosa Borhidi & Bisse	End.	VU	-	-	-	+
Stenostomum nipense (Borhidi & O. Muñiz) Borhidi & M. Fernández	End.	LC	-	-	-	+
Stenostomum orbiculare (Alain) Borhidi & M. Fernández	End.	VU	-	-	-	+
Amyris cubensis (Borhidi & Acuña) Beurton	End.	EX	-	-	-	+
Amyris diatrypa Spreng.	----	CR	-	-	+	-
Ravenia baracoensis Borhidi & O. Muñiz	End.	VU	-	-	-	+
Banara brittonii Roig	End.	VU	+	-	-	-
Casearia bissei J.E. Gut.	End.	EN	-	-	-	+
Casearia crassinervis Urb.	End.	EN	-	-	-	+
Casearia moaensis Vict.	End.	EN	-	-	-	+
Samyda cubensis P. Wilson	End.	EN	-	-	+	-
Samyda macrantha P. Wilson	End.	Rara	+	-	+	+
Euchorium cubense Ekman & Radlk.	End.	CR	+	-	-	-
Pouteria aristata (Britton & P. Wilson) Baehni	End.	EN	+	-	-	+
Pouteria cubensis Baehni	End.	CR	-	-	-	+
Pouteria dictyoneura (Griseb.) Radlk. subsp. ***dictyoneura***	End.	EN	+	+	+	+
Pouteria micrantha (Urb.) Baehni	End.	CR	-	-	-	+
Castela calcicola (Britton & Small) Ekman	End.	EN	+	-	-	-

Species	Endemism	IUCN status	GUANI	BAM	GUA	NSB
ex Urb.						
Brunfelsia linearis Ekman ex Urb.	End.	VU	-	-	-	+
Brunfelsia pluriflora Urb.	End.	LC	-	-	-	+
Cestrum moaense Borhidi & O. Muñiz	End.	VU	-	-	-	+
Anthurium cubense Engl.	----	VU	+	+	+	+
Bactris cubensis Burret	End.	LC	-	-	-	+
Calyptrogyne plumeriana (Mart.) Roncal	----	LC	-	+	+	+
Gaussia spirituana Moya & Leiva	End.	EN	-	+	-	-
Roystonea lenis León	End.	VU	-	-	-	+
Roystonea regia (Kunth) O.F. Cook	----	LC	+	+	+	+
Roystonea stellata León	End.	EX	-	-	-	+
Roystonea violacea León	End.	EN	-	-	-	+
Agave acicularis Trel.	End.	EN	-	-	+	-
Rhynchospora bucherorum León	End.	EN	-	-	-	+
Basiphyllaea wrightii (Acuña) Nir	End.	EN	+	-	-	-
Platystele ovalifolia (H. Focke) Garay & Dunsterv.	End.	EN	-	-	-	+
Platythelys querceticola (Lindl.) Garay	----	EN	+	-	+	+
Pleurothallis mucronata Lindl. ex Cogn.	End.	EN	-	-	-	+
Arthrostylidium pinifolium Catasús	End.	EN	-	-	-	+
Lithachne pinetii (C. Wright ex Griseb.) Chase	End.	CR	-	-	-	+
Piresiella strephioides (Griseb.) Judziewicz, Zuloaga & Morrone	End.	EN	+	-	-	-

Invertebrates[34]:

Key: I. Guaniguanico, II. Guamuhaya; III. Bamburanao, IV. Nipe-Sagua-Baracoa.

Class	Order	Species	IUCN	I	II	III	IV
Gastropoda	Stylommatophora	*Coryda armasi*	CR				X
Gastropoda	Littorinimorpha	*Diploma pujalsi*	EN				X
Gastropoda	Stylommatophora	*Polydontes apollo*	CR				X
Gastropoda	Archeogastropoda	*Farcimen yunquense*	CR				X
Gastropoda	Stylommatophora	*Polydontes natensoni*	VU				X
Gastropoda	Stylommatophora	*Polydontes torrei*	VU				X
Gastropoda	Stylommatophora	*Polymita picta*	CR				X
Gastropoda	Stylommatophora	*Polymita sulphurosa*	CR				X
Gastropoda	Stylommatophora	*Polymita venusta*	EN				X
Gastropoda	Stylommatophora	*Suavita suavis*	VU		X		
Gastropoda	Cycloneritimorpha	*Troschelviana spinopoma*	EN				X
Gastropoda	Littorinimorpha	*Xenophoma aguayoi*	EN				X
Gastropoda	Stylommatophora	*Zachrysia petitiana*	VU		X		
Arachnida	Astigmata	*Cubanochirus maXimus*	CR				X
Arachnida	Prostigmata	*Ewingana isabellae*	VU			X	X
Arachnida	Mesostigmata	*Ornithonyssus noeli*	VU				X
Insecta	Coleoptera	*Stoiba marginata*	VU		X		
Insecta	Lepidoptera	*Anetia cubana*	VU				X

[34] Hidalgo-Gato et al. (en prensa). Lista roja de los invertebrados terrestres de Cuba

Class	Order	Species	IUCN	I	II	III	IV
Insecta	Lepidoptera	*Atlantea perezi*	VU				X
Insecta	Lepidoptera	*Calisto bradleyi*	VU	X			
Insecta	Lepidoptera	*Calisto brochei*	EN				X
Insecta	Lepidoptera	*Calisto bruneri*	VU				X
Insecta	Lepidoptera	*Calisto israeli*	VU				X
Insecta	Lepidoptera	*Calisto occulta*	EN				X
Insecta	Lepidoptera	*Chioides marmorosa*	EN	X			
Insecta	Lepidoptera	*Dianesia carteri ramsdeni*	VU				X
Insecta	Lepidoptera	*Eloria cubana*	EN				X
Insecta	Lepidoptera	*Eunica heraclitus*	CR				X
Insecta	Lepidoptera	*Holguinia holguin*	EN	X			
Insecta	Lepidoptera	*Iodopepla alayoi*	EN				X
Insecta	Lepidoptera	*Lycorea halia demeter*	VU				X
Insecta	Lepidoptera	*Meragisa toddi*	EN				X
Insecta	Lepidoptera	*Oarisma bruneri*	EN				X
Insecta	Lepidoptera	*Paucivena cubana*	EN		X		
Insecta	Lepidoptera	*Paucivena fusca*	CR		X		
Insecta	Lepidoptera	*Zellatilla columbia*	EN	X			

Terrestrial and freshwater fauna[35].

Key: I. Guaniguanico, II. Guamuhaya; III. Bamburanao, IV. Nipe-Sagua-Baracoa (• = endemic)

Class	Order	Species	IUCN	I	II	III	IV
Mammalia	Chiroptera	*Mormopterus minutus* •	VU			X	X
Mammalia	Rodentia	*Mysateles melanurus* •	VU				X
Mammalia	Soricomorpha	*Solenodon cubanus* •	CR				X
Aves	Accipitriformes	*Chondrohierax wilsonii* •	CR				X
Aves	Accipitriformes	*Accipiter gundlachi*•	EN	X	X		X
Aves	Anseriformes	*Dendrocygna arborea*	VU	X		X	X
Aves	Apodiformes	*Mellisuga helenae* •	VU	X			X
Aves	Columbiformes	*Geotrygon caniceps* •	VU	X	X		X
Aves	Columbiformes	*Patagioenas inornata*	VU	X			X
Aves	Columbiformes	*Patagioenas leucocephala*	VU	X	X	X	X
Aves	Columbiformes	*Starnoenas cyanocephala* •	EN	X		X	
Aves	Passeriformes	*Setophaga pityophila*	VU	X			X
Aves	Passeriformes	*Myadestes elisabeth* •	VU	X			X
Aves	Passeriformes	*Tyrannus cubensis*	EN	X			X
Aves	Piciformes	*Colaptes fernandinae* •	VU	X			
Aves	Piciformes	*Campephilus principalis*	CR				X
Aves	Psitaciformes	*Amazona leucocephala*	VU	X	X		X
Aves	Psitaciformes	*Aratinga euops* •	EN		X		X
Reptiles	Squamata	*Diploglossus nigropunctatus* •	VU				X
Reptiles	Squamata	*Anolis alfaroi* •	CR				X
Reptiles	Squamata	*Anolis cupeyalensis* •	VU				X
Reptiles	Squamata	*Anolis fugitivus* •	EN				X
Reptiles	Squamata	*Anolis inexpectata* •	EN				X
Reptiles	Squamata	*Anolis macilentus* •	CR				X

[35] González, H., L. Rodríguez-Schettino, A. Rodríguez, C. A. Mancina y I. Ramos. 2011. *Libro rojo de los vertebrados de Cuba.* Editorial Academia. 303 pp.

Class	Order	Species	IUCN	I	II	III	IV
Reptiles	Squamata	*Anolis rubribarbus* •	VU				X
Reptiles	Squamata	*Anolis barbatus* •	EN	X			
Reptiles	Squamata	*Cyclura nubila*	VU	X			X
Reptiles	Squamata	*Tarentola crombie* •	VU				X
Reptiles	Squamata	*Sphaerodactylus armasi* •	EN				X
Reptiles	Squamata	*Sphaerodactylus bromeliarum* •	CR				X
Reptiles	Squamata	*Sphaerodactylus ruibali* •	EN				X
Reptiles	Squamata	*Tropidophis fuscus* •	CR				X
Reptiles	Squamata	*Tropidophis pilsbryi* •	CR				X
Amphibia	Anura	*Peltophryne longinasus* •	EN	X	X		X
Amphibia	Anura	*Eleutherodactylus acmonis* •	VU				X
Amphibia	Anura	*Eleutherodactylus bartonsmithi* •	VU				X
Amphibia	Anura	*Eleutherodactylus bresslerae* •	VU				X
Amphibia	Anura	*Eleutherodactylus emiliae* •	VU		X		
Amphibia	Anura	*Eleutherodactylus iberia* •	VU				X
Amphibia	Anura	*Eleutherodactylus mariposa* •	VU				X
Amphibia	Anura	*Eleutherodactylus orientalis* •	VU				X
Amphibia	Anura	*Eleutherodactylus pezopetrus* •	VU				X
Amphibia	Anura	*Eleutherodactylus symingtoni* •	EN	X			
Amphibia	Anura	*Eleutherodactylus tetajulia* •	VU				X
Osteichties	Perciformes	*Nandopsis ramsdeni* •	EN				X
Osteichties	Cyprinodontiformes	*Girardinus cubensis* •	EN	X			

PART III. Results of Corridor Design Workshop

Guaniguanico

Activity. Definition of potential areas for the establishment of biological corridors

Exercise A: Identification in the map of each área the sites of interest for conservation, and justufy their importance

	Sites of conservation interest	Ecological and/or social importance
1	RE El Salón	Categoría II de UICN, 581 ha
2	RN El Mulo	Cat I UICN, 280 ha
3	RN Las Peladas	Cat I UICN, 214 ha
4	END Cañón del Río Santa Cruz	Cat II UICN, 400 ha
6	END Guajaibón	Cat II UICN, 837 ha
7	RFM San Marcos	Cat IV UICN, 259 ha
8	RE Sierra de la Güira	Cat I UICN, 2065 ha

Exercise B. Definition of limits of corridor(s) on the base of the criteria provided and taking into account the sites of conservation interest identified above.

See Map Annex

Exercise C. Define the criteria (biophysical, ecological and social) used for the delimitation of the corridor(s).

Biophysical	Ecological	Social
- Various drainage basins - Range of elevations - Roads - System of terraces - Erosion	- Resident populations of a number of herbivorous bird, bat and reptile species - High invertebrate diversity (butterflies and hymenoptera) - Presence of fragments or patches of vegetation of natural forest (conservation forest) - High values of endemism and threatened species - Presence of productive forest systems	- Population with high level of environmental awareness - Protected areas with administration, apart from Cañón del Santa Cruz - Production of non-BD friendly coffee (exotic shade, use of chemicals and non-ecological depulping facilities

Activity: Definition of inputs for the design of ecological connectivity networks

Exercise D1. Definition of priority core areas for the reestablishment of maintenance of connectivity in the target massif.

Core areas	Importance
1. APRM Sierra del Rosario	- Cat IV UICN. - Biodiversity at various levels (species, ecosystems and ecosystem services)
2. APRM Mil Cumbres (Sierra de la Güira, Pan de Guajaibón and San Marcos)	- Biodiversity at various levels (species, ecosystems and ecosystem services)
3. END Cañón del Río Santa Cruz	- Cat II UICN - Biodiversity at various levels (species, ecosystems and ecosystem services)

Exercise D2. Determine the objective of the Ecological Connectivity Network.

Connection of foci of biological diversity in the eastern half of the Guaniguanico massif.

Exercise D3. Establish weighting values for each of the criteria (sum = 100).

	Criterion	Weighting
1	Fragment size	30
2	Form index	10
3	Distance from roads	5
4	Distance from population centres	10
5	Distance from rivers	5
6	Agroforestry practices	15
7	Áreas vulnerable to forest fires	10
8	Law #300	15

Exercise D4. Choose the land use classification that most closely applies to the landscape of the massif and define friction values for each land use type (1 = least / N = greatest).

	Coverage type	Friction value
1	Natural forest	1
2	Plantations (wáter and soil conservation forest)	2
3	Secondary forest	3
4	Shade coffee	4
5	Small farms, FFI	5
6	Tourism	6
7	Agro-silvo-pastoral farms	7
8	Sun coffee	8
9	Roads	9
10	Reservoirs	10
11	SettlementsAsentamientos	11

Guamuhaya

Activity. Definition of potential areas for the establishment of biological corridors

Exercise A: Identification in the map of each área the sites of interest for conservation, and justufy their importance

Site of conservation interest		Ecological and/or social importance
1	Galerías de Rio Hondo	High endemism, well conserved gallery forest
2	Carso de Buenos Aires	High endemism Important área for nesting of threatened and endemic bird species
3	La Yaba	Área of high importance for threatened and endemic flora species
4	Naranjo	Área of high importance for threatened and endemic flora species
5	San Juan Beltrán	Connectivity, conservation of flora, fauna, water resources
	Guanayara	Ecotourism development, conservation of vegetation, connectivity
	Trinitario	Connectivity and conservation of vegetation, wáter resources, ecotourism
	Frente del Brollo	Connectivity
	Norte Hanabanilla	water resources , Ecotourism, connectivity, conservation of flora,

		vegetation and fauna
	Rincón Naranjo	Connectivity and conservation of vegetation, water resources , mountain agriculture, rural communities
	Campamento de Seibabo	Connectivity and conservation of vegetation
	Algarrobo	Connectivity and conservation of vegetation
	Sopimpa	Connectivity and conservation of vegetation
	La Escofina	Connectivity and conservation of vegetation
	La Veinte	Connectivity and conservation of vegetation

Exercise B. Definition of limits of corridor(s) on the base of the criteria provided and taking into account the sites of conservation interest identified above.

See Map Annex.

Exercise C. Define the criteria (biophysical, ecological and social) used for the delimitation of the corridor(s).

Biophysical	Ecological	Social
- Hydrology - Topography - Plant formations	- Endemism - Threats - Important area for the reproduction and feeding of fauna	- Presence of rural communities - Ecotourism - Health tourism - Mountain agriculture (coffee , subsistence, diverse crops) - Forest farms

Activity: Definition of inputs for the design of ecological networks

Exercise D1. Definition of priority core areas for the reestablishment of maintenance of in the target massif.

	Core areas	Importance
1	Mameyal	- BD values DB - Landscape
2	Mataguá	- High floristic endemism. - Refuge for threatened species - The highest karst área of the insular Caribbean
3	Pico San Juan	- High values de DB. A nivel de species , ecosystems - High endemism
4	Hanabanilla	- High values de DB a nivel de species , ecosystems and water resources - High flora endemism. Social importance. Reservoir (environmental services). - Tourism, hotels, hiking
5	Cueva El Brollo	- BD values
6	Topes de Collantes	- Environmental services. high diversity of flora, fauna and vegetation. Social importance, development of health tourism and ecotourism. Generates employment for local rural populations.
7	Valle Yaguanabo	- High fauna values (nesting site for catey). Shade coffee. *Coccothrinax* palm (threatened). Extends to the coast.
8	Martín Infierno	- Landscape value. Karstic vegetation. Important cave. Presence of *Coccothrinax* (threatened). Core area connecting Aguacate and Yaguanabo.
10	Banao	- High BD values. Source of two local rivers. Nature tourism. High levels of contamination by agrochemicals used in garlic and onion production at the edge of the PA.

Exercise D2. Determine the objective of the Ecological Network.

Conservation of connectivity of important nuclei for BD of flora and fauna species, ecosystems, landscapes and environmental services. Identification of priority zones to link local communities to the conservation of connectivity.

Exercise D3. Establish weighting values for each of the criteria (sum = 100).

	Criterion	Weighting
1	Fragment size	40
2	Form index	25
3	Distance to roads	5
4	Distance to population centres	5
5	Distance to rivers	10
6	Number of plant formations per fragment	5

Exercise D4. Choose the land use classification that most closely applies to the landscape of the massif and define friction values for each land use type (1 = least / N = greatest).

	Coverage	Friction value
1	Natural forests (conservation)	1
2	Forestry plantations	4
3	Shade coffee	3
4	Coffee	7
5	Pasture	8
6	Crops	9
7	Fruit tres (citrus)	5
8	Secondary scrub	6
9	Water bodies	2

Bamburanao

Activity. Definition of potential areas for the establishment of biological corridors

Exercise A: Identification in the map of each area the sites of interest for conservation, and justufy their importance

	Sites of conservation interest	Ecological and social importance
1	Boquerón	Rich biodiversity, seriously affected by anthropic pressures. Important cave system, which is home to species such as *Gaussia spirituana* and numerous populations of quiroptera in the caves. High bird diversity, including endemic and threatened species
2	Lomas de la Canoa	Three plant formations: mogotes complex, semideciduous mesophyllous forest and gallery forest, which contain rich floristic diversity. Cave system with important biodiversity, including abundant and diverse quiropterofauna and other vertebrates and invertebrates. The cave system is located in a mogote formation with karstic cliffs and exuberant vegetation including *Gaussia spirituana.*
3	APRM Jobo Rosado	Flora includes 305 species belonging to 229 genera and 77 families, in four natural plant formations: mesophyllous evergreen forest, typical

		semideciduous mesophyllous forest, semideciduous mesophyllous forest on skeletal soils, and gallery forest. Invertebrates include 262 species and vertebrates 127; 203 species of insects, 87 bird species 35 molluscs and 21 reptiles.
4	Lomas de Platero	276 species of vascular plants, in 87 families and 201 genera. Home to critically threatened *Tabernaemontana apoda*. Fauna includes several taxa of endemic birds and a number of populations of quiroptera in the caves of the area.
5	Biocentro Bamburanao	Semideciduous mesophyllous forest, which due to anthropic influence has largely been converted into secondary forest and patchy scrub, with 130 plant species from 104 gener and 60 families, of which 62 are new reports. 25 species of molluscs belonging to 19 genera and 14 families. 49 bird species, of which 7 are national endemics and 12 are winter migrants.
6	Dos Sierras	The presence of flat areas has led to strong anthropic influence, resulting in a mix of natural and secondary vegetation. Natural vegetation is only found in higher areas and even there shows anthropic influence, although to a lesser degree than in the lowlands. Mogote vegetation, dominated by semideciduous mesophyll forest 10-15m in height, with patches of evergreen forest in higher parts of some mogotes. 74 bird species belonging to 30 families, of which 12 are national endemics, 30 are migratory and 5 are threatened.

Exercise B. Definition of limits of corridor(s) on the base of the criteria provided and taking into account the sites of conservation interest identified above.

See Map Annex

Exercise C. Define the criteria (biophysical, ecological and social) used for the delimitation of the corridor(s).

Biophysical	Ecological	Social
Located in the northeastern uplands, including the Sierra de Bamburanao, Sierra de Meneses and Cueto, Lomas de la Canoa and Sierra de Jatiibonico ranges. Characterized by abundance of karstic processes, resulting in features such as caves and mogotes.	Semideciduous forest, mogotes complex and gallery forest with high levels of diversity endemism and threat, as well as cave systems with rich troglodyte fauna.	45,900 habitants, in 56 population centres. Main activities are agricultura and forestry. In Jatibonico, Meneses and Cueto ranges there are open cast limestone mines

Activity: Definition of inputs for the design of ecological networks

Exercise D1. Definition of priority core areas for the reestablishment of maintenance of in the target massif.

	Core areas	Importance
1	Bamburanao - Lomas de Platero – coastal mangroves corridor	Important biodiversity values, with Little distance between the mountain areas and the coastal mangroves. Includes small patches of vegetation, which are very important for connectivity, as well as creeks that extend from the mountains to the coast.
2	APRM Jobo Rosado – Ciénaga	An area of vital importance for the catey (*Aratinga eups*), as

	de la Guayabera corridor	individuals of this species move constantly in search of food between Caguanes National Park and APRM Jobo Rosado.
3	Alunao – Boquerones Loma de la Canoa Corridor	An area with much anthropogenic influence and hábitat fragmentation, due in large part to vegetable production. Natural values of interest in the área include mogotes and limestone cliffs, the biodiversity of which is seriously threatened by the agriculture which extends right to their bases.
4	Juan Francisco Corridor	An area with much anthropogenic influence and hábitat fragmentation due to of agriculture and grazing.
5	Bamburanao – Dos Sierras Corridor	An area with much anthropogenic influence due to socioeconomic activities (agriculture and grazing): of much importance for connectivity between Sierra de Bamburanao and Dos Sierras.

Exercise D2. Determine the objective of the Ecological Network.

Promotion of connectivity between well conserved natural areas located in the mountain ranges (Sierra de Jatibonico, Lomas de La Canoa, Sierra de Meneses and Cueto and Sierra de Bamburanao) and ecosystems located in neighbouring areas sicj as the northern coastal plains (Caguanes NP), thereby guaranteeing genetic interchange between them and therefore promoting population viability.

Exercise D3. Establish weighting values for each of the criteria (sum = 100).

	Criterion	Weighting
1	Fragment size	25
2	Form index	10
3	Distance from roads	15
4	Distance from population centres	10
5	Distance from rivers	15
6	Altitude range	5
7	Productive activities	20

Exercise D4. Choose the land use classification that most closely applies to the landscape of the massif and define friction values for each land use type (1 = least / N = greatest).

	Cover	Friction value
1	Natural forests	1
2	Secondary vegetation	2
3	Forestry	3
4	Hydrography	4
5	Water bodies	5
6	Pasture	6
7	Crops	7
8	Roads	8
9	Settlements	9
10	Mines	10

Nipe-Sagua-Baracoa

Activity. Definition of potential areas for the establishment of biological corridors

Exercise A: Identification in the map of each área the sites of interest for conservation, and justufy their importance

In floristic terms, pine forests and charrascales (sub-spiny xeromorph scrub on serpentine) predominate with high indices of endemism, as well as rainforests and evergreen forests constituting 6 distinct phytogeographic districts.

Sites of conservation interest	Ecological and social importance
- Quivijan – Humboldt: Rainforest. - Puriales – Quivijan: Rainforest. - Pico Galán – Humboldt: Pinares, Xeromorphic scrub, rainforest.	- Protection of water, soil and biota, centre for Caribbean speciation, forest resources, refuge for endemic flora and fauna, conservation of genetic resources. - Pollinators, carbon sinks, climate modulation.
- Humboldt – Pico Cristal 1: Pine forests, xeromorphic scrub, rainforest, evergreen forests. - Humboldt – Pico Cristal 2: evergreen forests. - Humboldt – Pico Cristal 4: - Evergreen forests - Humboldt – Pico Cristal 3: evergreen forests. - Humboldt – Pico Cristal 10: evergreen forests. - Humboldt – Pico Cristal 5: evergreen forests. - Humboldt – Pico Cristal 6: evergreen forests. - Humboldt – Pico Cristal 7: evergreen forests. - Humboldt – Pico Cristal 9: evergreen forests. - Humboldt – Pico Cristal: evergreen forests. - Mensura – Pico Cristal: Pine forests and xeromorphic scrub.	- Protection of water, soil and biota, centre for Caribbean speciation, forest resources, refuge for endemic flora and fauna, conservation of genetic resources. - Pollinators, carbon sinks, climate modulation. - Reservoir water quality.
- Pico Cristal – Micara 3: Pine forests, xeromorphic scrub, and Rainforest. - Pico Cristal – Micara 4: Pine forests and xeromorphic scrub. - Pico Cristal – Micara 2: Pine forests and xeromorphic scrub. - Pico Cristal – Micara 1: Pine forests and scrub. - Pico Cristal – Micara 5: Pine forests and xeromorphic scrub.	- Protection of water, soil and biota, centre for Caribbean speciation, forest resources, refuge for endemic flora and fauna, conservation of genetic resources. - Pollinators, carbon sinks, climate modulation. - Important mineral reserves.
- Mensura – Pico Cristal 1: Pine forests and xeromorphic scrub.	- Protection of water, soil and biota, centre for Caribbean speciation, forest resources, refuge for endemic flora and fauna, conservation of genetic resources. - Pollinators, carbon sinks, climate modulation. - Reservoir water quality. - Important mineral reserves.
- Cayo Rey: Mogotes complex - Guantanamito – Calunga: Mogotes complex	- Protection of water, soil and biota, centre for Caribbean speciation, forest resources, refuge

	for endemic flora and fauna, conservation of genetic resources. - Pollinators, carbon sinks, climate modulation.

<u>Exercise B</u>. Definition of limits of corridor(s) on the base of the criteria provided and taking into account the sites of conservation interest identified above.

See Map Annex

<u>Exercise C</u>. Define the criteria (biophysical, ecological and social) used for the delimitation of the corridor(s).

Biophysical	Ecological	Social
- Geological substrate - Soil type - Relief -	- Natural vegetation formations - Presence of flagship fauna species such as the endemic insectivorous Cuban solenodon. - Presence of flagship flora species such as the strict endemics *Pinus cubensis* and *Bonnetia cubensis*, and the genera *Spathelia* and *Euphorbia*, which contain various strict endemic species.. - Carbon sink/oxygen production	- Environmental goods and services, including timber and non-timber forest products. - Soil and water protection. - New economic incentives for local production. - New technologies for local production. - Reduction of population exodus.

<u>Activity: Definition of inputs for the design of ecological networks</u>

<u>Exercise D1.</u> Definition of priority core areas for the reestablishment of maintenance of in the target massif.

	Core areas	Importance
1	Alto de las Canas Ecological Reserve (Puriales) (submontane rainforest vegetation)	Protection of water, soil and biota, centre for Caribbean speciation, forest resources, refuge for endemic flora and fauna, conservation of genetic resources.
2	El Yunque Outstanding Natural Element (mesophyllous evergreen forest)	Protection of water, soil and biota, centre for Caribbean speciation, forest resources, refuge for endemic flora and fauna, conservation of genetic resources.
3	Alejandro de Humboldt NP (Bosques evergreen mesophyllous forests; vegetation on serpentine rocks, sclerophyll rainforest, pine forests, sclerophyll xeromorphic scrub)	Protection of water, soil and biota, centre for Caribbean speciation, forest resources, refuge for endemic flora and fauna, conservation of genetic resources..
4	Pico Cristal NP (vegetation on serpentine rocks, sclerophyll rainforest, pine forests, sclerophyll xeromorphic scrub)	Protection of water, soil and biota, centre for Caribbean speciation, forest resources, refuge for endemic flora and fauna, conservation of genetic resources.
5	Mensura-Piloto NP (vegetation on serpentine rocks, pine forests, sclerophyll xeromorphic scrub)	Protection of water, soil and biota, centre for Caribbean speciation, forest resources, refuge for endemic flora and fauna, conservation of genetic resources.

Exercise D2. Determine the objective of the Ecological Network.

General: promote connectivity between ecosystems with high values of BD within a diverse matrix, for their conservation and sustainable use

Specific: Strengthen the conservation of protected landscapes, promote the sustainability of the use of natural resources, guarantee environmental goods and services (water, soils and biota) in the long term.

Exercise D3. Establish weighting values for each of the criteria (sum = 100).

	Criterion	Weighting
1	Fragment size	40
2	Form index	20
3	Distance to roads	10
4	Distance to population centres	10
5	Distance to rivers	20

PART IV. Stakeholders

Actor	Organism	Roles and functions	Interest in the project	Participation in the Project
Central Government				
Ministry of Science, Technology and the Environment (CITMA)	CITMA	Principal implementing partner through the Environment Agency (AMA). Also participates in key research institutes (see below)	The Project will contribute to the implementation of national policies on BD conservation.	Responsible for supervising processes of environmental evaluation of each proposed investment
Ministry of Agriculture (MINAG)	MINAG	Direction and execution of Government policies related to the use, conservation and improvement of soils; property and posession of agricultural and forestry lands; plant health; vetereninary medicine; conservation, management and rational use of forest resources and wild fauna and flora; mechanization and irrigation of production programmes; agricultural production activities;; processing of rice, tobacco, citrus, coffee, beekeeping products; animal feed; forest products and bird products.	The project includes a number of terrestrial areas that are responsibility of MINAG.	MINAG, with its delegations at provincial and municipal levels, is a key implementing stakeholder, in terms of the facilitation of local Access to stakeholders, networks and resources, and the integration of new and improved sector planning instruments during and after the Project. Supervision and control of the execution of the Project in accordance with its institutional roles.
Environment Agency (AMA)	CITMA	Base of the Project Management Unit of CITMA; coordination of inputs from scientific institutes	Contribution with models of municipal and community-based environmental planning.	Supervision and control of the execution of the Project in accordance with its institutional roles; responsible for the facilitation of operational procedures with UNDP and cofinancing sources.
Environment Directorate (DMA)	CITMA	Responsible for the generation and direction of the national environment policy, aimed at guaranteeing the protection of the environment and the rational use of natural resources, integrated with the sustainable development of the country. Enables, in conjunction with all of the Organisms of the	The Project will contribute to the implementation of national environmental policies.	Development, improvement and control of strategies, plans and programmes for the protection of the environment and the rational use of natural resources and priority ecosystems, with particular attention to the

Actor	Organism	Roles and functions	Interest in the project	Participation in the Project
		Central Administration of State, AMA and other directorates and depenencies of CITMA, the incorporation of guidelines of the national environmental policy in different policies, priority programmes and other actions with direct implications for the economic and social development of the country, guaranteeing at the same time its expression and international level. Forms part of the coordinating board of the NPAS. Collects and prcesses information to produce environmental indicators and provides them to the National Office of Ststistics and Information		integrated management of river drainage basins, bays and coasts, mountain zones and PAs. Control of the implementation of the SNAP, the National Strategy for Emvironmental Education and the National Monitoring System. Generation, establishment and control of policies related to the application of clean technologies and production practices. Direction and control of environmental planning through oversight of environmental requirements and regulations in territorial land use plans, prior to their approval. Control of environmental indicators at project site.
Ministry of External Trade and Foreign Investment (MINCEX)	MINCEX	Coordination and advice on instrumentation and coherence with policies of State and Government with regards to economic cooperation .	Responsible for ensuring that the Project is implemented in accordance with Government approaches and policies.	Approval, oversight and control of the implementation of the activities of the Project, in accordance with its institutional mandate.
National Centre for Protected Areas (CNAP)	CITMA	Lead entity for the planning of PAs in Cuba. Provides methodological guidance, supervision and control to the SNAP .	Works together with productive sectors in the incorporation of biodiversity protection in activities related to production and protected landscapes	Member of the Coordinating Board of the project. Contributes experience in the management of PAs for biodiversity conservation in mountain massifs.
Centre for	CITMA	Órganism of CITMA responsible for the	Collaboration in	Control, provision of information

Actor	Organism	Roles and functions	Interest in the project	Participation in the Project
Environmental Control and Inspection (CICA)		control, protection and inspection. Ensure backup of environmental regulations. Supervises processes of Environmental Impact Assessment, acts as national authority for CITES, controls access to biodiversity.	ensuring the regulated use of natural resources by local stakeholders.	and training related to Environmental Impact Assessment, the management of flora and fauna, participation in the Steering Committee of the Project.
Ministry of the Interior, Forest Guard Corps (national, provincial and local levels)	MININT	Protection of forest resources, wildlife and other natural resources, together with other State organisms and institutions related to this. Member of the coordination board of the SNAP.	Support to the Project through the supervisión of the use of natural resources.	Action against infringements of regulations relating to the forest estate, wildlife, hunting and others, and imposition of fines and other measures. Key actor in the Early Warning System for forest fires, carrying out actions that lead to detection and reporting of damage to forest resources, wildlife and the environment in general. Training aimed at educating local communities in the protection of forest resources and wildlife, hunting, management and control of fire and the environment in general. Special emphasis on protecting mountain massifs and PAs. Participation in the Steering Committee of the Project.
Ministry of Education (MINED)	MINED	Leads and executes educational policy up to pre-university level.	Development of capacities and knowledge on nature conservation.	Provision of human resources for the training of local communities.
Institute of Phyiscal Planning (national, provincial and		Planning of territorial planning, approval of micro-locations, generation of tourism development plans.	Contribution to adequate territorial planning, taking into account environmental	Contribution to making development and land use plans compatible.

Actor	Organism	Roles and functions	Interest in the project	Participation in the Project
Municipal levels)			considerations and biodiversity conservation.	
Ministry of Tourism (MINTUR) and its provincial delegations	MINTUR	Evaluates, controls and executes the application of State and Government policy related to tourism	Contribution to the implementation of the Project, according to the current policies of State and Government.	Supervision of activities linked to tourism within the Project.
National Forestry Directorate and offices of Forest Services at provincipal and municipal levels	MINAG	Ensure compliance with the provisions of the Forestry Law #85 and its regulation. Overseas the correct use of FONADEF, approves projeects presented to FONADEF for the forest estate and wildlife, and carries out certification for forest owners and in PAs.	Establishment of synergies with the Project through the funding of conservation projects in the target areas.	Financing of conservation projects in the terrestrial parts of the target PAs. Contribution to the creation of technical capacities for the use and sustainable management of forest resources.
Agrinfor	MINAG	Production and dissemination of audiovisual communication materials covering social, political, cultural, historical, scientific, environmental and agricultural issues.	Production of audiovisual materials aimed at promoting and visualizaing the actions of the Project in the agricultural and forestry sectors, training and extension.	Provision of human and material resources
National Association of Small Farmers (ANAP)	ONG/ asociation vinculada al MINAG	Promotes the social and economic interests of small farmers. Its functions include the organization and orientation of farmers to facilitate their participation in the social and economic transformation of the rural context; the execution of the agrarian programme of the Cuban Revolution; promotion of agricultural production; and sustained increases in its contribution to national food supply and agroindustry.	Agriculture and livestock production in lands belonging to cooperatives and others in usufruct.	Development of sustainable agricultural production, compatible with BD and rational soil use in the areas of influence of the project.
Ministry of Energy and Mines	MINEM	Prioritised attention to environmental impacts associated with current and projected industrial development, in	Contribution to the correct implementation of activities related to	Supervision and control the execution of the Project in areas affected by mining

Actor	Organism	Roles and functions	Interest in the project	Participation in the Project
		particular that related to chemicals; petroleum and petrochemicals; mining, especially of nickel; cement and other building materials; including the strengthening of control and monitoring systems.	mining in the Project, according to current policies.	
Mundo Latino (Biodiversity Directorate)	Consejo de Estado	Contribute to the recovery of the historical memory of Cuba and the diffusion of its reality at national and international levels, through the production of audiovisual communication products that cover social, political, cultural, historical, scientific and environmental issues using contemporary televisión language	Production of audiovisual materials aimed at promoting and visualizaing the actions of the Project and BD conservation, for the development of capacities in the process of raising awareness of local communities, and training and extension.	Provision of human and material resources for dissemination and communication of the activities of the Project.
Regional/provincial entities				
Territorial delegations of CITMA and Environment Units	CITMA	Control and supervision of environmental management in the provinces. Control, coordination and supervision of the provincial system of PAs.	Ensure the correct implementation and control of actions related to conservation and sostuinable use of BD of the target PAs.	Coordination of the actions of the Project with provincial actors. Coordination of the creation if new management strategies and their implementation. Responsible for coordination and implementation of the monitoring and evaluation system of the project. Supervision and control of the use of Project resources..
Territorial delegations of MINAG: State Forest Service (SEF) and agriculture	MINAG	Promotion of the sustainable use of forest resources and the conservation of ecosystems and biodiversity.	Ensure the implementation of the actions of the National Forestry Programme	Participation in the development of economic incentives relation to the use of forest godos ans services, including coffee. Contribution to the creation of technical capacities for the

Actor	Organism	Roles and functions	Interest in the project	Participation in the Project
dependencies.				sustainable use and management of BD.
Representatives of provincial governments (Local Organs of Popular Power, Council of Municipal Administration)	National Assembly of National Popular Power	Control and administration of resources and local level.	Increase capacities for the harmonious use of natural resources and community needs.	Support to Project actions, coordination with and provision of information to different provincial actors. Support to the decisión making process. Consolidation and strengthening of the integrated management of territory.
Protected Areas in the areas of intervention	CITMA	Achievement of efficient protection and conservation of nature, as well as the historical and cultural values and resources associated with it. Promotion of the protection of ecosystems and natural habitats of high genetic diversity or fragility, species, evolutionary processes and genetic resources. Constitute the SNAP.	Contribute to the correct planning and management of PAs.	Provision of human and material resources for monitoring the management effectiveness of BD in the PAs and the coordination and execution of environmental education.
Órganisms for the integral development of mountain zones (OADIM)	CITMA	Specialized structures created by CITMA, for attending to mountain areas, through CITMA Resolution No. 143/95, and respond to the mandate imposed through Decree 197 with regard to the establishment of specialized structures for the integral management of mountain areas. Through Decree No. 280/2007 they come to form part of the National Commission of the Turquino Plan. Their function is to direct, execute and coordinate, as appropriate, scientific, technical and environmental management work in mountain areas, with the aim of achieving sustainable development there.	Opportunity for strengthening capacities and knowledge in the OADIM	Provision of specialists and technicians with knowledge of the mountain massifs, from the perspective of the environmental, social, economic and policy issues. Interrelation with decisión-makers, leaders and other key actors in the massifs. Coordination unit between universities and research centres to carry out studies that are needed for communities, for the conservation of forests, biodiversity, soils and river basins.
Gaviota Tours, and its local employees.	MINTUR	Enterprise Group that promotes, commercializes and operates hotel installations of different types and	Minimize the negative effects of tourism activities in Hotel	Participation in activities of training, support to evaluations of tourism impacts, appropriate

Actor	Organism	Roles and functions	Interest in the project	Participation in the Project
		categories, in Hotel Villa Mayarí en Pinares de Mayarí (Nipe-Sagua-Baracoa)	Villa Mayarí in Pinares de Mayarí (Nipe-Sagua-Baracoa)	development of tourism activities.
Islazul, and its local employees.	MINTUR	Enterprise Group that promotes, commercializes and operates hotel installations of different types and categories, in Hotel Mirador de San Diego, Pinar del Río; Hanabanilla, Villa Clara; Villa San José de Lago, Sancti Spíritus	Minimize the negative effects of tourism activities in Hotel Mirador de San Diego, Pinar del Río; Hanabanilla, Villa Clara; Villa San José de Lago, Sancti Spíritus	Participation in activities of training, support to evaluations of tourism impacts, appropriate development of tourism activities.
Production entities and cooperatives				
National Enterprise for the Protection of Flora and Fauna (ENPFF) (national company with establishments in provinces and PAs)	MINAG	Created through Resolution No. 181/1986 of MINAG. Mission: ensure the conservation of the most representative natural values in the country, with an emphasis in BD, guaranteeing ecological stability and sustainable use, as well as the protection of associated historical and cultural values. Responsible for the management of the majority of the PAs in the SNAP, and membetr of the SNAP Coordination Board.	Strengthening of PAs. Contribution to the correct planning and management of PAs under is administration. Support to local development, promoting nature and agrarian tourism.	Responsible for the administration of some od the PAs in the target areas of the Project (Jobo Rosado, Lomas de Banao, Hanabanilla, Mil Cumbres, Sierra de la Güira, Pan de Guajaibón, Reserva de San Marcos, Pico Cristal, Mensura-Pilotos). Creation of capacities, execution of Project activities, creation of infrastructure.
Integrated Forest Enterprises (EFI)	MINAG	Responsible for the management and appropriate and sustainable use of forest resources.	Development of sustainable forest activities.	Reforestation and forest management in the target areas.
Credit and Service Cooperatives (CCS)	Cooperative Sector	Agriculture and livestock production in agricultural lands belonging to individual members of cooperatives. Belong to ANAP.	Development of sustainable agricultural production using agricultural soils rationally in the target areas of the project.	Adequate development of productive activities in the target areas of the Project.
Agricultural and Livestock	Cooperative Sector	Agriculture and livestock production in agricultural lands belonging to cooperatives,	Development of sustainable agricultural	Adequate development of productive activities in the target

Actor	Organism	Roles and functions	Interest in the project	Participation in the Project
Production Cooperatives		or held under usufruct. Belong to the ANAP	production using agricultural soils rationally in the target areas of the project.	areas of the Project.
Local residents				
Local residents (children, workers, wives, retired workers)	Mass organizations (CDR, FMC, OPJM)	Execution of policies and programmes for the conservation of natural resources.	Increased knowledge of how to use, manage and protect natural resources. Increase participation in natural resource management.	Forming part of the actions of the project. Increase knowledge of local resources and increased awareness of sustainable resource use. Provision of human resources and traditional knowledge of natural resource use.
Centros de investigation				
Institute of Ecology and Systematics (IES)	CITMA	Contribution of knowledge on BD through integrated studies of systematics and ecology, promoting conservation and sustainable use in natural and restored ecosystems, increased contribution to scientific and socioeconomic development.	Strengthening of institutions and capacities. Contribution to the implementation of the National Strategy for Biological Diversity and its Action Plan.	National coordinator of the technical and financial implementation of the project. Direction and supervision of the execution of the project. Provision of specialists and technicians for studies of systematics and ecology, workshops, courses and training activities.
Institute of Oceanology (IDO)	CITMA	Establishment of scientific bases for conservation and sustainable us of coastal and marine resources and ecosystems of the Cuban platform and adjacent seas, through research into biological, physical, chemical and geological processes, evaluation and monitoring of BD and environmental quality and the development of marine biotechnology and aquaculture.	Increase in capacities and knowledge regarding marine conservation. Establishment of synergies with the project, through the execution of activities and the implementation of conservation projects.	Provision of specialists and technicians for BD research and , monitoring in marine areas, workshops, courses and training activities. Responsible for the study of reefs in marine areas adjacent to the Project areas, for the improvement of reef health and the reduction of sediment load. Use of technical equipment for marine research, as well as laboratories for analysis of biological samples of water and sediments. Coordination and

Actor	Organism	Roles and functions	Interest in the project	Participation in the Project
				interchange with other institutions related to the coastal and marine zone.
National Aquarium of Cuba (ANC)	CITMA	Scientific centre specialized in research, environmental education and dissemination related to the marine environment, its flora, fauna and ecology. Development of technical, didactic and recreational exhibitions and activities.	Increased capacities and knowledge of natural resource conservation.	Participation in monitoring programmes. Training on issues of marine ecology and support to environmental education activities.
Institute of Tropical Geography (IGT)	CITMA	Development of scientific knowledge in the area of geography, conduct and coordination of investigations and scientific- technical services on the structure and dynamics of different components of nature and society, their environmental interrelations, and their cartographic modeling, with the aim of contributing to the sustainable development of the country and the creation of the bases of the Cuban school of geography, in the tropical, Latin American and Caribbean context.	Opportunity for strengthening the Environmental Information Management System "INFOGEO"	Contribution to the INFOGEO system, with training on environmental planning and community-based participatory strategies and the design and implementation of GIS.
Museo Nacional de Historia Natural (MNHN)	CITMA	Collection, investigation, conservation and exhibition of natural objects with the aim of promoting scientific and cultural knowledge of nature.	Opportunity for increasing capacities and knowledge on BD conservation	Provision of human and material resoucees for environmental education activities
Centre for Local and Community Development (CEDEL)	CITMA	Advice, studies, research and promotion of integrated local community development through the formulation of strategies, through the generation of social transformation projects; including technology transfer and the development and training of local social actores (representatives of local Government, organizations and communities) in principles, procedures and the development	Opportunity to promote local development local in communities in the target areas	Training and development of local actors.

Actor	Organism	Roles and functions	Interest in the project	Participation in the Project
		of structures and projects for self-managed participatory action		
National Institute for Agroforestry Research (INAF)	MINAG	Strengthening of actions of the National Foresrtry Programme in environmental education, training, extensionism, genetic improvement and the production of native forest seed, promotion of plantations, forest inventory and planning, protection against pests and diseases and strengthening of institutional management to preserve biodiversity.	Opportunity to increase capacities and knowledge on the conservation and sustainable use of BD, as well as ensuring the implementation of actions of the National Forestry Programme	Member of the project's Coordinating Board. Provision of specialists and technicians for research, activities related to the forest estate, workshops, courses and training activities.
Centre for Environmental Research and Services of Pinar del Río (ECOVIDA)	CITMA	Scientific research into environmental issues, provision of scientific and technical services, including ecotourism, contributing to the conservation and management of the natural capital and the sustainable development of the province, through the promotion of actions for the maintenance of biological diversity in the administered PAs.	Strengthening of administered PAs. Contribution to their correct planning and management. Increase of capacities and knowledge for nature conservation.	Creation of capacities, execution of Project activities, creation of infrastructure. Participation in monitoring programmes. Contribution of human and material resources for the coordination and execution of training, environmental education environmental, research, monitoring and environmental evaluation.
Centre for Environmental Studies in Villa Clara (CESAM)	CITMA	Works in research, services and scientific/technical programmes in environmental issues, to promote BD conservation and integral management of ecosystems in function of sustainable development.	Increases in capacities and knowledge on nature conservation.	Provision of specialists and technicians for research and monitoring of BD in the massif, workshops, courses and training activities.
Centre for Environmental and Technological Research and Services of Holguín (CISAT)	CITMA	Generation, application and/or transfer of knowledge and technologies according to the requirements of sustainable development in the territory, through Scientific Research and Technological Innovation Projects, and Scientific and Technical Services and Products.	Increases in capacities and knowledge on nature conservation.	Provision of human and material resources for the coordination and execution of training, environmental education, research and environmental monitoring.

Actor	Organism	Roles and functions	Interest in the project	Participation in the Project
Eastern Centre for Ecosystems and Biodiversity (BIOECO)	CITMA	Specializedos and interdisciplinary studied, principally in Cuba, helping to define and characterize the areas of greatest interest and importance for BD, as well as establishing means and methods for its conservation, rational use, ecological improvement and sustainable cultural, economic and social development.	Increases in capacities and knowledge on nature conservation.	Provision of human and material resources for the coordination and execution of training, environmental education, research and environmental monitoring.
Soils Institute (IS)	MINAG	Provision of scientific and technical bases for the correct use, management, conservation and improvement of soil resources.	Opportunity for increasing capacities and knowledge of the use, management and conservation of soils.	Contribution to the implementation of agroecological and agricultural/ranching practices, in order to generate sustainable socio-economic and environmental progress in mountain ecosystems, as an essential condition for increases in BD.
Instituto Superior de Diseño Industrial (ISDI)	MES	University of Industrial and Communication Design.	Oportunity to scale-up identitiy of the project and its key messages, preparing them for the wider public	Preparation of visual identity of the project and communication materials. Preparation of key messages and adaptation of scientific concepts to decision-makers and the wider public.
Universidades provinciales involucradas en el project, y centros universitarios municipales.	Ministry of Higher Education (MES)	Direction, execution and control of policies related to higher education. Several universities have the potential to play an important role in the execution of the project.	Increases in capacities and knowledge on nature conservation. Strengthening and updating of plans of higher studies.	Provision of scientific tools for decision-making. Provision of human and material resources for the coordination and execution of training, environmental education, research and environmental monitoring.
National Botanic Garden	Ministry of Higher Education (MES)	Institution dedicated to the exhibition of tropical plant diversity, and significant actions in environmental education, as well as visitor recreation.	Increases in capacities and knowledge on nature conservation.	Provision of human and material resources for the coordination and execution of training, environmental education, research and environmental monitoring.

Actor	Organism	Roles and functions	Interest in the project	Participation in the Project
National NGOs				
Cuban Association of Agricultural and Forestry Technicians (ACTAF)	NGO/association linked to MINAG	Non-Governmental Association with a disaggregated functional structure, divided into branches with their on judicial existence, in each of the 14 provinces of the country. Mission is the integration of agricultural and forestry technicians and professionals, for sustainable agricultural development based on agroecology.	Contribution to the reproduction of materials on BD conservation for the development of capacities in the process of raising the awareness of local communities.	Support to local and community development. Training of technicians and producers. Agricultural extensión. Dissemination and intechange of experiences on agricultural activities through publications and events.
Cuban Association for Animal Production (ACPA)	NGO/ association linked to MINAG	Contribution with actions, experiences and resources, to sustainable human and technical/productive development, in the area of animal production and industries.	Potential for the project to contribute through the production of materials related to BD conservation, and the development of capacities for the process of raising awareness raising in local communities. Establishment of synergies with the project, through the implementation of de conservation projects.	Promote the adoption of sustainable, BD-friendly production technologies.
Félix Varela Centre (CFV)	NGO	Contribute to sustainable development in Cuba, by accompanying experiences of self-management, the development of local initiatives for environmental improvement and the promotion of ethic humanistic approaches with gender perspective.		Provision of personnel to support environmental education activities.
Cuban Botanical Society (SOCUBOT)	NGO	Contribute to the knowledge of Cuban BD, work for the appropriate management of ecosystems and the sustainable use of plant species, contributing to the conservation of vegetation.		Support through its programmes and actions for the promotion of conservation values and BD in mountain areas.
Cubana Zoological Society (SOCZOO)	NGO	Promote and strengthen research, teaching and dissemination of zoology, in order to permit knowledge and understanding of Cuban fauna. Contribute to the conservation and rational use of fauna, in order to promote a harmonious relation between man and nature, furthering scientific communication and interchange between zoologists and other intereste parties.		

PART V. Native species for use in reforestation programmes

Objective/type	Recommended species
Conifers	*Pinus caribaea* (pino macho), *P. tropicales* (pino hembra), *P. cubensis* (pino Mayarí), *P. maestrensis* (pino de la Sierra Maestra), *Juniperus lucayana* (sabi *Juniperus saxicola* (sabina), *Podocarpus angustifolius* (sabina cimarro *Podocarpus aristulatus* (sabina cimarrona).
Hardwoods	*Manilkara valenzuelana* (acana), *M. jaimiquí* (acana), *M. wrightiana* (aca *Sideroxylon salicifolium* (cuya-almendrillo), *S. foetidissimum* (jocuma), *Mata apetala* (macurije), *M. domingensis* (macurije), *Acrosynanthus latifolius* (jarag *Calophyllum antillanum* (ocuje), C. *pinetorum* (ocuje), *C. utile* (ocuje colora *Calycophyllum candidissimun* (dagame), *Oxandra lanceolata* (yaya), *Alb cubana* (bacona), *Lysiloma sabicu* (sabicu-jigüe), *Junglans insulares* (nogal país), *Conocarpus erectus* (yana), *Terminalia intermedia* (chicharrón), *Bu buceras* (júcaro), *B. palustres* (júcaro de costanera), *Buchenavia tetraph* (júcaro matelero), *Quercus cubana* (encino), *Maclura tinctoria* (futete-mora país).
Valuable timbers	Swietenia mahogani (caoba del país), *Cedrela odorata* (cedro), *Car guianensis* (najesí), *Gerascanthus gerascanthoides* (varía), *Gerascan alliodorus* (varía prieta-v. colorada), *Taliparíti elatum* (majagua), *Gua guidonia* (yamagua), *Guaiacum officinale* (guayacan), *Pera bumeliaefolia* (jic *Guibourtia hymenifolia* (caguairán), *Thespesia cubensis* (majagua negra de Cu *Pouteria dictyoneura* (cocuyo-caimito de perro).
Semi-hardwoods	*Sloanea curatellifolia* (achotillo, raizú), *Samanea saman* (algarrobo del p *Trichilia hirta* (cabo de hacha), *Zanthoxylum martinicense* (ayúa), *Zanthoxy caribaeum* (bayúa), *Protium fragrans* (incienso), *P. cubense* (copal), Lysil latisiliquum (soplillo- dormido, tamarindillo), *Magnolia cubensis* (mantequ azulejo), *Talauma orbicularis* (marañón de la Maestra), *Prunus occiden* (cajuani), *Tabebuia angustata* (roble blanco), *T. leptoneura* (roble blanco) *shaferi* (roble blanco), *Simarouba glauca* (gavilán), *S. laevis* (gavil *Macrocatalpa punctata* (roble de olor), *Cojoba arborea* (moruro rojo), *Poepp procera* (tengue), *Exothea paniculada* (yaicuaje-mulato), *Coccoloba diversif* (uvilla), *Celtis trinervia* (ramón de costa - r. de sierra), *Phyllostylon brasilie* (jatía).
Soft timber	*Bursera simaruba* (almacigo), *Spondias mombin* (jobo), *Cecropia pel* (yagruma), *Guazuma ulmifolia* (guásima), *Ochroma lagopus* (lanero-ba *Trichospermum grewiifolius* (majagüilla), *Schefflera morototoni* (yagr macho), *Annona glabra* (baga), *Fraxinus caroliniana* subsp. *cubensis* (bufa *Cupania glabra* (guara de costa), *Cupania americana* (guara), *Luehea spec* (guásima varía), *Pseudolmedia spuria* (macagua).
Matchwood	*Ochroma lagopus* (lanero-balsa), *Spondias mombin* (jobo), *Pinus caribaea* (j macho), *P. tropicales* (pino hembra), *P. cubensis* (pino de Mayarí), *P. maestre* (pino de la Sierra Maestra), *Pseudalbizzia berteriana* (abey blanco-mo blanco), *Lysiloma latisiliquum* (soplillo- dormido, tamarindillo), *Poepp procera* (tengue), *Schefflera morototoni* (yagruma macho), *Phyllost brasiliensis* (jatía).
Boards	*Spondias mombin* (jobo), *Pinus caribaea* (pino macho), *P. tropicales* (j hembra), *P. cubensis* (pino de Mayarí), *P. maestrensis* (pino de la Sierra Maes

Objective/type	Recommended species
	Junglans insulares (nogal del país), *Sideroxylon foetidissimum* (jocuma), *Poeppigia procera* (tengue), *Behaimia cubensis* (guayacancillo- guayacán blanco), *Gerascanthus alliodorus* (varía prieta-v. colorada), *Terminalia intermedia* (chicharrón).
Traviesas	*Cojoba arborea* (moruro rojo-moruro prieto), *Calophyllum antillanum* (ocuje), *C. pinetorum* (ocuje), *C. utile* (ocuje colorado), *Acrosynanthus latifolius* (jaragua), *Terminalia intermedia* (chicharrón), *Bucida buceras* (júcaro), *B. palustres* (júcaro de costanera), *Lysiloma sabicu* (sabicu-jigüe), *Maclura tinctoria*, *Poeppigia procera* (tengue), *Exothea paniculada* (yaicuaje- mulato), *Sideroxylon foetidissimum* (jocuma), *Albizia cubana* (bacona).
Utility poles	*Pinus caribaea* (pino macho), *P. tropicales* (pino hembra), *P. cubensis* (pino de Mayarí, *P. maestrensis* (pino de la Sierra Maestra), *Calophyllum antillanum* (ocuje), *C. pinetorum* (ocuje), *C. utile* (ocuje colorado), *Pera bumeliaefolia* (jiquí).
Energy	*Lysiloma latisiliquum* (soplillo-dormido, tamarindillo), *Pseudalbizzia berteriana* (abey blanco-moruro blanco), *Poeppigia procera* (tengue), *Leucaena leucocephala* subsp. *glabrata* (ipil-ipil-leucaena), *Casuarina equisetifolia* (casuarina), *Eucalyptu*s spp. (eucalipto).
Round timber	*Pinus caribaea* (pino macho), *P. cubensis*, *P. maestrensis, Bucida buceras* (júcaro), *B. palustres* (júcaro de costanera), *Buchenavia tetraphylla* (júcaro matelero), *Quercus cubana* (encino), *Lysiloma latisiliquum* (soplillo-dormido, tamarindillo).
Tobacco boxes	*Oxandra lanceolada* (yaya), *Eugenia maleolens* (mije colorado, m. peludo), *Mirciaria floribunda* (mije), *Salix carolineana* (clavellina blanca-sauce), *Nectandra coriacea* (cigua-sigua), *Eucalyptus* spp. (eucalipto), a partir de plantaciones al efecto y *Syzygium jambos* (pomarrosa-manzana rosa), a partir del control y manejo de las extensas poblaciones ya existentes en cada región), no más plantaciones.

PART VI. Multi-purpose native tree species for use in forest enrichment.

Key:
BG: Galley forest/water regulation belts
BSV: Evergreen mesophyllous forest
BS: Mesophyllous semideciduous forest and variants
BC: Swamp forest
ME: Mangrove ecotone
PDC: Beaches – Dunes - Coasts
S: Savannas
MXE: Spiny xeromorph scrub on serpentine (cuabal)
MXSE: Sub-spiny xeromorph scrub on serpentine (charracal)
IEDB: Special interest for biological diversity at territorial or national levels
P/VS: Pioneer/secondary vegetation

Family	Species	Type	Endemic	Observations
Boraginaceae	Gerascanthus gerascantoides (HBK) Borhidi	Tree		BS, P/VS
Sapotaceae	Sideroxylon foetidissimum Jacq. subsp. foetidissimum	Tree		BS
Bombacaceae	Ceiba pentandra (L.) Gaertn.	Tree		BS, S, IEDB
Meliaceae	Swietenia mahogani L.	Tree		BS, S, IEDB
Meliaceae	Cedrela odorata L.	Tree		BS, IEDB
Rubiaceae	Calycophyllum candidissimum DC.	Tree		BS, IEDB
Boraginaceae	Cordia collococca L.	Tree		BS, P/VS
Boraginaceae	Cordia nitida Vahl.	Tree		BS, P/VS
Clusiaceae	Clusia rosea Jacq.	Tree		BS, BG, BC
Fabaceae	Lonchocarpus pentaphyllus (Poir.) DC	Tree		BS
Fabaceae	Lonchocarpus sericeus (Poir.) DC var. glabrescens Benth.	Tree		BG, BC, P/VS
Sapotaceae	Sideroxylon salicifolium (L.) Lam.	Tree		BS
Rhamnaceae	Colubrina arborescens (Mill.) Sarg.	Tree		BS
Malvaceae	Talypariti elatum (Sw.)Fryxell	Tree		BC, BG, P/VS
Mimosaceae	Lysiloma sabicú Benth	Tree		BS
Bignoniaceae	Tabebuia angustata Britton	Tree		BC, BG, S, P/VS
Bignoniaceae	Tabebuia leptoneura Urb.	Tree	X	BC, BG, S, P/VS
Bignoniaceae	Tabebuia shaferi Britt.	Tree	X	BC, BG, S, P/VS
Polygonaceae	Coccoloba diversifolia Jacq.	Tree		BS, PDC
Polygonaceae	Coccoloba uvifera Jacq.	Tree		PDC

Family	Species	Type	Endemic	Observations
Bignoniaceae	Crescentia cujete L.	Tree		BC, BG, S, P/VS
Combretaceae	Bucida buceras L.	Tree		BC, BG, S
Combretaceae	Bucida spinosa (Northr.) Jennings	Tree		ME, PDC
Meliaceae	Guarea guidonia (L.) Sleumer	Tree		BG, BC
Annonaceae	Annona glabra L.	Tree		BC, BG
Combretaceae	Conocarpus erectus L.	Tree		ME, PDC
Sapotaceae	Chrysophyllum oliviforme L.	Tree		BS, S, P/VS
Combretaceae	Buchenavia capitata (Vahl.)	Tree		BSV, BS, IEDB
Amygdalaceae	Prunus occidentalis Sw.	Tree		BSV, IEDB
Arecaceae	Calypthronoma plumierii	Tree		BG, IEDB
Erythroxylaceae	Erythroxylum areolatum L.	Shrub/ small tree		BS, BG
Erythroxylaceae	Erythroxylum confusum Britton	Shrub/ small tree		BC, BG
Burseraceae	Bursera simaruba L.	Tree		BS, P/VS
Arecaeae	Sabal palmetto Lodd.	Tree		S, BG
Arecaeae	Gastrococcus crispa	Tree	X	BS, IEDB
Mimosaceae	Abarema glauca (Urb.) Barneby & J. W. Grimes	Tree		BC, IEDB
Apocynaceae	Cameraria latifolia L.	Tree		BSV, BS, IEDB
Apocynaceae	Cameraria retusa Grises.	Shrub	X	S, BS, IEDB
Sapotaceae	Manilkara jaimiqui (C. Wright ex Griseb.)Dubard subsp. wrightiana (Pierre) Cronquist	Tree		BS, ME, PDC, IEDB
Arecaceae	Roystonea regia O. F. Cook.	Tree		BG. BC, P/VS
Malpighiaceae	Byrsonima crassifolia (L.) DC.	Tree		S
Anacardiaceae	Spondias mombin L.	Tree		BS, P/VS
Annonaceae	Oxandra lanceolada (Sw.) Bail.	Tree		BS,
Bignoniaceae	Jacaranda arborea Urb.	Tree	X	MXSE
Bignoniaceae	Jacaranda coerulea (L.) Griseb.	Tree		BS
Bignoniaceae	Macrocatalpa punctata Griseb.	Tree		BS
Boraginaceae	Ehretia tinifolia L.	Tree		BS, BG, P/VS
Burseraceae	Protium cubense (Rose) Urb.	Tree	X	BSV, BG, IEDB
Burseraceae	Protium fragrans (Rose) Urb.	Tree	X	MXSE, IEDB
Caesalpinaceae	Guibourtia hymenifolia (Moric.) J. Leonard	Tree	X	MXSE, BSV
Caesalpinaceae	Peltophorum adnatum Griseb. Fl.	Tree		BS
Caesalpinaceae	Poeppigia procera Presl.	Tree		BS, P/VS
Cecropiaceae	Cecropia peltata L.	Tree		BS, P/VS
Cupressaceae	Juniperus lucayana Britt.	Tree		BSV, P/VS
Euphorbiaceae	Alchornia latifolia Sw.	Tree		BSV
Euphorbiaceae	Hyeronima cubana Müell. Arg.	Tree	X	BSV, IEDB

Family	Species	Type	Endemic	Observations
Euphorbiaceae	Margaritaria nobilis L. f.	Tree		BS
Euphorbiaceae	Pera bumeliaefolia Griseb.	Tree		BS, BSV, IEDB
Euphorbiaceae	Pera oppositifolia Griseb.	Tree	X	BSV, IEDB
Fabaceae	Geoffroea inermis W.Wright.	Tree		BG, BS, P/VS
Fabaceae	Piscidia piscipula (L.) Sargent.	Tree		BG
Fabaceae	Hebestigma cubense (HBK) Urb.	Tree	X	BS
Junglandaceae	Junglans insulares Griseb.	Tree	X	BSV, IEDB
Lauraceae	Nectandra coriacea (Sw.) Griseb.	Tree		BS, P/VS
Lauraceae	Nectandra antillana Meisn.	Tree		BSV, P/VS
Lauraceae	Cinnamomun montanum (Sw.) Berchthold et Persl.	Tree		BSV
Lauraceae	Licaria cubensis (Schmidt) Kostermans	Tree	X	BSV, BG, MXSE
Lauraceae	Licaria triandra (Sw.) Kostermans	Tree		BSV, BG
Malvaceae	Thespesia cubensis Britt. & Wilson	Tree	X	BS, S, IEDB
Meliaceae	Carapa guianensis Aubl.	Tree		BSV, BG, IEDB
Meliaceae	Trichilia havanensis Jacq.	Tree		BSV, BS, P/VS
Meliaceae	Trichilia hirta L.	Tree		BS, P/VS
Mimosaceae	Abarema nipensis (Britton) Barneby & J. W. Grimes	Tree	X	MXSE, IEDB
Mimosaceae	Cojoba arborea (L.) Britton & Rose	Tree		BSV, BG
Mimosaceae	Samanea saman (Jacq.) Merr.	Tree		BS, S, P/VS
Moraceae	Pseudolmedia spuria (Sw.) Griseb.	Tree		BSV, BG
Moraceae	Trophis racemosa (L.) Urban	Tree		BSV, BG
Oleaceae	Chionanthus domingensis Lam.	Tree		BSV
Podocarpaceae	Podocarpus angustifolius Griseb.	Tree	X	BSV, IEDB
Podocarpaceae	Podocarpus aristulatus Parl.	Tree	X	BSV, MXSE, IEDB
Rubiaceae	Acrosynanthus latifolius Standl.	Tree	X	MXSE, BG, IEDB
Rubiaceae	Genipa americana L.	Tree		BS, P/VS
Rutaceae	Zanthoxylum caribaeum Lam.	Tree		BS, P/VS
Rutaceae	Zanthoxylum ekmanii (Urb.) Alain	Tree	X	BS, P/VS
Rutaceae	Zanthoxylum martinicense (Lam.) DC.	Tree		BS, P/VS
Sapindaceae	Allophyllus cominia (L.) Sw.	Tree		BS, P/VS
Sapindaceae	Cupania americana L.	Tree		BS, P/VS
Sapindaceae	Cupania glabra Sw.	Tree		BS, P/VS
Sapindaceae	Exothea paniculata (Juss.) Radlk.	Tree		BS
Sapindaceae	Matayba apetala (Macf.) Radlk.	Tree		BS, P/VS
Sapindaceae	Matayba domingensis (P.D.C.) Radlk	Tree		BS, P/VS
Sapotaceae	Manilkara mayarensis (Ekm. ex Urb.) Cronquist	Tree	X	MXSE, BG, IEDB

Family	Species	Type	Endemic	Observations
Sapotaceae	Manilkara valenzuelana (A. Rich.) T. D. Penn.	Tree		BS, BG, IEDB
Sapotaceae	Manilkara wrightiana (Pierre) Bisse	Tree	X	BS, BG, IEDB
Sapotaceae	Pouteria dictyoneura (Griseb.) Radlk. subsp. dictyoneura	Tree		BSV, BG, IEDB
Simaroubaceae	Simarouba glauca DC.	Tree		BS
Simaroubaceae	Simarouba laevis Griseb.	Tree		MXSE, BG, IEDB
Ulmaceae	Celtis trinervia Lam.	Tree		BS, P/VS
Ulmaceae	Trema micrantha (L.) Blume	Tree		P/VS
Zygophyllaceae	Guaiacum officinale L.	Tree		BS, PDC, IEDB
Zygophyllaceae	Guaiacum sanctum L.	Tree		BS, PDC, IEDB

PART VII. Terms of References for key project staff and main sub-contracts

Project Coordinator

The Coordinator will have the following responsibilities:

- Coordination of project actions, in compliance with Annual Work Plans and Budgets (APWBs).
- Supervision of the activities of the technical members of the Project Implementation Unit (PIU), thereby ensuring their relevance, effectiveness and efficiency.
- Preparation of terms of reference for external consultants contracted by the project, supervision and coordination of their work, and review and approval of their products.
- Ensuring that the project is implemented with the full participation of local actors and that functioning mechanisms exist that ensure that their interests are taken into account, communicated and reflected in the implementation of the project.
- Promotion of the coordinated participation of Government institutions and NGOs, at central and local levels, in project implementation.
- Realization of continuous and periodic monitoring of project impacts, in relation to the achievements foreseen in the APWBs and the impacts foreseen in the project results framework.
- In communication with the NPD, ensuring that the project is implemented in accordance with the policies and plans of the Executing Agency.
- In communication with the Programme Official of UNDP, ensuring that the project is implemented in accordance with the United Nations Development Assistance Framework (UNDAF) in Ecuador.
- Identification and promotion opportunities for actions by other agencies of the UN system in the project areas.
- Ensuring that a cross-cutting gender focus is incorporated into the actions of the project.
- Together with UNDP, preparation of Periodic Implementation Reports (PIRs), detailing project progress, to be presented to GEF.
- Together with UNDP and the project team and in discussion with local stakeholders, preparation of APWBs for approval by the NSC and the GEF.
- With support from the project administrative team, ensuring efficient and transparent execution of financial and physical resources, in conformity with the rules of the Government, GEF and UNDP.
- Design and implementation of professional development plans for the members for the PIU.
- Identification of risks that could affect the achievement of the foreseen impacts of the project, and the definition and application of corresponding mitigation strategies.
- Support to the functioning of the PSC, through the provision of advice and logistics.
- Preparation and oversight of the implementation of the operational manuals for the implementation of the project.
- Organization and support of external evaluations of the project.

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