IWEco National Sub-Project 1.2

Conservation and sustainability of biodiversity in Cuba through the integrated watershed and coastal area management approach

REPUBLIC of CUBA

Appendix 25

COVER SHEET

- Name of small-scale intervention: **Conservation and sustainability of biodiversity in Cuba through the integrated watershed and coastal area management approach**
- Name of Lead Partner Organization:
  a) Centro de Estudios Ambientales de Cienfuegos (CEAC)
- Contact person:
  a) Clara Elisa Miranda Vera, Centro de Estudios Ambientales de Cienfuegos (CEAC)
- IWEco Project focus: Biodiversity
- Total area covered: Targeted interventions for enhancement and maintenance of biodiversity resources over 13,670 hectares within four watershed areas of the country and strengthening associated integrated natural resource management governance frameworks.
- Duration of sub-project: 48 months
- Amount of GEF grant: $**2,169,685** USD
- Amount of Co-financing: $**2,886,140** USD
- Total funding: $**5,055,825** USD

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1 SUB-PROJECT IDENTIFICATION

1.1 Sub-project Summary

The biological diversity of Cuba is the greatest in the Caribbean Sea both in terms of number of floral and faunal species and endemism. It is ranked among the ten most important islands in the world in terms of biodiversity richness. Approximately 19,500 species of flora and fauna have been identified, with 8,378 of these, or 42.7%, being endemic. These consist primarily of flowering plants, insects, molluscs and arachnids. The greatest degree of endemism is among flowering plants, insects and molluscs, and amphibians and reptiles among vertebrates. Of the country's 7,994 identified species of plants, 52.4% are endemic, and of these over 30% are threatened. Much of this biodiversity is concentrated in the specific geographic areas to be addressed by this sub-project in the western, central and eastern regions of the country which is home to around 1 million people.

The principal global benefit of this sub-project will be the conservation of a number of endemic species found in sub-project intervention areas, many of which are threatened which include 13 amphibian and 13 reptile species. Project intervention areas will directly enhance critical habitats for at least 130 species of birds of which some 15 are endemic to Cuba. Within the project target areas some thirty-three (33) floral species are critically endangered, 41, endangered and 21 vulnerable to human-induced threats. Of these floral species, 64 % are endemic. Many of these endangered species inhabit the semi-deciduous mesophyll forests in sub-project intervention areas.

Biodiversity loss has been identified as one of the principal environment problems affecting Cuba. In light of the need to conserve these globally important natural resources, the sub-project, "Conservation and sustainability of biodiversity in Cuba through the integrated watershed and coastal area management approach," seeks to strengthen national capacities for the integrated management of critical watersheds and coastal areas that support biodiversity conservation and sustainable development. The landscape of the country is segregated into 573 watersheds and harbours three of the most important wetlands in the entire Caribbean region. In addition to direct threats to biodiversity, these critical ecosystems that will be the focus of the project also face indirect threats from land and soil degradation, loss of forest cover, atmospheric, land and water pollution, compromised availability and quality of freshwater resources. Compounding this situation are the additional negative burdens that climate change will impose. Consequently, it is national priority to reorient economic development in these target watershed areas to mainstream environmental considerations and reduce or reverse the impacts from unsustainable practices.

This sub-project will implement integrated environmental management approaches, including land-use planning, good agricultural practices (GAP), better environmental practices (BEP), as well as identify and monitor environmental indicators, utilize mechanisms for strengthening cross-sectorial and inter-institutional coordination, and provide capacity-building in sub-project intervention areas. This sub-project will support the Government of Cuba develop alternative models and options for addressing a wider range of stresses affecting the biodiversity conservation within watersheds and coastal areas elsewhere in the country through up-scaling and replication.

The four sub-project intervention areas that have been selected for this sub-project are located in the western, central and eastern regions of the country and cover a combined surface area of 2,952.4 km^2, or 2.69% of the land area of Cuba:

i. The East Havana Demonstration Area along the country's northern coast, which includes the **Guanabo watershed** with a surface area of 119.2 km^2.
ii. The Cumanayagua-Cienfuegos Demonstration Area in the country's southeast, which includes the **Arimao watershed**, with a surface area of 978.5 km^2.
iii. The Trinidad-Sancti Spiritus Demonstration Area in the country's southeast, including the **Agabama River Basin**, with a surface area of 1,713 km^2.
iv. The Santiago de Cuba Demonstration Area in the country's east, containing the **San Juan watershed**, with a surface area of 141.7 km^2.

For three of the four selected watersheds; the Guanabo, Arimao and San Juan, the Cuban Government has committed that at least 136.7 km^2 of existing forest cover will be protected and sustainably managed through the project. The extent of protected areas within the Agabama watershed will be identified and incorporated during the sub-project's inception phase. For all four selected watersheds, the project will support the reforestation within impacted ecosystems over 1,690 hectares. Through on-site land and forest cover investments within 1,690 hectares over the target watershed areas, it is expected that an estimated 134,737.8 equivalent tonnes of CO_2 over the life of the project, or an average of 26,947.6 tCO_2eqv/year will be sequestered.

The four target watershed areas were selected through careful multi-stakeholder consultations in consideration of the approximately one million people living within them, or within their proximity in respect of the various different environmental stresses affecting each. Each site will require unique integrated approaches but will collectively provide Cuba with the experience and expertise to be able to implement a wide range of effective biodiversity conservation and sustainable land use management actions in the future within other watershed and coastal locations elsewhere in the country.

Finally, by integrating its work in the GEF focal areas of biodiversity, international waters, land degradation and the cross-cutting theme of sustainable forest management, Cuba looks to implement a comprehensive approach for sustainably managing key natural resources that in turn will contribute to the country's sustainable economic development.

Table of Regional Components, Project Outcomes, and Link to Sub-Project

Regional Component	Project Outcomes
C1. TECHNICAL SOLUTIONS & BENEFITS	C1.1 Measurable **stress reduction of biodiversity at project sites** through appropriate sustainable water, land and ecosystems management interventions that account for climate change.
	C1.2 Enhanced **livelihood opportunities and socio-economic co-benefits** for targeted communities from improved ecosystem services functioning.
C2. MONITORING SYSTEMS	C2.1 Strengthened **national and regional systems for monitoring** of environmental status with respect to key international agreements.
C3. POLICY & CAPACITY	C3.1 Strengthened **policy and legislation** for the effective management of water, land and ecosystems resources that account for climate change.
	C3.2 Strengthened **capacity of national and regional institutions** and other stakeholders for water, land, and ecosystems management that accounts for climate change.
C4. KNOWLEDGE MANAGEMENT	C4.1. Improved **engagement and information access** for practitioners and other stakeholders through targeted knowledge sharing networks.

Table of GEF FA Objectives, Project Outcomes and Corresponding Sub-Project Outcomes

GEF Focal Area Outcome	Project Outcomes (above)	Sub-Project Outcomes
National Component 1: Development and implementation of innovative environmental management solutions for biodiversity conservation, including addressing climate change impacts.		
IW 1.3, 1.4, 2.3; LD 3.3, BD 2.1	C1.1 Solutions	• Implemented intervention actions with sustainable solutions for four watersheds according to the identified uses and problems (IW 1.3, LD 3.3 and BD 2.1) • Rehabilitation and restoration of important ecosystems and habitat (BD 2.1 and LD 3.3) • Implemented actions to mitigate and eliminate untreated wastewater and contaminated soils (IW 1.3 and LD 3.3). • Increased local community participation in the conservation and sustainable management of biodiversity (BD 2.1) • Mitigation of climate change (IW 1.4)
LD 3.2; BD 2.1	C1.2 Benefits	• Implemented intervention actions with sustainable solutions for four watersheds according to the identified uses and problems (IW 1.3, LD 3.3 and BD 2.1) • Reduced stress on biodiversity in project intervention areas (BD 2.1) • Sustainability of biodiversity and other natural resources in project demonstration areas (BD 2.1) • Improved livelihoods of selected communities (BD 2.1 and LD 3.2) • Improved land use (LD 3.2)
National Component 2: Assessment and monitoring of the problems that need to be addressed through integrated watershed and coastal area management (IWCAM) in the western, central and eastern regions of Cuba		
IW 2.1; BD 2.1	C2.1 Monitoring	• Identification of prioritized environmental problems to be addressed through the integrated management of ecosystem resources and the conservation and sustainable use of biodiversity (IW 2.1 and BD 2.1) • Measureable stress reduction of anthropogenic pressures in the selected areas of the actions implemented through the project (IW 2.1 and BD 2.1) • Greater understanding of the extent and scale of biodiversity in selected ecosystems within the four project demonstration areas (IW 2.1 and BD 2.1) • Greater understanding of the status of water quality in fluvial systems and the relationship to biodiversity conservation efforts in the four project demonstration areas (IW 2.1 and BD 2.1) • Improved biodiversity conservation actions in the four project demonstration areas due to assessments leading, as required, to corrective measures and adjustment of relevant plans and strategies (IW 2.1 and BD 2.1) • Knowledge base for selecting mitigation and adaptation measures for responding to threats from climate change to biodiversity and other natural resources in project intervention areas (IW 2.1 and BD 2.1)
National Component 3: Improvement of the institutional, legal and regulatory frameworks and capacity building for integrated watershed and coastal area management in support of biodiversity conservation in Cuba		
IW 1.1, 1.4, 2.1	C3.1 Policy	• Improved legal and regulatory frameworks for integrated watershed and coastal area management (IW 1.1, IW 1.4 and IW 2.1) • Strengthened inter-institutional coordination and cooperation for the application of integrated watershed and coastal area management in support of the conservation and

		sustainable use of biodiversity (IW 1.1, IW 1.4 and IW 2.1) • Improved procedures for the resolution of inter- institutional and inter-jurisdictional conflicts affecting the conservation and sustainable use of biodiversity in Cuba (IW 1.1, IW 1.4 and IW 2.1)
IW 2.3; LD 3.1, 3.2; BD 2.1; SFM 1.1, 1.2	C3.2 Capacity	• Strengthened capacity of partners and stakeholders to contribute more efficiently and effectively to project implementation (LD 3.1, LD 3.2, SFM 1.1 and SFM 1.2) • Improved project coordination among partners and stakeholders (IW 2.3, LD 3.2, BD 2.1, SFM 1.3) • Sharing of experiences by project partners (IW 2.3, LD 3.2, BD 2.1, SFM 1.3) • Increased number of professionals in IWCAM based partly on the information and results generated by the project (LD 3.1, LD 3.2, SFM 1.1 and SFM 1.2) • Increased number of professionals in ICZM based partly on the information and results generated by the project (LD 3.1, LD 3.2, SFM 1.1 and SFM 1.2) • Increased capacity of partners and stakeholders to continue with project activities upon project completion and to contribute to its sustainability (LD 3.1, LD 3.2, SFM 1.1 and SFM 1.2) • Increased professional capacity for project replication (LD 3.1, LD 3.2, SFM 1.1 and SFM 1.2)
National Component 4: Information management and dissemination and sub-project replication		
IW 2.3, LD 3.2, BD 2.1, SFM 1.3	C4.1. Knowledge	• Increased awareness and knowledge of the project's status • Increased awareness and knowledge of the project's status, achievements and lessons learned inside and outside of Cuba (IW 2.3, LD 3.2, BD 2.1, SFM 1.3) • Greater understanding by decision-makers on the importance of sustaining the project and replicating its activities in other areas (IW 2.3, LD 3.2, BD 2.1, SFM 1.3) • Greater public awareness within and outside of the project's demonstration areas on the importance of sustaining and replicating the project (IW 2.3, LD 3.2, BD 2.1, SFM 1.3) • Increased support nationally and internationally for the implementation, sustainability and replication of the project (IW 2.3, LD 3.2, BD 2.1, SFM 1.3)

Table of activities by GEF funding and co-finance

Output		Sources of funding		
		GEF funding (US$)	**Co-financing/ counterpart (US$)**	**Total Cost (US$)**
National Component 1.1 Innovative Solutions		1,000,000	682,936	1,682,936
Sub-component - 1.1.1: Environmentally sound land use planning tools for biodiversity conservation		200,000	207,737	407,737
Sub-component - 1.1.2: Innovative management investments for addressing specific environmental problems threatening biodiversity conservation.		800,000	475,200	1,275,200
National Component 1.2 Socio-Economic Benefits		70,000	157,350	227350
Sub-component - 1.2.1: Promotion of conservation and sustainable use of biodiversity through good agricultural practices.		70,000	157,350	227,350
National Component 2 - Systems for monitoring		661,000	1,758,393	2,419,393
Sub-component - 2.1.1: Baseline data in the four sub-project demonstration areas and selection of indicators		120,000	449,490	569,490
Sub-component - 2.2.1: Systematic biodiversity monitoring program for the four sub-project demonstration areas, taking into account climatic variability and relevant environmental and socio-economic factors		541,000	1,308,903	1,849,903
National Component 3.1 Policy and legislation		226,185	294,100	520,285
Sub-component - 3.1.1: Legal and regulatory frameworks for integrated watershed and coastal area management		24,100	24,840	48,940
Sub-component - 3.1.2: Institutional framework for integrated watershed and coastal area management		31,500	31,860	63,360
Sub-component - 3.1.3: Procedures for the resolution of inter-institutional and inter-jurisdictional conflicts		40,000	53,200	93,200
Sub-component - 3.1.4: Coordination and information sharing mechanisms on sub-project status and developments among sub-project partners and stakeholders		130,585	184,200	314,785
National Component 3.2 Capacity building		115,000	124,200	239,200
Sub-component - 3.2.1: Capacity building, training and education programmes for project implementation, sustainability and replication		115,000	124,200	239,200
National Component 4 Knowledge Management		97,500	114,160	211,660
Sub-component - 4.1.1: Mechanisms, tool and resources for national and international dissemination of sub-project information and replication		97,500	114,160	211,660
	TOTAL (in PIF)	N/A	N/A	N/A
	TOTAL (revised if applicable)	**2,169,685**	**3,131,140**	**5,300,825**

2. SUB-PROJECT DESIGN

2.1 Background and Context

The Republic of Cuba is located between the Caribbean Sea, the Gulf of Mexico and Atlantic Ocean. The Cuban archipelago consists of more than 1,600 islands, islets and cays. Its total land surface area is 109,886 km^2. It is characterized by its long, narrow shape, longitudinally extending 1,256 km from Maisí at its eastern end, to Cape San Antonio, in the west enclosed by approximately 5,746 km of coastline. Most of the territory is characterized by a gently-sloping plain, however rising to the Guaniguanico Heights in the western region, the Guamuhaya Heights in central region and the Massif Nipe-Sagua-Baracoa and the Massif Sierra Maestra in the eastern region, where Pico Turquino some 1,974 m above sea level, the highest elevation of the country is located. Cuba's total population is 11,125,288 (2013), settled mainly in the island of Cuba and Isla de la Juventud. Its capital is Havana. The nation is organized into 15 provinces and 168 municipalities.

Cuba has the greatest and most diverse biological diversity in the Antilles, both in species wealth and in endemism. In fact, Cuba is the principal center of evolution and speciation of the Antilles as well as one of the most significant on the planet, ranking in the world's top ten countries for the importance of its insular flora. More than 52.4% of vascular plants are endemic. Cuba's fauna is also characterized by a high level of endemism in amphibians and reptiles, with a predominance of birds over terrestrial animals, few mega-fauna (huge carnivores and herbivores), and the presence of dwarfisms (the smallest species in their group as in birds and amphibians). Cuba's marine biodiversity is also one of the richest in the tropics, and its coral reefs are particularly noteworthy both for their beauty, as the back bone of an important ecosystem that sustains one of the Caribbean's richest and most varied marine fauna and flora, and for the role they play in maintaining ocean chemistry and as a carbon sink.

Nevertheless, the insular features of the country that favored the evolution of such extensive endemic biological diversity are now contributing to its increasing fragility, vulnerability and even loss. Almost one third of endemic vascular plants are currently threatened to some degree. Increasing population pressure and the desire to increase food production have already taken a significant toll on Cuba's irreplaceable biological resources. Anthropogenic pressures include:

- unsustainable agricultural practices,
- excessive land clearance for agriculture, animal husbandry and construction
- mis-use of soil and fresh water resources leading to degradation, run-off and sedimentation,
- introduction of exotic and invasive forest and other species of flora,
- over-exploitation of fish, forest and other biodiversity resources,
- soil and water contamination by agrochemical, industrial and household wastes,
- urban and industrial air pollution,
- haphazard and environmentally-detrimental construction of buildings, roads and coastal infrastructure due to lack of cross-sectoral planning,
- and other damaging human-induced changes.

In addition, Cuba is experiencing the slow and steady disappearance of land, and salinization of freshwater aquifers due to rising sea-levels. Extreme weather events, such as the increase in the number and strength of hurricanes, are leading to high and erosive tides and flooding. As a result of climate change, extended periods of drought and more frequent and widespread forest fires are also degrading, fragmenting and isolating many of Cuba's unique ecosystems.

Biodiversity resources, issues and proposed investments under the project

The ***four intervention areas*** (Figure 1) proposed in this sub-project each have their own unique features and respective threats to biodiversity and ecosystems.

Figure 1. IWEco Project sites in Cuba

1. The ***East Havana Demonstration Area*** containing the ***Rio Guanabo watershed*** is located 27 kilometers east of the City of Havana. The headwaters of the Rio Guanabo are located at 150 meters above sea level and it flows northward for a distance of 22.1 kilometers until it empties into the Florida Straits. The watershed, with a total area of 119.2 km^2, and its associated coastal area is an important center of ecotourism in Cuba, renowned for its beaches, coral reefs, mangroves, wetlands and endemic flora and fauna. It includes the Protected Landscape Area Rincon de Guanabo covering 11,925 and 507 hectares of landscape and seascape respectively. The watershed is characterized by important biodiversity within the Coca Ecological Reserve and Landscape Protected areas. These areas are noteworthy for harbouring a high number of species, including representatives of diverse groups such as birds, mollusks, reptiles and fish (see Annex 3.4). The area has high botanical endemism with a significant number of endangered species; important bird species that are of conservation interest include Snowy Plover (*Charadrius alexandrines*), American flamingo (*Phoenicopterus ruber*) and the White-crowned pigeon (*Patagioenas leucocephala*). The watershed areas also contain important nest sites, migratory corridors and feeding grounds for a wide variety of aviafauna.

Principal problems affecting the watershed include (1) contamination of water courses and coastal waters due to urban and industrial wastes leading to biodiversity degradation and (2) soil degradation from unsustainable agricultural practices, including contamination from agrochemicals, resulting in the sedimentation and pollution of coastal areas. The sub-project will target the reforestation of 640 hectares, equivalent to 5% of the watershed's area, principally in areas bordering rivers and pasture lands. Actual forest cover for the total watershed is currently at 495.8 hectares. The project actions will be aimed at improving the management and conservation of forest resources and associated biodiversity through the rehabilitation of areas affected by deforestation. It will also focus on mitigating pollution from untreated wastewater, minimizing negative environmental impacts on biodiversity within the watershed basin and its associated marine area.

2. The ***Cumanayagua-Cienfuegos Demonstration Area*** is the ***Arimao River watershed*** with a total area of 974.5 km^2 and is the drainage basin of the 85-kilometer long Arimao River which drains into the Bay of Cienfuegos along the country's south-eastern coast. It is estimated that biodiversity values in the intervention area are characterized by high species richness (See Annex 3.4) with a 9.2% endemism level. The number of known species includes 750 species of plants and 179 species of animals, with at least 110 of them under threat, and ascribed national and global conservation priority. The species of conservation priority include the endangered Gundlach's hawk (*Accipiter gundlachi*) and Cuban Black Hawk (*Buteogallus gundlachi*), the Cuban parakeet (*Aratinga euops*), the Cienfuegos Blindsnake (*Typhlops satelles*), *Peltophryne longinasadunni* (toad), *Eleutherodactylus casparii* (frog), the Cuban fig-eating bat *Phyllops falcatus* and plant species that include *Agave grisea, Coccothrinax crinite* and *Dendrocereus nudiflorus*. The ecosystems are being compromised by anthropic pressures driven by extraction of valuable timber of species such as West Indian walnut (*Juglans jamaicensis*) and the endemic Thatch Palm (*Coccotrrinax crinita*) for artisanal production.

The biodiversity of the area faces multiple threats from forest fragmentation and habitat loss, forest fires, deforestation caused by agriculture and urbanization, overexploitation of resources for various religious, artisanal and medicinal purposes, in addition to the negative effects of alien species and extreme weather events such as prolonged droughts and hurricanes. Topographical and edaphic conditions, along with current agricultural practices, have also contributed to acute soil erosion from surface runoff. Forest cover tends to be fragmented, covering a surface area of 114.7 km^2, or 11,472 hectares, concentrated primarily in the Cumanayagua and Manicaragua municipal districts.

The focus of the project will be on promoting the implementation of good agricultural and best environmental practices over a 250-hectare area at an elevation of some 256 meters above sea level, within a wider area dominated by mineral extraction activities, agricultural production for coffee, fruit and animal husbandry, as well as forestry, among others. Of the 4,469 hectares remaining in forest cover in Cumanayagua, 1,471 hectares are utilized for forest-grown (shade) coffee cultivation. The project will also promote the farming of native forest species in plantations over a 37-hectare demonstration area, in addition to installation of land degradation control measures to protect soil productivity and reduce sedimentation to the watercourses within the watershed.

3. The third demonstration area is composed of three different environmental units associated with the ***Agabama River watershed*** in central Cuba, constituting a significant conservation biodiversity site. Its full extent covers 26,013 hectares including offshore coastal areas. (1) The first target area (environmental unit) within this site is the interfluvial Guarabo-Agabama plain, including Ancon Peninsula which encompasses approximately 13,000 ha. The ecological integrity of the area is influenced by various economic activities yet contains important centers of biodiversity (See Annex 3.4) which includes an important floristic endemism center in Cuba where evergreen forests overlie a sandy substrate that creates the unique habitat for aquatic carnivorous plants that has limited distribution in the country. (2) The other major biological center is located within the eastern portion, or the lower reaches of the Rio Agabama that covers an approximate 10,000-hectare area. The deltaic lagoon system within this area is of great importance as a migratory bird corridor. The delta is an ecosystem of transition between the terrestrial ecosystem and the submerged coastal platform and plays an important role in the circulation and dispersal of energy in the area. It remains a relatively unexplored area to date and is one of five deltaic systems in the country. (3) Conservation of marine biodiversity within the project will focus on the area encompassing the coastal zones of South Central Zone Cabagan in proximity to the mouth of the Agabama River that being proposed as a Protected Area of some 3,013 hectares. This area is of high importance as spawning sites for snapper and grouper and several species of high economic importance are known from this area. This area remains largely under-studied although species of noted conservation concern include the endemic Cuban Black Hawk (*Buteogallus gundlachi*) and the American flamingo (*Phoenicopterus ruber*).

Despite recognition of the biological importance of these areas, intensive human activity and lack of proper environmental management controls, coupled with weak regional planning processes related to tourism and agricultural development has been manifested in land degradation, habitat degradation, liquid and solid waste pollution, with notable impacts in terms of deterioration of ecosystems, mainly within the mangrove coastline of Agabama-Ancon. Climate change will likely compound the situation, further affecting the ecological integrity of the ecosystems within the demonstration area.

The project seeks to restore the landscape through reforestation over approximately 350 hectares within the most highly degraded areas using native species to restore and maintain the ecological character of the original sites and surrounding landscapes. An innovate approach will be demonstrating the application of biological restoration not only to natural areas, but integrating within managed multi-use landscapes along with agriculture, forestry, fishing, and even urban land use areas.

4. The ***San Juan River Basin***, some 141.7 km^2 in extent is underlain by a 2.23 km^2 aquifer with reserves yielding some 12 million m^3 of water per year, is of great importance to the economic development

of the city of Santiago de Cuba from the standpoint of potable water supply and water for crop production. There are approximately 170,000 inhabitants within the watershed. San Juan is among the most economically important basins in eastern Cuba however, the landscape is being degraded due to the numerous point- and non-point source pollution discharges on account of the level of development within the watershed; important contributors include industry and agriculture. The watershed has within its limits three protected areas: (1) the Baconao Biosphere Reserve, (2) the Siboney-Juticí Ecological Reserve and (3) the Estrella-Aguadores Protected Landscape. The biodiversity of conservation importance include *Tropidophis galacelidus* (snake), the Cienfuegos Blindsnake (*Typhlops satelles*), plants species including *Tabebuia leptoneura*, *Cylindropuntia hystrix* and the black mastic (*Terminalia eriostachya*). A characterization of the biodiversity within the watershed is provided in Annex 3.4

The project will include investments over approximately 450 hectares to enhance environmental sustainability within traditional agricultural management systems and contribute to the development of integrative measures to protect, conserve and rehabilitate the natural environment. Applied research studies will aim at providing options for building resilience to climate change in the agricultural sector, contributing to increased food production and improving animal health, including the improvement of services to producers, reducing the extent of unproductive lands and increasing yields through diversification. Focus consideration will be given to management of agri-ecological benefits so that biodiversity within the area is not further negatively impacted.

The project will advance innovative approaches in environmental sanitation and decontamination of soils that have been affected by water pollution and other forms of poor land management through techniques such as phyto-remediation and pollution control and diversion. The project will also contribute to the expansion of acreages under forest using appropriate indigenous species so as to restore the ecological integrity and habitats to natural conditions to the extent practical.

In all the four target areas under the national project, emphasis will be placed on improved understanding of the biological assets given the relatively few scientific studies that have been conducted in these areas to date. Environmental baselines, fundamental tools in the management of biotic resources will be carried out during the inception stages of project implementation.

Challenges and progress in addressing biodiversity conservation

Cuba has made significant efforts to implement its national plans to adapt to climate change and to protect its biodiversity. As a result of the already established government infrastructure and wide experience in implementing some 25 GEF projects with another 18 on-going, the country has been able to identify the necessary economical and developmental changes that are needed in order to diminish the present unsustainable pressures on the Cuban biosphere. The principal threats and limitations to the future success of Cuba's biodiversity and climate change plans include the need to:

- Reduce the fragmentary and inconsistent nature of baseline data on which to base decision-making;
- Train personnel in monitoring and evaluating biodiversity and overall ecosystem health and set up an ongoing system of assessment and monitoring so that the negative effects of anthropogenic and climate induced changes to already fragile ecosystems are identified and the appropriate corrective actions are taken in a timely manner;

- Create an overarching political, legal and social infrastructure so that the necessary plans and strategies are prioritized and applied consistently throughout the various government agencies and research institutes and at al levels of bureaucracy;
- Further educate and train all social groups of the fundamental importance of biodiversity and ecosystem integrity to availability of fresh water resources, as well as for food production, protection of the land from extreme weather events, generation of wealth and overall economic development of the country, and as national patrimony;
- Introduce and aggressively encourage Good Agricultural Practices and Best Environmental Practices throughout the country;
- Educate all social groups in the importance of forest cover for ecosystem health and actively promulgate the planting of indigenous rather than exotic tree species;
- Use more modern technologies and systems to treat household and industrial wastes;
- Use more modern technologies and infrastructure for cleaning up fresh water resources;
- Use more modern technologies and infrastructure to identify contaminants and clean up contaminated soils;
- Strengthen already Protected Areas and Ecological Reserves.

The threat to Cuba's biodiversity is currently considered one of the country's most pressing environmental problems, particularly in the nine most important hydrographic basins and coastal areas that harbor the greatest wealth of endemic and other threatened species, where 60% of the country's economic activity is centered and where 40% of the population lives.

The vast majority of the anticipated actions outlined in this sub-project will be conducted in demonstration areas that fall within the boundaries of Cuba's National System of Protected Areas (SNAPs). However, although the SNAPs are well established on paper, these lands are poorly managed due to insufficient funding, lack of trained manpower, and lack of understanding of the importance of protecting these ecosystems by the very populations who stand most to benefit from their proper management, conservation and sustainable use.

Besides the direct threats to Cuba's biodiversity, the on-going misuse of ecosystem resources has resulted in numerous other environmental problems including:

- human-induced damage to natural protected areas, particularly mangroves and coral reefs;
- depletion of fish stocks;
- coastal habitat degradation;
- haphazard and detrimental construction practices due to lack land-use planning - particularly in coastal areas;
- water contamination from household and industrial wastes;
- air pollution from untreated household and industrial wastes;
- lack of, and difficulties with, fresh water supply due to misuse, pollution, deforestation, etc;
- soil degradation, run-off and sedimentation;
- lack of soil productivity;
- unconventional and unsustainable farming techniques;
- homogeneity of forests; and
- proliferation of exotic plantation species over indigenous trees.

The pressures of climate change further exacerbate each of these identified threats.

Cuba's recognition of the innate and implicit link between the environment and improving the quality of Cubans' life is enunciated/enshrined in the government's Economic and Social Guidelines no. 133 which specifies the need to re-orient socio-economic development towards the rational use and conservation of ecosystems resources and to take into account and to plan around the realities of climate change impacts. In addition, Cuba's National Environmental Strategy 2011-2015 reiterates the need to prevent and minimize environmental problems and to systematically seek their solutions as an essential step towards improving food security, human health and living standards.

Cuba has already developed successful national scientific/technical programs that have given it institutions and trained human resources for implementing GEF projects, as well as a trained GEF focal point experienced in project implementation and the importance of providing a stable flow of up-to-date information. These already established and functioning government bodies and agencies will be responsible for monitoring and controlling this sub-project execution in a transparent and systematic way.

However, Cuban decision makers and key players within the government remain unaware of the fundamental importance of socio-economic planning that takes the overarching protection and sustainable use of inter-related ecosystems goods and services as the starting point.

Furthermore, the Cubans who most stand to benefit from improved ecosystems goods and services do not yet understand the importance of their natural patrimony, both in terms of its intrinsic worth and as the crux of future socio-economic development policies and actions that could improve living standards and generate a brighter future for all.

Implementing this GEF sub-project that uses the integrated watershed and coastal area management approach in four demonstration areas throughout Cuba would be a significant step forward showing Cubans that conserving and protecting biodiversity is a pragmatic and effective means of achieving sustainable solutions to many other environmental problems and to maintaining the ecosystem services on which the country's future depends.

Policy, legal and institutional situation

Cuba's *National Environmental Strategy 2011-2015* (NES) provides the overarching policy framework for the development and implementation of this sub-project. Its goal is the achievement of socio-economic sustainable development. To this end, the Strategy focuses on addressing six priority environmental problems, most of which are addressed in the sub-project:

- Loss of biological diversity;
- Impacts to forest cover;
- Soil degradation;
- Impacts of climate change;
- Water scarcity and difficulties with water supply and quality; and
- Pollution: liquid and solid waste, emissions to the atmosphere and noise.

As a Party to the Convention on Biological Diversity and based on the NES, Cuba in 1999 adopted its *National Biodiversity Strategy and Action Plan* (NBSAP), which was subsequently updated in 2005. Five of its objectives are being supported by the sub-project:

- The conservation and sustainable use of biodiversity;

- Social and economic development and physical planning;
- A strengthened legal framework;
- The integration and coordination of relevant national strategies; and
- The promotion of environmental education, awareness and participation in support of biodiversity conservation and sustainable use.

In 2000 Cuba also adopted its *National Action Plan to Combat Desertification and Drought* (NAP).

Environmental Law 81 (1997) provides the overall legal framework for environmental management in the country. It serves as the legal basis of both the NBSAP[1] and the NAP.

Law 81, through Articles 110 and 111, also defines the objectives of integrated watershed management and assigns to the National Watershed Council (CNCH for the Spanish acronym) the responsibility of enabling integrated watershed management activities, in coordination with other central government entities. The CNCH works to promote synergies among its members without assuming their functional responsibilities.

In 1994, Cuba's Academy of Science, the National Commission for Environment and Natural Resources and the Executive Secretariat for Nuclear Energy were merged into the Ministry of Science, Technology and Environment (CITMA for the Spanish acronym). Today CITMA is the lead ministry in the country on proposing and implementing government policies in science, technology, environment and the use of nuclear energy, promoting their cross-sectoral coherent integration. CITMA chairs the National Watershed Council, with the National Hydrological Institute serving as the vice-chair of the CNCH.

Nevertheless, the Cuban Government recognizes that it currently lacks the appropriate legal, political and social policy framework and infrastructure that are essential if government initiatives within the various sectors are to be managed cohesively, without duplication, and in an integrated manner. It is the next logical step for Cuba to adjust its legal regulatory framework and to make the corrective policy revisions necessary to be able to interconnect these various sectors so that they share a common vision and mission and understand the fundamental importance of implementing socio-economic development initiatives using the ecosystems-based approach. With government guidance and support, the benefits and importance of the IWCAM methodology will filter down through all levels of state bureaucracy and to the general populace as a whole.

Stakeholder Involvement

In designing the sub-project, the Center of Environmental Studies of Cienfuegos (CEAC for the Spanish acronym) of the Ministry of Science, Technology and Environment consulted with stakeholders throughout the country on priorities, sub-project elements and activities, the selection of project intervention areas and stakeholder participation in sub-project implementation. Over 20 organizations and institutions were involved in these consultations and are expected to be involved in sub-project implementation.

Universities and research centers such as the Centers of Environmental Studies will play a prominent role in the sub-projects monitoring and assessment, education and training activities. Local authorities and regional and local representatives of key government ministries (Science, Technology and Environment; Agriculture; and Education), as well as the local Centers of Environmental Studies, will be working together with local communities in the design and implementation of project interventions in the four demonstration areas.

[1]Along with Law-Decree 201 (1999) on the National System of Protected Areas.

Government ministries and their centers will work closely with the participating universities in assessing and strengthening the policy, legal and regulatory frameworks for achieving integrated watershed and coastal areas management and the conservation and sustainable management of biodiversity. Farmer cooperatives will play a prominent role in the application of good agricultural practices and best environmental practices in support of biodiversity sustainable management. Key stakeholders and expected roles in the implementation of this sub-project are listed in Table 1.

Table 1. Roles of lead local organizations in support of the project.

Local organization	Role in project
International Relations, CITMA	• Primary support to project execution, ensure coordination amongst all stakeholders • Promote project buy-in to all stakeholders at national level • Provide liaison between national stakeholders
Ministry of Agriculture, Cienfuegos	• Provide technical support to design and execution of sustainable agricultural practices • Support monitoring of environmental and socio-economic benefits derived from implementation of good agricultural practices • Provide regulatory support to implementation of sustainable agricultural management practices
Center of Environmental Studies of Cienfuegos (CEAC)	• Primary support to project execution, ensure coordination amongst all stakeholders • Promote project buy-in to all stakeholders at national level • Conduct applied research in all relevant areas of the project • Conduct monitoring and assessment of project impacts • Develop and strengthen research capacities
The Center of Environmental Service of Sancti Spiritus	• Conduct applied research in all relevant areas at the local project site • Conduct monitoring and assessment of project impacts • Develop and strengthen local research capacities
Centro Oriental de Ecosistemas y Biodiversidad (BIOECO), Santiago de Cuba	• Conduct applied research in areas of biodiversity • Conduct monitoring and assessment of project impacts • Develop and strengthen research capacities
Cienfuegos Botanical Garden	• Responsible for the project in the demonstration area of Cienfuegos.
Ministry of Education	• Support the uptake of lessons learn from project execution and development of curricula resources for advanced scientific studies
University of Oriente Universidad Central Marta Abreu de Las Villas University of Cienfuegos University of Havana	• Conduct the professional training and education programmes for project implementation • Conduct applied research in all relevant areas of the project • Conduct monitoring and assessment of project impacts • Develop and strengthen research capacities • Contribute to the design and development of policy based on research findings
Danger, Vulnerability and Risks Group of the Cuban Environmental Agency, CITMA	• Contribute to climate change vulnerability assessments and project design to reduce risk • Support project monitoring in assessment of risk reduction • Contribute to policy design in vulnerability and risk reduction

Local organization	Role in project
Institute of Tropical Geography, CITMA	• Support conduct of research in all relevant areas • Advises the design and implementation of the National Network RIWECo and Environmental Information System
Organo de Montaña Central y Oriental	• Facilitate the implementation process, assimilation and application of science and technological innovation to achieve comprehensive and sustainable development in mountain
State Working Group for the Bay of Cienfuegos and Santiago de Cuba	• Conduct applied research in areas of pollution control • Conduct monitoring and assessment of project impacts • Develop and strengthen research capacities
CITMA Territorial Delegation in Havana	• CITMA Delegations from each of the provinces representing and supporting institutions CITMA involved in the implementation of project activities.
CITMA Territorial Delegation in Sanct Spiritus	
CITMA Territorial Delegation in Santiago de Cuba	
Center for Marine Research, University of Havana	• Conduct applied research in areas of pollution control and marine impacts • Conduct monitoring and assessment of project impacts • Develop and strengthen research capacities
Center of Engineering and Management of Bays and Coasts (CIMAB)	• Conduct applied research in areas of pollution control and marine impacts • Conduct monitoring and assessment of project impacts • Develop and strengthen research capacities
State Forestry Service in the participating provinces	• Support technical contributions to reforestation and forest conservation • Conduct monitoring and assessment of project impacts
Soil Institute	• Support technical contributions to soils assessments • Provide recommendations for project investments based on soil suitability/capability • Conduct monitoring and assessment of project impacts
Cuban Society of Soil Science (SCCS)/ONG	• Updating and scientific and technical advice on issues of soil and fertilizer.
Provincial Tele Centre of Cienfuegos "Pearl Vision"	• Disseminate widely communication products on the results of the project will generate
Cuban Association of Agricultural and Forestry Technicians (ACTAF)/ONG	• Scientific and technical advice on agro-forestry issues
Cuban Association for Animal Production (ACPA)/ONG	• Scientific and technical advice on issues of livestock production
Basic Unit of Cooperative Production (CCS)/ONG	• Executors and direct project beneficiaries.
Federation of Cuban Women (FMC) /ONG	• Mobilize groups of rural women involved in the project implementation.
Committee for the Defense of the Revolution (CDR)/ONG	• Mobilize the population by ensuring community participation in actions designed in the project demonstration areas

2.2 Overall Objective and Outcome

2.2.1 Objective: To conserve, protect and ensure the sustainable use of Cuba's biological diversity in support of the country's future socio-economic development, for the benefit of current and future generations, and to protect and rehabilitate four already fragile and vulnerable insular hydrographic and coastal ecosystems from further damaging anthropogenic activities and the effects of global warming.

2.2.2 The expected outcomes are:

- the strengthening and inter-connecting of the political, legal and social infrastructure so that Cuba's current fragmented and separate environmental, health, welfare, economic, social and other government management initiatives are applied cohesively, without duplication, under the umbrella of integrated hydrological and coastal management plans that are implemented at all levels of society, including from the grass roots level and up;
- introduction of effective land-use planning, particularly in coastal areas that are most vulnerable to extreme weather events and climate change effects;
- increased awareness at all levels of the population of the importance of biodiversity and ecosystem integrity for the provision of ecosystem services;
- improved system for monitoring and evaluating biodiversity and establishment of indicators to demonstrate the changing health of the ecosystem;
- a strengthened and more effective system of National Protected Areas in Cuba;
- creation of a national internet data basis that is widely used to divulge and promulgate further information regarding biodiversity, its conservation, protection and sustainable use;
- a measureable increase in the number of people earning a livelihood from sustainable ecosystem services, including eco-tourism and food production;
- a measureable increase in the number of farmers managing productive soils ecologically rather than agriculturally, using good agricultural practices (GAP) and best environmental practices (BEP);
- a measureable reduction in soil degradation and runoff;
- increased yields in productive agricultural lands where BEP and GAP are being implanted;
- a measureable decrease in the extent of soils contaminated by household and industrial wastes;
- a measureable increase in the amount and extent of household and industrial wastes that are properly and effectively treated;
- a measureable improvement in the quality of atmospheric air and freshwater resources;
- a measureable increase in the number and heterogeneity of indigenous trees planted,
- a measureable increase in indigenous forested cover in riverine, reservoir and watershed areas;
- a measureable reduction in the number of invasive and exotic species of trees planted;

- a measureable improvement in the extent of semi-deciduous indigenous forest cover;
- a measureable increase in the extent of mangroves proliferating in coastal areas prone to hurricane and tidal surges;
- a measureable decrease in coral reef degradation.

2.3 Consistency with International Efforts

As a Party to the Convention on Biological Diversity (CBD), this sub-project will contribute to Cuba meeting its obligations under the CBD, as well as other multilateral environmental agreements (MEAs) such as the United Nations Framework Convention on Climate Change (UNFCCC) and the Ramsar Convention on Wetlands of International Importance, especially as Waterfowl Habitat. It also will contribute to Cuba meeting its obligations under the United Nations Convention on Law of the Sea (UNCLOS) and the Specially Protected Areas and Wildlife (SPAW) Protocol of the Cartagena Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region.

The UNEP Caribbean Regional Coordinating Unit (UNEP/CAR-RCU), which serves as the Secretariat of the Cartagena Convention, and its Caribbean Environment Programme (CEP), recently implemented two regional GEF-funded projects:

1. Integrating Watershed and Coastal Areas Management (IWCAM) in the Small Island Developing States of the Caribbean and
2. Reducing Pesticide Run-Off to the Caribbean Sea (REPCar).

These projects have effectively demonstrated a number of best practices for water, wastewater and waste management in the Wider Caribbean that will be applicable to this sub-project. Other lessons learned from both the IWCAM and REPCar projects will also be utilized in the implementation of this sub-project:

In addition, Cuba is party to the following international agreements related to environment and natural resource management:

- Convention on the International Trade of Endangered Species of wild flora and fauna (CITES) (1990), ratified in 1990.
- United Nations Framework Convention on Marine Rights (1982), ratified in 1984.
- United Nations Framework Convention to Combat Desertification in countries affected by severe or particular droughts (1994), ratified in 1997.
- Cartagena Protocol to the CBD on biotechnology, ratified in 2002.
- International Treaty on phytogenetic resources for food provision and agriculture (Rome, Italy, 2001), ratified in 2004.
- Convention on the Conservation of Migratory Species and Wild Animals (Bonn, 1979), ratified in 2007.
- Convention on the Protection of Sub-aquatic Cultural Patrimony (Paris, 2001), ratified in 2008.
- The Stockholm Convention on Persistent Organic Contaminants – COP (2001), ratified in 2007.

- The Kyoto Protocol of the United Nations Convention on Climatic Changes. (1997), ratified in 2002

The sub-project will also build upon the experiences and lessons learned from previous and on-going relevant GEF projects being or to be undertaken in Cuba. To date, a total of 43 national, regional and global GEF projects worth US$27,733,068.41 have been approved. Of these, 25 projects, worth a total investment of US$ 9,180,949.00, have been satisfactorily completed, and 18 other projects, worth US$18,552,119.41, are currently in progress. In summary, the main GEF projects by focal area, including projects in progress and awaiting final approval, as well as regional projects are:

Focal Area	Number of Projects	Amount (US$M)
Biodiversity	14	16.74
Climate change	19	10.24
International waters	9	4.39
Land degradation	3	10.36
POPs	1	0.5

In particular, this sub-project has synergy with the following GEF actions developed in the country, either from the application of an integrated management approach, or from the biodiversity perspective:

1) 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 biodiversity considerations into the agriculture, forestry and tourism sectors in landscapes characterized by ecological vulnerability and productive importance.
2) The GEF **Small Grants Program (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.
3) The GEF-UNDP project 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 biodiversity 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 – Trinidad and Topes de Collantes, and the Cauto Delta).
4) The GEF-UNDP project **"Application of a regional approach for the management of protected seascapes and coastal areas in the southern Cuban archipelagos" ("Aplicación de un enfoque regional al manejo de áreas costeras y marinas protegidas en los archipiélagos del sur de Cuba"),** has been strengthening the capacities of the national system of protected areas (SNAP for the Spanish acronym) in regards to the identification and widening of the seascapes of the south region of the country creating methodologies for monitoring biodiversity with the purpose of its conservation and sustainable use.

2.4 Activities, Outputs, Outcomes

The aim of the sub-project is to conserve, protect and ensure the sustainable use of Cuba's biological diversity to support the country's future economic development, for the benefit of current and future generations, and to protect and rehabilitate four already fragile and vulnerable insular hydrographic and coastal ecosystems from further damaging anthropogenic activities and the effects of global warming.

The sub-project has four major components:

1 Development and implementation of environmental management tools for biodiversity conservation, including addressing climate change impacts;
2 Assessment and monitoring of the problems that need to be addressed through integrated watershed and coastal area management (IWCAM) in the western, central and eastern regions of Cuba;
3 Improvement of the institutional, legal and regulatory frameworks and capacity building for integrated watershed and coastal area management in support of biodiversity conservation in Cuba; and
4 Information management and dissemination and sub-project replication.

Component 1: Development and implementation of environmental management tools for biodiversity conservation, including addressing climate change impacts

Component 1 aims at developing land use plans for underpinning biodiversity conservation and sustainable use in four critical watersheds in the country that are particularly important for biodiversity richness and endemism and where unsustainable practices pose significant threats. Through it, specific management measures will be applied for reducing and eliminating environmental problems threatening biodiversity conservation.

The GEF Small Grants Programme (GEF-SGP) will support the development and implementation of smaller-scale investments associated with the main project to enhance economic livelihood opportunities. These will be defined during project inception and negotiated over the early stages of project implementation.

Proposed approaches for biodiversity restoration within the target watershed areas:

At Habana del Este, within the **Rio Guanabo watershed**, the focus of interventions will be on the reduction of contamination and land degradation that is contributing to sedimentation and pollution within the watercourses and the receiving marine environment. The areas of Rincón de Guanabo, La Coca, farm Campo Florido and the Forestry Business Unit Base Habana del Este will be the primary targets of investments where degraded forests over 640 hectares will be enriched with planting of species of favour to local biodiversity that will include *Coccothrinax sp., Coccoloba uvifera*, *Rhizophora mangle, Rhizophora racemosa, Avicennia germinans, Conocarpus erectus, Cordia gerascantus, Cedrela odorata, Swietenia mahagonia, Samanea saman, Calophillum calaba, Manguifera indica, Pouteria zapota, Talipariti elatum, Tectona grandis and Persea americana*. Some of these species are native hardwoods that have been locally threatened through over-exploitation, while others are more common native forest species, and others are fruit tree crops. In terms of pollution control, the project will focus on the Rincón de Guanabo Protected Area and the Coca Ecological Reserve to address land use practices that are negatively affecting the quality of local ecosystems. Principal measures that to be applied will include enhanced agronomic practices that include improved nutrient application efficiency, diversion and neutralization of livestock waste particularly from swine,

poultry, goats, cattle and horses, and land conservation measures to reduce surface erosion and gully erosion. Composting of waste by-products to reduce nutrient loading will also be integrated as part of the suite of good agricultural practices. Agro-forestry systems that will include intercropping of *Persea americana, Manguifera indica, Pouteria zapota* with *Cordia gerascantus*, *Calophillum calab*, *Samanea saman* will not only aid in enhancement of ecosystem quality through increasing floral diversity, but serve to diversify income streams to the farm holders.

At the Santi Spíritus within the **Rio Agabama watershed** the interventions will primarily focus on rehabilitation of coastal ecosystems over three sub-areas. Within the coastal areas of Guarabo-Agabama plain, including Ancon Peninsula the project will engage with farmers, ranchers and the population living in the basin mainly in the communities of La Boca, Casilda and Trinidad where there is acute erosion, desertification, salinization and loss of soil fertility. The project interventions will seek to restore the ecological character in these areas through the installation of pollution control measures that include wastewater diversion and treatment using appropriate low-cost measures such as constructed wetlands and phyto-remediation techniques using native plant species, soil erosion control measures through storm drainage management, vegetation control and bio-engineering techniques. Mangrove restoration and enrichment including establishment of other wetland species will be undertaken over areas that have been degraded so as to improve the habitat quality within the ecosystem. Within the lower reaches of the Rio Agabama that includes the deltaic plain a similar suite of measures will be applied. Ecological degradation in this area is principally the result of poor agricultural practices, deforestation, fires and poaching, mainly of native species of conservation concern, and pressures from tourism and the local population. It is estimated that the most acute areas for remediation covers approximately 350 hectares. The project will install control measures within select farms to minimize wastewater discharges and nutrient loading into the watercourses and adjacent marine environment, along with measures to restore the biological character of the coastal and mangrove forests where they have been compromised by degradation. This will entail a combination of reforestation within Ancon Peninsula and agroforestry and other habitat enrichment measures within farm holdings particularly those along the riparian zones to create diversity in habitat. Within the South Central Zone - Cabagan in proximity to the mouth of the Agabama River the project will contribute to the enhancement of wetland habitats that serve as important fish (snapper and grouper) and other marine biodiversity sanctuaries. This will be done through restorative expansion of plant species that include *Coccoloba uvifera, Coccothrinax argentata, Avicennia germinans, Rhizophora mangle, Rhizophora racemosa, Conocarpus erectus*.

At Cienfuegos within the **Rio Arimao watershed** the project will target investments oriented around the implementation of good agricultural and best environmental practices over approximately 250 hectares in areas dominated by mineral extraction activities, agricultural production for coffee, fruit and animal husbandry, as well as forestry, among others. The diversity of the land use activities that are compromising the maintenance of biological resources in the area means that a wide range of conservation approaches will need to be applied. In areas such as Barajagua in the municipality of Cumanayagua that has been undergoing forest fragmentation, further investments in shade coffee to enhance ecological diversity will be promoted to local area farmers. Some six farms of Basic Units of Cooperative Production Victoriano Brito will be targeted to reduce polluting runoff and nutrient loading through wastewater diversion and stabilization, applying wetland treatment and bioremediation techniques, along with soil conservation technologies, such as anti-erosion barriers, management of vegetation cover, organic soil improvement, production and application of organic-fertilizers and improved irrigation systems and water conservation measures. Reforestation with species of high economic value such as *Swetenia mahagoni, Tectona grandis, Cordia gerascanthus, Cedrela odorata, Talipariti elatum* will be complemented by soil conservation and bioengineering controls installed within land holdings that slow rates of acute land degradation. The project will also promote the farming of native forest species in plantations over a 37-hectare demonstration area. The principle tree species to be

used will include *Cordia gerascantus, Cedrela odorata, Swietenia mahagonia, Samanea saman, Calophillum calaba*, *Manguifera indica, Persea americana, Bursera simaruba* that will serve to enhance and improve ecological functioning and maintain biological diversity. Some traditional forest users continue to use inappropriate farming techniques such as tillage against the slope, soil burning and the use of chemical fertilizers, which are continuously contributing to environmental degradation of the watershed. The project will support the training of these users by promoting environmentally safe and sustainable techniques and providing the basic resources needed to implement them.

Within the **Rio San Juan watershed** in Santiago de Cuba, the project will implement environmentally sensitive and sustainable solutions to help reverse some of the effects of environmental degradation that has endangered ecosystems particularly around the town of Canasí. In this area, high urbanization due to proximity to the city of Santiago de Cuba and extensive deforestation and accompanying loss of biodiversity are critical issues. With expansion of the city, contamination from various industrial and urban sources to the San Juan River and its tributaries has increased significantly. The measures to be implemented as part of the project will include runoff and wastewater treatment using physical means to improve infiltration into the soil and phytoremediation using selected species of vegetation to immobilize pollutants including nutrients. Bioengineering and other measures to control soil erosion will be installed in areas particularly along watercourses and on the steeper areas that are prone to land degradation.

The project will implement restoration of degraded forests that border the Baconao Biosphere Reserve, the Siboney Juticí Ecological Reserve and the Estrella Aguadores Protected Landscape so as to enhance ecosystem functioning within these reserve areas. The targeted area is situated within the Canasí sub-basin which will also serve to protect the water recharge to two micro reservoirs (Canasí and Dorotea). The lands in the area fall mainly under state ownership, although some lands are under individual landholdings. Over 70% of the area is occupied dedicated to livestock rearing, belonging to Agropecuaria Caney. There are also important areas cultivated with fruit and smaller scale subsistence crops. The project will support the rehabilitation of existing orchard plantations, encourage agro-forestry and reforestation of shelterbelts (associated with the micro reservoir protection) using forest and fruit species such as *Swietenia mahagoni*, *Cedrela odorata*, *Colubrina arborescens*, *Gerascanthus gerascanthoides*, *Guaiacum oficinale*, *Calophyllum antillanum*, *Mangifera indica*, *Cashew*, *Tamarindus indica*, *Persea americana*. This activity will be carried out over an estimated 450 hectare area.

Mainstreaming biodiversity considerations within wider policy and legislative frameworks

The project will contribute to the mainstreaming process for integration of biodiversity considerations into national developmental planning. Watershed management plans will be developed for each target area which will convey spatial representation of the interventions to be developed and implemented during the course of the project. The watershed management planning will incorporate other developmental considerations and data that may already exist that will be of relevance to the project. The watershed management plan will serve as a communications platform to local stakeholders and decision makers at the policy level to articulate priority setting and actions over the short, medium and long-term in the context of biodiversity conservation. This will be done during the inception phase of the project and presented to the stakeholders towards gaining collective agreement and buy-in.

Mechanisms will be put in place to garner cross-sectoral support and enhanced coordination and cooperation for the project by way of establishment of memoranda of agreements or similar instruments. This process will be coordinated by the Center of Environmental Studies of Cienfuegos. These agreements will articulate the scope of work of the various partner agencies and stakeholders in channeling their specific inputs

towards successful implementation of the project. These agreements will set forth the specific deliverables and provide a means for assessment of progress amongst the partners and importantly, mainstream the connections between work under the project relative to broader statutory mandates.

Central to the mainstreaming process will the provision of direct policy guidance to elicit changes in policy and regulatory frameworks that will appropriate institutional response to strengthen the biodiversity conservation in the country. This will be the focus of Component 3 of the project that derives the lessons learned from execution of component 1. At the highest level, the project will be mainstreamed within the scope of the government's Economic and Social Guidelines No. 133 which specifies the need to re-orient socio-economic development towards the rational use and conservation of ecosystems resources and to take into account, and to plan around the realities of climate change impacts. Further, the project will be nested within Cuba's National Environmental Strategy 2011-2015 (NES) that serves to direct interventions within six priority environmental issues, most of which are addressed in the sub-project that include loss of biological diversity, impacts to forest cover, soil degradation, impacts of climate change, water scarcity and difficulties with water supply and quality and pollution (liquid and solid waste, emissions to the atmosphere and noise). Finally, the actions and outputs of the project will fall within the scope of Environmental Law 81 (1997) that provides the overall legal framework for environmental management in the country and serves as the legal basis of both the NBSAP[2] and the NAP. Lessons learnt from the project will contribute to the body of knowledge that will drive future enhancements of this legislation.

Component 1.1 Measurable stress reduction of biodiversity at project sites through appropriate sustainable water, land and ecosystems management interventions that account for climate change

National component 1.1.1 Innovative Solutions: Environmentally sound land use planning tools for biodiversity conservation

Activities

- **1.1.1.1** Development and implementation of integrated land use planning in the following four watersheds in the four sub-project demonstration areas:

  Habana del Este:
  1. The Rio Guanabo watershed

  Santi Spíritus:
  2. The Rio Agabama watershed

  Cienfuegos:
  3. The Rio Arimao watershed

  Santiago de Cuba:
  4. The Rio San Juan watershed

Outputs:

- Integrated watershed management plans

[2]Along with Law-Decree 201 (1999) on the National System of Protected Areas.

Outcomes:

- ***the implementation of intervention actions with sustainable solutions for each area according to the identified land and biodiversity uses and problems,***
- ***improved management of National Protected Areas***
- ***the sustainability of biodiversity and other natural resources in sub-project demonstration areas.***

National component 1.1.2 Innovative Solutions: Application of management investments for addressing specific environmental problems threatening biodiversity conservation

Activities:

- **1.1.2.1** Analyze and identify solutions, including environmental cleanup, to control contamination due to non-treated household and industrial wastewater in sub-project demonstration areas.
- **1.1.2.2** Analyze and identify solutions, including environmental cleanup, to control soil contamination due to unsustainable industrial and agricultural practices in sub-project demonstration areas.
- **1.1.2.3** Restore and rehabilitate ecosystems over 1,690 hectares in each demonstrative area considering lessons learned from the IWCAM Project.
- **1.1.2.4** Reduce CO_2 emissions by means of the intensive growth of algae as a biomass source and by means of reforestation in selected areas within the sub-project intervention areas.

Outputs:

- A sub-project report addressing wastewater treatment options covering the four sub-project demonstration areas,
- Four sub-project reports addressing options for treating soil contamination from industrial and agricultural activities in the sub-project demonstration areas,
- Four annual sub-project reports assessing progress in the restoration and rehabilitation of selected ecosystems and habitats,
- Two sub-project reports: one on the utilization of algae growth as a carbon sink and a second on the extent of reforestation undertaken and its contribution to climate change mitigation,
- Surface area reforested and forest cover preserved and
- An estimation of carbon captured by the sub-project.

Outcomes:

- ***rehabilitation and restoration of important ecosystems and habitat,***
- ***mitigation and elimination of untreated wastewater,***
- ***rehabilitation of contaminated soils, and***
- ***climate change mitigation.***

Component 1.2: Enhanced livelihood opportunities and socio-economic co-benefits for targeted communities from improved ecosystem services functioning.

National component 1.2.1 Promotion of conservation and sustainable use of biodiversity through good agricultural practices.

Activities:

- **1.2.1.1** Promote Forest Farms with programs of sustainable management of biodiversity (PGSB for the Spanish acronym) over 82 hectares in the four sub-project demonstration areas.
- **1.2.1.2** Support Farmers' Cooperatives implementing sustainable management of biodiversity.
- **1.2.1.3** Promote farms in usufruct implementing PGSB.
- **1.2.1.4** Develop guidelines for good agricultural practices (GAP) based on lessons learned from interventions in each demonstration area of the sub-project.

Outputs:

- sub-project reports on the promotion of forest farms based on sustainable management of biodiversity,
- the provision of support to farmers' cooperatives practicing sustainable management of biodiversity,
- provision of support to farms in usufruct practicing PGSB,
- production of guidelines on good agricultural practices suitable for the sub-project's demonstration areas.

Outcomes:

- ***reduced stress on biodiversity in the sub-project's intervention areas,***
- ***sustainable management of biodiversity, and***
- ***demonstrated good practices and lessons learned from the intervention actions implemented in each demonstration area.***

Component 2: Assessment and monitoring of the problems which need to be addressed through integrated watershed and coastal area management (IWCAM) in the western, central and eastern regions of Cuba

Through this component, the identification, scope and degree of environmental problems threatening biodiversity in the four critically important sub-project intervention areas will be assessed as a basis for implementing specific actions that strategically respond to these threats, as well as for assessing the effectiveness of the measures implemented in reducing and eliminating these threats. The activities of this component are grouped under two sub-components.

National Component 2.1.1 Systems for monitoring: Completion of baseline data in the four sub-project demonstration areas and selection of indicators

Activities:

- **2.1.1.1** Complete baseline data and assessment of four sub-project demonstration areas.

- **2.1.1.2** Analyze and select indicators for measuring progress in integrated watershed and coastal area management and biodiversity conservation.
- **2.1.1.3** Develop in consultation with stakeholders a Monitoring Protocol for the utilization of existing and the designing of new indicators for assessing sub-project implementation.

Outputs:

- A diagnostic analysis of baseline data evaluating the present environmental state of basins and coastal areas in the selected sub-project demonstration areas,
- An assessment of conflicts between conservation efforts and the unsustainable use of biodiversity resources,
- A set of indicators for assessing progress in the implementation of integrated watershed and coastal area management and biodiversity conservation, including indicators for monitoring and assessing the decrease of ecosystem stress in the sub-projects' four demonstration areas, and
- A Monitoring Protocol consulted with stakeholders.

Outcome:

- ***Enhanced capability for improved strategic monitoring and assessment in support of decision making in project implementation based on the availability of a set of baseline data and appropriate indicators, including the identification of prioritized environmental problems to be addressed.***

National Component 2.2.1 - Systems for monitoring: Establishment of a systematic biodiversity monitoring program for the four sub-project demonstration areas, taking into account climatic variability and relevant environmental and socio-economic factors

Activities:

- **2.2.1.1** Update biodiversity inventories of selected ecosystems in each of the sub-project demonstration areas.
- **2.2.1.2** Identify marker organisms to be monitored and the state of health indicators in the selected ecosystems.
- **2.2.1.3** Monitor and assess water quality in fluvial systems and coastal areas using biological, physical and chemical indicators selected under sub-component 1.1.
- **2.2.1.4** Evaluate functional ecosystem response to natural and anthropogenic disturbances.
- **2.2.1.5** Develop models for principal at risk locations for projecting potential threats from climate change in the four sub-project demonstration areas.

The overarching outcome of this sub-component will be on-going strategic monitoring for continual assessment of biodiversity conservation actions in the four sub-project demonstration areas taking, as required, corrective measures and adjusting accordingly the relevant plans and strategies.

Outputs:

- Four updated sub-regional biodiversity inventories,
- A sub-project report with identified marker organisms for monitoring the health of selected ecosystems,
- Four annual reports on water quality and fluvial systems in the sub-project's demonstration areas,

- Four sub-project reports on ecosystem response to natural and anthropogenic disturbances in the sub-project demonstration areas, and
- Four assessment reports on principal at risk locations and potential threats from climatic change.

Outcomes:

- ***a greater understanding of the status of water quality in fluvial systems and the relationship to biodiversity conservation efforts in the four sub-project demonstration areas,***
- ***more effective assessment of the effectiveness of sub-project interventions with resultant corrective measures and adjustments, and***
- ***a knowledge base for selecting mitigation and adaptation measures for responding to threats from climate change to biodiversity and other natural resources in sub-project intervention areas.***

Component 3: Improvement of the political, legislative and institutional framework and capacity building for implementing integrated watershed and coastal area management in support of biodiversity conservation in Cuba

The aim of component 4 is four-fold:

a. strengthen inter-institutional coordination and cooperation in integrated watershed and coastal area management,
b. improve arrangements and mechanisms for resolving inter-institutional conflicts affecting IWCAM,
c. improve sub-project coordination among partners and stakeholders through a fluid system of communication and information exchange; and
d. build capacity for improved sub-project implementation.

National Component 3.1.1 Policy and legislation: Legal and regulatory frameworks for integrated watershed and coastal zone management

Activities:

- **3.1.1.1** Identify the legal and regulatory frameworks for IWCAM.
- **3.1.1.2** Diagnosis of the systematization, coherence, efficiency, efficacy and legal certainty of the legal and regulatory frameworks for IWCAM.
- **3.1.1.3** Propose a revised theoretical basis for the improvement of the legal and regulatory frameworks for IWCAM.

Outputs:

- Three respective sub-project reports to be utilized in generating a follow-up discussion and debate leading to corrective policy revisions for improving the legal and regulatory basis for IWCAM.

Outcome:

- ***Improved legal and regulatory frameworks for integrated watershed and coastal area management.***

National Component 3.1.2 Policy and legislation: Institutional framework for integrated watershed and coastal area management

Activities:

- **3.1.2.1** Analyze the distribution of capabilities, assigned functions and outstanding public responsibilities for IWCAM.
- **3.1.2.2** Identify the hierarchical subordination relationships and arrangements for inter-institutional coordination and cooperation.
- **3.1.2.3** Assess the effectiveness of the present inter-institutional framework for coordination and cooperation.
- **3.1.2.4** Propose a more effective framework for inter-institutional coordination and cooperation.

Outputs:

- Four respective sub-project reports that will be utilized to generate a follow-up discussion and debate leading to corrective policy revisions for improving the institutional framework for IWCAM.

Outcome:

- ***Strengthened inter-institutional coordination and cooperation for the application of integrated watershed and coastal area management in support of the conservation and sustainable use of biodiversity.***

National Component 3.1.3 Policy and legislation: Procedures for the resolution of inter-institutional and inter-jurisdictional conflicts

Activities:

- **3.1.3.1** Identify the existing procedures for resolving conflicts between different institutions and/or between different governmental and administrative jurisdictions**.**
- **3.1.3.2** Assess the effectiveness of the procedures currently provided by Law, for the resolution of inter-institutional and inter-jurisdictional conflicts.
- **3.1.3.3** Propose new procedures and/or the improvement of existing procedures for the resolution of inter-institutional and inter-jurisdictional conflicts.

Outputs

- Three sub-project analytical reports to be utilized to generate a follow-up discussion and debate leading to corrective policy revisions for improved procedures for the resolution of inter-institutional and inter-jurisdictional conflicts affecting the conservation and sustainable use of biodiversity in Cuba.

Outcome:

- ***Improved procedures for the resolution of inter-institutional and inter-jurisdictional conflicts affecting the conservation and sustainable use of biodiversity in Cuba.***

Sub-Component 3.1.4 Policy and legislation: Coordination and information sharing on sub-project status and developments among sub-project partners and stakeholders

Activities:

- **3.1.4.1** Design and implement the sub-project's National Network (RIWEco for the Spanish acronym) from a Central Node to all Secondary Nodes.
- **3.1.4.2** Design and implement the Information Management System (SGI for the Spanish acronym) with specialists from the Central Node for dissemination to all Secondary Nodes and trained users.
- **3.1.4.3** Design and implement desktop and Web services and applications for the management of spatial information with trained specialists and users.
- **3.1.4.4** Assemble and diffuse distance training courses for teaching with Web online platform.

Outputs:

- An electronic National Network (RIWEco for the Spanish acronym) for communicating on sub-project implementation and disseminating information on the status, achievements and lessons learned from sub-project implementation to sub-project partners,
- An Information Management System (SGI for the Spanish acronym) for use by sub-project partners,
- Sub-project spatial information for use by sub-project partners and
- A sub-project report on results of training with the Web online platform.

Outcomes:

- ***improved sub-project coordination among partners and stakeholders as a result of improved internet connectivity,***
- ***the sharing of experiences and information by sub-project partners and stakeholders and***
- ***strengthened technical capacity of staff engaged in sub-project implementation.***

Sub-Component 3.2.1 Capacity Building: Capacity building, training and education programmes for project implementation, sustainability and replication

Activities:

- **3.2.1.1** Input sub-project information and results into the Masters Degree Programmes on Integrated Coastal Area Management (ICAM).
- **3.2.1.2** Teach the 5th edition of the Masters Programme in ICZM at a national level in order to satisfy the sub-project's professional training needs on this topic.
- **3.2.1.3** Teaching the Distance online Diploma course on "Management of Biodiversity from an IWCAM Approach", at a national level with the aim of involving the main social actors in the integrated management of resources in the country.
- **3.2.1.4** Teach short term courses and workshops, as well as lectures, with the aim of involving the sub-project's- main social actors in the integrated management of resources in each sub-project demonstration area

- **3.2.1.5** Undertake a Community Environmental Education programme in the sub-project's intervention areas, with special attention paid to the identified problems in each location on the basis of the results and learned lessons.

Outputs:

- Three strengthened university Masters degree programmes on Integrated Management of Coastal Areas at the Universities of Havana, Oriente and Cienfuegos,
- Trained professionals in ICZM,
- Trained biodiversity and IWCAM professionals,
- Trained sub-project partners and stakeholders,
- Sub-project report on community outreach, public awareness and education.

Outcomes:

- ***Increased number of professionals trained in IWCAM, based partly on the information and results generated by the sub-project.***
- ***strengthened capacity of partners and stakeholders to contribute more efficiently and effectively to sub-project implementation,***
- ***increased capacity of partners and stakeholders to continue with sub-project activities upon sub-project completion and to contribute to its sustainability,***
- ***increased awareness of local communities about the achievements and lessons learned from the sub-project and the need to maintain its sustainability through local community support***
- ***increased professional capacity for sub-project replication.***

Component 4: Information management and dissemination and sub-project replication

This sub-project component has two basic aims:

- to increase awareness and knowledge of the sub-project's status, achievements and lessons learned,
- to provide a broader information platform for replicating the sub-project both within and outside Cuba.

Component 4.1 Knowledge Management: Mechanisms, tool and resources for national and international dissemination of sub-project information and replication

Activities:

- **4.1.1.1** Design and implement the sub-project's IWEco Cuba website.
- **4.1.1.2** Establish the sub-project's Network of Knowledge (RIWEco for the Spanish acronym) with the aim of creating synergies among national and international networks and other projects dedicated to related topics.
- **4.1.1.3** Publish the results of the sub-project for decision-makers and a wider public audience.

- **4.1.1.4** Promote and systematically present the sub-project in national and international events in Cuba on the implementation of the integrated management approach of resources (ICZM, IWCZ and IMNR, among others) in relation to the conservation and sustainable use of biodiversity.
- **4.1.1.5** Develop a Biannual National Event to present, debate and interchange experiences related to the results of the sub-project in each of the four demonstration areas.

Outputs:

- The IWEco Cuba website for dissemination of information on the sub-project's status, achievements and lessons learned to a wider audience within and outside Cuba,
- The Network of Knowledge (RIWEco).
- Publications, including books, booklets, guidelines of good practices, bulletins, posters and calendar diaries (agendas),
- Presentations at national and international conferences,
- Two sub-project biannual reports of consultations on sub-project implementation.

Outcomes:

- ***an increased awareness and knowledge of the sub-project's status, achievements and lessons learned inside and outside Cuba***
- ***greater understanding by decision-makers of the importance of sustaining the sub-project and replicating its activities in other areas,***
- ***promotion nationally and internationally of the importance of the sub-project,***
- ***increased support nationally and internationally for the implementation, sustainability and replication of the sub-project, and***
- ***feedback from national and local authorities and stakeholders contributing to sub-project improvement.***

Land tenure dimensions, stakeholder engagement and support

In Cuba, the land distribution and its use, is governed in accordance with the land tenure arrangements. Some 54% of the total area is operated by state companies that specialize in agricultural crop and livestock production, mining and other industrial and commercial activities. The bulk of the productive outputs come from these lands. Agricultural lands constitutes 6.3 million hectares, with some 70% operated by private producers through 'usufruct' tenure held in different cooperative forms like the Basic Unit of Cooperative Production (UBPC), that conveys 'usufruct' rights (land use for free and for an indefinite time) to users. A large percentage of farmers have acquired access to lands under this arrangement that constitutes at least 18% of the total land area of the country or 26% of the agricultural land (1.7 million hectares). Other non-state agricultural production fall under Agricultural Production Cooperatives (CPA) which operate 8% of the land area or 522,000 hectares, as well as the Credit and Service Cooperatives (CCS) that have access to 36% of the land area (2.3 million hectares).

At the project locations the lands targeted for investments generally fall within either larger state-controlled holdings, smaller-scale farm holdings under cooperative arrangement, and as such will be relatively easy to coordinate actions across the various agencies and farmers. There are strong supports financial mechanisms

available to farmers dedicated to forest and soil conservation and supported by Agriculture Ministry, such as the National Program for Soil Conservation and Improvement (PNCMS) and the National Forest Development Fund (FONADEF). The famers that participate in the project will be eligible for receipt of between 5% and 15% of harvest outputs, implying corresponding increment of family incomes and environment conservation by reforest actions, including access to training and resources to implement the solutions.

There are agencies that will play a key role in ensuring that lands are transformed into more sustainable agricultural systems that seek to conserve biological resources and reduce land and water degradation. These will include the Cuban Association of Agricultural and Forestry Technicians (ACTAF), which is a nongovernmental organization that integrates technical, agricultural and forestry professionals, for sustainable development of agriculture, and the Cuban Association of Animal Production (ACPA), a nongovernmental organization that specializes in the field of animal production and husbandry.

2.5 Incremental Reasoning

2.5.1 Baseline

The vast majority of the anticipated actions outlined in this sub-project will be conducted in demonstration areas that fall within the boundaries of Cuba's National System of Protected Areas, which cover 22% of national territory. However, although they are well established on paper, these lands are inadequately managed and insufficiently funded due to inadequate allocation of resources, lack of trained manpower, and lack of understanding of the importance of protecting these ecosystems by the very populations who stand most to benefit from their proper management, conservation and sustainable use.

The loss of biological diversity in the more populated areas where almost half of Cuba's population live and work is already considered one of Cuba's principal environmental problems. This is not only due to the alteration, fragmentation and loss of habitat, ecosystems, and landscapes that have already decreased threatened populations of flora and fauna, but also because of their negative impact on food, agricultural and silviculture production, which has led to subsequent problems for consumption and incomes for workers linked to these activities.

Coastal ecosystems are already showing the severe negative impacts of land-based sources of pollution, including untreated household and industrial wastes, particularly in coastal areas close to Havana. Uncontrolled coastal development and overfishing have also resulted in the decline of fishery products and other coastal goods and services. These include the removal, degradation and fragmentation of natural barriers such as mangroves and coral reefs, which result in diminishing coastal protection from extreme weather events and disasters such as high tidal surges, hurricanes and flooding, and, in turn, contribute to beach erosion and the reduction of recreational resources important for tourism.

In some cities, green spaces are progressively becoming deteriorated because insufficient care is given to their maintenance and, where urban trees are replanted, there is inadequate selection of replacement species. As a consequence, air quality is becoming poorer and there is increasing vulnerability in cases of extreme hydro-meteorological events and the appearance of so called "urban hot isles" where temperatures can become extreme due to the insular effects of vast expanses of concrete, tarmac etc.[3]

[3] Fernández, M.A y Péres de los R., R. (2009). *GEO Cuba. Evaluación del Medio Ambiente Cubano. Resumen Ejecutivo.* Ciudad de la Habana: PNUMA.

The government's focus on increasing food security by implementing intensive agricultural practices is negatively impacting soils and has led to structural loss, increased compacting of soils, and increased run off. Sixty-five percent of agricultural lands yield less than half of their potential.[4] Consequently food security remains an elusive dream, with insufficient agricultural produce being available for consumption, let alone to sell to generate income. The cost of living continues to increase due to the need for food importations and the rising costs of fertilizers and pesticides. Living standards remain low.

The alteration, fragmentation and general impoverishment of the overall ecosystem and landscape from anthropogenic sources is particularly evident in semi-deciduous forests because most of Cuba's productive agricultural and livestock processes are developed in their ecotypes. The great number of exotic species in forest plantations, some of them specifically planted for productive purposes, is one of the causes of forest coverage degradation, and presents a threat to Cuba's biological diversity. Insufficient attention has been given to reforesting crucial riverine and reservoir borders and more effort is required to achieve significant forest coverage in these important areas.

Environmental actors are aware of the need to manage ecosystems in an integrated way but lack the resources and expertise to propagate this to all key players at all levels and in the different agencies of government and the population as a whole. Consequently, economic, health, development and other decisions and policies are still made sectorally and without considering the health, welfare and sustainability of the ecosystem as a fundamental and essential starting point.

Cuba also lacks the technology, scientific expertise, chemical reactive for laboratory analyses, equipment and other resources needed to be able to monitor, identify and measure key environmental pressures and their trends. For example, there are insufficient means to identify industrial and household contaminants of water and soils, to elaborate and implement clean up solutions, to select the type and number of indicators that could be used to determine ecosystem health, and to set up a nationwide, publically available biodiversity database that could be used for monitoring, evaluating, education, and other purposes.

However, Cuba's familiarity with GEF processes and experience gained in implementing previous and on-going GEF projects will be a definite benefit and will facilitate the effective and efficient coordination of this sub-project's wide arching and inter-sectoral objectives.

[4] Ídem.

2.5.2 Business as usual scenario

- Without consistent, sustained and practical government support and orientation, as well as education of the population as a whole, the conservation and sustainable use of biodiversity will continue only as an ideological policy and not as a practice.
- Important and unique ecosystems will continue to be degraded and fragmented due to unsustainable agricultural practices and other human activities that will continue to encroach and abuse the natural patrimony in a disorganized and unwittingly destructive attempt to eke out sustenance food production and a meager income.
- Unsustainable agricultural practices will also lead to further soil degradation and concomitantly lower yields, creating worsening problems for consumption and incomes for workers linked to these activities.
- Food security will continue to be an elusive dream, food shortages will become more common and there will be little or no agricultural production left to generate income. Food importations will continue, using up the countries precious foreign currency reserves. Living standards will remain low, or even fall still further.
- Semi-deciduous forests will continue to be altered, fragmented and generally impoverished by the increase in unsustainable agricultural and livestock practices that are most common in their ecotopes.
- Introduced plantation tree species will continue to proliferate at the expense of native species, with subsequent deterioration in fauna diversity and therefore the health of the ecosystem.
- Deforestation of riverine strips and other forest resources will continue unabated leading to shortages of freshwater resources.
- With no efforts to treat household and industrial wastes, the watershed area will continue to be diminished, degraded and polluted, affecting the health and welfare not only of the human population but also of the flora and fauna that also need reliable sources of uncontaminated fresh water for survival.
- Similarly, if terrestrial sources of untreated household, agricultural and industrial wastes continue to go untreated, they will continue to further pollute and destroy coral reefs, mangroves and other important and already fragile coastal ecosystems.
- The incidences of red tides will increase.
- Fish reserves will continue to be depleted, beaches will erode still further and the damage wreaked by severe weather events will intensify and become progressively worse, particularly flooding and beach erosion.
- Coastal populations in particular will experience diminished food resources and sources of income, adding to potential poverty, malnutrition and general worsening of already difficult lifestyles.
- The cumulative destruction to the beach environments that attracted recreational visitors in the first place will cause tourism to dwindle and further lead to loss of income and jobs for local people.
- In urban areas, air quality will continue to deteriorate as green areas vanish leading to extreme temperatures and more urban hot spots or islands. As protective surrounding vegetation vanishes, and with the effects of global warming, urban populations will be increasingly susceptible to extreme

hydro-meteorological events, including thunderstorms, hailstorms, tornados, coastal storm surges, floods including flash floods, drought, heat-waves and cold spells.[5]

- Without further resources and improved management, Cuba's National System of Protected Areas will continue to exist only as a weak and ineffective bureaucracy that is unable to conserve or sustain the natural patrimony it is supposed to protect.
- Without further resources and concerted effort to overhaul/improve/correct/adjust/modify and interconnect the country's political, legislative and economic institutions, it will not be possible to create the legal, regulatory framework that will permit integrated watershed and coastal area management initiatives to be implemented in an effective, coordinated way.
- Unless it can be brought into the public domain, important biodiversity data will remain inaccessible to decision makers and key players who will remain ignorant of the need to take the health of watershed ecosystems and conservation and protection of ecosystem goods and services into account as a fundamental element in territorial planning.
- Without access to and knowledge of this essential environmental information, decision makers, other key players and the populace as a whole will continue to make unsustainable choices that will allow erosion, fragmentation, and degradation of watershed ecosystems to continue unabated.

2.5.3 Incremental reasoning

The areas where the GEF IWEco sub-project will be developed are among the richest in the country in biodiversity and endemism - covering a surface area of nearly 3,200 square km that is increasingly coming under human pressure – and therefore the positive impact will be considerable and wide-reaching nationally. The sub-project will generate global environmental benefits as described under GEF focal area strategies, particularly its Biodiversity Strategy. As indicated in the over-arching IWEco project description, this sub-project will promote the conservation and sustainable use of biodiversity and the maintenance of ecosystem goods and services through the improved management of ecologically sensitive areas of interest towards long-term positive impacts in representation of terrestrial and marine ecosystems, and threatened species. In doing so, the sub-project will address Strategic Objective 2 **of the GEF Biodiversity Strategy:** to mainstream biodiversity conservation and sustainable use into production landscapes, seascapes and sectors.

Strengthening the National System of Protected Areas (SNAP) (which covers 22% of the national territory in all its categories) will not only help conserve biodiversity but will of itself generate employment for local populations as rangers and other park employees. This, together with the anticipated increase in revenues from more local and international tourists visiting Protected Areas will have a cumulative effect in encouraging local populations and Cubans in general to value their parks and national patrimony.

This GEF Sub-project will demonstrate to Cuba, and the region as a whole, that the integrated approach to managing hydrological basins and coastal area ecosystems is an effective, efficient and pragmatic way to mainstream the conservation and sustainable use of biodiversity. It will help consolidate and support the considerable efforts of the Cuban government and other regional and international efforts to date to conserve and promote the rational use of biodiversity, and it will further the promulgation of lessons learned from previous and ongoing national, regional and global biodiversity, climate change and other environmentally beneficial projects.

[5] Fernández, M.A y Péres de los R., R. (2009). *GEO Cuba. Evaluación del Medio Ambiente Cubano. Resumen Ejecutivo.* Ciudad de la Habana: PNUMA.

This GEF intervention will stimulate a dynamic team approach towards considering environmental aspects as a fundamental starting point when tackling social, development, economic, health, political and other issues in the future.

Cuba has already developed many successful national scientific/technical programs that have given it institutions, trained human resources and the appropriate legal framework for implementing GEF projects, as well as a designated National GEF Focal Point. As indicated earlier, through its National Environmental Strategy and other sectoral strategies, Cuba has already established country-wide bodies that can be responsible for monitoring and controlling project execution in a coordinated, transparent and systematic way. It is the next logical step for Cuba to adjust its legal regulatory framework and to make the corrective policy revisions necessary to be able to interconnect these various sectors so that they share a common vision and mission and understand the fundamental importance of implementing socio-economic development initiatives using the ecosystems-based approach. With government guidance and support, the benefits and importance of the IWCAM methodology will filter down through all levels of state bureaucracy and to the general populace as a whole.

Taking an integrated approach will help to put an end to the fragmented and isolated nature of the Cuban government's various sectors and agencies. This GEF sub-project will help make key government players, particularly at the local level, aware that ultimately the health of the natural environment is intimately inter-related with sustainable development, the health and welfare of the Cuban people and the future of the Cuban economy. The following issues will no longer be viewed as independent problems, but rather symptoms of a more pervasive general environmental malaise that will be treated holistically so that they are successfully resolved:

- the conservation and sustainable use of biodiversity,
- preventing soil degradation,
- increasing agricultural production
- resolving issues of food security,
- improving the quantity and availability of fresh water resources,
- ensuring the sustainable use of coastal and fisheries resources,
- preventing air pollution,
- cleaning up of household and industrial waste,
- generation of wealth, and
- improving national defenses against the ravages of extreme weather events and climate change.

This sub-project will furthermore demonstrate that teamwork and cooperation amongst the various government agencies and the general populace is the most likely road to a brighter future for all.

This sub-project will educate the communities most affected by the deterioration of ecosystem goods and services on the interactions of ecosystems processes. The interventions will allow them to experience hands-on that the appropriate management of these resources can lead not only to a healthier ecosystem but also to better agricultural yields and increased food security, cleaner and more abundant fresh water, cleaner air, more abundant and sustainable fisheries products, and more opportunities to generate wealth leading to better prosperity for the community as a whole.

Also, training farmers in good agricultural practices and best environmental practices will help to increase yields and to prevent further soil degradation, leading to progressively more agricultural productivity, greater food security and generation of increased wealth in the future.

Finally, cleaning up household and industrial sources of pollution will lead to less contamination of the watershed and coastal ecosystems, healthier and more abundant fisheries and other marine resources, more food security and generation of wealth, and cleaner air.

The sooner integrated management actions can be taken, the better, since Cuba is already very vulnerable to the effects of severe weather events that are increasing in intensity and number largely as a result of climate change.

2.5.4 Socioeconomic benefits

The overall objective of the IWECO project, upon which this sub-project is constructed, is to implement an integrated approach to water, land and ecosystems services management, supported by policy, institutional and legislative reforms, and implementation of effective appropriate technologies to accelerate contribution to global targets on access to safe and reliable water supplies and improved sanitation, and contributing to improved ecosystem functioning in the Caribbean. As indicated in the overall project description, at the strategic outcome level the project will seek to increase and expand sustainably managed landscapes and seascapes that integrate biodiversity conservation. In the project, a significant underpinning will be maintaining economic livelihoods that are closely tied to maintenance of healthy ecosystems through improved pollution control measures. In the Caribbean the fisheries and the tourism sectors are heavily reliant on the integrity of healthy terrestrial and marine ecosystems. Watershed protection and sustainable forest management for water-related ecosystem services will translate seamlessly to biodiversity conservation.

Building on this strategic approach, sub-project activities will collectively generate a number of socio-economic benefits, including:

- Valuation of national biodiversity patrimony – not only in intrinsic terms but also as a fundamental basis on which economy and future development of country depend
- Greater public awareness of the importance of protecting and conserving ecosystem goods and services
- Greater public awareness of ways to prevent negative impacts on biodiversity and ecosystems
- Ecosystem goods and services given due value and importance within the economic sector
- Greater agricultural production contributing to increased food security
- Greater agricultural production leading to more income from increased sales
- Improved fresh water supply both in terms of quality and quantity, leading to better human and ecosystem health
- Less pollution from households as people are made aware of the devastating effects and plants are constructed to treat domestic and industrial waste.
- Less pollution as industries are held accountable for polluting practices through an enforceable system of fines, community clean up initiatives, among others, and effective mechanisms are introduced for cleaning up and recycling industrial wastes.

- Cleaner and healthier environment for local communities in project intervention areas.
- Improvement in health of the populace, particularly in terms of improved nutrition and decrease in gastrointestinal disorders
- More technologically trained and able workforce
- More jobs available both within parks, as a result of increase in tourism, and from other ecosystem goods and services

Integrative benefits through the GEF multi-focal area management approach - Sustainable Forest Management, Biodiversity and International Waters: Investments in sustainable forest management will seek to principally enhance national important biological diversity within the four target areas of the Guanabo, Agabama, Arimao and San Juan watersheds. Pressures from agriculture, industry and settlement expansion have resulted in loss of critical habitat for endemic 'majasito' snakes including the Cienfuegos Blindsnake (*Typhlops satelles*), the Escambray White-necked Trope (*Tropidophis galacelidus*) and the Escambray Small-headed Trope *(Tropidophis hardyi)* along with endemic flora such as *Euleria tetramera* Urb., the critically threatened endemic plant *Tabernaemontana apoda* and the endemic palm, *Coccothrinax trinitensis* (see Annex 3.4). Land degradation and fragmentation has seen the contraction of critically of threatened as mangroves, evergreen mesophilic and mesophilic-deciduous forests, and microphyllous vegetation types, coastal scrub and xerophytic vegetation complexes along the coastal fringes. The loss of forest biodiversity and associated ecosystem services have spelt declining economic opportunity for farmers and communities that utilize timber and non-timber produce to sustain livelihoods. Notable impacts are being observed in adjacent coastal areas, most notably within Rincón de Guanabo, Ensenada de Rancho Luna, Península Ancón and Santiago de Cuba Bay.

The project will contribute to the direct reforestation and enhancement of reserve areas for restoration of habitat quality, and serve as an ecological buffer to minimize pollution influxes into the coastal environment. Upland areas to be rehabilitated include Rincón de Guanabo, Barajagua in the Arimao watershed, Península Ancón in the Agabama watersheds and the Canasí in the San Juan watershed. The strategy will involve the planting of indigenous species that are native to the areas so as to maintain the ecological integrity. Special areas that are heavily polluted, notably Barajagua in the Arimao watershed and the San Juan watershed will be treated in-situ using phytoremediation approaches where vegetation with capacities for immobilizing pollutants will be established. The project will establish forest farms (woodlots) comprising of West Indian walnut (*Junglas jamaisensis), Juniperus lucayanas,* Cuban Magnolia (*Magnolia cubensis*), *Pouteria dominguensis, Prudus occidentalis* and Spanish-cedar (*Cedrela odorata)* among others that are of local commercial importance in the production of craft, ornamental use, soil conservation, timber, food, medicinal and carbon sequestration. Through on-site land and forest cover investments within 1,690 hectares over the target watershed areas, it is expected that an estimated 134,737.8 equivalent tonnes of CO_2 over the life of the project, or an average of 26,947.6 tCO_2eqv/year will be sequestered (see Annex 3.5).

2.5.5 Gender dimensions

The existing legislative framework and the enforcement of laws and regulations guaranteeing gender equality and women's rights have made Cuba among the highest-ranking nations in the advancement of women. It is reported that although Cuba consistently ranks high in international surveys on women, they (women) make up only 38.1 percent of Cuba's work force. Less than 40 percent of working-age women are employed, and

Cuban women earn on average less than half what men make, mostly because men have access to higher-paying jobs[6].

In the case of Cuba therefore, with respect to gender, the issue is not one related to the absence or inadequacy of laws but of the need for increased employment opportunities for women. One of the stated outcomes of the project is *a measureable increase in the number of people earning a livelihood from sustainable ecosystem services, including eco-tourism and food production.* As women are most affected in their role as head of single-parent households in particular, benefits in the areas of improved sanitation and environmental health will be reflected in an improved quality of life for women, youth and disadvantaged groups.

The project will seek to carefully consider the gender equity dimension over the course of implementation. The state of biodiversity degradation caused by land use changes, poor agricultural and land use practices, along with poor and/or indiscriminate waste discharges influences the mid to long-range sustainable access to resources for agriculture and fisheries development, and development and sustainability of productive sectors such as tourism. These influences have very direct economic value-chain impacts where the flow of benefits are compromised which in turn affects household income security, maintenance of health and stability in the home and the community at large. The gender roles in counterbalancing these impacts will need to be evaluated so as to determine relative influence and how the project can support means to address gender-based deficiencies and understand strengths in adapting.

Emphasis will be placed on advancing gender mainstreaming within policy and capacity building elements of the project; at the national level and across the regional components of the project mainly within Component 3 related to policy. The project will undertake a gender audit within the project site so as to understand gender-based deficiencies with respect to livelihoods and to ensure that there is equity with respect to the capacity building and training activities within the workforce.

2.6 Budget

The total cost of the Cuba sub-project is **5,300,825 USD**. The GEF Grant is **2,169,685 USD**. The co-financing is **3,131,140 USD**, provided through IAEA and CITMA (through national actions), UNEP Car/RCU and UNDP.

Table 1: Sub-project 1.1 – Entire budget at activity level

National Sub-project 1.2: Cuba	GEF Funding (US$)	Co-Financing (US$)	Total component Cost (US$)
COMPONENT 1: Development and implementation of environmental management tools for biodiversity conservation, including addressing climate change impacts.	**1,070,000**	**840,287**	**1,910,287**
Component 1.1 Measurable stress reduction in land, soil and watershed quality through appropriate sustainable water, land and ecosystems management interventions that account for land degradation and climate change	1,000,000	682,936.5	1,682,936.5
Sub-component 1.1.1 Environmentally-sound land use plan for biodiversity conservation	200,000	207,737	407,737

[6] http://www.nytimes.com/2013/03/06/world/americas/06iht-letter06.html

National Sub-project 1.2: Cuba	GEF Funding (US$)	Co-Financing (US$)	Total component Cost (US$)
Activity 1.1.1.1 Develop and implement integrated environmentally sound land use planning in the following 4 watersheds in the four sub-project demonstration areas	200,000	207,737	407,737
Sub-component 1.1.2 Innovative management investments for addressing environmental problems threatening biodiversity conservation.	800,000	475,200	1,275,200
Activity 1.1.2.1 Analyse and identify solutions, including environmental clean-up, to control contamination due to non-treated household and industrial wastewater in sub-project demonstration areas.	100,000	108,000	208,000
Activity 1.1.2.2 Analyse and identify solutions, including environmental clean-up, to control soil contamination due to unsustainable industrial and agricultural practices in sub-project demonstration areas.	100,000	108,000	208,000
Activity 1.1.2.3 Restoration and rehabilitation of the ecosystems in each demonstrative area considering lessons learned from the IWCAM Project.	300,000	151,200	451,200
Activity 1.1.2.4 Reduce CO_2 emissions by means of the intensive growth of algae as a biomass source and by means of reforestation in selected areas within the sub-project intervention areas.	300,000	108,000	408,000
Component 1.2: Enhanced livelihood opportunities and socio-economic co-benefits for targeted communities from improved ecosystem services functioning.	70,000	157,350	227350
Sub-component 1.2.1 Farms practicing good agricultural practices for promotion of conservation and sustainable use of biodiversity with support from the GEF-SGP	70,000	157,350	227,350
Activity 1.2.1.1 Promote Forest Farms with programs of sustainable management of biodiversity (PGSB for the Spanish acronym) in the four sub-project demonstration areas.	20,000	21,600	41,600
Activity 1.2.1.2 Support Farmers' Cooperatives implementing sustainable management of biodiversity.	20,000	48,850	68,850
Activity 1.2.1.3 Promote farms in usufruct implementing biodiversity sustainable management (PGSB for the Spanish acronym).	20,000	48,850	68,850
Activity 1.2.1.4 Develop guidelines for good agricultural practices (GAP) based on the sub-projects lessons learned.	10,000	38,050	48,050
COMPONENT 2: Assessment and monitoring of the problems that need to be addressed through integrated watershed and coastal area management (IWCAM) in the western, central and eastern regions of Cuba	**661,000**	**1,758,393**	**2,419,393**
Sub-component 2.1.1: Baseline data for the four sub-project demonstration areas and suite of indicators	120,000	449,490	569,490
Activity 2.1.1.1 Complete baseline data and assessment of four sub-project demonstration areas.	70,000	227,990	297,990
Activity 2.1.1.2 Analyse and select indicators for measuring progress in IWCAM and biodiversity conservation.	25,000	167,250	192,250
Activity 2.1.1.3 Develop in consultation with stakeholders a Monitoring Protocol for the utilization of existing and the designing of new indicators for assessing sub-project implementation.	25,000	54,250	79,250
Sub-component 2.2.1: Comprehensive biodiversity monitoring program for the four sub-project demonstration areas (taking into account climatic variability and relevant environmental and socio-economic factors)	541,000	1,308,903	1,849,903
Activity 2.2.1.1 Update biodiversity inventories of selected ecosystems in sub-project demonstration areas.	80,000	313,650	393,650
Activity 2.2.1.2 Identify marker organisms to be monitored and the state of health indicators in the selected ecosystems.	30,000	237,250	267,250
Activity 2.2.1.3 Monitor and assess water quality in fluvial systems and coastal areas using biological, physical and chemical indicators selected under Sub-component 2.1.	250,000	390,803	640,803
Activity 2.2.1.4 Evaluate functional ecosystem response to natural and anthropogenic disturbances.	96,000	260,000	356,000
Activity 2.2.1.5 Develop models for principal at risk locations for projecting potential threats from climate change in the four sub-project demonstration areas.	85,000	107,200	192,200

National Sub-project 1.2: Cuba	GEF Funding (US$)	Co-Financing (US$)	Total component Cost (US$)
COMPONENT 3: Improvement of the institutional, legal and regulatory frameworks and capacity building for integrated watershed and coastal area management in support of biodiversity conservation in Cuba	**341,185**	**418,300**	**759,485**
Component 3.1 Strengthened policy and legislation for the effective management of water, land and ecosystems resources that account for climate change.	226,185	294,100	520,285
Sub-component 3.1.1: Strengthened legal and regulatory frameworks for integrated ecosystem, watershed and coastal area management	24,100	24,840	48,940
Activity 3.1.1.1 Identify the legal and regulatory frameworks for IWCAM.	8,100	8,640	16,740
Activity 3.1.1.2 Diagnosis of the systematization, coherence, efficiency, efficacy and legal certainty of the legal and regulatory frameworks for IWCAM.	10,000	10,800	20,800
Activity 3.1.1.3 Propose a revised theoretical basis for the improvement of the legal and regulatory frameworks for IWCAM.	6,000	5,400	11,400
Sub-component 3.1.2: Institutional framework for integrated ecosystem, watershed and coastal areas management	31,500	31,860	63,360
Activity 3.1.2.1 Analyze the distribution of capabilities, assigned functions and outstanding public responsibilities for IWCAM.	9,000	8,640	17,640
Activity 3.1.2.2 Identify the hierarchical subordination relationships and arrangements for inter- institutional coordination and cooperation.	9,000	8,640	17,640
Activity 3.1.2.3 Assess the effectiveness of the present inter- institutional framework for coordination and cooperation.	5,000	5,400	10,400
Activity 3.1.2.4 Propose a more effective framework for inter-institutional coordination and cooperation.	8,500	9,180	17,680
Sub-component 3.1.3: Procedures for the resolution of inter-institutional and inter-jurisdictional conflicts	40,000	53,200	93,200
Activity 3.1.3.1 Identify the existing procedures for resolving conflicts between different institutions and/or between different governmental and administrative jurisdictions.	15,000	16,200	31,200
Activity 3.1.3.2 Assess the effectiveness of the procedures currently provided by Law, for the resolution of inter-institutional and inter-jurisdictional conflicts.	15,000	16,200	31,200
Activity 3.1.3.3 Propose new procedures and/or the improvement of the existing ones for the resolution of inter-institutional and inter-jurisdictional conflicts.	10,000	20,800	30,800
Sub-component 3.1.4: Coordination and information sharing on sub-project status and developments among sub-project partners and stakeholders	130,585	184,200	314,785
Activity 3.1.4.1 Design and implement the sub-project's National Network (RIWEco for the Spanish acronym) from a Central Node to all Secondary Nodes.	79,000	129,600	208,600
Activity 3.1.4.2 Design and implement the Information Management System (SGI for the Spanish acronym) with specialists from the Central Node for dissemination to all Secondary Nodes and trained users.	30,000	30,000	60,000
Activity 3.1.4.3 Design and implement desktop and Web services and applications for the management of spatial information with trained specialists and users.	12,000	15,960	27,960
Activity 3.1.4.4 Assemble and diffuse distance training courses for teaching with Web online platform.	9,585	8,640	18,225
Component 3.2 Strengthened capacity of national and regional institutions and other stakeholders for water, land, and ecosystems management that accounts for climate change.	115,000	124,200	239,200
Sub-component 3.2.1: Capacity building programmes and trained personnel for project implementation, sustainability and replication	115,000	124,200	239,200
Activity 3.2.1.1 Input sub-project information and results into the Masters Degree Programmes on Integrated Coastal Area Management (ICAM).	40,000	43,200	83,200
Activity 3.2.1.2 Teach the 5th edition of the Master Programme in ICZM at a national level in order to satisfy the Sub-project's professional training needs on this topic.	10,000	10,800	20,800
Activity 3.2.1.3 Teaching the Distance online Diploma course on "Management of Biodiversity from an IWCAM Approach", at a national level with the aim of involving the main social actors in the Integrated Management of Resources in the Country.	15,000	16,200	31,200

National Sub-project 1.2: Cuba	GEF Funding (US$)	Co-Financing (US$)	Total component Cost (US$)
Activity 3.2.1.4 Teach short term courses and workshops, as well as lectures, with the aim of involving the sub-project's main social actors in the Integrated Management of Resources in each sub-project demonstration area.	25,000	27,000	52,000
Activity 3.2.1.5 Undertake a Community Environmental Education programme in the sub-project's intervention areas, with special attention paid to the identified problems in each place on the basis of the results and learned lessons.	25,000	27,000	52,000
COMPONENT 4: Information management and dissemination and sub-project replication	**97,500**	**114,160**	**211,660**
Sub-component 4.1: Knowledge networks for national and international dissemination of sub-project information and replication	97,500	114,160	211,660
Activity 4.1.1.1 Design and implement the sub-project's IWEco Cuba website.	9,000	9,720	18,720
Activity 4.1.1.2 Establish the sub-project's Network of Knowledge (RIWEco for the Spanish acronym) with the aim of creating synergies among national and international networks and sub-projects dedicated to related topics.	15,000	24,060	39,060
Activity 4.1.1.3 Publish the results of the Sub-project for decision-makers and a wider public audience.	25,000	27,000	52,000
Activity 4.1.1.4 Promote and systematically present the sub-project in national and international events in Cuba on the implementation of the integrated management approach of resources (ICZM, IWCZ and IMNR, among others) in relation to the conservation and sustainable use of biodiversity.	23,500	26,380	49,880
Activity 4.1.1.5 Develop a Biannual National Event to present, debate and interchange experiences related to the results of the sub-project in each of the four demonstration areas.	25,000	27,000	52,000
TOTAL	**2,169,685**	**3,131,140**	**5,300,825**

Co-financing

Table 2. Co-finance

Name of Co-financier	Sources of Co-financing	Type of Co-financing	*Amount*
IAEA	Multilateral agency	Grant	$605,000
CITMA	National govt. agency	In-kind	$2,281,140
UNEP Car/RCU	GEF Agency	In-kind	$210,000
UNDP	GEF Agency	In-kind	$35,000
	Total co-financing		**$3,131,140**

Consultants working for technical assistance in the sub-project description:

Table 3. Consultants working for technical assistance in the subproject description:

Activity	GEF($)	Co-financing (US$)	Project total (US$)
International consultants	0	0	0
Local consultants	406,475		406,475
	406,475		**406,475**

2.7 Sub-project Timeline

Table 4: Workplan and Timeline

M = Meeting, **R**= Report (includes other publications), **W** = Workshop, **S** = Communication Strategy, **MR** = Mid-term Report, **TR** = Terminal Report, **I** = Project website (NOTE: the timing of the outputs are indicative; these will be finalized on project inception and subject to review during project implementation)

COMPONENT 1. National Sub-project 1.2: Cuba	**Year 1**				**Year 2**				**Year 3**				**Year 4**			
	Q1	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
Component 1: Development and implementation of environmental management tools for biodiversity conservation, including addressing climate change impacts.																
Sub-component 1.1 Environmentally sound land use planning for biodiversity conservation																
Activity 1.1.1.1 Develop and implement integrated environmentally sound land use planning in the following 4 watersheds in the four sub-project demonstration areas		**R**														
Sub-component 1.1.2 Innovative management investments for addressing environmental problems threatening biodiversity conservation.																
Activity 1.2.1.1 Analyse and identify solutions, including environmental clean-up, to control contamination due to non-treated household and industrial wastewater in sub-project demonstration areas**.**	**R**															
Activity 1.2.1.2 Analyse and identify solutions, including environmental clean-up, to control soil contamination due to unsustainable industrial and agricultural practices in sub-project demonstration areas**.**	**R**															
Activity 1.2.1.3 Restoration and rehabilitation of the ecosystems in each demonstrative area considering lessons learned from the IWCAM Project**.**		**R**														
Activity 1.2.1.4 Reduce CO_2 emissions by means of the intensive growth of algae as a biomass source and by means of reforestation in selected areas within the sub-project intervention areas**.**															**R**	
Sub-component 1.2.1 Farms practicing good agricultural practices for promotion of conservation and sustainable use of biodiversity with support from the GEF-SGP																
Activity 1.2.1.1 Promote Forest Farms with programs of sustainable management of biodiversity (PGSB for the Spanish acronym) in the four sub-project demonstration areas**.**			**M/ W**	**R**		**R**		**R**		**R**			**R**			
Activity 1.2.1.2 Support Farmers' Cooperatives implementing sustainable management of biodiversity**.**				**R**		**R**		**R**		**R**		**R**		**R**		
Activity 1.2.1.3 Promote farms in usufruct implementing biodiversity sustainable management (PGSB for the Spanish acronym).				**R**		**R**		**R**		**R**		**R**		**R**		
Activity 1.2.1.4 Develop guidelines for good agricultural practices (GAP) based on the sub-projects lessons learned**.**													**R**	**R**	**R**	

COMPONENT 1. National Sub-project 1.2: Cuba	Year 1				Year 2				Year 3				Year 4			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Component 2: Assessment and monitoring of the problems that need to be addressed through integrated watershed and coastal area management (IWCAM) in the western, central and eastern regions of Cuba																
Sub-component 2.1.1: Baseline data for the four sub-project demonstration areas and suite of indicators																
Activity 2.1.1.1 Complete baseline data and assessment of four sub-project demonstration areas.		R														
Activity 2.1.1.2 Analyse and select indicators for measuring progress in IWCAM and biodiversity conservation.	R															
Activity 2.1.1.3 Develop in consultation with stakeholders a Monitoring Protocol for the utilization of existing and the designing of new indicators for assessing sub-project implementation.	W	R														
Sub-component 2.2.1: Comprehensive biodiversity monitoring program for the four sub-project demonstration areas (taking into account climatic variability and relevant environmental and socio-economic factors)																
Activity 2.2.1.1 Update biodiversity inventories of selected ecosystems in sub-project demonstration areas.					R	R	R									
Activity 2.2.1.2 Identify marker organisms to be monitored and the state of health indicators in the selected ecosystems.									W /M			R			R	
Activity 2.2.1.3 Monitor and assess water quality in fluvial systems and coastal areas using biological, physical and chemical indicators selected under Sub-component 2.1.				R	R	R	R	R	R	R	R	R	R	R	R	
Activity 2.2.1.4 Evaluate functional ecosystem response to natural and anthropogenic disturbances.								R								
Activity 2.2.1.5 Develop models for principal at risk locations for projecting potential threats from climate change in the four sub-project demonstration areas.							W /M					R				
Component 3: Improvement of the institutional, legal and regulatory frameworks and capacity building for integrated watershed and coastal area management in support of biodiversity conservation in Cuba																
Sub-component 3.1.1: Strengthened legal and regulatory frameworks for integrated ecosystem, watershed and coastal area management																
Activity 3.1.1.1 Identify the legal and regulatory frameworks for IWCAM.				R												
Activity 3.1.1.2 Diagnosis of the systematization, coherence, efficiency, efficacy and legal certainty of the legal and regulatory frameworks for IWCAM.						R										
Activity 3.1.1.3 Propose a revised theoretical basis for the improvement of the legal and regulatory frameworks for IWCAM.							W /R									

COMPONENT 1. National Sub-project 1.2: Cuba	Year 1				Year 2				Year 3				Year 4			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Sub-component 3.1.2: Institutional framework for integrated ecosystem, watershed and coastal areas management																
Activity 3.2.1.1 Analyze the distribution of capabilities, assigned functions and outstanding public responsibilities for IWCAM.																
Activity 3.2.1.2 Identify the hierarchical subordination relationships and arrangements for inter- institutional coordination and cooperation.								R								
Activity 3.2.1.3 Assess the effectiveness of the present inter- institutional framework for coordination and cooperation.										R						
Activity 3.2.1.4 Propose a more effective framework for inter-institutional coordination and cooperation.											W /R					
Sub-component 3.3: Procedures for the resolution of inter-institutional and inter-jurisdictional conflicts																
Activity 3.3.1.1 Identify the existing procedures for resolving conflicts between different institutions and/or between different governmental and administrative jurisdictions.												R				
Activity 3.3.1.2 Assess the effectiveness of the procedures currently provided by Law, for the resolution of inter-institutional and inter-jurisdictional conflicts.												M	R			
Activity 3.3.1.3 Propose new procedures and/or the improvement of the existing ones for the resolution of inter-institutional and inter-jurisdictional conflicts.														W /R		
Sub-component 3.1.4: Coordination and information sharing on sub-project status and developments among sub-project partners and stakeholders																
Activity 3.1.4.1 Design and implement the sub-project's National Network (RIWEco for the Spanish acronym) from a Central Node to all Secondary Nodes.				R												
Activity 3.1.4.2 Design and implement the Information Management System (SGI for the Spanish acronym) with specialists from the Central Node for dissemination to all Secondary Nodes and trained users.				M		R										
Activity 3.1.4.3 Design and implement desktop and Web services and applications for the management of spatial information with trained specialists and users.						I										
Activity 3.1.4.4 Assemble and diffuse distance training courses for teaching with Web online platform.																
Sub-component 3.2.1: Capacity building programmes and trained personnel for project implementation, sustainability and replication																
Sub-component 4.1: Knowledge networks for national and international dissemination of sub-project information and replication						R										
Activity 4.1.1.1 Design and implement the sub-project's IWEco Cuba website.						R										

COMPONENT 1. National Sub-project 1.2: Cuba	Year 1				Year 2				Year 3				Year 4			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Activity 4.1.1.2 Establish the sub-project's Network of Knowledge (RIWEco for the Spanish acronym) with the aim of creating synergies among national and international networks and sub-projects dedicated to related topics**.**												R				
Activity 4.1.1.3 Publish the results of the Sub-project for decision-makers and a wider public audience.				R				R				R				
Activity 4.1.1.4 Promote and systematically present the sub-project in national and international events in Cuba on the implementation of the integrated management approach of resources (ICZM, IWCZ and IMNR, among others) in relation to the conservation and sustainable use of biodiversity**.**				**R**				**R**				**R**			**R**	
Activity 4.1.1.5 Develop a Biannual National Event to present, debate and interchange experiences related to the results of the sub-project in each of the four demonstration areas**.**																
Sub-component 4.1: Knowledge networks for national and international dissemination of sub-project information and replication																
Activity 4.1.1.1 Design and implement the sub-project's IWEco Cuba website**.**		I														
Activity 4.1.1.2 Establish the sub-project's Network of Knowledge (RIWEco for the Spanish acronym) with the aim of creating synergies among national and international networks and sub-projects dedicated to related topics**.**																
Activity 4.1.1.3 Publish the results of the Sub-project for decision-makers and a wider public audience.			R	R	R	R	R	R	R	R	R	R	R	R	R	R
Activity 4.1.1.4 Promote and systematically present the sub-project in national and international events in Cuba on the implementation of the integrated management approach of resources (ICZM, IWCZ and IMNR, among others) in relation to the conservation and sustainable use of biodiversity**.**				M/ W				M/ W				M/ W				M/ W
Activity 4.1.1.5 Develop a Biannual National Event to present, debate and interchange experiences related to the results of the sub-project in each of the four demonstration areas**.**							**W /R**								**W /R**	

2.8 Risk Analysis

Risk	Rating	Risk management strategy
Unexpected weather conditions, including from extreme events such as hurricanes and droughts, could delay sub-project activities.	M	The sub-project's intervention strategy is based on an ecosystem approach. The resulting increase in ecosystem resilience (water conservation, soil stabilization, climate regulation) will go a long way towards sustainably providing stakeholders with a more solid foundation to withstand any extreme climatic events, such as droughts and flooding which may be exacerbated by climate change. Although no significant external risks derived from the consequences of climate change are foreseen to jeopardize the success of the proposed intervention, climate adaptation and vulnerability assessments will be made by the sub-project to stay abreast of any potential associated problems or limitations.
The slow process of acquisition by local governments.	M	This can be addressed by (a) developing early on in the implementation of the sub-project a purchasing plan for the acquisition of equipment and (b) timely sub-project implementation.
Poor inter-institutional coordination affecting negatively sub-project implementation.	M	Sub-project activities 3.2.1, 3.2.2, 3.2.3 and 3.2.4 will be implemented at the beginning of the sub-project with a view to improving inter-institutional coordination and cooperation in integrated watershed and coastal zone management.
Lack of availability of adequate internet services and communications	M	This could hinder dissemination of information and make it less widely used than could otherwise be expected.

2.9 Sustainability

Sub-project sustainability will be achieved through different avenues.

- First, it is expected that through sub-project implementation, national and local authorities participating in the sub-project will mainstream elements of biodiversity conservation and sustainable use into their work programmes, plans and strategies. This process will include the application of environmental management tools, supportive financial mechanisms, and ecosystem and biodiversity monitoring activities across the sub-project's four intervention areas.

- Second, **capacity-building activities** under sub-component 4.2 will help build the necessary knowledge foundation and expertise in long-term integrated watershed and coastal area management for biodiversity conservation and sustainable use. By demonstrating that the integrated management of ecosystems goods and services works in practice to conserve and protect

biodiversity and at the same time improve living standards, it is anticipated that national and local authorities, key players and stakeholders will continue to further develop, refine and apply corresponding environmental management tools, as well as strengthen their capacities in environmental monitoring, assessment and enforcement.

- Third, it is anticipated that the involvement of a wide range of stakeholders, including universities, scientific and technical institutions, local authorities and farmers organizations in successful implementation of IWCAM sub-project activities in demonstration areas will be a stimulus for other socio-economic development efforts to make the sustainable use of biodiversity and other ecosystems goods and services a fundamental cornerstone of their activities. Through this sub-project's **information dissemination and replication activities** under sub-project component 4.3, the findings, including lessons learned and the tools and methodologies developed and applied, will be disseminated to other sub-projects, programs and areas in the country for replication, will have a multiplier effect and will contribute to wider sustainability.

- Fourth, by improving the livelihoods of local communities through improved sustainable use of biodiversity and ecotourism, it is expected that the sub-project's tools and methodologies, as well as good practices in agriculture and ecosystem management, will continue to be practiced, refined and further developed. This will be particularly encouraged through technical support and necessary follow-up activities that continue to be provided by participating national and local authorities and stakeholder organizations.

- Finally, sound land use management and improved management of protected areas, as well as the rehabilitation and restoration of natural ecosystems, will result in the expansion of habitat for the island's rich biodiversity and endemic species. This, together with increased recognition of the importance of sustaining biodiversity integrity both in terms of national patrimony and for the key role it plays in providing goods and services for economic growth, will ensure a more promising future for the long-term conservation and sustainability of Cuba's biodiversity overall.

2.10 Replicability

Under sub-project component 4, capacity building will be undertaken for disseminating the lessons learned in this sub-project to other sub-projects, programs and areas, which will also contribute to the sub-project's sustainability. A public education and awareness programme will also be developed for effectively involving local communities in biodiversity conservation protection and use both in the sub-project's four intervention areas and throughout Cuba.

Sub-project components cover key issues that are faced throughout much of Cuba, as well as by several countries throughout the Wider Caribbean. Ecosystem rehabilitation and restoration sites in particular will involve monitoring and analysis that will enable replication of these activities. Policies, plans and strategies developed through the sub-project will also serve as examples for other countries to replicate. Innovations such as the development of education and public awareness materials on biodiversity conservation and sustainable use directed at national and local authorities and communities can also be replicated.

2.11 Execution Arrangements

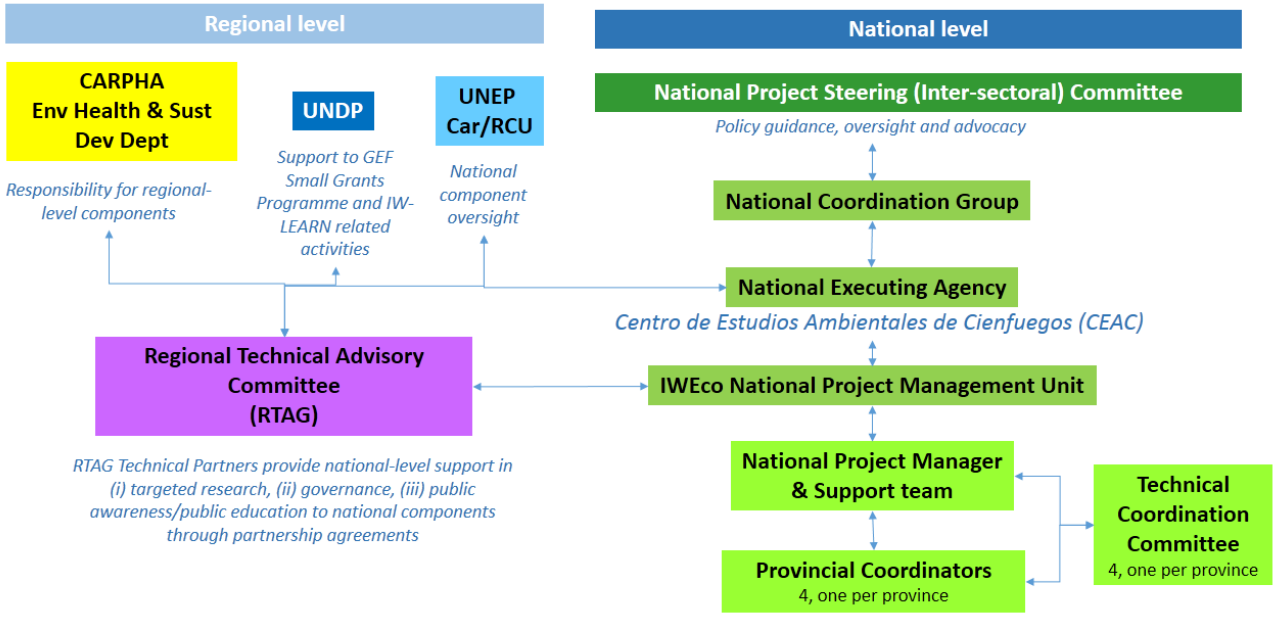
The sub-project will establish a Sub-project Steering Committee (PSC) consisting of CEAC, CITMA, MINCEX, MINAG and MININT, as executing partners, and UNEP as GEF implementing agency. The PSC may also include other major co-financing and implementing partners. CEAC, UNEP CAR-RCU and CARPHA

(Environmental Health and Sustainable Development Department - EHSD) have spearheaded the development of the sub-project and will play a leading role in guiding and monitoring the sub-project and maintaining its strategic focus. The PSC, presided by CEAC, will be responsible for managing the execution of sub-project activities, including reviewing and advising on the main outputs of the sub-project, ensuring that the Government's environmental policy is fully reflected in the FSP, ensuring effective communication and decision-making, and assisting with mobilization of expertise as needed for proper execution of FSP sub-project outputs. On an annual basis the PSC will meet with all executing partners to fulfill steering mechanism responsibilities including: oversight of sub-project implementation, monitoring of sub-project progress, strategic and policy guidance and to review and approve annual work plans and budgets.

CEAC as the sub-project National Executing Agency (NEA) will be responsible for implementing the sub-project in accordance with the components outlined in Section 2.4. UNEP, as the GEF Implementing Agency (IA), will be responsible for overall sub-project supervision to ensure consistency with GEF and UNEP policies and procedures, and will provide guidance on linkages with related UNEP and GEF funded activities. UNEP CAR-RCU will have responsibility for oversight of the national sub-project and will monitor implementation of the activities undertaken during the execution of the sub-project. UNEP CAR-RCU will also be responsible for clearance and transmission of financial and progress reports to the GEF.

CEAC, as the NEA, will cooperate with UNEP so as to allow the organization to fulfill its responsibility as IA accountable to the GEF. To this end, free access to all relevant information will be provided by CEAC. The NEA will also convene the Sub-project Steering Committee (PSC) and, in consultation with CARPHA and UNEP CAR-RCU, appoint a National Project Coordinator (NPC), also referred to as the Executive Sub-project Director. In conjunction with the NPC, CEAC in consultation with CARPHA and UNEP CAR-RCU will establish reporting guidelines for all partners and specialists (technical assistance consultants) and ensure that they submit quality reports. The NEA and NPC will collaborate to prepare biannual progress reports, quarterly financial reports and annual summary progress reports for UNEP.

The NPC with the support of the sub-project's Technical Coordinator (TC) will be responsible for coordinating, managing and monitoring the implementation of the FSP sub-project for Cuba conducted by local experts, consultants, subcontractors and implementing partners. The NPC supported by the TC will also coordinate and oversee the preparation of the FSP outputs, manage FSP finances, oversee overall resource allocation, and, where relevant, submit proposals for budget revisions to the PSC and UNEP.



Project Management Unit
Executive Project Director
Technical Coordinator
Financial and Operational Administrator
4 S-P Component Coordinators
5 technical specialists

National Coordination Group
Directed by CEAC
CITMA (IGT, CNAP, AMA, IES, ANC, IDO, INSMET)
MINAG (SEF, CNSV, IMV)
MININT (CGB, CGF)
MES (UH, UCF, UO)
NGOs (Pro-Naturaleza, Fundación Antonio Núñez Jiménez, ACTAF, ANAP)

Project Steering Committee
Chaired by CEAC
Members: CITMA, MINCEX, MINAG, MININT, MES

2.12 Communications and Dissemination Mechanisms

Public awareness and communication are an integral part of this sub-project, particularly since reaching and persuading local communities about the importance and value of the sub-project is key to its success. A communications strategy aimed at a broad range of potential beneficiaries will be developed during the sub-project's inception phase to aid in:

(i) informing stakeholders about the importance of the region's ecosystems and the services they provide,
(ii) promoting the use of biodiversity conservation and sustainable use tools and methodologies,
(iii) disseminating information on sub-project activities related to good practices in agriculture and natural resource management,
(iv) strengthening and expanding the conservation of biodiversity in the four sub-project intervention areas, and
(v) raising awareness of the potential socioeconomic benefits for the region's inhabitants.

Ecosystem rehabilitation and restoration sites, as well as selected model farms, will be used to demonstrate and raise awareness of options and opportunities for improving the productivity of ecosystems and agro-ecosystems and for strengthening the conservation of the region's biodiversity and the management of its protected areas. This will include the development of public awareness information and education materials directed at local stakeholders that can be used to help in biodiversity conservation, better management of

natural resources, increased productivity of agro-ecosystems and rehabilitation and restoration of degraded ecosystems.

Tools for achieving increased awareness and communications will include:

- Regular communication and meetings with partner agencies and stakeholders involved in the implementation of sub-project components;
- Reporting to key government agencies and bodies;
- Public availability of sub-project deliverables including maps, briefings, and training manuals, among others;
- Community meetings and school presentations, particularly for updates on pilot demonstrations and presentations on deliverables, once completed;
- As part of Component 4, a communications strategy, including dissemination of knowledge management developed and implemented with the added intent of highlighting the achievements of successful sub-project activities.

2.13 Monitoring and Evaluation (M&E)

The project will be monitored through the following M&E activities:

A Project Inception Workshop will be held within the first 3 months of project start with those with assigned roles in the project organization structure, representatives of the Executing Agencies (UNEP and CARPHA) and, where appropriate/feasible, regional technical policy and program 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.

The Inception Workshop will address a number of key issues including:

a . Assist all partners to fully understand and take ownership of the project.
b. Detail the roles, support services and complementary responsibilities of UNEP CAR and RCU staff vis à vis the project team.
c. Discuss the roles, functions, and responsibilities within the project's decision-making structures, including reporting and communication lines, and conflict resolution mechanisms.
d. The Terms of Reference for project staff will be discussed again as needed.
e. Based on the project results framework and the relevant GEF Tracking Tool if appropriate, finalize the first annual work plan. Review and agree on project performance indicators, targets and their means of verification, and recheck assumptions and risks.
f. 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.
g. Discuss financial reporting procedures and obligations, and arrangements for annual audit.
h. Plan and schedule Project Steering Committee meetings. Roles and responsibilities of all project organization structures should be clarified and meetings planned. The first Project Steering Committee meeting should be held within the first 12 months following the inception workshop.

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 and Annual project progress reports as will be outlined in the project agreement. The reports will include, but are not limited to: (a) Progress made toward project objective and project outcomes - each with indicators, baseline data and end-of-project targets (cumulative); (b) Project outputs delivered per project outcome (annual); (c) Lessons learned/good practices; (d) AWP and other expenditure reports; (e) Risk and adaptive management; (f) 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: the UNEP 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 PSC may also join these visits. A Field Visit Report will be prepared by UNEP/CAR RCU and will be circulated no less than one month after the visit to the project team and PSC members.

Mid-term of project cycle: The project will undergo an independent Mid-Term Evaluation at the mid-point of project implementation. 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 UNEP based on guidance from the Regional Coordinating Unit and the GEF. The relevant GEF Focal Area Tracking Tools will also be completed during the mid-term evaluation cycle.

End of Project: An independent Final Evaluation will take place three months prior to the final Project Board meeting and will be undertaken in accordance with UNEP 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 UNEP based on guidance from the Regional Coordinating Unit and the GEF.

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: Results from the project will be disseminated within and beyond the project intervention zone through existing information sharing networks and forums. 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. Finally, there will be a two-way flow of information between this project and other projects of a similar focus.

Table 7: Monitoring and Evaluation Matrix for Sub-project 1.2

Sub-Project 1.2: *Conservation and sustainability of biodiversity in Cuba from the integrated watershed and coastal area management approach*				
Project Outputs	**Description of indicator**	**Baseline level**	**Mid-term targets**	**End-of-project targets**
Component 1: Development and implementation of environmental management tools for biodiversity conservation, including addressing climate change impacts.				
Sub-component 1.1.1 Environmentally-sound land use plan for biodiversity conservation	• Environmentally sound land use management plans.	• Development activities are being implemented in the selected watersheds in an ad hoc, disjointed manner resulting in conflicts leading to the degradation and depletion of natural resources.	• Adoption and implementation of 4 environmentally sound land use management plans for priority watersheds, taking into account the variability of threats impacting them.	• Management Plans are the basis for guiding project implementation
Sub-component 1.1.2 Innovative management investments for addressing environmental problems threatening biodiversity conservation.	• Area planted /restored (hectares; including number and types of trees) • Estimated biomass accumulation (Kg C/ha/year) • Biodiversity intactness index • Indicator species counts • Ambient water quality pollutant loads (bacterial load; TSS; COD; BOD; other relevant parameters) • Assessment on wastewater treatment options for the four sub-project demonstration areas. • No of Investments in wastewater treatment solutions • Volume of wastewater treated (m^3/day). • Assessments of soil treatment options for treating soil contamination from industrial and agricultural activities in the sub-project demonstration areas. • Number of investments in soil treatment options • Level of soil contamination (nutrient traces mg/kg) • Estimated soil loss	• The treatment of wastewater in the sub-project intervention areas is inadequate, contributing to the further degradation of the respective watersheds. • The treatment of contaminated soil in the sub-project intervention areas is inadequate, contributing to the further degradation of the respective watersheds • While the loss of forest cover is being reduced throughout Cuba, degraded lands and ecosystems continues to be a serious problem • Algal carbon sequestration is yet to be employed in Cuba. The sub-project will serve as a pilot for validating its usefulness as a carbon sink	• At least 500 hectares of degraded ecosystems planted / restored • Assessment of options and at least 1 investment in wastewater • At least 20% reduction in water pollutant loads at investment locations. • Assessment of treatment options and at least 1 investment in soil amelioration • At least 10% reduction in level of soil contamination • At least 10% decrease in estimated soil loss • At least 20 % reduction in visible signs of surface erosion • At least 10% improvement in soil fertility (nutrient concentrations) • Feasibility assessment and establishment of one experimental test site (laboratory) and one pilot algal sequestration investment	• Total of 1,690 hectares of degraded ecosystems restored and rehabilitated • Positive change in biodiversity intactness index • Positive change on key indicator species counts • Commissioned water treatment solutions in at least 2 of four sub-project demonstration areas. • At least 50% reduction in water pollutant loads at investment locations • Successful investments in at least 2 of the 4 sites and demonstrable change in soil contamination • Results from experimental algal sequestration test sites to guide future investments

Sub-Project 1.2: ***Conservation and sustainability of biodiversity in Cuba from the integrated watershed and coastal area management approach***				
Project Outputs	**Description of indicator**	**Baseline level**	**Mid-term targets**	**End-of-project targets**
	(t/ha/yr) • Visible signs of surface erosion – rill and gully erosion (% reduction in visible evidence) • Soil fertility (nutrient concentrations; N, P, K) • Experimental test results on potential use of algae growth as a carbon sink.			
Sub-component 1.2.1 Farms practicing good agricultural practices for promotion of conservation and sustainable use of biodiversity with support from the GEF-SGP	• Number of forest farms practicing sustainable biodiversity management. • Number of field visits by stakeholder/activities to encourage uptake. • Established collaboration with farmers' cooperatives for promoting sustainable management of biodiversity. • number of farms in usufruct receiving support for practicing PGSP • Number of farms adopting GAPs • Acreage under GAPs	• Pilot project has been designed by the Government of Cuba for use in this sub-project. • While the Cuba's Ministry of Agriculture has prepared a policy on GAP, it is still practiced only by a small minority of farmers and needs to be extended	• Establishment of at least 3 forest farms to demonstrate sustainable practices; • At least 6 field visits / promotional activities by stakeholders • Collaboration established with at least 1 farmers' cooperative on a pilot basis with a view to further expansion. • At least 10 farms in usufruct receiving support for practicing PGSB. • At least 4 farms with a combined surface area of approximately 40 hectares where GAPs are being applied	• Establishment of at least 8 forest farms; process for expanding pilots to other farm holdings • Total of at least 6 field visits / promotional activities by stakeholders • Recommendations advanced for expanding the initiative with other farm holdings • Collaboration established with a total of at least 2 farmers' cooperative • Total of 20 farms in usufruct receiving support for practicing PGSB • Total of 8 farms with a combined surface area of 81.9 hectares utilizing GAPs
Component 2: Assessment and monitoring of the problems which need to be addressed through integrated watershed and coastal area management (IWCAM) in the western, central and eastern regions of Cuba				
Sub-component 2.1.1: Baseline data for the four sub-project demonstration areas and suite of indicators	• Data base of parameters required for assessment. • Consensus by government agencies and stakeholders on the indicators selected • Environmental assessment • Scientifically and technically sound protocol for monitoring activities in sub-project intervention areas	• Structured baseline information is unavailable and is inadequate for assessing progress in sub-project implementation in the four demonstration areas. • Inadequate strategies and programmes are in place for environmental monitoring in the sub-project's intervention areas. • No monitoring protocol is currently in use	• Completed assessment of current environmental state of target basins and coastal areas • Finalized suite of monitoring indicators selected • Monitoring protocol for the 4 sub-project demonstration areas established • Reliable data generated	• Augmented baseline data for post project monitoring • Reliable data generated • Indicators successfully monitored and reported on over project duration • Protocol adequately guides activities
Sub-component 2.2.1: Comprehensive biodiversity monitoring program for the four sub-project demonstration areas (taking into account climatic variability and relevant	• Biodiversity database populated with at list 30% of its required data • Mechanism for updating information on the current status of biodiversity in sub-project	• Biodiversity inventories are incomplete, thus hindering the development of adequate plans and strategies for their conservation. • Ecosystem heath marker	• Completed biodiversity database – at least 50% populated • Suite of indicator/marker species validated for monitoring and under use in initial assessments	• Biodiversity data base at least 90% populated and is foundation for reviewing and revising biodiversity conservation and sustainable use plans and strategies.

Sub-Project 1.2: ***Conservation and sustainability of biodiversity in Cuba from the integrated watershed and coastal area management approach***				
Project Outputs	**Description of indicator**	**Baseline level**	**Mid-term targets**	**End-of-project targets**
environmental and socio-economic factors)	intervention areas. • Identified group of marker species for effectively monitoring ecosystem health. • Monitoring programme for water quality and fluvial systems in place • Assessments of ecosystem response to natural and anthropogenic disturbances • Maps and spatial products/models identifying at risk locations and potential threats from climate change	organisms have not been identified • Monitoring of water quality and fluvial systems is generally weak or non-existent in sub-project intervention areas; difficult to make baseline assessments; lack or poor level of knowledge required for supporting decision making • The lack of such an assessment ecosystem health to disasters hinders the development and implementation of appropriate corrective responses • Current knowledge is incomplete, hindering decision making and the implementation of appropriate responses.	• Water quality monitoring programme encompassing the 4 watersheds and data generated • At least 20 research protocols and topics established and research papers generated • Initial suite of maps and spatial products related to climate change vulnerability generated	• Project successfully using indicator species in assessment reports • Scientifically and technically reliable information available and used in monitoring freshwater resources in the four sub-project demonstration areas • A reliable knowledge base for developing and implementing appropriate corrective responses • Complete suite of geographic mapping and simulation of principal at risk locations from climate change
Component 3: Improvement of the institutional, legal and regulatory frameworks and capacity building for integrated watershed and coastal area management in support of biodiversity conservation in Cuba				
Sub-component 3.1.1: Strengthened legal and regulatory frameworks for integrated ecosystem, watershed and coastal area management	• Legal and regulatory review study competed • Number of consultations leading to corrective gender-sensitive policy revisions for improving the legal and regulatory frameworks for IWCAM. • Adopted new regulations	• Current legislation is insufficient for improving the implementation of integrated watershed and coastal area management.	• At least 2 Consultations undertaken and draft policy design in progress • Draft new gender-sensitive regulations and/or amendments	• Total of at least 4 consultations • Adopted new and/or revised regulations
Sub-component 3.1.2: Institutional framework for integrated ecosystem, watershed and coastal areas management	• Institutional framework analysis and recommendations study completed and adopted • Number of consultations (agency and community) • Adopted Inter-agency agreements	• Institutional collaborative arrangements are weak • Challenges in information flow, inter-agency coordination and effective delegation of responsibilities amongst agencies	• Institutional capacity review and capability assessment • At least 2 joint agency-stakeholder consultations • Draft recommendations toward improved institutional coordination and cooperation	• At least a total of 3 agency-stakeholder consultations to gain consensus • Institutional review adopted at policy level • Agency reconfiguration process commenced • Inter-agency agreements formulated and signed
Sub-component 3.1.3: Procedures for the resolution of inter-institutional and inter-jurisdictional conflicts	• Number and scope of new procedural instruments prepared • Number of consultative dialogues.	• Inter-institutional and inter-jurisdictional conflicts remain unresolved due to a lack of a definition of effective procedures.	• At least 4 consultations held; • Proposed institutional arrangements under review toward preparation of new/strengthened procedures	• Suite of improved procedures for resolving inter-institutional and inter-jurisdictional conflicts are proposed.

Sub-Project 1.2: ***Conservation and sustainability of biodiversity in Cuba from the integrated watershed and coastal area management approach***				
Project Outputs	**Description of indicator**	**Baseline level**	**Mid-term targets**	**End-of-project targets**
Sub-component 3.1.4: Coordination and information sharing on sub-project status and developments among sub-project partners and stakeholders	• Web-based information exchange platform installed • GIS platform installed and geographic information generated • Number of active users of information system • Number of persons trained on use and access of the Web online platform	• Current facilities limit the access of partners to critical information and hinder the taking of timely decisions. • Limited capacity for rapid information exchange	• RIWEco established and operational • Enhanced GIS capacity installed to support project knowledge sharing • At least 100 trained and actively using the knowledge management platform • Suite of spatial information products generated for the four sub-project demonstration areas	• RIWEco is effective web portal in provision of knowledge to stakeholders • Total of 200 trained sub-project personnel and actively using the system • Suite of spatial information products generated for the four sub-project demonstration areas
Sub-component 3.2.1: Capacity building programmes and trained personnel for project implementation, sustainability and replication	• Number of trained professionals in ICZM and ecosystems management at Masters level (Universities of Havana, Oriente and Cienfuegos) • Number of trained biodiversity and IWCAM professionals through the distance on-line Diploma Course on Management of Biodiversity (from an IWCAM approach) • Number of trained sub-project partners and stakeholders in (disaggregated by gender and socio-economic status)	• More trained professionals in ICZM are needed to implement and sustain sub-project activities and to replicate the sub-project's lessons learned. • More trained professionals in biodiversity conservation and management and IWCAM are needed to implement and sustain sub-project activities and to replicate the sub-project's lessons learned. • More trained partners and stakeholders are needed to implement and sustain sub-project activities and to replicate the sub-project's lessons learned • Little awareness of efforts to promote and undertake integrated watershed and coastal area management	• At least 20 trained professionals with Masters degrees in ICZM through 3 • At least 30 trained professionals in ICZM on the 5th edition of the Masters Degree Programme in ICZM • At least 10 trained professionals based on the Distance online Diploma course on "Management of Biodiversity from an IWCAM Approach • Increase by at least 20% the number of trained partners and stakeholders (over baseline) • Number of people familiar with the work of the project increased by 20% over start of the project (baseline) (disaggregated by gender and socio-economic status)	• Total of at least 100 trained professionals with Masters degrees in ICZM. • Total of at least 18 trained professionals in IWCAM-based biodiversity management approaches. • Number of people familiar with the work of the project increased by 50% over start of the project (baseline) • Increase by at least 50% the number of trained partners and stakeholders (over baseline)
Component 4: Information management and dissemination and sub-project replication				
Sub-component 4.1.1: Knowledge networks for national and international dissemination of sub-project information and replication	• IWECO national website supported by the Network of Knowledge (RIWEco) (as a vehicle for dissemination of sub-project information within and outside Cuba) • Publications, including books, booklets,	• Little awareness of efforts to promote and undertake integrated ecosystems, watershed and coastal area management in Cuba. • Due to poor internet communication, opportunities to share	• Establishment of IWEco Cuba website within six months of sub-project inception. • Range of publications that are widely disseminated and easily accessible to stakeholders • Participation of project	• Cuba IWEco Project website is core online repository and linked to main project website • Suite of publications easily accessible to population • Participation at a total 4 major national

Sub-Project 1.2: ***Conservation and sustainability of biodiversity in Cuba from the integrated watershed and coastal area management approach***				
Project Outputs	**Description of indicator**	**Baseline level**	**Mid-term targets**	**End-of-project targets**
	guidelines of good practices, bulletins, posters and agenda. • Number of recipient institutions for awareness resources • Number of presentations at national and international conferences • Number of project stakeholders participating at conferences • Sub-project biannual reports of consultations on sub-project implementation • Number of stakeholder consultations	and build upon experiences of other related networks and projects has been very limited	stakeholders at 2 major national conferences. • Participation of project stakeholders at 2 international conferences. • 1 major project stakeholder consultation at the end of the first year of project implementation.	conferences. • Participation at a total of at least 4 international conferences • 1 major national stakeholder consultation at end of third year

3 SUB-PROJECT ANNEXES

Annex 3.1 Logical Framework and Objectively Verifiable Impact Indicators

Objective: To conserve, protect and ensure the sustainable use of Cuba's biological diversity to support the country's future economic development, for the benefit of current and future generations, and to protect and rehabilitate four already fragile and vulnerable insular hydrographic and coastal ecosystems from further damaging anthropogenic activities and the effects of global warming.					
National Component Outcome:	**Indicator**	**Baseline**	**Targets**	**Sources of verification**	**Risks and Assumptions**
Component 1: Development and implementation of environmental management solutions for biodiversity conservation, including addressing climate change impacts.					
Outcome 1.1: Measurable **stress reduction at project sites** through appropriate sustainable water, land and ecosystems management interventions that account for climate change	• Investments successfully demonstrate stress reduction and replication is taking place based on lessons learnt. • Replication and up-scaling of methods and approaches is initiated in other parts of the country and across other SIDS	• General ecosystems and environmental degradation within target watersheds due to land and water resource degradation with pressures on sensitive ecosystems and species. • Development activities are being implemented in the selected watersheds in an ad hoc, disjointed manner resulting in conflicts leading to the degradation and depletion of natural resources. • Some level of intervention but not as sustained as needed to effect sustainable change; financial resources are a challenge.	• Coordinated implementation through adoption of environmentally sound land use management plans for the target watersheds, taking into account the variability of threats impacting them. • Enhanced ecosystems functioning due to stress reductions through investments in restoration of at least 1,690 hectares of forests, installation of wastewater discharge control measures and soil pollution reduction measures	• Watershed land use management plans • Project progress reports • Collaborating agency progress reports • Media reports • Scientific reports (monitor impacts of investments) on biodiversity status • Reports of replication and up-scaling across Cuba and translation to other Caribbean countries and at the global level .	Risks: Vulnerability of sub-project interventions to hurricanes and other extreme weather events; limited financial resources from the Government. Assumptions: Strong commitment from government agencies involved in sub-project implementation.
Sub-component 1.1.1 Environmentally-sound land use plan for biodiversity conservation	Environmentally sound land use management plans.	Development activities are being implemented in the selected watersheds in an ad hoc, disjointed manner resulting in conflicts leading to the degradation and depletion of natural resources.	**Mid-term** • Adoption and implementation of 4 environmentally sound land use management plans for priority watersheds, taking into account the variability of threats impacting them.	• Collaborating agency reports • Project reports .	**Risks**: Reluctance of stakeholders and local communities to buy into sub-project objectives and goals **Assumptions**: Strong government commitment to engage local communities and

Objective: To conserve, protect and ensure the sustainable use of Cuba's biological diversity to support the country's future economic development, for the benefit of current and future generations, and to protect and rehabilitate four already fragile and vulnerable insular hydrographic and coastal ecosystems from further damaging anthropogenic activities and the effects of global warming.					
National Component Outcome:	**Indicator**	**Baseline**	**Targets**	**Sources of verification**	**Risks and Assumptions**
			End of Project • Management Plans are the basis for guiding project implementation		farmers in sub-project implementation; environmental and economic benefits of applying GAP and BEP will attract wider involvement of local communities and farmers.
Sub-component 1.1.2 Innovative management investments for addressing environmental problems threatening biodiversity conservation.	• Area planted /restored (hectares; including number and types of trees) • Estimated biomass accumulation (Kg C/ha/year) • Biodiversity intactness index • Indicator species counts • Ambient water quality pollutant loads (bacterial load; TSS; COD; BOD; other relevant parameters) • Assessment on wastewater treatment options for the four sub-project demonstration areas. • No of Investments in wastewater treatment solutions • Volume of wastewater treated (m^3/day). • Assessments of soil treatment options for treating soil contamination from	• The treatment of wastewater in the sub-project intervention areas is inadequate, contributing to the further degradation of the respective watersheds. • The treatment of contaminated soil in the sub-project intervention areas is inadequate, contributing to the further degradation of the respective watersheds • While the loss of forest cover is being reduced throughout Cuba, degraded lands and ecosystems continues to be a serious problem • Algal carbon sequestration is yet to be employed in Cuba. The sub-project will serve as a pilot for validating its usefulness as a carbon sink	**Mid-term** • At least 500 hectares of degraded ecosystems planted / restored • Assessment of options and at least 1 investment in wastewater • At least 20% reduction in water pollutant loads at investment locations. • Assessment of treatment options and at least 1 investment in soil amelioration • At least 10% reduction in level of soil contamination • At least 10% decrease in estimated soil loss • At least 20 % reduction in visible signs of surface erosion • At least 10% improvement in soil fertility (nutrient concentrations) • Feasibility assessment and establishment of one experimental test site (laboratory) and one pilot algal sequestration	• Project progress reports (4) for each of the four sub-project demonstration areas. • Monitoring data compilations and analytical reports • Scientific publications • Media reports •	**Risks**: • Limited availability of government funding to support investments post-project. • Extreme weather events such as hurricanes and droughts **Assumptions**: • Strong commitment of government to implementing environmental policies for the conservation and sustainable use of biodiversity and for mitigating the impacts due to climate change; • support of local communities and stakeholders, including farmers and industry

Objective: To conserve, protect and ensure the sustainable use of Cuba's biological diversity to support the country's future economic development, for the benefit of current and future generations, and to protect and rehabilitate four already fragile and vulnerable insular hydrographic and coastal ecosystems from further damaging anthropogenic activities and the effects of global warming.					
National Component Outcome:	**Indicator**	**Baseline**	**Targets**	**Sources of verification**	**Risks and Assumptions**
	industrial and agricultural activities in the sub-project demonstration areas. • Number of investments in soil treatment options • Level of soil contamination (nutrient traces mg/kg) • Estimated soil loss (t/ha/yr) • Visible signs of surface erosion – rill and gully erosion (% reduction in visible evidence) • Soil fertility (nutrient concentrations; N, P, K) • Experimental test results on potential use of algae growth as a carbon sink.		investment. **End of Project** • Total of 1,690 hectares of degraded ecosystems restored and rehabilitated • Positive change in biodiversity intactness index • Positive change on key indicator species counts • Commissioned water treatment solutions in at least 2 of four sub-project demonstration areas. • At least 50% reduction in water pollutant loads at investment locations • Successful investments in at least 2 of the 4 sites and demonstrable change in soil contamination • Results from experimental algal sequestration test sites to guide future investments		
Outcome 1.2: Enhanced **livelihood opportunities and socio-economic co-benefits** for targeted communities from improved ecosystem services functioning**.**	• Expanded uptake by farmers of more sustainable agricultural practices with enhanced economic benefit • Replication is triggered in other parts of the country • Clear evidence of gender-equity achievement in enterprise support	While Cuba through its Ministry of Agriculture has adopted a policy on GAP, it is still practiced by a small minority of farmers and needs to be extended.	• Livelihood opportunities are enhanced through adoption of good agricultural practices • Other farm holdings commerce process of uptake of lessons and practices • Tools and methods become part of mainstreamed agency extension outreach/practice with stakeholders	• Project report on GAP guidelines, their application and socio-economic benefits produced. • Scientific studies confirming positive impacts of GAPs on the environment • Farmers incomes and expansion of activity • Number of new economic activities generated	Risks: Reluctance of farmers to buy into sub-project objectives and goals. Assumptions: Strong government commitment to engage local communities and farmers in sub-project implementation; environmental and economic benefits of applying GAP and BEP will attract wider involvement of local

Objective: To conserve, protect and ensure the sustainable use of Cuba's biological diversity to support the country's future economic development, for the benefit of current and future generations, and to protect and rehabilitate four already fragile and vulnerable insular hydrographic and coastal ecosystems from further damaging anthropogenic activities and the effects of global warming.					
National Component Outcome:	**Indicator**	**Baseline**	**Targets**	**Sources of verification**	**Risks and Assumptions**
					communities and farmers.
Sub-component 1.2.1 Farms practicing good agricultural practices for promotion of conservation and sustainable use of biodiversity with support from the GEF-SGP	• Number of forest farms practicing sustainable biodiversity management. • Number of field visits by stakeholder/activities to encourage uptake. • Established collaboration with farmers' cooperatives for promoting sustainable management of biodiversity. • number of farms in usufruct receiving support for practicing PGSP (disaggregated by gender and socio-economic status) • Number of farms adopting GAPs • Acreage under GAPs •	• Pilot project has been designed by the Government of Cuba for use in this sub-project. While the Cuba's Ministry of Agriculture has prepared a policy on GAP, it is still practiced only by a small minority of farmers and needs to be extended	**Mid-term** • Establishment of at least 3 forest farms to demonstrate sustainable practices; • At least 6 field visits / promotional activities by stakeholders • Collaboration established with at least 1 farmers' cooperative on a pilot basis with a view to further expansion. • At least 10 farms in usufruct receiving support for practicing PGSB. • At least 4 farms with a combined surface area of approximately 40 hectares where GAPs are being applied; **End of Project** • Total of at least 6 field visits / promotional activities by stakeholders • Recommendations advanced for expanding the initiative with other farm holdings • Collaboration established with a total of at least 2 farmers' cooperative • Total of 20 farms in usufruct receiving support for practicing PGSB	• Sub-project report • Collaborating agency reports • Media reports • Consultation meeting reports • Revenue generation reporting • Scientific reports	Risks: Extreme weather events such as hurricanes and droughts; poor buy-in by farmers in sub-project intervention areas. Assumptions: Commitment of government to implementing environmental policies for the conservation and sustainable use of biodiversity and for mitigating the impacts due to climate change; generation of environmental and economic benefits for farmers.

Objective: To conserve, protect and ensure the sustainable use of Cuba's biological diversity to support the country's future economic development, for the benefit of current and future generations, and to protect and rehabilitate four already fragile and vulnerable insular hydrographic and coastal ecosystems from further damaging anthropogenic activities and the effects of global warming.					
National Component Outcome:	**Indicator**	**Baseline**	**Targets**	**Sources of verification**	**Risks and Assumptions**
			• Total of 8 farms with a combined surface area of 81.9 hectares utilizing GAPs		
Component 2: Assessment and monitoring of the problems which need to be addressed through integrated watershed and coastal area management (IWCAM) in the western, central and eastern regions of Cuba					
Outcome 2.1: Strengthened **national and regional systems for monitoring** of environmental status with respect to key international agreements**.**	• Heightened awareness amongst policy makers and national stakeholders of the value of monitoring systems for informed decision making • Improved understanding of the impacts of project investments on change of environmental status through monitoring and tracking the relevant indicators • Decision makers and technical personnel are using the data and information generated to strengthen the evidence base and apply it in future decision making	• Structured baseline information is unavailable and is inadequate for assessing progress in sub-project implementation in the four demonstration areas. • Relatively low level of awareness and understanding. These issues are not generally in the mainstream and solutions are not typically integrated in mainstream development planning. • Inadequate strategies and programmes are in place for environmental monitoring in the sub-project's intervention areas	• Technical analyses from effective monitoring systems to inform effectiveness of project investments • Agreement on indicators for assessing progress in the implementation of integrated watershed and coastal area management and biodiversity conservation • Built capacity to undertake reliable monitoring • Expanded knowledge of the state of environment within the target watersheds	• Project reports • Scientific research publications • Suite of data outputs • Adopted indicators for assessment of project effectiveness	Risks: None foreseen. Assumptions: Strong commitment by government agencies, universities and research institutes.
Sub-component 2.1.1: Baseline data for the four sub-project demonstration areas and suite of indicators	• Data base of parameters required for assessment. • Consensus by government agencies and stakeholders on the indicators selected • Environmental assessment Scientifically and technically sound protocol for monitoring activities in sub-project intervention areas	• Structured baseline information is unavailable and is inadequate for assessing progress in sub-project implementation in the four demonstration areas. • Inadequate strategies and programmes are in place for environmental monitoring in the sub-project's intervention areas. No monitoring protocol is	**Mid-term** • Completed assessment of current environmental state of target basins and coastal areas • Finalized suite of monitoring indicators selected • Monitoring protocol for the 4 sub-project demonstration areas established	Diagnostic analysis of baseline data evaluating the present environmental state of basins and coastal areas in the selected sub-project demonstration areas	Risks: None foreseen. Assumptions: Strong commitment by government agencies, universities and research institutes.

Objective: To conserve, protect and ensure the sustainable use of Cuba's biological diversity to support the country's future economic development, for the benefit of current and future generations, and to protect and rehabilitate four already fragile and vulnerable insular hydrographic and coastal ecosystems from further damaging anthropogenic activities and the effects of global warming.					
National Component Outcome:	**Indicator**	**Baseline**	**Targets**	**Sources of verification**	**Risks and Assumptions**
		currently in use	• Reliable data generated **End of Project** • Augmented baseline data for post project monitoring • Reliable data generated • Indicators successfully monitored and reported on over project duration • Protocol adequately guides activities		
Sub-component 2.2.1: Comprehensive biodiversity monitoring program for the four sub-project demonstration areas (taking into account climatic variability and relevant environmental and socio-economic factors)	• Biodiversity database populated with at list 30% of its required data • Mechanism for updating information on the current status of biodiversity in sub-project intervention areas. • Identified group of marker species for effectively monitoring ecosystem health. • Monitoring programme for water quality and fluvial systems in place • Assessments of ecosystem response to natural and anthropogenic disturbances Maps and spatial products/models identifying at risk locations and potential threats from climate change	• Biodiversity inventories are incomplete, thus hindering the development of adequate plans and strategies for their conservation. • Ecosystem heath marker organisms have not been identified • Monitoring of water quality and fluvial systems is generally weak or non-existent in sub-project intervention areas; difficult to make baseline assessments; lack or poor level of knowledge required for supporting decision making • The lack of such an assessment ecosystem health to disasters hinders the development and implementation of appropriate corrective responses Current knowledge is incomplete, hindering decision making and the implementation of appropriate responses.	**Mid-term** • Completed biodiversity database – at least 50% populated • Suite of indicator/marker species validated for monitoring and under use in initial assessments • Water quality monitoring programme encompassing the 4 watersheds and data generated • At least 20 research protocols and topics established and research papers generated • Initial suite of maps and spatial products related to climate change vulnerability generated **End of Project** • Biodiversity data base at least 90% populated and is foundation for reviewing and revising biodiversity	Agreement on a Monitoring Protocol consulted with stakeholders.	Risks: None foreseen. Assumptions: Strong commitment by government agencies, universities and research institutes.

Objective: To conserve, protect and ensure the sustainable use of Cuba's biological diversity to support the country's future economic development, for the benefit of current and future generations, and to protect and rehabilitate four already fragile and vulnerable insular hydrographic and coastal ecosystems from further damaging anthropogenic activities and the effects of global warming.					
National Component Outcome:	**Indicator**	**Baseline**	**Targets**	**Sources of verification**	**Risks and Assumptions**
			conservation and sustainable use plans and strategies. • Project successfully using indicator species in assessment reports • Scientifically and technically reliable information available and used in monitoring freshwater resources in the four sub-project demonstration areas • A reliable knowledge base for developing and implementing appropriate corrective responses • Complete suite of geographic mapping and simulation of principal at risk locations from climate change		
Component 3: Improvement of the institutional, legal and regulatory frameworks and capacity building for integrated watershed and coastal area management in support of biodiversity conservation in Cuba					
Outcome 3.1: Strengthened **policy and legislation** for the effective management of water, land and ecosystems resources that account for climate change**.**	• Improved resource management based on strengthened and mainstreamed legal and regulatory instruments that enables improved enforcement and compliance. • Enhanced Inter-institutional and inter-jurisdictional arrangements to minimize conflicts	Current legislation is insufficient for improving the implementation of integrated watershed and coastal area management. Inter-institutional and inter-jurisdictional conflicts remain unsolved due to a lack of a legal definition of effective procedures	• Improved regulation through adoption of appropriate policy, legislative instruments for enhanced natural resources management • Reduced incidents of stakeholder conflicts through implementation of alternative procedures for resolution of inter-institutional and inter-jurisdictional conflicts	• Project reports. • MOUs or other collaborative inter-agency arrangements • Inter-sectoral committee meeting reports • Level of information dissemination from the information system to stakeholders	**Risks:** • A traditional sectoral approach to legislative and regulatory functions in Cuba. • A traditional judicial approach to conflict resolution hinders the implementation of Alternative Dispute Resolution (ADR) procedures • low level of perception of

Objective: To conserve, protect and ensure the sustainable use of Cuba's biological diversity to support the country's future economic development, for the benefit of current and future generations, and to protect and rehabilitate four already fragile and vulnerable insular hydrographic and coastal ecosystems from further damaging anthropogenic activities and the effects of global warming.					
National Component Outcome:	**Indicator**	**Baseline**	**Targets**	**Sources of verification**	**Risks and Assumptions**
	• Enhanced transfer of information at the institutional level to facilitate improved decision making		• Enhanced information exchange through a robust mechanism for the collection and sharing of spatial information generated for the four sub-project demonstration areas		the possibility of inter-institutional and/or inter-jurisdictional conflicts **Assumptions:** • Commitment of the Cuban Government to improve environmental legislation and regulations and inter-institutional and inter-jurisdictional cohesion through effective conflict resolution procedures
Sub-component 3.1.1: Strengthened legal and regulatory frameworks for integrated ecosystem, watershed and coastal area management	• Legal and regulatory review study completed • Number of consultations leading to corrective gender-sensitive policy revisions for improving the legal and regulatory frameworks for IWCAM. • Adopted new regulations	Current legislation is insufficient for improving the implementation of integrated watershed and coastal area management.	**Mid-term** • At least 2 Consultations undertaken and draft policy design in progress • Draft new gender-sensitive regulations and/or amendments **End of Project** • Total of at least 4 consultations • Adopted new and/or revised regulations.	3 analytical sub-project reports.	Risks: A traditional sectoral approach to legislative and regulatory functions in Cuba. Assumptions: Commitment of the Cuban Government to improve environmental legislation and regulations for the effective conservation and protection of biodiversity.
Sub-component 3.1.2: Institutional framework for integrated ecosystem, watershed and coastal areas management	• Institutional framework analysis and recommendations study completed and adopted • Number of consultations (agency and community) • Adopted Inter-agency agreements	• Institutional collaborative arrangements are weak • Challenges in information flow, inter-agency coordination and effective delegation of responsibilities amongst agencies	**Mid-term** • Institutional capacity review and capability assessment • At least 2 joint agency-stakeholder consultations • Draft recommendations toward improved institutional coordination and cooperation **End of Project**	4 analytical sub-project reports.	Risks: A traditional sectoral approach to institutional functions in Cuba. Assumptions: Commitment of the Cuban Government to improve inter-institutional, cross-sectoral coordination and cooperation for effective conservation and protection of biodiversity.

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National Component Outcome:	**Indicator**	**Baseline**	**Targets**	**Sources of verification**	**Risks and Assumptions**
			• At least a total of 3 agency-stakeholder consultations to gain consensus • Institutional review adopted at policy level • Agency reconfiguration process commenced • Inter-agency agreements formulated and signed.		
Sub-component 3.1.3: Procedures for the resolution of inter-institutional and inter-jurisdictional conflicts	• Number and scope of new procedural instruments prepared • Number of consultative dialogues .	Inter-institutional and inter-jurisdictional conflicts remain unresolved due to a lack of a definition of effective procedures.	**Mid-term** • At least 4 consultations held; • Proposed institutional arrangements under review toward preparation of new/strengthened procedures **End of Project** • Suite of improved procedures for resolving inter-institutional and inter-jurisdictional conflicts are proposed.	4 analytical sub-project reports.	Risks: A traditional sectoral approach to conflict resolution hinders the implementation of alternative dispute resolution (ADR) procedures; (ii) a low level of perception of the possibility of inter-institutional and/or inter-jurisdictional conflicts. Assumptions: Commitment of the Cuban Government to improve inter-institutional and inter-jurisdictional cohesion through effective conflict resolution procedures.
Sub-component 3.1.4: Coordination and information sharing on sub-project status and developments among sub-project partners and stakeholders	• Web-based information exchange platform installed • GIS platform installed and geographic information generated • Number of active users of information system • Number of persons trained on use and access of the Web online	• Current facilities limit the access of partners to critical information and hinder the taking of timely decisions. • Limited capacity for rapid information exchange	**Mid-term** • RIWEco established and operational • Enhanced GIS capacity installed to support project knowledge sharing • At least 100 trained and actively using the knowledge management platform • Suite of spatial information products generated for the	Operationalization of the electronic National Network (RIWEco for the Spanish acronym) for disseminating and communicating information on the status, achievements and lessons learned from sub-project implementation to sub-project partners.	Risks: Poor internet accessibility and communications. Assumptions: Very strong commitment by CEAC to improve internet access and communications.

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National Component Outcome:	**Indicator**	**Baseline**	**Targets**	**Sources of verification**	**Risks and Assumptions**
	platform		four sub-project demonstration areas **End of Project** • RIWEco is effective web portal in provision of knowledge to stakeholders • Total of 200 trained sub-project personnel and actively using the system • Suite of spatial information products generated for the four sub-project demonstration areas		
<u>Outcome 3.2</u>: Strengthened **capacity of national and regional institutions** and other stakeholders for water, land, and ecosystems management that accounts for climate change**.**	Expanded knowledge and capacities amongst stakeholders support the implementation of investments	More trained professionals in ecosystems management and ICZM are needed to implement and sustain sub-project activities and to replicate the sub-project's lessons learned.	Cadre of trained professionals in ecosystems and ICZ management	• University course offerings • Performance by candidates • Replication efforts in expanding training post-project • Project reports	<u>Risks</u>: None foreseen. <u>Assumptions</u>: Strong commitment from universities and support from government agencies.
Sub-component 3.2.1: Capacity building programmes and trained personnel for project implementation, sustainability and replication	• Number of trained professionals in ICZM and ecosystems management at Masters level (Universities of Havana, Oriente and Cienfuegos) • Number of trained biodiversity and IWCAM professionals through the distance on-line Diploma Course on Management of Biodiversity (from an	• More trained professionals in ICZM are needed to implement and sustain sub-project activities and to replicate the sub-project's lessons learned. • More trained professionals in biodiversity conservation and management and IWCAM are needed to implement and sustain sub-project activities and to replicate the sub-project's lessons learned.	**Mid-term** • At least 20 trained professionals with Masters degrees in ICZM through 3 • At least 30 trained professionals in ICZM on the 5th edition of the Masters Degree Programme in ICZM • At least 10 trained professionals based on the Distance online Diploma	3 strengthened university Masters degree programmes on Integrated Management of Coastal Areas atxc: • University of Havana, • Universidad de Oriente, • University of Cienfuegos • Cadre of trained professionals • Project reports • University attendance records	<u>Risks</u>: None foreseen. <u>Assumptions</u>: Strong commitment of participating universities in supporting sub-project capacity building activities.

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National Component Outcome:	**Indicator**	**Baseline**	**Targets**	**Sources of verification**	**Risks and Assumptions**
	IWCAM approach) • Number of trained sub-project partners and stakeholders in (disaggregated by gender and socio-economic status)	• More trained partners and stakeholders are needed to implement and sustain sub-project activities and to replicate the sub-project's lessons learned • Little awareness of efforts to promote and undertake integrated watershed and coastal area management	course on "Management of Biodiversity from an IWCAM Approach • Increase by at least 20% the number of trained partners and stakeholders (over baseline) • Number of people familiar with the work of the project increased by 20% over start of the project (baseline) (disaggregated by gender and socio-economic status) **End of Project** • Total of at least 100 trained professionals with Masters degrees in ICZM. • Total of at least 18 trained professionals in IWCAM-based biodiversity management approaches. • Number of people familiar with the work of the project increased by 50% over start of the project (baseline) • Increase by at least 50% the number of trained partners and stakeholders (over baseline).	• Training resources	
Component 4: Information management and dissemination and sub-project replication					
Outcome 4.1: Improved **engagement and information access** for practitioners and other stakeholders through	• Technologies and approaches are being adapted and replicated through effective knowledge management	Little awareness of efforts to promote and undertake integrated watershed and coastal area management in Cuba.	• National project website providing knowledge for stakeholders • Publications are disseminated at global level	• Project reports • Website usage • Uptake of the range of publications and evidence of use by stakeholders	Risks: Poor internet accessibility and communications. Assumptions: Very strong commitment by CEAC to

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National Component Outcome:	**Indicator**	**Baseline**	**Targets**	**Sources of verification**	**Risks and Assumptions**
targeted knowledge sharing networks.	methods and tools. • Acceptance, buy-in and engagement of local communities in support of project implementation. • Improved project implementation and replication of lessons post-project •		• Significant and impactful presence at national, regional and international conferences to showcase lessons learnt • Large segment of communities within target areas are aware of the project and its achievements and are actively participating	• Media reports and articles • Conference proceedings • Evidence of replication of tools and methods in other parts of the country, within the Caribbean and at the global level	improve internet access and communications; strong commitment of government to disseminate lessons learned and to replicate the sub-project in other areas of Cuba.
Sub-component 4.1.1: Knowledge networks for national and international dissemination of sub-project information and replication	• IWECO national website supported by the Network of Knowledge (RIWEco) (as a vehicle for dissemination of sub-project information within and outside Cuba) • Publications, including books, booklets, guidelines of good practices, bulletins, posters and agenda. • Number of recipient institutions for awareness resources • Number of presentations at national and international conferences • Number of project stakeholders participating at conferences • Sub-project biannual reports of consultations on sub-project	• Little awareness of efforts to promote and undertake integrated ecosystems, watershed and coastal area management in Cuba. Due to poor internet communication, opportunities to share and build upon experiences of other related networks and projects has been very limited	**Mid-term** • Establishment of IWEco Cuba website within six months of sub-project inception. • Range of publications that are widely disseminated and easily accessible to stakeholders • Participation of project stakeholders at 2 major national conferences. • Participation of project stakeholders at 2 international conferences. • 1 major project stakeholder consultation at the end of the first year of project implementation. **End of Project** • Cuba IWEco Project website is core online repository and linked to main project website	• Operationalization of the IWEco Cuba website for dissemination of information on the sub-project's status, achievements and lessons learned to a wider audience within and outside Cuba. • Books, Booklets, Guidelines of good practices, Bulletins, Posters, Annual diaries • Project reports.	Risks: Poor internet accessibility and communications. Assumptions: Very strong commitment by CEAC to improve internet access and communications. Assumptions: Strong commitment of participating sub-project partners in supporting sub-project capacity building activities among stakeholders and local communities, including dissemination of sub-project information and lessons learned Assumptions: Willingness of government officials to organize national and international presentations on the sub-project and its achievements and lessons learned

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National Component Outcome:	**Indicator**	**Baseline**	**Targets**	**Sources of verification**	**Risks and Assumptions**
	implementation • Number of stakeholder consultations		• Suite of publications easily accessible to population • Participation at a total 4 major national conferences. • Participation at a total of at least 4 international conferences • 1 major national stakeholder consultation at end of third year		Assumptions: Strong commitment of participating sub-project partners in supporting sub-project capacity building activities among stakeholders and local communities, including dissemination of sub-project information and lessons learned

Annex 3.2: Letters of Co-financing

MISNISTRY OF SCIENCE, TECHNOLOGY AND ENVIRONMENT
INTERNATIONAL AFFAIRS DEPARTMENT

Havana, Cuba, March 28 2014

DRI: 264/2014

To: Maryam Niamir-Fuller
Director, GEF Coordination Office
United Nations Environment Programme
Block 2, North Wing, Ground Floor
PO Box 30552 Nairobi, Kenya

Subject: Endorsement for the project entitled: "Conservation and sustanability of biodiversity in Cuba from the integrated watershed and coastal zone management approach".

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 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 UNEP as GEF Agency. If approved, the proposal will be prepared and implemented by the Ministry of Science, Technology and Environment- CITMA. I request the GEF Agency to provide a copy of the project document before it is submitted to the GEF Secretariat for CEO endorsement.

I am also pleased to inform that Cuba has provided a co-finance of USD 2 281,140 for this project.

MINISTERIO DE CIENCIA, TECNOLOGÍA Y MEDIO AMBIENTE
DIRECCIÓN DE RELACIONES INTERNACIONALES

Sincerely,

Enrique Moret Hernández
Director. GEF Political and Operational Focal Point.

Copy to: Nelson Andrade Colminares – UNEP
CARIRCU Patricia Aquing - CEHI
Isabelle Van der Beck – UNEP DEPI /GEF IW

Calle 18 A # 4118 e/ 45 y 47, Playa, La Habana 11300, CUBA
Tel: (537) 214 4256, Fax: (537) 214 4257
e- mail: emoret@citma.cu

Establishing the Caribbean Observing Network for Ocean Acidification and its impact on Harmful Algal Blooms, using nuclear and isotopic techniques.

Project IAEA: RLA 7020

Dr. Maryam Naimir-Fuller
Director
Division of Global Environment Facility Coordination (DGEF)
United Nations Environment Programme
PO Box 30552, Nairobi,
Kenya
E-mail: maryam.niamir-fuller@unep.org

Dear Ms Naimir-Fuller,

Subject: Letter of Commitment for Partnership and Co-financing to the GEF-funded Full Size Project "Integrating Water, Land and Ecosystems Management in Caribbean Small Island Developing States (IWEco Project)"

The International Atomic Energy Agency through the project **Establishing the Caribbean Observing Network for Ocean Acidification and its impact on Harmful Algal Blooms, using nuclear and isotopic techniques (RLA7020)** notes and commends the development of the GEF-funded Integrating Water, Land and Ecosystems Management in Caribbean Small Island Developing States (IWEco) Project.

We note that several of the IWEco Project outcomes and outputs are of direct relevance to the scope of work/activities that are carried out by the RLA7020 and we are in a position to lend support to this important regional initiative.

This letter therefore serves to confirm the commitment of RLA7020 in contributing to the implementation of the GEF-IWEco Project particularly in the areas of the project related with the monitoring of water, land, biodiversity and ecosystem quality at the national level of the project.

The contribution of the RLA7020 to the IWEco Project is estimated at US$605000 in-kind over the duration of the project.

We are pleased to be engaged as a partner and look forward to fruitful collaboration in the implementation of the Integrated Water, Land and Ecosystems Project.

Yours Sincerely,

PhD. Carlos Manuel Alonso Hernández
Project Manager

cc Nelson Andrade Colmenares
Coordinator, UNEP-CAR/RCU
Email: nac@cep.unep.org

Annex 3.3 Terms of Reference for Partners and Consultants

Consultant: GIS and Satellite Image Treatment Specialist

Description of work: The Consultant will advise sub-project staff, mainly regarding the following issues:

a. Modern technologies for watershed and coastal satellite monitoring.
b. Assessment methods and applications of satellite image in management of biodiversity and other watershed and coastal areas processes.

Outputs: Sub-project maps, including for the 4 environmentally sound land use plans for the Rio Guanabo, Rio Agabama, Rio Arimao and Rio San Juan watersheds.

Timeline: 6 weeks spread over 4 years.

Provisional budget: $6,000

Consultant: Watershed and Coastal Area Processes Modeling Specialist

Description of work: The Consultant will advise sub-project staff, mainly regarding the following issues:

a. Model improvement and the new numerical tools for the coastal marine process representation.
b. Agreement on hydrologic models to be employed in the management and sustainable use of freshwater resources
c. Agreement on hydrographic equipments and materials needed for model validation.

Outputs:

a. Models for principal at risk locations for projecting potential threats from climate change in the four demonstration areas.
b. Hydrologic models to be employed in the management and sustainable use of freshwater resources.
c. Identification of hydrographic equipments and materials needed for model validation.

Timeline: 6 weeks spread over 4 years.

Provisional budget: $6,000

Consultant: Management of biodiversity and ecosystem services specialist.

Description of work: The Consultant will advise sub-project staff, mainly regarding the following issues:

a. Agreement on criteria and elements to be employed in the management and sustainable use of the biodiversity in the watershed and marine areas.
b. Development of economic incentives or disincentives that will contribute to the management of biodiversity.
c. Development of proposed economic measures that correspond to economic and environmental damage caused by inadequate management of biodiversity.
d. Development and implementation of methodologies for the economic valuation of the impacts of anthropogenic pressure on biodiversity, natural and productive ecosystems, and productive sectors.
e. Development and implementation of methodologies for conducting cost benefit analysis in the context of risk analysis.

Outputs:

a. Criteria and elements to be employed in the management and sustainable use of the biodiversity in the watershed and marine areas.
b. Proposal on economic incentives or disincentives that will contribute to the management of biodiversity.
c. Proposed economic measures that correspond to economic and environmental damage caused by inadequate management of biodiversity.
d. Methodologies for the economic valuation of the impacts of anthropogenic pressure on biodiversity, natural and productive ecosystems, and productive sectors.
e. Methodologies for conducting cost benefit analysis in the context of risk analysis.

Timeline: 12 weeks spread over 4 years.

Provisional budget: $6,000

Consultant: Cleaner Production Specialist

Description of work: The Consultant will advise sub-project staff, mainly regarding the following issues:

a. Use of better technology for treatment of agro-industrial and domestic wastewater.
b. Development and implementation of methodologies for the organization of agricultural processes to reduce the negative impacts on biodiversity and ecosystem services.
c. Evaluate the effectiveness of selected technology.

Outputs:

a. Proposal on better technology for treatment of agro-industrial and domestic wastewater.
b. Methodologies for the organization of agricultural processes to reduce the negative impacts on biodiversity and ecosystem services.

c. Evaluation of the effectiveness of selected technology.

Timeline: 6 weeks spread over 4 years.

Provisional budget: $6,000

Consultant: Biomass Algae Production to Reduce CO_2 Specialist

Description of work: The Consultant will advise sub-project staff, mainly regarding the following issues:

a. Develop an economically and environmentally viable technological process for capturing CO_2 emitted by industry through the intensive cultivation of algae.
b. Evaluate the technical, economic and environmental feasibility for determining the practicality of installing a station for the intensive cultivation of algae in an area bordering industries emitting CO_2.

Outputs:

a. The design of an economically and environmentally viable technological process for capturing CO_2 emitted by industry through the intensive cultivation of algae.
b. Evaluation of the technical, economic and environmental feasibility for determining the practicality of installing a station for the intensive cultivation of algae in an area bordering industries emitting CO_2.

Timeline: 12 weeks spread over 4 years.

Provisional budget: $6,000

Consultant: Good Agricultural Practices Specialist

Description of work: The Consultant will advise sub-project staff, mainly regarding the following issues:

a. Identify the most appropriate good agricultural practices to be promoted in the four sub-project demonstration areas.
b. Evaluate the effectiveness of the good agricultural practices employed in the conservation and sustainable use of biodiversity in the four sub-project demonstration areas.

Outputs:

a. Application of appropriate good agricultural practices in the four sub-project demonstration areas.
b. Evaluation of the effectiveness of the good agricultural practices employed in the conservation and sustainable use of biodiversity in the four sub-project demonstration areas.

Timeline: 12 weeks spread over 4 years.

Provisional budget: $6,000

Annex 3.4 Biodiversoty found within the IWEco Project watershed areas

Watershed key: G: Guanabo; **A**: Arimao; **S**: Sancti Spiritus; **J**: San Juan;
IUCN status: CR: Critically endangered; **EN**: Endangered; **VU**: Vulnerable; **NT**: Near threatened; **LC**: Least concern; **DD**: Data deficient; **NE**: Not evaluated; ***** : Endemic.

Birds reported within the watershed intervention areas

Family	Scientific name	Common name	Categoría para Cuba	IUCN status category	Watershed presence
Podicipedidae	*Podilymbus podiceps*	Zaramagullón Grande	LC	LC	A
	Tachybaptus dominicus	Zaramagullón Chico	LC	LC	A G
Pelecanidae	*Pelecanus occidentalis*	Pelícano	LC	LC	A
Phalocrocoracidae	*Phalacrocorax brasilianus*	Corúa de agua dulce	LC	LC	A
	Phalacrocorax auritus	Corúa de mar	LC	LC	A
Anhingidae	*Anhinga anhinga*	Marbella	LC	LC	A
Fregatidae	*Fregata magnificens*	Rabihorcado	LC	LC	A
Ardeidae	*Ixobrycus exilis*	Garcita	LC	LC	A
	Ardea herodias	Garcilote	LC	LC	A G
	Ardea alba	Garzón	LC	LC	A G
	Ardea thula	Garza de Rizos	LC	LC	A G
	Ardea caerulea	Garza Azul	LC	LC	A G
	Ardea tricolor	Garza de Vientre Blanco	LC	LC	A G
	Ardea rufescens	Garza rojiza	LC	LC	A
	Bubulcus ibis	Garza ganadera	LC	LC	A G
	Butorides virescens	Aguaitacaimán	LC	LC	A G
	Nycticorax nycticorax	Guanabá de la Florida	LC	LC	A G
	Nyctanassa violacea	Guanabá Real	LC	LC	A G
Aramidae	*Aramus guarauna*	Guareao	LC	LC	A G
Threskiornithidae	*Plegadis falcinellus*	Coco Prieto	VU	LC	A
	Eudocimus albus	Coco Blanco	LC	LC	G
	Platalea ajaja	Sevilla	LC	LC	A
Rallidae	*Gallinula chloropus*	Gallareta Piquiroja	LC	LC	A G
	Fulica americana	Gallareta Piquiblanca	CA	CA	A G
	Porphylura dominica	Gallareta Azul	LC	LC	A
	Rallus longirostris	Gallinuela de manglar	LC	LC	A G

Family	Scientific name	Common name	Categoría para Cuba	IUCN status category	Watershed presence
	Rallus elegans	Gallinuela de agua dulce	LC	LC	A
Jacanidae	*Jacana spinosa*	Gallito de Río	LC	LC	A
Cathartidae	*Cathartes aura*	Aura Tiñosa	LC	LC	A G
Phoenicopteridae	*Phoenicopterus ruber*	Flamenco	VU	LC	A S G
Anatidae	*Dendrocygna bicolor*	Yaguasín	LC	LC	A
	Dendrocygna arborea	Yaguasa	VU	VU	A
	Aix sponsa	Pato Huyuyo	VU	LC	A
	Nomonix dominicus	Pato Agostero	VU	LC	A
	Oxyura jamaicensis	Pato Chorizo	LC	LC	A
	Anas clypeata	Pato Cuchareta	LC	LC	A
	Mergus serrator	Pato Serrucho	LC	LC	A
	Anas americana	Pato Lavanco	LC	LC	G
Accipitridae	*Buteo jamaicensis*	Gavilán de Monte	LC	LC	A
	**Accipiter gundlachi*	Gavilán colilargo	EN	EN	A
	Pandion halieatus	Águila Pescadora	LC	LC	A S
	**Buteogallus gundlachi*	Gavilán Batista	EN	NT	A S
	Rostrhamus sociabilis	Gavilán caracolero	LC	LC	A
Falconidae	*Falco sparverius*	Cernícalo	LC	LC	A
	Falco columbarius	Halcón de Palomas	LC	LC	A
	Caracara cheriway	Caraira	VU	LC	A
Phasianidae	*Colinus virginianus*	Codorniz	NT	NT	A
Charadriidae	*Charadius vociferus*	Títere sabanero	LC	LC	A G
	Charadrius wilsonia	Títere playero	LC	LC	G
	Charadrius alexandrinus	Frailecillo blanco	VU	LC	G
Recurvirostridae	*Himantopus mexicanus*	Cachiporra	LC	LC	A G
Jacanidae	*Jacana spinosa*	Gallito de río	LC	LC	A G
Scolopacidae	*Tringa melanoleuca*	Zarapico patiamarillo grande	LC	LC	A
	Tringa flavipes	Zarapico patiamarillo chico	LC	LC	A
	Tringa solitaria	Zarapico solitario	LC	LC	A
	Catoptrophorus semipamatus	Zarapico real	LC	LC	A
	Calidris minutilla	Zarapiquito	LC	LC	A
	Gallinago gallinago	Becasina	LC	LC	A
Laridae	*Larus atricilla*	Galleguito	LC	LC	A
	Larus argentatus	Gallego	LC	LC	A
	Sterna maxima	Gaviota real	VU	LC	A
	Sterna antillarum	Gaviotica	VU	LC	A
	Rynchops niger	Gaviota pico de tijera	LC	LC	A

Family	Scientific name	Common name	Categoría para Cuba	IUCN status category	Watershed presence
Columbidae	*Patagioenas squamosa*	Torcaza cuellimorada	LC	LC	A
	Patagioenas leucocephala	Torcaza caeciblanca	VU	NT	G
	Zenaida asiatica	Paloma aliblanca	LC	LC	A
	Zenaida macroura	Paloma Rabiche	LC	LC	A G
	Zenaida aurita	Paloma Sanjuanera	LC	LC	A
	Columbina passerina	Tojosa	LC	LC	A G
	**Geotrygon caniceps*	Camao	VU	VU	A
	Geotrygon chrysia	Barbiquejo	VU	LC	A
	Geotrygon montana	Boyero	VU	LC	A
Psittacidae	* *Aratinga euops*	Perico Catey	EN	VU	A
	Amazona leucocephala	Cotorra	VU	NT	A
Cuculidae	*Coccyzus merlini*	Arriero	LC	LC	A G
	Crotophaga ani	Judío	LC	LC	A G
Tytonidae	*Tyto alba*	Lechuza	LC	LC	A
Strigidae	**Glaucidium siju*	Sijú Platanero	LC	LC	A
	**Otus lawrencii*	Sijú Cotunto	LC	LC	A
Caprimulgiforme	*Chordeiles gundlachii*	Querequeté	LC	LC	A
	Caprimulgus cubanensis	Guabairo	LC	LC	A
Apodidae	*Streproprocne zonaris*	Vencejo de Collar	VU	LC	A
	Cypseloides niger	Vencejo negro	VU	LC	A
	Tachornis phoenicobia	Vencejito de Palma	LC	LC	A
Trochilidae	*Chlorostilbon ricordii*	Zunzún	LC	LC	A G
Trogonidae	**Priotelus temnurus*	Tocororo	LC	LC	A
Todidae	**Todus multicolor*	Cartacuba	LC	LC	A S G
Alcedinae	*Ceryle alcyon*	Martín Pescador	LC	LC	A G
Picidae	*Melanerpes superciliaris*	Carpintero jabado	LC	LC	A
	Sphyrapicus varius	Carpinterito de paso	LC	LC	A
	**Xiphidiopicus percussus*	Carpintero verde	LC	LC	A
Tyrannidae	*Contopus caribeus*	Bobito Chico	LC	LC	A
	Myiarcus sagrae	Bobito Grande	LC	LC	A
	Tyrannus caudifasciatus	Guatibere	LC	LC	A
	Tyrannus tyrannus	Pitirre Americano	LC	LC	A
	Tyrannus dominicensis	Pitirre Abejero	LC	LC	A
Vireonidae	**Vireo gundlachii*	Juan Chiví	LC	LC	A
	Vireo altiloquus	Bien te veo	LC	LC	A
Corvidae	*Corvus nasicus*	Cao montero	LC	LC	A
Hirundinidae	*Petrochelidon fulva*	Golondrina de cuevas	LC	LC	A

Family	Scientific name	Common name	Categoría para Cuba	IUCN status category	Watershed presence
	Progne cryptoleuca	Golondrina Azul Cubana	LC	LC	A
	Polioptila caerulea	Rabuita	LC	LC	A G
Turdidae	*Turdus plumbeus*	Zorzal real	LC	LC	A
Mimidae	*Dumetella carolinensis*	Zorzal Gato	LC	LC	A
	Mimus poiyglottos	Sinsonte	LC	L	A G
Parulidae	*Dendroica tigrina*	Bijirita Atigrada	LC	LC	A
	Dendroica caerulescens	Bijirita Azul de Garganta Negra	LC	LC	A
	Dendroica palmarum	Bijirita Común	LC	LC	A S G
	Mniotilta varia	Bijirita Trepadora	LC	LC	A
	Setophaga ruticilla	Candelita	LC	LC	A
	Geothlypis trichas	Caretica	LC	LC	A G
	Dendroica virens	Bijirita de garganta negra	LC	LC	A
	Parula americana	Bijirita Chica	LC	LC	A
	Dendroica dominica	Bijirita de garganta amarilla	LC	LC	A
	Seiurus motacilla	Señorita de Río	LC	LC	A
	Seiurus aurocapilla	Señorita de Monte	LC	LC	A
	Seiurus aurocapilla	Señorita de Manglar	LC	LC	G
	**Teretistri fernandinae*	Chillina	LC	LC	A
	Dendroica discolor	Mariposa Galana	LC	LC	A
	Helmitheros vermivorus	Bijirita gusanera	LC	LC	A
	Seiurus noveboracensi	Canario de manglar	LC	LC	A G
Thraupidae	*Spindalis zena*	Cabrero	LC	LC	A
Emberizidae	*Melopyrrha nigra*	Negrito	NT	LC	A
	Tiaris olivacea	Tomeguín de la tierra	LC	LC	A G
	**Tiaris canora*	Tomeguín del Pinar	LC	LC	A
Cardinidae	*Passerina cyanea*	Azulejo	LC	LC	A
	Passerina ciris	Mariposa	VU	NT	A
Passeridae	*Paaser domesticus*	Gorrión doméstico	LC	LC	A G
Icteridae	*Dives atroviolacea*	Totí	LC	LC	A G
	**Icterus melanopsis*	Solibio	LC	LC	A
	Angelaius humeralis	Mayito	LC	LC	A G
	Sturnella magna	Sabanero	LC	LC	A
	Quiscalus niger	Chichinguaco	LC	LC	A G

Reptiles reported within the watershed intervention areas

Family	Scientific name	Common name	Categoría para Cuba	IUCN status category	Watershed presence
Boidae	**Chilabothrusangulifer*	Majá de Santa María	NT	NT	A
Tropidophiidae	**Tropidophis melanurus*	Majasito bobo	NE	NE	A J
	**Tropidophis pardalis*	Majasito	NE	LC	A
	**Tropidophis maculatus*	Majasito	NE	NE	
	**Tropidophis galacelidus*	Majasito	CR	NE	J
	**Tropidophis hardyi*	Majasito	CR	NE	
	**Tropidophis semicinctus*	Majasito	NE	NE	A
Dypsadidae	**Caraibaandreae*	Magdalena	NE	NE	A J
	Cubophiscantherigerus	Jubo	NE	NE	A J
	**Arrhytonvittatum*	Jubito	NE	NE	J
	**Arrhytontaeniatum*	Jubito	NE	LC	J
	Tretanorhinusvariabilis	Cativo de agua dulce	NE	NE	A
Thyphlopiidae	**Typhlops satelles*	Culebrita ciega	CR	NE	A J
	*Typhlops*cf. *lumbricalis*	Culebrita ciega	NE	NE	
Emiidae	*Trachemysdecussata*	Jicotea	NT	NE	A
Leiocephalidae	**Leiocephaluscubensis*	Bayoya	NE	NE	A
	Leiocephaluscarinatus	Bayoya	NE	NE	J
	**Leiocephalusmacropus*	Bayoya	NE	NE	J
	**Leiocephalusstictigaster*	Bayoya	NE	NE	
Dactyloidae	**Anolis lucius*	Coronel	NE	NE	A
	Anolis allisoni	Lagartija azul	NE	NE	
	**Anolis porcatus*	Lagartija verde	NE	NE	A J
	Anolis sagrei	Torito	NE	NE	A J
	** Anolis ahli*	Lagartija	VU	EN	
	**Anolis homolechis*	Lagartija de cresta	NE	NE	A J
	**Anolis angusticeps*	Lagartija	NE	NE	J
	**Anolis pumilus*	Lagartija	NE	VU	J
	**Anolis alutaceus*	Lagartija	NE	NE	
	**Anolis ophiolepis*	Lagartija	NE	NE	J
	**Anolis vanidicus*	Lagartija	NE	VU	J
	**Anolis equestrispersparsus*	Chipojo	NE	NE	A
Anguidae	**Diploglossus delasagra*	Culebrita de cuatro patas	NE	LR	
Teiidae	**Ameivaauberiatrothorax*	Arrastra panza	NE	NE	A J
Gekkonidae	*Hemidactylus turcicus*	Salamanca	NE	NE	A
	Hemidactylus angulatus	Salamanca	NE	NE	
Sphaerodactylidae	**Sphaerodactyluoliveri*	Salamanquita	NE	VU	A
	Sphaerodactyluelegans	Salamanquita	NE	NE	

Family	Scientific name	Common name	Categoría para Cuba	IUCN status category	Watershed presence
	Sphaerodactyluargus	Salamanquita	NE	NE	
	Sphaerodactylunotatus	Salamanquita	LC	NE	
	Gonatodesalbogularis	Salamanquita	NE	NE	J
Phyllodactylidae	*Tarentola americana*	Salamanca	NE	NE	J
Amphisbaenidae	**Amphisbaenabarbouri*	Anfisbena	NE	NE	
	**Amphisbaena cubana*	Anfisbena	NE	NE	

Amphibians reported within the watershed intervention areas

Scientific name	Categoría para Cuba	IUCN status category	Watershed presence
**Peltophryne longinasadunni*	EN	CR	A
**Peltophryne peltocephala*	LC	LC	A J
**Peltophryne empusa*	LC	LC	
**Peltophryne taladai*	VU	VU	A
**Eleutherodactylus limbatus*	VU	VU	A
**Eleutherodactylus dimidiatus*	NT	NT	
**Eleutherodactylus varleyi*	LC	LC	A J
**Eleutherodactylus eileenae*	NT	NT	
**Eleutherodactylus atkinsi*	LC	LC	A J
**Eleutherodactylus casparii*	EN	EN	A
Eleutherodactylus planirostris	LC	LC	A J
**Eleutherodactylus thomasi*	EN	EN	A
**Eleutherodactylus emiliae*	VU	EN	
**Eleutherodactylus greyi*	EN	EN	A
**Eleutherodactylus riparius*	LC	LC	A
**Eleutherodactylus auriculatus*	LC	LC	A
**Eleutherodactylus varians*	VU	VU	A
Osteopilus septentrionalis	LC	LC	A J
Lithobatescatesbeianus	LC	LC	A J

Mammals reported within the watershed intervention areas

Scientific name	Common name	Categoría para Cuba	IUCN status category	Watershed presence
Artibeus jamaicensis	Murciélago frutero grande	LC	LR	A
Tadarida brasiliensis	Murciélago brasileño de cola libre	LC	LR	A
Noctilioleporinus	Murciélago pescador	LC	VU	
Eptesicus fuscus	Murciélago pardo	LC	LR	A
Molossus molossus	Murciélago de las casas	LC	LR	A
Monophyllus redmani	Murciélago lengüilargo	LC	LR	A
Mormoopsblainviilei	Murciélago fantasma	LC	LR	
Phyllops falcatus	Murciélago frutero chico	LC	EN	A
Pteronotus parnelli	Murciélago bigotudo grande	LC	LR	A
Pteronotus quadridens	Murciélago bigotudo chico	LC	LR	A
Pteronotus macleayi	Murciélago bigotudo de MacLeay	LC	VU	A
Macrotus waterhousei	Murciélago orejudo	LC	LR	A
* *Nyctiellus lepidus*	Murciélago mariposa	LC	LR	A
* *Phyllonycterispoeyi*	Murciélago de Poey	LC	VU	A
Erophyllasezekorni	Murciélago de las flores	NE	NE	A
Brachyphylla nana	Murciélago gritón	LC	LR	A
**Lasiurus insularis*	Murciélago de cola peluda grande	VU	VU	A
Mus musculus	Guayabito	NE	NE	A
Rattus norvegicus	Rata parda	NE	NE	A
Rattus rattus	Rata negra	NE	NE	A
**Capromyspilorides*	Jutia conga	NE	NE	A
**Mysatelesprehensilis*	Jutía carabalí	NE	NE	A

Threatened plants reported in the watershed intervention areas

Family	Scientific name	IUCN status category	Watershed presence
Agavaceae	*Agave grisea* Trel.	EN	A
Anacardiaceae	*Euleria tetramera* Urb.	CR	A
Annonaceae	*Annona havanensis* R. E. Fr.	EN	A
Apocynaceae	*Tabernaemontana apoda* C. Wright	CR	A
	Philodendron fragantissimun (Hook.) G. Don	CR	A
Arecaceae	*Calyptronoma plumeriana* (Mart.) Lour.	LC	A

	Coccothrinax crinita subsp. *brevicrinis* Borhidi & O. Muñiz	EN	A
	Coccothrinax trinitensis Borhidi & O. Muñiz	CR	A
Aspleniaceae	*Asplenium corderoanum* Proctor	CR	A
	Asplenium delicatulum C. Presl.	CR	A
	Asplenium rectangulare Maxon	CR	A
	Schaffneria nigripes Fée ex T. Moore	NT	A
Asteraceae	*Gochnatia wilsonii* (Britton) Jervis & Alain	EN	A
Begoniaceae	*Begonia glabra* Aubl.	VU	A
	Begonia lomensis Britton & P. Wilson	CR	A
	Begonia wrightiana A. DC.	VU	A
Bignoniaceae	*Tabebuia glaucescens* Urb.	EN	A
	Tabebuia leptoneura Urb.	EN	J
Bromeliaceae	*Tillandsia bulbosa* Hook	VU	A
	Tillandsia pruinosa Sw	EN	A
Cactaceae	*Cylindropuntia hystrix* (Griseb.) Areces	CR	A, J
	Dendrocereus nudiflorus (Engelm.) Britton & Rose	EN	A, J
	Melocactus acunai León	CR	J
	Melocactus harlowii (Br. et R.) Vpl.	CR	J
	Pilosocereus brooksianus (Br.& R.) Byl. & Rowl.	VU	A, J
	Pilosocereus millspaughii (Britt.) Byl. & Rowl.	EN	J
Clusiaceae	*Garcinia aristata* (Griseb.) Borhidi	EN	A, J
Combretaceae	*Terminalia chicharronia*C.Wright	EN	A, J
	Terminalia eriostachya A. Rich.	EN	A, J
Cupressaceae	*Juniperus lucayana* Britton.	CR	A
Dryopteridaceae	*Adenoderris glandulosa* (C. Presl.) J. Sm	CR	A
	Ctenitis sanctae-clarae (C. Chr.) Ching	CR	A
Elaeocarpaceae	*Sloanea amiydalina* Griseb.	VU	A
Ericaceae	*Lyonia trinidadensis* Judd	VU	A
	Vaccinium bissei Berazaín	VU	A
Erythroxylaceae	*Erythroxylum clarense* Borhidi	VU	A
Euphorbiaceae	*Croton subdecumbens* Borhidi & O. Muñiz	VU	A
Fabaceae	*Erythrina elenae* R. A Howard & W. R. Briggs	CR	A
Flacourtiaceae	*Lunania sauvallei* Griseb.	CR	A
	Samyda cubensis P. Wilson	EN	A

Juglandaceae	*Juglans jamaicensis* C. DC. subsp. *jamaicensis*	CR	A
	Juglans jamaicensis subsp. *insularis* (Griseb.) H. Schaarschm.	CR	A
Lentibulariaceae	*Pinguicula jackii* Barnhart	CR	A
	Pinguicula lithophytica C.Panfet-Valdés & P.Temple	CR	A
Magnoliaceae	*Magnolia cubensis* subsp. *acunae* Imkhan.	EN	A
	Magnolia cubensis subsp. *Cubensis* Imkhan.	EN	J
Malvaceae	*Pavonia calcicola* (Britton) Ekman	VU	A
	Thespesia cubensis (Britton & P. Wilson) J. B. Hutchinson	EN	A
Melastomataceae	*Tetrazygia aurea* R. A. Howard & W. R. Briggs	NT	A
Mimosaceae	*Mimosa asperata* L.	EN	A
Moraceae	*Dorstenia nummularia* Urb. & Ekman	EN	A
	Dorstenia rocana Britton	EN	A
Myrtaceae	*Calyptrantes clementis* Britton & P. Wilson	EN	A
	Psidium celastroides Urb.	EN	A
Nyctaginaceae	*Neea ekmanii* Heimerl	CR	A
Orchidaceae	*Encyclia nematocaulon* (A.Rich.) Acuña	CR	A
	Lephantes trichodacttyla Lindl.	EN	A
	Specklinia longilabris (Lindl.) Luer	EN	A
	Tolumnia usneoides (Lindl.) Braem	EN	A
	Eurystyles ananassocomus (Rchb. f) Schltr.	DD	A
Piperaceae	*Piper perditum* Trel.	EN	A
Podocarpaceae	*Podocarpus angustifolius* Griseb.	CR	A
Rhamnaceae	*Doerpfeldia cubensis* (Britton) Urb.	CR	A
Rubiaceae	*Guettarda nervosa* Urb. & Ekman	EN	A
Rutaceae	*Amyris diatripa* Spreng.	CR	A
	Zanthoxyllum coriaceum A. Rich.	CR	A
Sapotaceae	*Manilkara jaimiqui* subsp. *wrightiana* (Pierre) Cronquist	EN	A
	Manilkara albescens (Griseb.) Cronquist.	VU	J
Tiliaceae	*Carpodiptera cubensis* Griseb. subsp. *cubensis*	EN	A
Verbenaceae	*Duranta arida* Britton & P.Wilson subsp. *arida*	CR	A
	Tamonea curassavica (L.) Pers.	VU	A

Annex 3.5. Carbon accounting – Cuba

Ouputs from FAO Ex-Ante Carbon-balance Tool (EX-ACT) tool

Project Name	*IWECO Cuba*	
Continent	Central America	
Climate	Tropical	
Moisture regime	Moist	
Dominant Regional Soil Type	HAC Soils	
Duration of the Project (Years)	Implementation phase	4
	Capitalisation phase	1
	Duration of accounting	5

Total acreage of direct investment	**1690**	ha
2.2 Afforestation/reforestation conversion of "degraded areas" to "plantation zone 2"	**1014**	**ha**
2.3 Other land use changes conversion of "degraded areas" to "perennial tree crop"	**676**	**ha**

	Gross fluxes tCO2eq (Positive = source / negative = sink)		**Results per year tCO2eq** (Positive = source / negative = sink)		
	Without project	**With project**	**Without project**	**With project**	**Balance**
Land Use Changes					
Deforestation	0.0	0.0	0.0	0.0	0.0
Afforestation	0.0	-97,049.1	0.0	-19,409.8	-15,635.3
Other	0.0	-20,157.8	0.0	-4,031.6	-4,031.6
Agriculture					
Annual	0.0	0.0	0.0	0.0	0.0
Perennial	0.0	-17,530.9	0.0	-3,506.2	-3,506.2
Rice	0.0	0.0	0.0	0.0	0.0

Grassland & Livestocks					
Grassland	0.0	0.0	0.0	0.0	0.0
Livestock	0.0	0.0	0.0	0.0	0.0
Degradation	**0.0**	**0.0**	**0.0**	**0.0**	0.0
Inputs & Investments	**0.0**	**0.0**	**0.0**	**0.0**	0.0
Total	**0.0**	**-134,737.8**	**0.0**	**-26,947.6**	**-23,173.0**
Per hectare	**0.0**	**-79.7**			
Per hectare per year	**0.0**	**-15.9**	**0.0**	**-15.9**	**-13.7**