IWEco National Sub-Project 1.8

Reduce and reverse land degradation at selected Quarry site(s) in the North East of Trinidad using an integrated water, land and ecosystems management approach

TRINIDAD & TOBAGO

Appendix 38

REVISED
OCTOBER 2018

COVER SHEET

- Name of small-scale intervention: **Reduce and reverse land degradation at selected Quarry site(s) in the North East of Trinidad using an integrated water, land and ecosystems management approach**
- Name of Lead Partner Organization: Environmental Management Authority (EMA)
- Contact person: Hayden Romano, Managing Director, Environmental Management Authority
- IWEco Project focus: Land Degradation
- Total area covered: Targeted rehabilitation interventions for mitigating further land degradation associated with quarry operations in 20 hectares of abandoned or exhausted pits.
- Duration of sub-project: 48 months
- Amount of GEF grant: **$643,658** USD
- Amount of Co-financing: **$768,875** USD (original) + $105,000 USD (projected partnership support) = **$873,876 USD**
- Total funding: **$1,412,533** USD (original) + additional projected co-financing support =$1,517,533 USD

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1 PROJECT IDENTIFICATION

1.1 Project Summary

The island of Trinidad exhibits exceptional biodiversity and unique ecosystems. The North East area is known both, for the Aripo Savannas, an Environmentally Sensitive Area (ESA) and Strict Nature Reserve that harbours unique habitats, rare and endemic biodiversity and is of great scientific importance, for its water resources for both aquifer recharge and direct extraction, as well as for high quality sand and gravel deposits and the livelihoods associated with the fiscalization of this commodity. However, indiscriminate quarrying has led to severe land degradation in the North East region, particularly in the Valencia, Matura, Manzanilla, Tamana and Tururе areas. The initial project area was defined as Valencia, however, by increasing the scope to include the Municipality of Sangre Grande, interventions can also be employed in/to degraded areas such as Tamana and Tururе.

This sub-project aims to reduce, and to the extent possible, reverse the negative impact which may have resulted as a consequence of indiscriminate quarrying practices in this area. Given this circumstance, it is intended that this be engaged through the employment of direct interventions on the ground, improved monitoring and reporting, policy-making, institutional strengthening and capacity-building, as well as knowledge exchange at the local, national, regional and, as appropriate, international (i.e. SIDs) level. In addition, on-site land and forest cover investments in a minimum of 40 hectares over the target watershed areas, it is expected that these interventions will also contribute to CO_2sequestration over the life of the project.

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

Regional Component	Project Outcomes
C1. TECHNICAL SOLUTIONS & BENEFITS	C1.1 Measurable **stress reduction 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: To develop and foster the implementation of targeted innovative, climate-change resilient approaches to integrated sustainable land and water resources management and enhanced management and maintenance of ecosystem services at selected quarry site(s) in the project area		

GEF Focal Area Outcome	Project Outcomes (above)	Sub-Project Outcomes
IW 1.3, 2.3; LD 3.3, BD 2.1	C1.1 Solutions	National Outcome 1.1: Measurable stress reduction at project sites through appropriate sustainable water, land and ecosystems management interventions that account for climate change.
LD 3.2; BD 2.1	C1.2 Benefits	National Outcome 1.2: Enhanced livelihood opportunities and socio-economic co-benefits for targeted communities from improved ecosystem services functioning for climate change.
National Component 2 To strengthen Sustainable Land Management (SLM), Integrating Water Resources Management (IWRM) and ecosystems Monitoring and Indicators frameworks in Trinidad and Tobago, particularly the North East area and surrounding watersheds		
IW 2.1; BD 2.1	C2.1 Monitoring	National Outcome C2.1 Strengthened national and regional systems for monitoring of environmental status with respect to key international agreements.
National Component 3: To strengthen policy, legislative and institutional reforms and capacity building to support Sustainable Land Management (SLM), Integrating Water Resources Management (IWRM) and ecosystem services management taking into consideration climate change resilience building in Trinidad and Tobago, particularly the North East area and surrounding watersheds.		
IW 1.1, 1.4, 2.1	C3.1 Policy	National OutcomeC3.1 Strengthened policy and legislation for the effective management of water, land and ecosystems resources that account for climate change.
LD 3.1, 3.2; SFM 1.1, 1.2	C3.2 Capacity	National Outcome C3.2 Strengthened capacity of national and regional institutions and other stakeholders for water, land, and ecosystems management, taking climate change into account.
National Component 4: To enhance knowledge exchange, promotion of best-practices, replication and expanding stakeholder involvement in Trinidad and Tobago, particularly the North East area and surrounding watersheds		
SFM 1.3	C4.1. Knowledge	National Outcome C4.1 Improved information access and enhanced engagement of practitioners and other stakeholders via targeted knowledge sharing networks.

Table of Sub-Project Outputs and GEF funding and co-finance

Outputs	Sources of funding		
	GEF Funding	Co-Financing	Total Project Cost
National Component 1.1 Innovative Solutions	**375,658**	337,750	713,408
Output C1.1.1: Conduct (rapid) environmental diagnostic analysis for selected quarry site(s) in project area as required to support project interventions	28,000	37,473	65,473
Output C1.1.2: Rehabilitation of selected areas in the North East Forest Reserve (through bioengineered techniques, replanting, soil treatment, etc.)	347,658	300,277	647,935
National Component 1.2 Socio-Economic Benefits	**13,600**	**127,190**	**140,790**
Output C1.2.1: Opportunities for economic livelihoods analysis and related enterprise generated through GEF-SGP	13,600	127,190	140,790
National Component 2.1 - Systems for monitoring	**16,000**	**76,720**	**92,720**
Output C2.1.1: A monitoring protocol for periodic assessment of identified environmental indicators (air quality, surface water quality, vegetation recovery, in particular) at intervention sites	16,000	76,720	92,720
National Component 3.1 Policy & legislation	**31,000**	**51,570**	**82,570**
Output C3.1.1: Legal requirements of the Environmental Management Act Chapter 35:05 including the Certificate of Environmental Clearance (CEC) Rules, and the Water Pollution Rules, effectively enforced in quarries in project area	31,000	51,570	82,570

Outputs	Sources of funding		
	GEF Funding	Co-Financing	Total Project Cost
National Component 3.2 Capacity building	**98,000**	**153,600**	**251,600**
Output C3.2.1: Professionals and technical staff in relevant lead agencies, primary CSO and individual stakeholders trained in core technical areas (e.g. bio-engineering, erosion control, storm water and wastewater management, rehabilitation)	98,000	153,600	251,600
National Component 4.1 Knowledge Management	**109,400**	**22,045**	**131,445**
Output C4.1.1: Increase awareness for practitioners and awareness resources for wider audiences	70,000	15,435	85,435
Output C4.1.2: Technical exchange visits between project staff, civil society organizations to share knowledge directly over the duration of the project	39,400	6,610	46,010
TOTAL (in PIF)*	**N/A**	**N/A**	**N/A**
TOTAL (revised if applicable)	**643,658**	**768,875**	**1,412,533**

* Trinidad and Tobago committed participation to the project following submission and approval of the PIF by the GEF CEO.

2 PROJECT DESIGN

2.1 Background and Context

2.1.1. Overview on globally significant ecological assets and linkages to mining in Trinidad and Tobago

Trinidad and Tobago's National Biodiversity Strategy and Action Plan (NBSAP) was revised in 2016 and provides an updated outlook on the state of the country's biodiversity, in terms of its value, ecosystem services to human health and well-being, threats and legal/policy context. Trinidad and Tobago's (T&T's) biodiversity is valued based on the ecosystem services provided (terrestrial, coastal and marine), tourism products and ecosystem-based adaptations (EBA) for disaster risk reduction in location communities. The NBSAP highlights that 'the synergy between humanity and biodiversity is a delicate balance that is being threatened through the reduction of natural ecosystems and species.' However, the report highlights that the synergy of human interaction with the natural environment is delicate and is being threatened by ecosystem and species loss.

The GoRTT (2013), reported that there was an approximate 12% decrease in forest cover, as at 2010. However, during the period 2010-2015, FAO (2010; 2015), there was an estimated 3% increase in forest cover in T&T. The proximity of the twin-island state so close to mainland South America has resulted in similar biodiversity as on the mainland although various studies indicate that T&T has 36 endemic animals and at least 53 endemic plants (NBSAP 2016). The International Union for the Conservation of Nature's (IUCN's) Red List of threatened species (2018) indicates that there are 118 threatened species across all categories, in T&T.

Locally, the designation of threatened species, which require management, is done under the Environmental Management Act Chapter 35:05 (EM Act) and the Environmentally Sensitive Species (ESS) Rules, 2001. To-date, ten (10) species have designated as ESSs with the 11th species in its final stages of designation. The species and year of designation are as follows:

- Pawi (*Pipile pipile*) – 2005;
- Manatee (*Trichechus manatus manatus*) – 2005;
- White-tailed Sabrewing Hummingbird (*Campylopterus ensipennis*) – 2005;

- Golden Tree Frog (*Phytotriades auratus*) – 2013;
- Ocelot (*Leopardus pardalis*) – 2013;
- Leatherback Turtle (*Dermochelys coriacea*) – 2014;
- Loggerhead Turtle (*Caretta caretta*) – 2014;
- Green Turtle (*Chelonia mydas*) – 2014;
- Hawksbill Turtle (*Eretmochelys imbricata*) – 2014;
- Olive Ridley Turtle (*Lepidochelys olivacea*) – 2014;
- Scarlet Ibis (*Eudocimus ruber*) – 2018.

In Trinidad and Tobago, threats to biodiversity and maintenance of ecosystem services include deforestation, erosion, coastal erosion and accretion, land-based pollution, poor agricultural practices, general and hazardous waste management, oil and gas-related spills, illegal and unsustainable quarrying and lack of environmental controls in legal quarries, effects of flooding and land salinization. The National Action Programme (NAP) to combat land degradation in Trinidad and Tobago (2006-2020)[1] suggests that "*Although the ecosystems of Trinidad and Tobago are not characterised by extensive dryland, and desertification is not a major development and environmental issue, land degradation and its consequential biophysical and socio-economic impacts are of great concern given its potential to restrict the country's socio-economic development and sustainable land management.* In this regard, the NAP articulates some 19 critical actions that are key to the success of a national programme that seeks to conserve ecosystems services through sustainable land management approaches. Of these actions, those that relate most closely to the mining and quarrying sector (of relevance to this project) include the "*Enactment of Appropriate Legislation for Regulation and Management of the Quarry Industry*; and "*Addressing Illegal Quarrying/Mining*".

In relation to quarrying, the NAP further notes that "*the majority of the country's quarry resources are on State lands and a significant percentage of the quarrying operations is illegal. Many quarries are operating in an unsustainable manner. There is generally an absence of a well-thought out approach or plan to the mining of materials and site restoration after extraction. Operators are known to quarry out entire parcels of land sometimes extending into neighbouring properties. This haphazard approach to quarrying leads to a myriad of land degradation challenges. Additionally, there is limited enforcement of the legislative framework for the licensing and operation of quarry operations. While quarrying/mining generally creates environmental problems, such as the presence of large holes and the scaring of the landscape, pollution and siltation of rivers, illegal mining generates some additional challenges including:*

- *change of land use from forestry to quarrying, for example in areas in Valencia and Wallerfield that were set aside for agriculture;*
- *introduction of a measure of criminality or insecurity in the areas where illegal operators engage in intimidating agricultural leaseholders and residents; and*
- *introduction into the market of materials at a cost below market rates*"

[1]National Action Programme (NAP) to combat land degradation in Trinidad and Tobago (2006-2020): online at http://greentnt.org/sites/default/files/documents/bills/Draft%20National%20Action%20Programme%20to%20Combat%20Land%20Degradation.pdf

Given the sensitivity of the ecosystems within the North East area, focussing attention on the restoration and rehabilitation of the degraded quarry areas is deemed to be of high priority, and experience gained in application of best practices will provide the basis for up-scaling and replication with close collaboration and engagement of local-level stakeholders. The following section provides more detail on the ecological assets quarrying activity within the North East area.

2.1.2. Global and national significance of the North East area, Trinidad

Ecosystems conservation

A recent floral survey identified a total of 206 species of plants, representing 73 families; including 85 species of trees, in the Valencia area. In the forest margins and un-mined areas, a richness in tree species, with an average height of 10m-15m, was recorded. The most abundant tree species were: *Tabebuia stenocalyx, Protium guianense, Terminalia amazonia, Pentaclethra macroloba, Byrsonima spicata, Attalea maripa, Euterpe precatoria*, and*Manicaria saccifera*. While no rare, endangered or threatened plant species were found during the surveys, 36 plant species of current or potential commercial importance as ornamentals, timber, in landscaping and medicine were inventoried.

Tracks of four native mammalian species were recorded: the grey (Mazama gouazoubira) and red (*Mazama americana*) brocket deer, Southern opossum (*Didelphys marsupialis*), ocelot (*Leopardus pardalis*). A not yet identified track may be the one of an otter, with *Lontra longicaudis* seeming more likely than Lutra sp., which is of Old World origin. Armadillos (*Dasypus novemcinctus)* have been seen previously in the area. Droppings suggest the presence of domestic dogs and bats, but no domestic/feral cats. Dusk and dawn observation yielded only four insectivorous bat species. It was noteworthy that no sightings of individuals or tracks were made of rats or mice or native rodents. While rodents and bats seem underrepresented, red brocket deer population were high by Trinidad and South American standards. The results of the T&T National Wildlife Surveys (2014-2016), conducted under the National Restoration, Carbon Sequestration, Wildlife and Livelihood Project (NRCSWLP), also revealed that the density estimates for the red brocket deer were higher than similar sites in Latin America and the Caribbean. The healthy deer population might explain the presence of the predatory ocelot.

A rapid bird assessment indicated diverse forest and savannah birds, but few waterfowl. About 60 species from 32 families were heard or sighted during three mornings, a count that had not levelled off. Extrapolations from the species acquisition rate of the three mornings suggest that a species count of 90 -100 is reasonable for the area. In fact, a new species sighting was recorded on the morning of October 15, 2013: that of a Whistling Heron (*Syrigma sibilatrix*) at Turure, Sangre Grande, and made the national newspaper[2]. The species composition was typical for less settled areas and can be considered as a rich avifauna. But population levels in the successional savannah areas were lower than in similar habitats elsewhere on Trinidad.Highly insectivorous forest birds did not venture into open ground, an observation further underlining the need for unfragmented forest corridors.

The one noteworthy observation regarding the herpetofauna is the absence of insectivorous reptiles, while larger predators (e.g. caiman, snakes) and herbivores (iguana) were recorded. This correlated with reduced numbers and diversity of Diptera (flies).

[2] http://www.newsday.co.tt/features/0,191526.html

During an ichthyofaunal survey in La Seiva River, the largest river in the Valencia area, common fish were *Astyanax, Hemigrammus* and *Corynopoma*. Fish population density over a 90 m length of La Seiva watercourse was estimated at under 8 individuals of all species per square metre. Some species were seen only under flood conditions, when they are believed to migrate upstream from the lower Oropuche or could have been washed down from the upper reaches of the stream, e.g. *Odontostilbe, Curimata* and the shrimp *Palaemonetes.* This is typical for Trinidad, where re-colonisation is rapid in connected water bodies, and stresses the need for aquatic connectivity.

The Aripo Savannas represent the largest remaining natural savannah ecosystem with endemic flora in Trinidad and Tobago. As such, it takes on special significance. It is also an outstanding representation of a naturally occurring marsh formation consisting of marsh forest, palm-marsh and savannah. It provides a habitat for a number of the country's rare and threatened species of plants and animals. The Aripo Savannas is also internationally renowned for its unusual flora and vegetation communities. It is one of the more intensively studied areas of natural ecosystems in Trinidad[3].

The importance of the Aripo Savannas has long been recognized and, as early as 1934, the Long Stretch Forest, which also includes the Aripo Savannas, was proclaimed a 1,660ha Reserve in an attempt to curb illegal logging. In 1940, a total of 1,660ha of the Long Stretch and the Cumuto Reserves, including Wallerfield and the Aripo Savannas, were leased to the United States of America (USA), who constructed Fort Read, an air force base. The U.S. military constructed culverts and drainage channels, roads, runways and buildings in the Aripo Savannas. The course of the Aripo River was moved eastwards to facilitate the construction of some of these runways. Also at this time, the El Mamoo Forest became part of the Wallerfield area.

After the war the site was abandoned. It was formally returned to the Government of Trinidad & Tobago (GORTT) in 1956. In 1980, GORTT in association with the Organization of American States (OAS), developed the Systems Plan of National Parks and other Protected Areas, in which the Aripo Savannas was identified as an area to be designated as a Scientific Reserve, as it was the major remaining natural savannah in the country and supported a unique assemblage of flora. In 1980 the area was proposed as a Scientific Reserve and in 1987 the Savannahs was declared a Prohibited Area under the Forests Act. In June 2007 the Aripo Savannas Strict Nature Reserve was declared an Environmentally Sensitive Area according to the Environmentally Sensitive Areas Rules, 2001 under Sections 41, 42 and 43 of the Environmental Management Act, 2000 (EM Act). It was designated as a Strict Nature Reserve because it is one of the areas in Trinidad and Tobago with high scientific value. This designation makes the area eligible for special protection and management under the laws of Trinidad and Tobago[3].

The current 1,788 ha Aripo Savannas Strict Nature Reserve Environmentally Sensitive Area and lies in North Central Trinidad between Arima and Sangre Grande and contains 250 hectares of Savannahs. It is administered by the National Parks Section of the Forestry Division of the Ministry of Agriculture, Land and Fisheries. Its general boundaries are:

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[3] Environmental Management Authority (2007). Aripo Savannas Environmentally Sensitive Area. Literature Review to Facilitate the Preparation of Management Plans. Prepared by the Caribbean Natural Resource Institute (CANARI), Trinidad.

administered by the National Parks Section of the Forestry Division of the Ministry of Agriculture, Land and Fisheries. Its general boundaries are:

- the Valencia River, excluding a 12 hectare parcel of land with the squatter settlement of Kangalee in the north
- the Eastern Main Road in Valencia on the east
- a disused railway line on the south and
- survey control points along the Aripo River on the west

Dominant vegetation types are: open savannah, palm marsh, marsh forest, Palm Island, intermittent open water and trackside. A total of 457 plant species have been identified thus far, 38 are restricted to the Aripo Savannas with 16 to 20 being rare or threatened. At least three, but possibly as many as 15, are endemic: *Rhynchospora aripoensis* (Cyperaceae) and *Xyris grisebachii* (Xyridaceae) in the open savannah and the Trinidad podocarp (*Podocarpus trinitensis*) in the marsh forest. The distribution and status of the latter species is not known and the Aripo Savannas may be the only protected area in the country in which it is represented. A comprehensive literature review was provided by EMA (2007)[4].

Faunal lists cover 78 insects, eight amphibians, 26 reptiles, 132 birds and 25 mammals. Five resident bird species include: Rufescent Tiger-heron (*Tigrisoma lineatum*), Red-bellied macaw (*Orthopsittaca manilata*), Epaulet oriole/Moriche oriole , (*Icterus cayanensis chrysocephalus*), Sulphury flycatcher (*Tyrannopsis sulphurea*) and the Fork-tailed Palm-swift (*Tachornis squamata*). Because of the restricted nature of the ecosystems in the Aripo Savannas, some species are found only in very few similar habitats, e.g. the moriche oriole and the red-bellied macaw. There are also several mammals, fishes, reptiles, amphibians, insects and crustaceans.

The open savannas constitute discrete areas with a very distinctive community of open, low growing herbaceous vegetation on a flat plain. The low stature of the vegetation is caused by the impervious hardpan layer a few centimetres beneath the soil that prevents larger plants establishing in anything but isolated individuals. In addition, the soils on the open savanna have a very poor nutrient status. To cope with this stressful environment, plants have adopted a number of characteristics to help them survive such as trapping and eating insects and nematodes. Ninety-five (95) species of plants are found in the open savanna community, some of which are confined to the Aripo Savannas Scientific Reserve (ASSR). The most common species in the open savannas are grasses, and sedges. Other notable plants of the open savannah include the carnivorous Sundew Plant (*Drosera capillaris*) and many terrestrial orchid species, such as *Pogonia tenuis* and *Epistephium parviflorum*.

Marsh forests cover most of the land area of the ASSR. This forest grows on land that becomes waterlogged or marshy during the wet season. Species tolerating periodic waterlogging form a relatively low forest with a closed canopy. The hardpan layer found under the open savannas is also found under the marsh forest (although thinner and at greater depth) and is responsible for the flooding of the marsh forest. There are approximately 118 species of plants found in the marsh forest. Species restricted to the marsh forest in Trinidad include the Lady Slipper Orchid (*Selenipedium palmifolium*).

The palm marshes and palm islands communities are found around the fringes of the open savannas and in isolated clumps or islands in the middle of the savanna. They are dominated by the Moriche Palm

[4]EMA (2007) ibid

(*Mauritia flexuosa*) that forms evenly spaced stands with a thick understory of shrubs, e.g. *Clidemia neglecta* or *Miconia ciliata*, or tall sedges and grasses, such as *Seleria bracteata* and *Panicum parvifolium*.

The Aripo Savannas, particularly the savanna ecosystem they contain, are one of the most intensively studied areas in the neotropics. Palm marsh and marsh forest communities, as well as entire ecosystems remain under-investigated, and there are few comparative studies or long term studies. Palm marsh and marsh forest ecosystems are very limited in their range in Trinidad. On the other hand, they are well represented by very similar habitats in South America. However, Palm marsh and marsh forest communities in Trinidad represent the edge of the range for a number of mainly South American species such as the Moriche palm. This probably means that their genetic variability is valuable to the overall conservation of the species, especially in the face of possible global climate change.

The Aripo Savannas have been a very popular eco- and edu-tourism destination for a remarkably long time. One of the earliest and best known examples of an ecotourist was Charles Kingsley, (1874, cited by EMA, 2007) who recorded his 1871 visit to Trinidad and the West Indies in 'At Last: A Christmas in the West Indies'. Today, the most common forms of eco- and edu-tourism are bird watching and field trips focused on study of the unique flora and fauna. All visitors are required to obtain a permit, a system that allows the numbers and frequency of visits to be recorded and monitored. However, available data are out of date.

Many international and local scientists have studied aspects of the Savannahs. According to a literature review collated by the EMA[5], exhaustive floral and faunal lists have been compiled but relatively few life histories, phenological or ecological studies of individual species or associations have been attempted: a critical and analytical component is often lacking. So the volume of information that has been generated has not necessarily deepened our understanding of the ecological processes that underpin the unique ecosystems of the Aripo Savannas, nor have they contributed satisfactorily to improving the management of the area.

It is an oft-repeated statement that a significant area of the Aripo Savannas have been lost through environmental degradation, yet there are no studies that have attempted to quantify the degree of this degradation or to determine the exact nature and dynamics of such degradation. Circumstantial evidence, based on a comparison of aerial photographs of 1969 and 1994, indicates that the marsh forest and palm marsh in the Aripo Savannas have shown marked deterioration. Only small patches of the ecosystems appeared intact with a smooth and continuous canopy. The majority of the marsh forest and palm marsh ecosystem had broken, lower canopies, which were interpreted as fire damaged. This is believed to be the direct result of human activities. The major threats to the area are fires, quarrying, residential and agricultural squatting, and poaching. The situation is exacerbated by the absence of public education, poor governance and decision-making procedures and lack of resources to implement a now outdated management plan". These documents regularly highlight the inability of the Forestry Division "to adequately fulfil its mandate to protect the Aripo Savannas from fires, illegal human settlement, illegal entry into prohibited areas and other illegal human impacts which has led to the environmental deterioration of the Savannahs".

[5] EMS (2007) *ibid*

Mining and quarrying

The energy sector accounts for around 33.7% of the country's Gross Domestic Product (GDP) according to the Ministry of Finance, by the end of 2017. Nonetheless, this sector which commenced commercial operations in the early 20th century (MEEI, 2018) continues to support economic growth and infrastructural development in the territory. This wealth and its accompanying large scale development projects, demand for housing and other amenities contributed to a greater demand for aggregate and therefore a proliferation of quarries (both legal and illegal). To date Trinidad and Tobago does not import aggregate; therefore to meet local demand, quarrying occurs on very large scales[6]. The prime geological features are sand and gravel which are extracted.

Quarrying in the North East area started in the 1940s (Figure 1), when the United States of America (USA) required large quantities of materials for the construction of military bases on leasehold lands located at Wallerfield, Chaguaramas, and Carlsen Fields. Wallerfield lies some 3km West of Valencia. At the end of World War II, the USA Forces terminated quarrying activities in Trinidad, but national demand for aggregate materials for use in building and road construction was on the rise, as a result of the healthy economic climate.

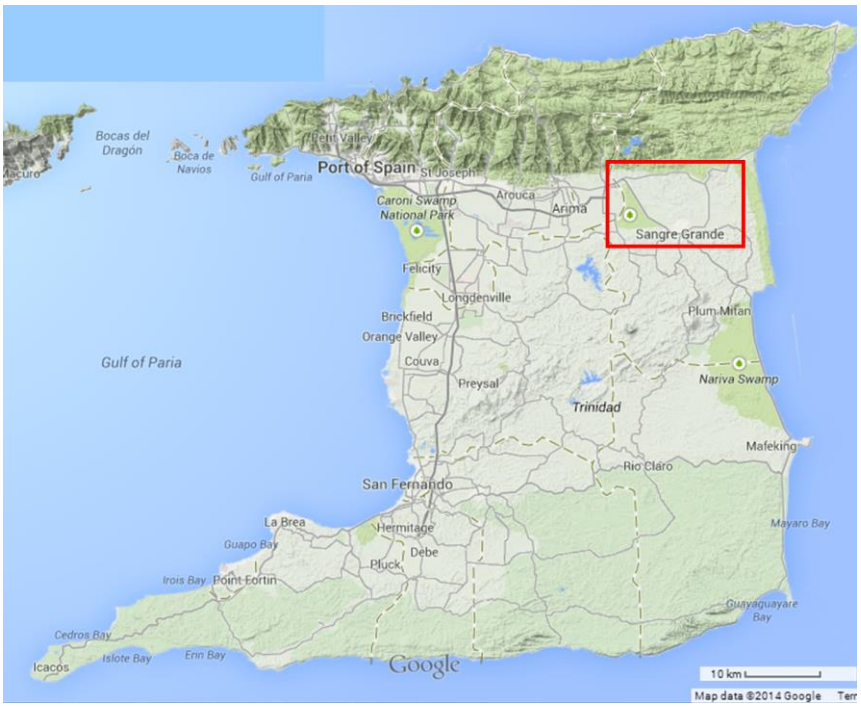


Figure 1. General location of the IWEco project area (source: Google Maps)

The Aripo Savannas comprise old alluvial terraces that consist of layers of sands, gravels and clays. Since 1961, eight quarrying licences were given for the extraction of sand and gravel. Though these licences allowed for extraction only until January 1976, operations continued beyond that date. In 1982, the Management Plan for the proposed ASESA noted that six companies were known to be operating on 162 hectares of the area with royalties being accepted by the government for the gravel on a load basis. In 1979, K.P. Quarry began operations on 40 acres in the northern part of the current Aripo Savannas, on a

[6] Singh, J.G. (2013) Quarrying in the Arima Valley Watershed. Situational Analysis for Trinidad and Tobago, Prepared for GEF – Integrating Watershed, Land and Ecosystems Management (IWEco) Project.

one-year lease. In 1996, after strong public pressure, they eventually ceased operations and left the then proposed ASESA. In the seventeen-year period of extraction, K.P. quarried approximately 150 acres of the area, subjecting it to intense excavation and wash plant activities, destroying much of the original ecology. A comparison of air photos of the Aripo Savannas taken in 1969 and 1994 showed that quarrying has disturbed approximately 2% to 5% of marsh forest and palm swamp[7].

During the years 1973-1982, in the wake of the petroleum boom, the construction sector grew at an annual rate of 9%. Recently, this sector is documented as contributing 5.5% (provisional figure) to GDP (GORTT, 2017). As of February 2015, there eighty-eight (88) active mining operations in Trinidad and Tobago, forty-two (42) of which are licensed, with the remainder forty-six (46) operating under expired licenses and are currently in the process of being re-licensed (MEEA, 2015). In addition to these sites of extraction, sixty-two (62) mineral processing facilities are also currently operating. These facilities are however operating without licenses, a challenge currently being addressed by the MEEA.

For the period 2005 to 2015 Sand and gravel mining from licenced quarry operators was marginally below 20,000,000 cubic yards (MEEA, 2015) with data still being outstanding for the latter two years.

This continued demand led to the production of highly priced, poor quality materials, widespread larceny by quarry operators and unsustainable quarrying practices. Further, encroachment by illegal operations endanger the fauna and flora of the Aripo Savannas Scientific Reserve and continue to threaten forest at Manzanilla. In 1979, the state-owned National Quarries Company Limited (NQCL) was formed with the aim to provide cost-effective, high quality aggregates for the construction industry, while considering conservation. Initially, NQCL operated with a workforce of eighty persons and had a plant capacity of 500 tonnes/hour. The company produced and sold an average of 200,000 to 250,000 cubic yards of washed aggregate (sand and gravel) per annum up to 1985.

Table 1: Private quarries in the North East area. They all produce gravel and sand (Source: Trinidad and Tobago Environmental Map)

Quarry Name	Location	License #	Acreage
Dondi Emamdee	Ravine Sable Trace, Vega de Oropouche, Sangre Grande	PQ0008	15.0
Neville Rajnauth	Oropouche Road, Valencia	SQ0018-11	22.0
Rohan Singh	Andrew Trace, Off Toco Main Road, Matura	PQ0020	4.3
Premix Concrete Ltd.	Block G, Tapana Road, Valencia	Q0005	32.5
Coosal's Construction Company Ltd., Block C	Tapana Road, Valencia	SQ0002-11	20.0
Hugh Pius Lee King	Block F, Tapana Road, Valencia	Q0003	54.1
Hugh Pius Lee King 2	Block H, Tapana Road, Valencia	Q0013	95.0
Lutchmeesingh's Transport Contractors Ltd.	Block J, Tapana Road, Valencia	Q0006	32.6
Wilson's Quarries Ltd.	Block 2, Matura	Q0011	83.4
St. Alban's Sand and Gravel Company Ltd. 2	Block 1, Matura	Q0010	132.0
St. Alban's Sand and Gravel Company Ltd.	Block D, Tapana Road, Valencia	Q0001	32.1
Dipcon Engineering Services Ltd. Block A	Block A, Tapana Road, Valencia	SQ0003-11	20.0
Thirbhawon Seegobin B3	Tapana Road, Valencia	SQ0006-11	20.0
Coosal's Construction Company Ltd., Block B	Block B, Tapana Road, Valencia	SQ0001-11	149.0
Harry Persad and Sons Ltd.	Block 6, Tapana Road, Valencia	Q0008	89.0

[7] EMA (2007) ibid

Quarry Name	Location	License #	Acreage
Hugh Glenroy Thomas 2	Oropouche Road, Turure	PQ0017	10.0
Hugh Glenroy Thomas	Block K, Tapana Road, Valencia	Q0012	33.0
Universal Projects	Tattoo Trace, Valencia	SQ0014-11	19.0
Watervis TT	Tattoo Trace, Valencia	SQ0016-11	20.0
Chang's Construction and Maintenance Company Ltd.	Tattoo Trace, Valencia	SQ0013-11	19.0
West and Associates	Tattoo Trace, Valencia	SQ0011-11	20.0
Reynold Patrong	Tattoo Trace, Valencia	SQ0009-11	20.0
KenKur Ltd.	Tattoo Trace, Valencia	SQ0010-11	20.0
Atlas Energy and Mining Corporation Ltd.	Tattoo Trace, Valencia	SQ0012-11	20.0
Trinity Asphalt Pavers	Tattoo Trace, Valencia	SQ0015-11	20.0
Zoett Enterprises Ltd.	Block 1, Plantation Road, Valencia	Q0009	103.0
Gowrie Persadsingh Contractors Ltd.	Block 2, Plantation Road, Valencia	Q0007	96.0

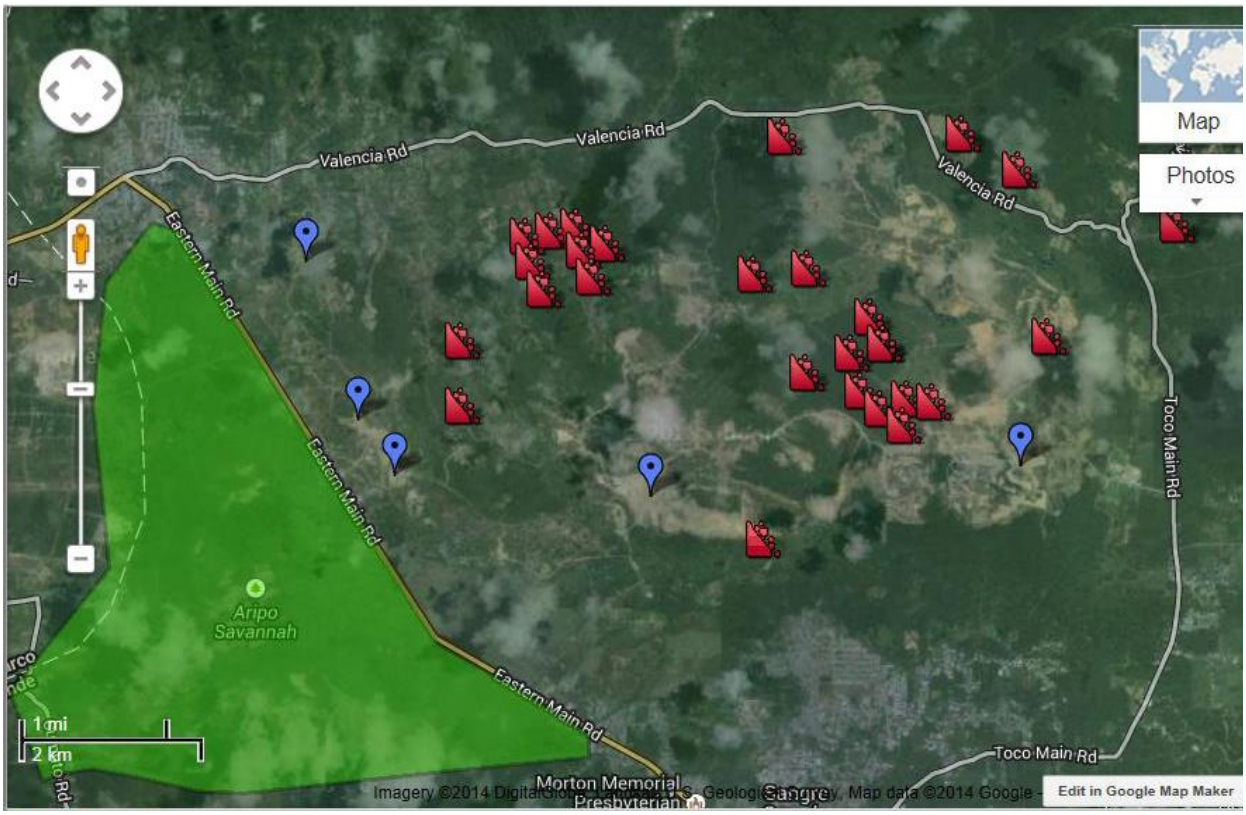


Figure 2. Registered (red flags) and non-registered (blue flags) quarry operations in the Eastern Main Road, Valencia Road and Toco Main Road triangle, bordering the Aripo Savannas to the West (Source: Trinidad and Tobago Environmental Map)

Though no statutorily approved land use plan as prescribed in the Town and Country Act, the Sangre Grande Regional Municipality, Final Draft Municipal Development Plan provides a Generalised Land Use and Committed Major Development map (Figure 3) which illustrated current and proposed land uses throughout the municipality.

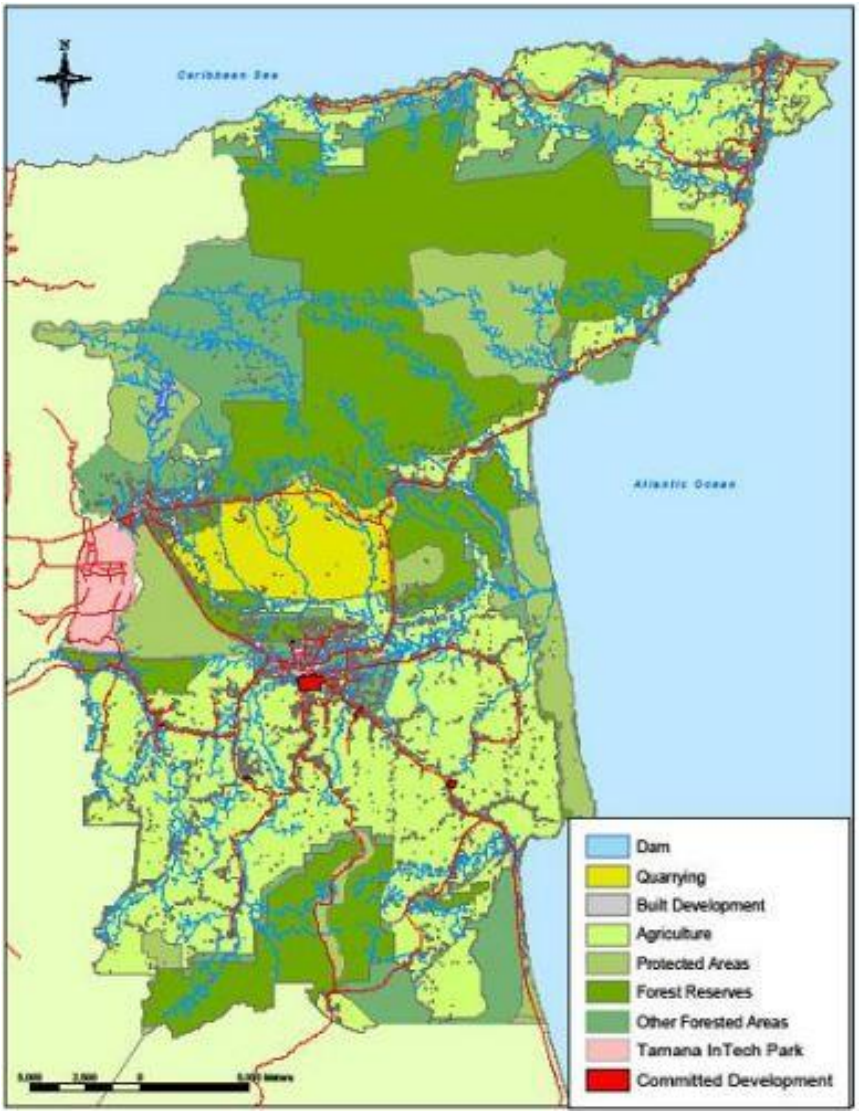


Figure 3. Generalised Land Use and Committed Major Development (Kairi Consultants Ltd, SGRC, 2010)

Extensive areas of the municipality have been designated for agricultural uses. Field reconnaissance however reveal that many of these sites including livestock farms leased from the government underutilised. Other agricultural holdings are more common north of the NQCL site along the Valencia Bypass Road. There are typically six quarries operating adjacent to the NQCL site. Unsustainable open pit mining may result in significant environmental impacts ranging from loss of traditional livelihoods as well as its impacts on various environmental components resulting in various environmental and health and safety problems (OECD, 2002).

The NQCL has recently been certified as ISO14001:2004 compliant. In preparation for certification the NQCL developed its Environmental Policy and Environmental Management System (EMS) in 2006 to ensure measurable improvements in the management of its environmental aspects. The EMS outlines measures to control emissions to air, releases to water, releases to land, and use of raw materials.

Much of the landscape has been mined or surveyed/explored with many large open pits, both active and abandoned, containing deep sediment laden pools in several areas (Figure 4). Sites that have not yet been excavated, contain clear-cut survey lines about 20m wide. Much of the original vegetation no longer exists, because of earlier harvesting for timber, capping and surveying operations, persistent mining, and forest fires to a lesser extent. Vegetation is at varying stages of regeneration at the abandoned pits, on mounds of overburden adjacent to the pits and within the surveyed and disturbed areas. It is doubtful if any extensive stands of the original vegetation exist in the area. Small isolated pockets of the remnant vegetation were found but had shown signs of disturbance either from timber harvesting or from surveys. The relatively undisturbed sites were identified by the numbers of large-diameter and tall trees (>15m), dense vegetation and relatively closed canopy.

Figure 4. Open pits in Valencia quarry area, associated erosion, siltation and loss of vegetation (Source: EMA)

Clearing of existing vegetation and top soil by bulldozers leading to loss of habitats, wildlife and plants – from exploration, capping operations and excavation of aggregates. About 65% of the area has been exploited over the past 30 years, resulting in approximately 65% of the vegetation at the site has been cleared away removing habitats for local species. Vegetation is being removed as other areas within the approved site are being exploited. On the rubble/overburden mounds adjacent to the pits, vegetation was generally sparse with fewer species than in the forest margins and dominated by grasses, sedges, vines and shrubs. The common plant species in such areas included *Clibadium* sp., *Scleria* sp., *Pueraria* sp., *Andropogon* sp., *Homolepis* sp., *Cordia* sp., and *Vismia* sp.

Water from the processing of aggregates is heavily laden with silt when it is discharged from the wash plant into silt drains. Erosion of the side of the silt drains, settling ponds and stream channels primarily by sediment laden runoff, will further contribute to stream channel erosion particularly where inadequate and/or non-functioning mine and wash plant design (i.e. closed loop systems) not being effectively employed. This scenario often results in high Total Suspended Solids (TSS) in effluent streams from the facilities far exceeding standards as prescribed in the Water Pollution Rules, 2001.

Large quantities of sediment from wash plants for example, enter directly into water courses, resulting in the creation of impoundments and raised river mouths and thus affect the hydrology of the North Oropuche and Aripo Rivers in the project area. The North Oropuche River deposits its sediment in areas

close to the breeding grounds of the West Indian manatee (*Trichechus manatus*)[8], a species designated an Environmentally Sensitive Species under the Environmentally Sensitive Species Rules, 2001.

The increased sedimentation and silt from inland operations are transported to the coastal areas via the water courses. The results are very visible in coastal areas, especially after heavy rains, as aesthetically unappealing murky waters and solid wastes (domestic and industrial garbage). It also brings with it all the associated problems, e.g. unhygienic water conditions (presence of pathogens), degradation of bathing beaches water quality, contamination of vegetables and fruit (where river water is used for irrigation), contamination of ground water and eutrophication (leading to fish kill), which are harmful to the CR-rated marine life highlighted under section 2.1.1.

Other impacts and nuisances identified by communities and users surrounding quarries are excessive noise, nuisance and dust, traffic congestion due to trucks and other heavy equipment, the deterioration of roadways by these trucks and equipment and the inability to use waterways for fishing or recreational use. Dust blown from stockpiles and vehicles is more noticeable in the dry season if sale of the stockpiles is slow. However, the EMA study concluded that most dust is contained within the NQCL property, given that processed stockpiles are 200m to 500m from the nearest boundary.

Stakeholders in the project area

Within a 10 km radius of the main concentration of quarry operations are the villages of Valencia, Damarie Hill, Guaico and the town of Sangre Grande. The major access roads in this area are the Valencia Stretch to the south of the site and the Toco Road, which passes East of the site. Quarrying (legal and illegal) operations and associated socioeconomic activities are concentrated in the triangle formed by Eastern Main Road, Valencia Road and Toco Main Road (Figure 2).

Valencia, one of the main communities in the project area has become a transport node for commuters to Sangre Grande and environs as well as well towards Toco. Valencia Junction, presents a variety of uses ranging from residential, commercial activities such as, street side cafes, bars and small shops and other conveniences. Valencia therefore offers a popular stop before the recreational areas of Valencia River, Matura River, Salybia, Balandra and Toco. Like the quarries, these small enterprises provide family income and employment for a relatively unskilled labour force. Schools and medical/health centres in Valencia employ a people with secondary education.

Valencia and Damarie Hill, a sub-community of the greater Guaico community both present ribbon type urban form though some infilling can be noted off access roads south of the Valencia Main Road and north of the Eastern Main Road respectively. In addition, both communities have relatively high number of households with Valencia possessing 2,127 units and Guaico 793 units (Kairi Consultants Ltd, SGRC, 2010) when compared to other communities in the municipalities. Regarding administrative services and social amenities in both these communities, two schools, four government offices and a sub-regional office of the Ministry of Works and Transport are sited in the area.

The town of Sangre Grande is a major commercial centre serving the northeast of Trinidad, with a population of 18,157 individuals (Kairi Consultants Ltd, SGRC, 2010). This urban centre also serves as the

[8] Water Resource Agency (2001). Integrating the Management of Watersheds and Coastal Areas in Trinidad and Tobago. Report prepared for the Ministry of the Planning and Development.

administrative centre for the municipality serving the districts of Toco/Fishing Pond, Sangre Grande North/East, Valencia, Sangre Grande North (Guaico), Cumuto/Tamana, Manzanilla, Sangre Grande South, North Oropouche, and Vega de Oropouche. With government offices, Sangre Grande and Guaico offer employment for a more skilled work force.

Various types of built development are forecasted throughout the municipality which can have some bearing of the viability and sustainability of the project. These include both ongoing and proposed squatter regularization and containment programmes in the Wallerfield and Sangre Grande proper being administered by the Land Settlement Agency. This is in addition to major infrastructural projects such as the extension of the Churchill Roosevelt Highway to the northeast to Toco and to the south to Mayaro. Of significance also is the proposed Toco Port at Mission Bay as well as a Technology Park and a station of the University of Trinidad and Tobago (UTT) in Wallerfield.

There are also plans to expand the eco-tourism activities at Aripo. There is widespread hope that these developments will bring socio-economic improvements to the area.

In 2003, the Forestry Division set up a Working Group focused on the management of the Aripo Savannas to put forward recommendations that could be implemented by the Forestry Division to properly manage the area. In 2006, the EMA contracted the Caribbean Natural Resources Institute (CANARI) to develop a comprehensive framework to guide and manage a participatory process for the development of updated management plans for the Aripo Savannas. The planning process involved a newly-created multi-stakeholder advisory body, the Aripo Savannas Stakeholders Management Committee (ASSMC), management personnel of the Forestry Division, members of the community and other critical stakeholders. The Updated Integrated Aripo Savannas Environmentally Sensitive Area Management Plans were completed in 2009. These plans outline the long term direction for the protection, development, management and use of the area's resources for a 10-15 year period. The Integrated ASESA Management Plans comprise four detailed plans, an Implementation Plan and a popular version Management Plan.

2.1.2. National policies and regulations related to quarrying in Trinidad and Tobago

While Trinidad and Tobago, at a first glance, may seem to have long standing and established legislation with respect to environmental concerns, many are outdated and not enforced. Singh (2013) also lamented a dis-harmonization of policies and legislative agendas, which tend to contribute more to confusion rather than to collusive and holistic environmental management. He highlights overlapping, conflicting and outdated legislation and guidance documents influencing quarrying in Trinidad and Tobago. Furthermore, frequently existing legislation is not enforced.

The Environmental Management (EM) Act and the National Environmental Policy (NEP) 2006 and 2017 (Final Draft) address critical environmental issues both nationally as well as those unique to communities the project area, including biodiversity management. The most recent version of the NEP though still in draft stage prescribe a series of policy objectives which are aligns itself with international conventions to which Trinidad and Tobago are party such as the 2030 Agenda for Sustainable Development (SDGs) as well as national policy as outlined in the National Spatial Development Strategy. The 2010 draft local area plans further complement these policy statement through its provision of a more focused and 'grassroots' perspective of challenges and opportunities which exist in the project area and wider municipality.
The Environmentally Sensitive Area (ESA) Rules, 2001 authorise the Authority to designate areas in Trinidad and Tobago as ESAs. Such designations are meant to conserve natural resources, protect the environment and to promote sustainable socio-economic development. Through such designations, the

EMA may establish limitations on use of the area and the type of activities to be undertaken within the selected area. Thus far, the Matura National Park (2004), Aripo Savanna Strict Nature Reserve, (2007) and Nariva Swamp Managed Resource Protected Area (2006) have been designated as ESAs, with the Aripo Savannas being closest in proximity located off the western limit of the project site.

The Environmentally Sensitive Species (ESS) Rules, 2001 provides for the EMA to designate species found in the territory that are indigenous to Trinidad and Tobago, threatened with extinction or required to be protected for the purpose of meeting international obligations with special protection. Such designations would allow the Authority to establish limitation on use and implement plans and programmes for recovery of the species. To date, the West Indian Manatee (*Trichechus manatus*) (20??), the pawi (*Pipile pipile*) (20??), the ocelot (*Leopardus paradalis*)(20??), the golden tree frog (*Phyllodytes auratus (20??)*) and the white-tailed sabrewing hummingbird (*Campylopterus ensipennis*)(20??), five species of marine turtles the Leatherback (Dermochelys coriacea), Green (Chelonia mydas), Olive Ridley (Lepidochelys olivacea), Loggerhead (Caretta caretta) and Hawksbill (Eretmochelys imbricata) in addition to the Scarlet Ibis ((Eudocimus ruber) which is also one of the national birds.

The Certificate of Environmental Clearance (CEC) Rules establish a comprehensive framework to ensure proper management of development and to safeguard the environment from degradation. These rules apply to proposed developers who are planning to undertake any one of the forty-four (44) Designated Activities listed in the CEC Designated Activities Order which cover a range of activities from agricultural to hydrocarbon exploration and production. Proponents who intend to undertake any activity which falls within the scope of the order must apply for and obtain a certificate prior to the commencement of their project. In effect, the CEC Rules are an environmental permitting process that allows developers to conduct scheduled activities under a prescribed set of conditions which pertain to mitigating the negative environmental impacts the activity may pose, parameters for monitoring of those impacts (in addition to the aspects of the project that may negatively affect the environment) as well as any other conditions that may be required to protect any specific features (biological or otherwise) of the project area.

2.1.3. Stakeholders connected to quarrying in Trinidad and Tobago:

The Ministry of Planning and Development (MPD) has responsibility for:

- coordinating stakeholder activities regarding the territory's National Strategy for Development, Vision 2030
- setting policy direction for the environmental sector
- coordinating activities of critical environmental and development policy and control regulators
- Co-ordinating and monitoring the implantation of the country's obligations to some Multi-lateral Environmental Agreements to which the country is Party.

The Ministry of Public Utilities (MPU) has responsibility for:

- the effective and efficient leadership and governance of the utility sector
- facilitate collaboration amongst agencies to ensure prudent financial management with the view of achieving financial viability

The Ministry of Housing and Urban Development (MHUD) has responsibility for:

- The formulation and execution of Government's policy in the Housing and Urban Development sector. The Ministry operates as facilitator in the implementation of those policies through various units and affiliated agencies
- Supervision of the Land Settlement Agency (LSA).

The Ministry of Agriculture, Land and Fisheries has responsibility for:

- overseeing agricultural planning and management, soil testing and research
- Supervision of the Forestry Division (FD), the Agricultural Land Administration, the Land and Surveys Division and the Commissioner of State Lands.

The Ministry of Energy and Energy Industries mandate is to

- develop the energy and energy related industries
- Monitor, control and regulate the mining of the country's minerals – oil and gas, quarry materials and asphalt by both private sector and state agencies.

The Ministry of Rural Development and Local Government, through the Municipal Corporations, has responsibility for:

- administration of the Municipal Corporations Act of 1990 and sections of the Public Health Ordinance of 1950
- execution of local infrastructural works
- disposal of municipal waste (solid and sewage)
- inspection of properties for health nuisances within their municipality
- Managing parks and other public open spaces within their municipality.

The *Environmental Management Authority (EMA)* is the statutory Authority in the country with respect to managing environmental resources under the Environmental Management Act (EM Act) Chapter 35:05. The EMA's roles are to:

- Lead the development and implementation of environmental policies, plans and strategies, particularly the National Environmental Policy (NEP) as prescribed in Section 18 of the EM Act
- initiate and support environmental-related activities
- coordinate, facilitate and oversee execution of the national environmental strategy and programmes
- promote public awareness of environmental concerns
- establish an effective regulatory regime which will protect, enhance and conserve the environment

The *Water and Sewerage Authority* (WASA) is responsible for the:

- development and maintenance of waterworks and sewerage facilities
- promote the sustainable use of the territories water resources
- Administration of the Water and Sewage Act of 1980 and sections of the Waterworks and Water Conservation Act (1980 Revision). Under the Water and Sewerage Act, WASA may define and prohibit or regulate activities in areas for the purpose of protecting any water (surface or groundwater) against pollution known as watershed protection areas.

The *Institute of Marine Affairs* (IMA) is in charge of:

- Development and implementation of an Integrated Coastal Zone Management Policy framework for Trinidad and Tobago
- the collection, analysis and dissemination of data relating to the economic, technological, environmental, social and legal developments in marine affairs
- the formulation and implementation of specific programmes/projects to achieve this objective
- Administering the Marine Areas (Preservation and Enhancement Act).

The *Forestry Division* administers several relevant laws, such as the Conservation of Wildlife Act, the Forests Act. It also is in charge of the:

- Forest Policy of Trinidad and Tobago
- National Wetlands Policy
- System of National Parks and other Protected Areas in Trinidad and Tobago, including the Aripo Savannas Environmentally Sensitive Area
- Eastern Northern Range Plan
- Tropical Forestry Action Plan for Trinidad and Tobago.

The *Town and Country Planning Division* (TCPD) is primarily charged with:

- ensuring the orderly and progressive development of land in urban and rural areas
- Development planning, development control and monitoring of development, including the preparation of development plans
- as well as informing on the direct control of physical development on land in order to ensure that development on land does not adversely affect coastal and marine areas
- Allocation of lands for communal parks, game and bird sanctuaries, protection of marine life, and preservation or protection of vegetation under a "tree preservation order".

The *Land Settlement Agency* (LSA), is responsible for:

- implementing the State Lands (Regularisation of Tenure) Act of 1998
- Administering the process of regularising the status of squatters residing on State lands prior to January 1998 and redeveloping their communities.

The *Agricultural Land Administration* unit is responsible for:

- administering and distributing state-owned agricultural lands
- The leasing process and monitors fulfilment of lease conditions.

The *Land and Surveys Division* (LSD) is responsible for:

- arranging surveys, verifying and approving surveys and ensuring valuations are carried out and executing leases of State lands

The *Commissioner of State Lands* is:

- the designated landlord of State Lands, inclusive of the sea bed in Trinidad and Tobago, and has the power to designate other agencies to manage such land under the State Lands Act (Chap. 57:01).

Civil society is involved on stakeholder committees, various NGOs, CBOs, and academic institutions. They also assists with research, monitoring, maintenance and management of edu- and ecotourism facilities, education and awareness, and livelihood development. Protected areas co-managed by civil society organisations include community groups assisting in the protection of marine turtle nesting sites which conduct patrols of sea turtle nesting beaches and assists with law-enforcement, research, monitoring and education; and the Sundew Tour-guiding Services which assist with trail maintenance and monitoring at the Aripo Savannas ESA. The University of the West Indies and NGOs such as the Buccoo Reef Trust and the Caribbean Forest Conservation Association (CFCA) have been engaged in research and provided expertise towards the management of PAs. Protected areas owned and managed by civil society organisations include parts of the Arima Valley managed by the Asa Wright Nature Centre.

Stakeholder participation has contributed to the success of PAs management in Trinidad and Tobago by providing a number of important benefits, including[9]:

- Incorporation of a wide range of perspectives and ideas, and pay attention to needs and expectations of all, resulting in improved management
- improving the knowledge and skills of all stakeholders
- increasing stakeholder buy-in through involvement in decision-making
- providing a forum for pro-actively identifying conflicts between users and negotiating solutions to them
- Contributing to stakeholder empowerment and local institutional development, especially when the sharing of management responsibility is involved.

The private sector plays an important role in the direct management of Protected Areas (PAs) in Trinidad and Tobago. Some privately owned and managed protected areas include Grafton Caledonia Wildlife Sanctuary, Asa Wright Nature Centre (AWNC), Vega de Oropouche, La Vega, Englishman's Bay Estate, Charlotteville Estate and Arnos Vale for instance. A section of the Pointe-a-Pierre Refinery is managed by the Pointe-a-Pierre Wildfowl Trust – an exemplary arrangement where conservationists (co-)manage privately owned or state owned sites.

The degree to which co-management benefits can be realised depends directly on the type and depth of the participatory process. Challenges to facilitating effective and equitable stakeholder participation in PAs management in Trinidad and Tobago include:

- insufficient education and awareness among key stakeholders and the public on the importance of PAs management in protecting the goods and services that PAs can provide
- insufficient education and awareness of the public regarding potential roles they could play in management
- the existing legal framework does not easily allow and encourage civil society participation in management and co-management of PAs. If such arrangements are to be formalised and encouraged, significant changes will be needed to the existing legislative framework;
- weak history of government agencies engaging NGOs, CBOs and the private sector in management resulting in limited opportunities and institutions for involvement of communities and civil society organisations in decision-making and management
- poor linkages between government agencies and academic research institutions to encourage research that informs management; and limited financial and human resource capacity of civil society organizations.

[9]Singh (2013) ibid

The following is the list of NGO and CBO stakeholders and anticipated roles in the project.

Table 2. Roles of lead local non-governmental and community-based organizations in support of the project.

Trinidad & Tobago	
	•
Caribbean Forest Conservation Association	• Support education and outreach activities • Provide expert advice from within its membership including expertize on suitable species of plants for use in replanting exercise • Interface between community groups and project operators
Caribbean Natural Resources Institute	• Foster co-management approaches • Promote and support participatory strategies for community groups with target areas • Facilitate community meetings • Identify strategies to benefit communities with target areas
Quarry Association of Trinidad and Tobago	• Contribute knowledge on financial considerations of rehabilitation from a quarrying industry perspective • Share mechanisms used within private sector quarrying to deal with areas quarried and with no further commercial quarrying opportunities • Contribute to discussions on any pricing adjustments of quarrying products in order to facilitate on-going rehabilitation.
Trinidad and Tobago Field Naturalist Club	• Provide support to scientific investigations • Promote tour guiding opportunities and development of other ecotourism initiatives • Support information sharing with club members and other interest groups
Trust for Sustainable Livelihoods	• Assist with identifying pragmatic approaches for sustainable livelihoods opportunities for communities within the area • Assist with building capacity within community groups • Advice on selection of appropriate species of plants for replanting exercise • Assist with replanting
IAMovement	• Assist with identifying pragmatic approaches for sustainable livelihoods opportunities for communities within the area • Assist with building capacity within community groups • Advice on selection of appropriate species of plants for replanting exercise • Assist with replanting
Fondes Amandes Community Reforestation Project (FACRP)	• Assist with identifying pragmatic approaches for sustainable livelihoods opportunities for communities within the area • Assist with building capacity within community groups

2.2Overall Objective and Outcomes

2.2.1 Objective:

The overall objective of this sub-project is a reduction in risk posed by land degradation by quarries at selected Quarry site(s) in the northeast of Trinidad through the employment of an integrated water, land and ecosystems management approach.

2.2.2. The expected outcomes are:

It is envisaged that the major two outcomes of this project will be 1) To reduce the scarring of the landscape through the implementation of appropriate rehabilitation techniques and 2) To reduce the impact on the natural and socio-economic environment through the application and adherence to

international best practice for quarry operators and improved adherence to local legislation. The major activities proposed are 1) The creation of demonstration sites for targeted rehabilitation efforts and 2) The establishment and implementation of an effective public awareness campaign to increase voluntary compliance by quarry operators and monitoring of quarries by regulatory agencies. Ultimately, these outcomes will lead to increased land cover and carbon sequestration, protect surface and groundwater resources, conserve biodiversity of global significance and create an enhanced enabling environment institutional capacity for good forest management practices.

2.3 Consistency with National and International Efforts

2.3.1 Relevant Multilateral Environmental Agreements

Any plan to address quarrying effectively must incorporate the country's requirements of the relevant Multilateral Environmental Agreements (MEAs). Trinidad and Tobago is a signatory to the following relevant MEAs and associated Protocols:

- 2030 Agenda for Sustainable Development (SDGs)
- United Nations Convention to Combat Desertification (UNCCD)
- Convention of Biological Diversity (CBD)
  - Protocol Concerning Specially Protected Areas and Wildlife in the Wider Caribbean Region
  - Protocol Concerning Pollution from Land-Based Sources and Activities in the Wider Caribbean Region
- Convention for the Protection and Development of the Marine Environment of the Wider Caribbean (Cartagena Convention)
  - Protocol concerning Cooperation in Combating Oil Spills in the Wider Caribbean
- Convention on Fishing and Conservation of the Living Resources of the High Seas
- Convention on the Continental Shelf
- Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar Convention)
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
- United Nations Convention of the Law of the Sea 1982 (UNCLOS)
  - Amendment for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10th December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks
  - Agreement relating to the Implementation of Part XI of the United Nations Convention of the Law of the Sea 1982
- International Tropical Timber Agreement
- Vienna Convention for the Protection of the Ozone Layer 1988
  - Montreal Protocol on Substances that deplete the Ozone Layer
- Basel Convention on the Control of Trans-boundary Movements of Hazardous Waste and Their Disposal
  - Ban Amendment to the Basel Convention on the Control of Trans-boundary Movements of Hazardous Waste and Their Disposal
- Stockholm Convention on Persistent Organic Pollutants
- Rotterdam Convention on the Prior Informed Consent Procedure for certain hazardous Chemicals and Pesticides in International Trade

2.3.2 The National Action Programme (NAP) to Combat Land Degradation in Trinidad and Tobago in Relation to Quarrying

The National Action Programme to Combat Land Degradation in Trinidad and Tobago (NAP) (2007) is an integrated framework for mitigating the physical, biological and socio-economic impacts of land degradation. The NAP provides a comprehensive framework for implementing the country's obligations under the United Nations Convention to Combat Desertification (UNCCD), which it acceded to on August 6, 2000. The following sections are taken from the NAP and focus on the issue of quarrying:

- *Developing Appropriate Standards and Regulations for Management of the Industry:* The Minerals Act, Chp. 61:03, governs the Minerals Sector in Trinidad and Tobago. As provided for under the said Minerals Act, the Minister is responsible for the general administration of the Act, and the Director of Minerals is responsible for the implementation of the Act. The Permanent Secretary serves as Chairman, of the Minerals Advisory Committee (MAC). The functions of the Director of Minerals as mandated in the Minerals Act, Chp. 61:03 include inter alia: Promoting and facilitating the effective and efficient management and development of mineral resources in general and the State mineral resources in particular. The Director of Minerals delegates his functions and duties to the staff of the Minerals Division as he may deem fit.

- *Establishing a Mechanism for Collaboration among Industry Stakeholders*: The task of achieving sustainable management and wise use of quarry resources falls under the Minerals Advisory Committee (MAC). This is an independent statutory committee established under the Minerals Act, Chp. 61:03, comprising the following members: Permanent Secretary of the Ministry responsible for mines (Chairman); Director of Minerals (Deputy Chairman); Commissioner of State Lands; Chief Technical Officer of the Ministry of Works and Infrastructure; A representative of the Town and Country Planning Department; Conservator of Forests; A representative of the Water and Sewage Authority; A representative of the Environmental Management Authority; A legal officer of the Ministry responsible for mines; A representative of OSHA; A technical officer representing the Tobago House of Assembly; A representative of the Ministry of Finance; and A representative of the Ministry of Health.

2.4 Activities, Outputs

Component 1: develop and foster the implementation of targeted Innovative, climate-change resilient rehabilitation approaches to integrated sustainable land and water resources management and enhanced management and maintenance of ecosystem services at selected quarry site(s).

NOTE: 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.

Activities

- 1.1.1.1Conduct (rapid) environmental assessment for selected quarry site(s) as required to support project interventions
- 1.1.2.1Develop restoration and reforestation plan for selected rehabilitation areas and regenerate

(through utilization of bioengineered techniques, replanting, soil treatment, etc.) selected areas in North East Forest Reserve (Support to Forestry Division interventions) ; including selection of trees/scrubs for restoration and reforestation (GEF Sustainable Forest Management- support to reforestation opportunities and forest livelihood)

- 1.2.1.1 Determine socio-economic benefits (including enhanced livelihood opportunities) for targeted communities resulting from project interventions (including SGP supported community projects)
- 1.2.1.2 Implement at least 2 small-scale community interventions/initiatives set up and implemented with SGP support addressing local challenges associated with water resources, sustainable land management including ecosystem impairment

Outputs

- Concerns and ideas of all key stakeholders within project area are captured
- A (rapid) environmental assessment at selected demonstration sites to inform definition of the innovative interventions.
- Restoration and reforestation at abandoned/exhausted quarry pits at National Quarries Company Limited (two pilot training and one rehabilitation site) in collaboration with the UNDP GEF SGP project's two NGOs, The Trust for Sustainable Livelihoods and IAMovement.
- Bioengineered stabilization and replanting of denuded and scarred areas at quarries in the St. Andrew County
- At least 2 small-scale community interventions/initiatives implemented in collaboration with SGP addressing local challenges associated with water resources, sustainable land management including ecosystem impairment through the GEF Small Grants Programme (training, knowledge transfer, rehabilitation champions programme)

Outcomes

- ***Measurable stress reduction at project sites through appropriate sustainable water, land and ecosystems management interventions that account for climate change.***
- ***Enhanced livelihood opportunities and socio-economic co-benefits for targeted communities from improved ecosystem services functioning for climate change.***

Sub-Component 2: Strengthen Sustainable Land Management (SLM), Integrating Water Resources Management (IWRM) and ecosystems Monitoring and Indicators frameworks in Trinidad and Tobago, particularly the Valencia area and surrounding watersheds.

Activities

- 2.1.1.1 Provide support to the Ministry of Planning and Development to develop a monitoring protocol for periodic assessment of identified environmental indicators (vegetation recovery, in particular) Provide support to the Ministry of Energy and Energy Industries and the Minerals Advisory Committee to enhance enforcement for compliance of relevant existing legislation (Minerals White Paper) within the quarrying sector at intervention sites in order to allow regular

monitoring according to the requirements of UNCCD

Outputs

- A monitoring protocol for periodic assessment of identified environmental indicators (air quality, surface water quality, vegetation recovery, in particular) at intervention sites with participatory engagement of stakeholders

Outcomes

- ***Strengthened national and regional systems for monitoring of environmental status with respect to key international agreements***

Sub-Component 3: Strengthen policy, legislative and institutional reforms and capacity building to support Sustainable Land Management (SLM), Integrating Water Resources Management (IWRM) and ecosystem services management taking into consideration climate change resilience building in Trinidad and Tobago, particularly in the North East area and surrounding watersheds.

Activities

- 3.1.1.1 Provide support to the Ministry of Energy and Energy Industries and the Minerals Advisory Committee to enhance enforcement for compliance of relevant existing legislation (Minerals White Paper; best practices hand book) within the quarrying sector
- 3.2.1.1 Provide capacity building to professionals and technical staff in relevant lead agencies, primary CSO and individual stakeholders in core technical areas related to quarry monitoring, enforcement of legislation, etc.
- 3.2.1.2 In collaboration with Ministry of Energy and relevant quarry stakeholders, update and complete draft training manual of best quarry layout, best extraction practices available, and rehabilitation techniques and produce 10 hard copies and 1 electronic version
- 3.2.1.3 Train quarry operators on site layout and extraction practices to facilitate subsequent restoration/reforestation

Outputs

- All quarries in the project area meet the legal requirements of the Environmental Management Act Chapter 35:05 including the Certificate of Environmental Clearance (CEC) Rules, Rehabilitation Plans and the Water Pollution Rules
- Cooperation/collaboration on public relations and awareness within and across organizations (e.g. NQCL, Ministries, private enterprises, AWNC, NGOs, CBOs) in Trinidad & Tobago on land degradation and watershed management, integrating SLM and ecosystems management to support mainstreaming and implementation by Year 4.
- Professionals and technical staff in relevant lead agencies, primary CSO and individual stakeholders trained by Year 4 in core project technical areas related to development and implementation of the interventions, also with a view toward future replication and mainstreaming within national frameworks

Outcomes

- ***Strengthened policy and legislation for the effective management of water, land and ecosystems resources that account for climate change***
- ***Strengthened capacity of national and regional institutions and other stakeholders for water, land, and ecosystems management, taking climate change into account.***

Component 4 Objective: To enhance knowledge exchange, promotion of best-practices, replication and expanding stakeholder involvement in Trinidad and Tobago, particularly in the project area and surrounding watersheds.

Activities

- 4.1.1.1 Increase awareness of sector stakeholders to enhance sustainability in the quarry sector (through Communications Campaigns, awareness days, promotional branded items, project and workshop banners, video clips, posters, field trips, learning exchange visits, social media, etc.)
- 4.1.2.1Facilitate the participation of project staff in major regional meetings etc. to share best practices and lessons learned & execution of relevant project management activities

Outputs

- Best practice guidelines
- Technical exchange visits (field trips to demonstration sites) between professionals, civil society organizations to share knowledge directly over the duration of the project
- Production of learning aids (videos, brochures etc.) for the sector
- Training manual of best quarry layout and extraction practices available
- Trained quarry operators on site layout and extraction practices to facilitate subsequent restoration/reforestation

Outcomes

- ***Improved information access and enhanced engagement of practitioners and other stakeholders via targeted knowledge sharing networks***

2.5 Incremental Reasoning

2.5.1 Baseline:

At present, one major, state-owned quarry, National Quarries Company Ltd. (NQCL), is operating in the project area with ISO certification. There are thirty-one (31) other quarries operating in the same area

with four (4) of them being illegal. They do not adhere to comparable standards and frequently operate without statutory approvals including a CEC. The result is loss of vegetative cover across extensive land areas, significant environmental degradation particularly of surface water resources. Habitats of vulnerable and ESS may also be compromised as a consequence of ecosystem degradation and declining environmental quality. Furthermore, aggregate trucks damage infrastructure and utilities, pose increased risk of accidents and elevate noise and dust emissions. While these challenges have long been recognized in principle, regular quantitative assessments are lacking. Solutions are not systematically shared, let alone implemented; even record-keeping and analyses in aid of decision-making leave room for improvement.

In preparation for ISO certification, NQCL developed its Environmental Policy and Environmental Management System (EMS) to ensure measurable improvements in the management of its environmental aspects. Furthermore, rehabilitation plans for exhausted pits are linked with the licenses issued by the Ministry of Energy and Energy Industries. Development, implementation and enforcement of these plans however, have not been universally adopted. Consequently, extensive areas of cleared and quarried lands remain scared and degraded. Further, several denuded pits are very noticeable from Valencia road and impacts negatively on aesthetics. Severe dust pollution in proximity to quarries from bulldozing, general equipment activity, crusher operations, and the wind blowing fine dust from the naked face of works occur in the project area.

Ecotourism and research facilities have voiced concern on the impact on the natural environment and loss of research and ecotourism potential. However, the linkages between water, land and ecosystem degradation and socio-economic impacts to tourism sector are not well documented and reported; there are no mainstreamed assessment protocols. Furthermore, there is little input by community groups, research institutions and ecotourism operators, on opportunities for improving quarry operations.

Only few data and reports on the operation and environmental quality within and around the quarry sites in the project exist and these are not collated. As a result, there is limited understanding of how investments in recovery management contributes to improved economies and sustainable livelihoods. The level of engagement and information sharing among other, competing quarries is low. Replication tends to be limited; low opportunity for learning.

Currently, decision-making beyond NQCL is not based on quantitative data. Effluent as well as air and noise emissions are not monitored regularly. The EMS outlines measures to control releases of air and waste water and the use of raw materials and could be used by smaller quarries however, ambiguity appears to exist in understand identified indicators or monitoring protocols to facilitate effective use of the EMS.

Regionally, sharing of solutions, experiences and lessons learnt is also limited. Research articles and published outputs tend to be limited in circulation to target stakeholders and may not be in most appropriate format to be considered relevant by target users. Opportunities for showcasing tools and techniques exist through conferences and meetings including UNEP's IGM, the OECS TAC, the CWWA and the CARICOM COTED.

2.5.2 Business as usual scenario:

Illegal quarries would continue to escape enforcement and prosecution. The aggregate removal in the project area alone, land degradation, with all its secondary effects, and loss of habit for rare plants and

animals would further exacerbate forest and savannah fragmentation and eventually the irreversible destruction of the ecosystem. Species, genetic resources, research and recreation opportunities, together with the associated livelihoods, would be lost. Air, water and noise pollution would continue to negatively impact human and environmental health. The project area would lose its attraction as an edu- and eco-tourism destination.

2.5.3 Incremental reasoning:

Trinidad, and the project area in particular, exhibits exception biodiversity and unique ecosystems. The project area, which is located east of the Aripo Savannas Environmentally Sensitive Area, provides unique ecosystems, rare and endemic species which provide vital ecosystem services, such as watersheds of national importance, and commercially viable mineral aggregate deposits.

The intention of the project will be to attenuate the potential impact of mining operations by involving all stakeholders particularly quarry operators, fence line communities and other grassroots organisations of the critical value of the biological and physical resources which offer critical ecosystem services and benefits such as critical potable water resources, educational, scientific opportunities in addition to recreational areas and publically accessible green spaces.

This can be achieved by reducing the risk posed by land degradation by quarries around Valencia (vegetation loss, floods, soil loss, water pollution, air pollution, denuded soils, and siltation). This will be tackled via direct interventions on the ground, as well as improved monitoring and reporting to create a scientific basis for decision- and policy-making, and by institutional strengthening and capacity-building. Local lessons learnt in Trinidad will be exchanged not only among quarries in the Valencia areas and in the Northern Range, but also with other project countries, i.e. St Kitts and Nevis, where similar problems plague Nevis, as well as SIDs world-wide, adding value to local investment. This will safeguard the unique ecosystems and the flora and fauna they contain, which are of global scientific value, representing the margins of the range for a number of mainly South American species, thereby conserving valuable genetic variability of global evolutionary importance, particularly in the face of possible global climate change.

2.5.4 Expected benefits

The project aims to restore natural vegetation, reduce sedimentation and flood risk and restore ecological functioning through quarry rehabilitation interventions at select pilot quarry sites. A minimum of 40 hectares is targeted, 20 hectares on state lands and 20 hectares through partnerships with privately owned and operated quarries. These interventions are expected to reduce the negative ecological footprint of sand and gravel pit mining through the promotion of rehabilitation interventions. These interventions are expected to be relatively low cost and low maintenance; use waste diversion streams such as tree and grass cuttings, waste hops from private sector breweries, and sargassum in site preparation.

Improved and maintained ecosystem service functioning, in turn, will create enhanced livelihood opportunities and socio-economic co-benefits for targeted communities. The national and regional systems for monitoring of environmental status with respect to key international agreements will be strengthened, thereby facilitating international comparison and exchange of experiences. This will result in improved information access and enhanced engagement of practitioners and other stakeholders via targeted knowledge sharing networks.

Integrative benefits through the GEF multi-focal area management approach - Sustainable Forest Management (SFM), Land Degradation and International Waters: Quarry operations and its impacts on the natural environment remains of critical concern to Trinidad and Tobago. SFM investments are therefore intended to target areas of most severe degradation. The project area of northeast Trinidad has been heavily impacted by quarrying over many years and there are now active efforts by the Government to take steps and implement measures aimed at reducing the extent and impacts of land degradation. Among the concerns are loss of ecological integrity and ecosystems functioning, impacts to traditional livelihoods and flood risk as a result elevated sediment discharges which far exceed prescribed standards (Ref. WPR, 2001) which reducing the hydraulic capacity of surface water channels. Widespread across the project area landscape are areas where unconsolidated spoil heaps are left exposed to weathering elements constituting a long-term erosion and sedimentation risk, rendering the area otherwise aesthetically unappealing, and reducing potential to transform the area into more productive land uses.

The strategy to be employed within the target area will include conventional forestry measures, with reforestation of mined out areas with fast-growing species to provide relatively rapid stabilization control, along with other species with commercial value to increase the potential of economic diversification for communities in the local area.

Interventions under the project will be supported by improvement in the policies that mainstream sustainable land and forest management aligned with national development frameworks so as to reduce the extent of land degradation in the country. The key outcome from investments supported by the GEF SFM contributions are in the promotion of good management practices in existing forests that are effected through enhancement of the enabling environment and uptake and up-scaling of lessons learnt in the management of land and forest resources.

2.5.5 Gender

Over the past decade, Trinidad and Tobago has made significant strides in making gender equality the core of its socioeconomic policy. The country recently ranked 44 out of 144 countries in the World Economic Forum Global Gender Gap Report 2016[10], which measures the relative gaps between men and women in the areas of health, education, economics and politics. The country's ranking is 69th in educational attainment, 51st for economic participation and 50th for political empowerment. Trinidad and Tobago's highest sub-index scores included a number-one ranking for the ratio of women who are enrolled in secondary and tertiary education and engaged in professional and technical work.

With the government of Trinidad and Tobago putting its weight behind initiatives to diversify the country's economy and advance a number of gender diversification initiatives, this presents a powerful opportunity for job-creating investments for grow. The government has recognised that sustainable development and a strong economy cannot be realised without gender equality.

The project will seek to carefully consider gender mainstreaming in the development and implementation of SLM/ecosystems management. Land degradation caused by land use changes, poor agricultural and land use practices, poor quarry management and mining operations, along with poor and/or indiscriminate waste discharges influences mid to long-term sustainable access to resources for economic development. 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

[10] http://reports.weforum.org/global-gender-gap-report-2016/rankings/

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. Gender audits and targeted analyses to ascertain derived benefits by stakeholders will be conducted, along with training that will strengthen gender-equitable access to ecosystem services, safe and adequate water, sanitation, food security and other benefits derived from project implementation.

The livelihoods component of the national project places heavy emphasis on the inclusion of women in all project activities. The Community Rehabilitation Champions Programme which is an initiative to train community persons in quarry rehabilitation interventions comprises a total of 30 community persons 24 of which are female. The group will undergo 4 months (September-December 2018) of classroom and field work sessions and 8 months of field maintenance of the 2 hectare pilot training site at National Quarries. Community members will be trained in areas such as site preparation and planting; creation of check dams and fire tracing; nursery development; top soil conservation and management; mulching and implementing vetiver as a rehabilitation intervention. The aim of this component is to develop community capability on the pilot training site for replication in the rest of sites to be identified under the project. There are currently four work groups in the field and they are all managed by women. The project site manager for one of the NGOs is female as well as the health and safety coordinator who is on site for field days. There is one differently abled person who is expected to engage in the livelihoods workshop where community members will learn to make craft items using the vetitver plant for resale under the House of Vetiver branded products.

Most of the community persons are high school educated. During the screening process for participation in the Community Rehabilitation Champions programme is was discovered that some of the potential participants experienced minor difficulty in the reading and writing aptitude tests. As a result arrangements have been made to encourage these candidates to enroll in the national Adult Literacy Tutors Association (ALTA) which provides free adult remedial writing and reading classes.

2.6 Budget and Co-finance

The total cost of the Trinidad and Tobago sub-project is **1,412,533 USD**. The GEF Grant is **643,658 USD**. The co-financing is **768,875 USD**, provided through the agencies – UNEP Car/RCU, UNDP, CARPHA, and UWI. Co-financing from the Government of Trinidad & Tobago will be negotiated at project inception.

Table 3: Sub-project 1.8 – Entire budget at activity level

COMPONENT 1. National Sub-project 1.8: Trinidad & Tobago	GEF Funding	Co-Financing	Total Project Cost
COMPONENT 1: Develop and foster the implementation of targeted Innovative, climate-change resilient approaches to integrated sustainable land and water resources	389,258	464,940	854,198

COMPONENT 1. National Sub-project 1.8: Trinidad & Tobago	GEF Funding	Co-Financing	Total Project Cost
management and enhanced management and maintenance of ecosystem services at selected quarry site(s).			
Component 1.1.: Measurable stress reduction at project sites through appropriate sustainable water, land and ecosystems management interventions that account for climate change.	151,658	337,750	489,408
Sub-component 1.1.1 : A (rapid) environmental diagnostic analysis for selected quarry sites in the project area to inform rehabilitation interventions	28,000	37,473	65,473
Activity 1.1.1.1 - Conduct (rapid) environmental diagnostic analysis for selected quarry site(s) in project area as required to support project interventions	28, 000	37,473	65,473
Sub-component 1.1.2 Restoration and reforestation at select sites in the project area	123,658	300,277	423,935
Activity 1.1.2.1 -Develop restoration and reforestation plan for selected rehabilitation areas and rehabilitate (through bioengineered techniques, replanting, soil treatment, etc.) selected areas in North East Forest Reserve and demonstration sites	123,658	300,277	423,935
Component 1.2: Enhanced livelihood opportunities and socio-economic co-benefits for targeted communities from improved ecosystem services functioning for climate change.	237,600	127,190	364,790
Sub-component 1.2.1: Opportunities for economic livelihoods analysis and related enterprise generated through GEF-SGP	237,600	127,190	364,790
Activity 1.2.1.1 - Determine socio-economic benefits for targeted communities resulting from reduced land degradation and opportunities for livelihoods	13,600	36,380	49,980
Activity 1.2.1.2 - Implement at least 2 small-scale community interventions/initiatives set up and implemented with SGP support addressing local challenges associated with water resources, sustainable land management including ecosystem impairment	224,000	90,810	314,810
COMPONENT 2: Strengthen Sustainable Land Management (SLM), Integrating Water Resources Management (IWRM) and ecosystems Monitoring and Indicators frameworks in Trinidad and Tobago, particularly in the project area	16,000	76,720	92,720
Component 2.1: Strengthened national and regional systems for monitoring of environmental status with respect to key international agreements.	16,000	76,720	92,720
Sub-component 2.1.1: Monitoring protocol for periodic assessment of identified environmental indicators (air quality, surface water quality, vegetation recovery, in particular) at intervention sites	16,000	76,720	92,720
Activity 2.1.1.1 -Provide support to MPD to develop a monitoring protocol for periodic assessment of identified environmental indicators (vegetation recovery, in particular) at intervention sites to allow regular monitoring according to the requirements of UNCCD	16,000	76,720	92,720
COMPONENT 3: Strengthen policy, legislative and institutional reforms and capacity building to support Sustainable Land Management (SLM), Integrating Water Resources Management (IWRM) and ecosystem services management taking into consideration climate change resilience building in Trinidad and Tobago, particularly the project area and surrounding watersheds.	129,000	205,170	334,170
Component 3.1: Strengthened policy and legislation for the effective management of water, land and ecosystems resources that account for climate change.	31,000	51,570	82,570
Sub-component 3.1.1: Legal requirements of the Environmental Management Act Chapter 35:05 including the Certificate of Environmental Clearance (CEC) Rules, and the Water Pollution Rules, effectively enforced in quarries in the project area	31,000	51,570	82,570
Activity 3.1.1.1 -Provide support to the Ministry of Energy and the Minerals Advisory Committee to enhance enforcement for compliance of relevant existing legislation (Minerals White Paper; best practices handbook) within the quarrying sector	31,000	51,570	82,570

COMPONENT 1. National Sub-project 1.8: Trinidad & Tobago	GEF Funding	Co-Financing	Total Project Cost
Component 3.2.: Strengthened capacity of national and regional institutions and other stakeholders for water, land, and ecosystems management, taking climate change into account.	98,000	153,600	251,600
Sub-component 3.2.1: Training programme and resources, and built capacity among professionals and technical staff in relevant lead agencies, primary CSO and individual stakeholders (in bio-engineering, erosion control, storm water and wastewater management, rehabilitation)	98,000	153,600	251,600
Activity 3.2.1.1 - Train professionals and technical staff in relevant lead agencies, primary CSO and individual stakeholders in core technical areas (e.g. bio-engineering, erosion control, storm water and wastewater management, rehabilitation)	27,000	57,070	84,070
Activity 3.2.1.2 - In collaboration with Ministry of Energy and relevant quarry stakeholders, update and complete draft training manual of best quarry layout, best extraction practices available, and rehabilitation techniques and produce 10 hard copies and 1 electronic version	48,000	39,460	87,460
Activity 3.2.1.3 - Train quarry operators on areas such as: site layout and extraction practices; rehabilitation best practices to facilitate subsequent restoration/reforestation	23,000	57,070	80,070
COMPONENT 4: Enhance knowledge exchange, promotion of best-practices, replication and expanding stakeholder involvement in Trinidad and Tobago, particularly in the project area and surrounding watersheds.	109,400	22,045	131,445
Component 4.1: Improved information access and enhanced engagement of practitioners and other stakeholders via targeted knowledge sharing networks.	109,400	22,045	131,445
Sub-component 4.1.1: Best practice guidelines / code of practices for practitioners and awareness resources for wider audiences	70,000	15,435	85,435
Activity 4.1.1.1 - Increase awareness of sector stakeholders to enhance sustainability in the quarry sector (through Communications Campaigns, awareness days, promotional branded items, project and workshop banners, video clips, posters, field trips, learning exchange visits, etc.)	70,000	15,435	85,435
Sub-component 4.1.2: Technical exchange visits between project staff, civil society organizations to share knowledge directly over the duration of the project	39,400	6,610	46,010
Activity 4.1.2.1 Facilitate the participation of project staff in major conferences andregional meetings, training opportunities to share best practices and lessons learned & execution of relevant project management activities	39,400	6,610	46,010
Sub-project Total	**643,658**	**768,875**	**1,412,533**

2.6.1 Co-financing

Table 4. Co-finance- Original

Name of Co-financier	Sources of Co-financing	Type of Co-financing	*Amount*
Government of Trinidad & Tobago*	Environmental Management Authority	In kind	0
UNEP Car/RCU	GEF Agency	In kind	210,000
UNDP	GEF Agency	In kind	35,000

CARPHA	Other Multilateral Agency	In kind	448,875
UWI	Other - University	In kind	75,000
	Total co-financing		**$768,875**

*Note: co-financing from the Government of Trinidad and Tobago will be negotiated at project inception

Table 4.1 Co-finance- Additional (Projected Estimations)*

Name of Co-financier	Sources of Co-financing	Type of Co-financing	*Amount*
Ministry of Energy and Energy Industries	Government Agency	In kind	5,000
Forestry Division- Ministry of Agriculture, Land and Marine Resources	Government Agency	In kind	5,000
Ministry of Planning and Development	Government Agency	In kind	5,000
National Quarries Co. Limited	Other- State Enterprise	In kind	60,000
SWMCOL	Other – State Enterprise	In kind	20,000
Carib Brewery	Other- Private Sector	In kind	10,000
	Total co-financing		**$105,000**

*Note : These are additional partners through in-kind support since inception of the project in August 2017. These are projected estimations for the duration of the project.

Consultants working for technical assistance in the subproject description:

Table 5. Consultants working for technical assistance in the subproject description:

Sub-project 1.8 Trinidad & Tobago	GEF($)	Co-financing (US$)	Project total (US$)
International consultants	0	0	0
Local consultants	0	0	0
Total	**0**	**0**	**0**

2.7 Project Timeline

Table 6: 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)

National Sub-project 1.8: Trinidad & Tobago	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: Develop and foster the implementation of targeted Innovative, climate-change resilient approaches to integrated sustainable land and water resources management and enhanced management and maintenance of ecosystem services at selected quarry site(s).																
Sub-component 1.1.1 : A (rapid) environmental diagnostic analysis for selected quarry sites in the project area to inform rehabilitation interventions																
Activity 1.1.1.1 - Conduct (rapid) environmental diagnostic analysis for selected quarry site(s) in project area as required to support project interventions				R												
Sub-component 1.1.2 Restoration and reforestation plan in reclamation/rehabilitation of quarry areas in the project area																
Activity 1.1.2.1 - - Develop restoration and reforestation plan for selected rehabilitation areas and rehabilitate (through bioengineered techniques, replanting, soil treatment, etc.) selected areas in North East Forest Reserve and demonstration sites			M	M /R				R				R				R
Sub-component 1.2.1: Opportunities for economic livelihoods analysis and related enterprise generated through GEF-SGP																
Activity 1.2.1.1 - Determine socio-economic benefits for targeted communities resulting from reduced land degradation and opportunities for livelihoods	W		W/ R													
Activity 1.2.1.2–Support the implementation of at least 2 small-scale community interventions/initiatives set up and implemented in collaboration with SGP addressing local challenges associated with water resources, sustainable land management including ecosystem impairment				R				R								
COMPONENT 2: Strengthen Sustainable Land Management (SLM), Integrating Water Resources Management (IWRM) and ecosystems Monitoring and Indicators frameworks in Trinidad and Tobago, particularly the project area.																
Sub-component 2.1.1: Monitoring protocol for periodic assessment of identified environmental indicators (air quality, surface water quality, vegetation recovery, in particular) at intervention sites																

National Sub-project 1.8: Trinidad & Tobago	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 2.1.1.1 - Provide support to MPD to develop a monitoring protocol for periodic assessment of identified environmental indicators (vegetation recovery, in particular) at intervention sites to allow regular monitoring according to the requirements of UNCCD								R				R				R
COMPONENT 3: Strengthen policy, legislative and institutional reforms and capacity building to support Sustainable Land Management (SLM), Integrating Water Resources Management (IWRM) and ecosystem services management taking into consideration climate change resilience building in Trinidad and Tobago, particularly the project area and surrounding watersheds.																
Sub-component 3.1.1: Legal requirements of the Environmental Management Act Chapter 35:05 including the Certificate of Environmental Clearance (CEC) Rules, and the Water Pollution Rules, effectively enforced in quarries in project area																
Activity 3.1.1.1 - Provide support to the Ministry of Energy and the Minerals Advisory Committee to enhance enforcement for compliance of relevant existing legislation (Minerals White Paper; best practices handbook) within the quarrying sector									W/ R							
Sub-component 3.2.1: Training programme and resources, and built capacity among professionals and technical staff in relevant lead agencies, primary CSO and individual stakeholders (in bio-engineering, erosion control, storm water and wastewater management, rehabilitation)																
Activity 3.2.1.1 - Train professionals and technical staff in relevant lead agencies, primary CSO and individual stakeholders in core technical areas (e.g. bio-engineering, erosion control, stormwater and wastewater management, rehabilitation)									W	R			W	R		R
Activity 3.2.1.2 - In collaboration with Ministry of Energy and relevant quarry stakeholders, update and complete draft training manual of best quarry layout, best extraction practices available, and rehabilitation techniques and produce 10 hard copies and 1 electronic version												W/ R				
Activity 3.2.1.3 - Train quarry operators on areas such as: site layout and extraction practices; rehabilitation best practices to facilitate subsequent restoration/reforestation																
COMPONENT 4: Enhance knowledge exchange, promotion of best-practices, replication and expanding stakeholder involvement in Trinidad and Tobago, particularly in the project area and surrounding watersheds.																
Sub-component 4.1.1: Best practice guidelines / code of practices for practitioners and awareness resources for wider audiences																
Activity 4.1.1.1 - Increase awareness of sector stakeholders to enhance sustainability in the quarry sector (through Communications Campaigns, awareness days, promotional branded items, project and workshop banners, video clips, posters, field trips, learning exchange visits, etc.)									R	R	R	R				

National Sub-project 1.8: Trinidad & Tobago	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 4.1.2: Technical exchange visits between project staff, civil society organizations to share knowledge directly over the duration of the project																
Activity 4.1.2.1 - Facilitate the participation of project staff in major conferences and regional meetings, training opportunities to share best practices and lessons learned & execution of relevant project management activities								W				W			W	

2.8 Risk Analysis

Risk	Rating	Risk management strategy
Some groups may not be supportive of project and might be disruptive	high	Deployment of consultative and participatory processes
Planted biomass is negligible for carbon accounting purposes	high	Risk acceptance: any amount of carbon constitutes an opportunities for carbon accounting training and institutional capacity building
Climate change variability: major natural disaster (such as hurricane, floods) strikes; severe earthquake.	medium	While this risk cannot be prevented, the implemented solutions will be used to prove their cost-effectiveness so that they will be widely regarded worth maintaining by project end.
Frameworks for monitoring and other established systems are not maintained as a result of resource commitment or because they exceed national level capabilities for long-term support	medium	With the above proof of cost-effectiveness and active engagement of the private quarrying sector sustainable long-term support is expected to be generated
Shifting government priorities resulting in diminished investment and promotion post-project	medium	
Capacity limitations within targeted communities	medium	Capacity within communities will be built during project

2.9 Sustainability

Project sustainability will be achieved through different avenues. The project will endeavour to build on the ongoing efforts to promote sustainable quarry practices in the country. The EMA will assume a lead role in creating a multi-stakeholder forum through the auspices of the project that will ultimately work towards main streaming aggregate mining/quarrying best practices within the overall natural resources management framework. This will be developed through the promotion of innovate tools and methods, along with the supportive policy frameworks that will encourage adoption of best practices by quarry operators.

Capacity-building activities in sustainable land and ecosystem management will help build the necessary knowledge foundation and expertise to continue to further develop, refine and apply corresponding regulatory frameworks and environmental management tools around improved quarry management. This will be supported by strengthening capacity in eenvironmental assessment and permitting, monitoring, enforcement and meaningful stakeholder engagement. Through the project's replication strategy, findings, including lessons learned, and the tools and methodologies developed and applied, will be

disseminated to other projects, programs and areas in the country. Lessons will be propagated through the EMA's website and the knowledge management portal of the wider project and other global knowledge networks.

At the community level, enhancing the livelihoods of local beneficiary communities through improved land productivity as a result of the restorative actions is a key priority. The project, through the GEF Small Grants Programme will seek out opportunities that emerge out of the project interventions to foster Local Economic Development (LED) and support ancillary economic activities. The creation of sustainable enterprises capable of improving ecosystems services brought about by the project, will strengthen long-term prospects for replication and enhance sustainability at the national level.

Multi-stakeholder participation, inclusive of private sector groups and NGOs in project activities, as well as in the dissemination of information about project findings and lessons learnt will have a multiplier effect and will contribute to sustainability.

2.10 Replicability

Interventions proposed represent an initial step for the sustainable replication and adoption of key lessons learnt during the predecessor GEF-IWCAM Project, particularly drawing on the experiences of rehabilitation within the Courland Watershed, Tobago from which land degradation continues to compromise the ecological services offered by the Buccoo Reef Complex. In addition to Tobago, the GEF-IWCAM piloted reversal of land degradation, water security, and pollution control projects in several Caribbean SIDs. Lessons learnt from this project are now proposed for replication in and adaptation to the conditions within the project area with a view to advance best practices in minimizing acute land degradation associated with poor quarry operations and demonstrate how the practice can be sustainably undertaken with reduced adverse environmental impact.

A suite of IW, LD and BD-related indicators of process, stress reduction, and environmental and socioeconomic status will be identified and strengthened under the project, and a protocol to monitoring them will be developed. This will be extended to the national level for the improved broader management of land/ecosystems and water resources in association with sustainable quarry management. The Government of Trinidad and Tobago has been making recent significant investments in improved quarry management and this sub-project will augment these efforts.

Participation by relevant professionals and practitioners in major relevant conferences will facilitate the promotion and enhance replication opportunities of tested technologies and adaptation protocols.

2.11 Execution Arrangements

The national sub-project will be implemented over a period of four years. The National Executing Agency (NEA) for the project will be the Environmental Management Authority (EMA). A dedicated Project Management Unit (PMU) will be established within the agency and will be directly responsible for the timely delivery of inputs and outputs and for coordination with all other relevant agencies through the PMU.

The NEA will execute its functions under the guidance of the lead Executing Agency, UNEP Caribbean Regional Coordinating Unit (Car/RCU) with technical back-stopping from the Environmental Health and

Sustainable Development Department of the Caribbean Public Health Agency (CARPHA). The Project Management Unit (PMU) within the EMA will coordinate the execution of the project, which will be headed by a Project Coordinator (PC), who will be hired by the EMA specifically for its duration. He/she will be directly responsible for the project execution including day to day operations guided by approved work plans. The PC will work under the direction of the Senior Project Manager of the EMA.

The PMU will have overall responsibility for project management, administrative, technical and financial reporting in collaboration with the GEF-Implementing Agency (UNEP) and will be responsible for achievement of the objectives and outputs of the project. The PMU will manage the selection process for all local contracts and recruitment of local consultants. This will include preparation of TOR, call for bids and organization of the selection process. This will all be done in close coordination with GEF-Implementing Agency (UNEP) but the contracts will be awarded by the EMA.

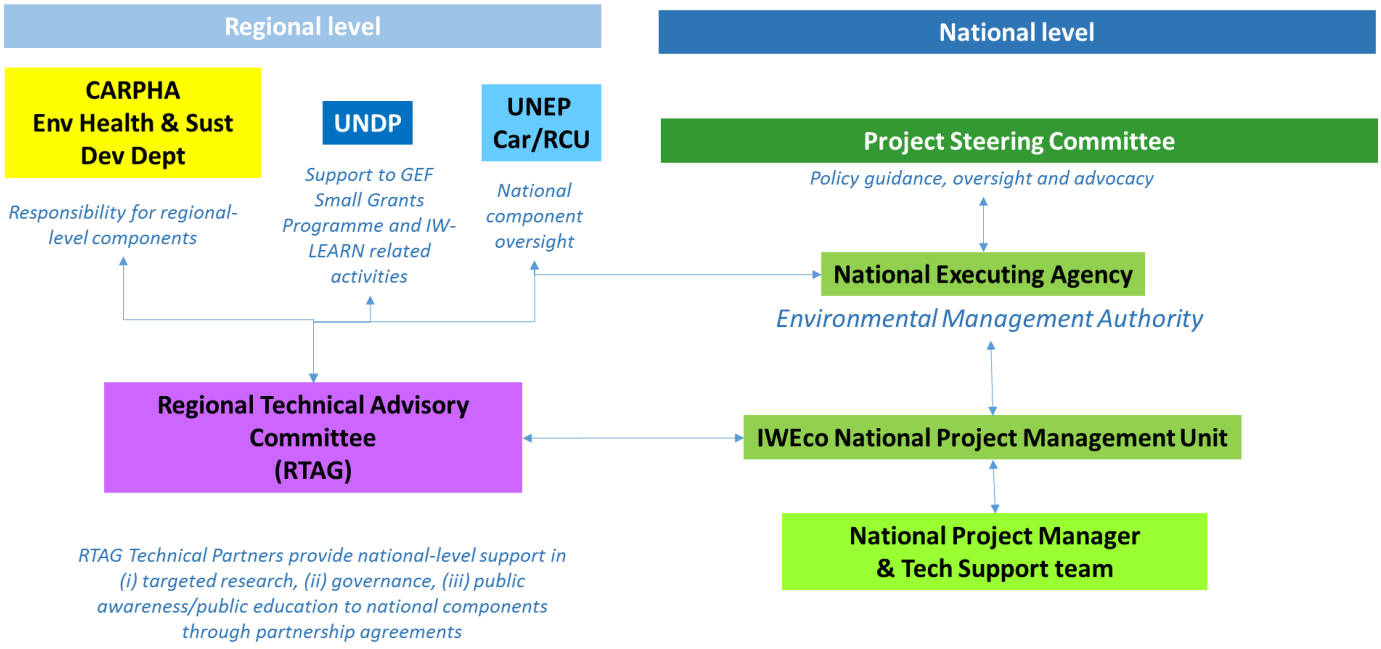
The project will receive high-level policy support and technical guidance through a Project Steering Committee (PSC) that will be constituted and responsible for policy input, functional guidance, and overall coordination of the project, and will meet every three months or as often as deemed necessary. The Project Coordinator shall be the Secretary of the Committee, which will be chaired by the Senior Project Manager of the EMA.

The PSC will be defined at project inception but will be composed of the representatives from the following front-line state ministries, agencies and statutory entities:

- Ministry of the Planning and Development
- Ministry of Rural Development and Local Government.
- Ministry of Works and Transport.
- Ministry of Energy and Energy Industries
- Ministry of Agriculture, Land and Fisheries
- Sangre Grande Regional Corporation
- Forestry Division
- Water and Sewerage Authority
- Water Resources Agency
- Land Settlement Agency
- Commissioner of State Lands
- Town & Country Planning Division

The project implementation progress and achievements will be reviewed by the EMA Board of Directors who will provide further policy guidance, and facilitate processes for establishing linkages and mainstreaming with International commitments such as the 2030 Agenda for Sustainable Development (SDGs) as well as local policy such as, the National Spatial Development Strategy.

Mechanisms will be developed to ensure that the project receives the maximum level of recognition, commitment, support and involvement at the highest level of Government. Agreements will be made between co-financing and partner institutions to ensure full commitment and assure that the objectives of the project are met.



2.12 Communications and Dissemination Mechanisms

Public awareness and communication are an integral part of this project, particularly as gaining buy-in from the national and fence-line communities in particular, of the significance of the project to the sustainable development of the territory. To this end, the communications outreach of the EMA the project will be disseminated to a wide cross-section of audiences and stakeholders to bring awareness of the potential ecosystem services and benefits, in addition to highlighting the consequences of unsustainable quarry practices on this vulnerable area. The project will further seek to promote the application of tools and methodologies, share information on project activities related to best practices in quarry operations relative or erosion control, water pollution mitigation and conservation of sensitive ecosystems. Also important, is the projects focus on raising awareness of the potential socioeconomic benefits through the facilitation of LED through participation in project interventions.

The on-site rehabilitation and restoration investments will be used to demonstrate and raise awareness among practitioners, decision-makers and other stakeholders of options and opportunities for improving quarry operations in the context of sustainable land management and for strengthening the conservation and the management of the region's ecosystems. This will include the development of public awareness information and education materials directed at local stakeholders focusing on methods for 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 project components;
- Reporting to key government agencies and bodies about sub-project achievements and lessons learned;

- Public availability of project deliverables including maps, briefings, and training manuals, among others;
- Stakeholder meetings, particularly for updates on pilot demonstrations and presentations on deliverables once completed;
- Participation of project staff and partners in national, regional and international fora to learn of best practices and share local experiences gained through the project.

2.13 Monitoring and Evaluation (M&E)

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

Sub-project start-up: An Inception Workshop will be held within the first 3 months of the establishment of the National Project Management/Coordinating Unit involving those with assigned roles in the overall project organization structure, UNEP, Regional Project Coordinating Unit, CARPHA and where appropriate/feasible regional partners, national advisors as well as other national and local stakeholders. The Inception Workshop is crucial to building ownership for the project and commitment to achieving project results and to plan the first year annual work plan.

The following are the key areas to be addressed in the Inception Workshop:

- Provide clear understanding amongst all partners of the project and create ownership of the sub-project.
- Detail the roles, support services and complementary responsibilities of UNEP Car/RCU, PCU, and CARPHA vis à vis the project team.
- Provide guidance on the roles, functions, and responsibilities within the sub-project's decision-making structures, including reporting and communication lines, and conflict resolution mechanisms.
- Review the sub-project staff Terms of Reference as appropriate.
- Finalize the first annual work plan based on the project results framework and the relevant GEF Tracking Tool. Review and agree on the indicators, targets and their means of verification, and recheck assumptions and risks.
- Provide a detailed overview of reporting, monitoring and evaluation (M&E) requirements. The Monitoring and Evaluation work plan and budget should be agreed upon.
- Discuss financial reporting procedures and obligations, and arrangements for annual audit.
- Plan and schedule National Project Steering Committee meetings.

The first National Project Steering Committee meeting should be held within the first 6 months following the Sub-Project 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.

Sub-project monitoring of implementation progress will be undertaken by the National Project Implementation Unit (NPIU) through the provision of quarterly reports. The reports are the responsibility of the National Project Coordinator, and will be developed with the close support of the PCU and RPC. Progress reports will be submitted to the PCU for onward submission to the PSC for review and reflection

on challenges and opportunities. These reports will be the principle tools of regular project monitoring, form the basis for adaptive management. Each report will minimally contain:

- An account of implementation activities undertaken during the reporting period, and an update and assessment of progress against the implementation plan;
- Identification of (known and/or new) barriers to project implementation and corresponding recommendations for corrective actions during the following period (including revisions to the implementation plan, as necessary);
- A detailed and costed work plan for the subsequent reporting period, including status of funds held locally and, when necessary, a request for further cash transfers to the sub-project;
- An updated inventory of non-expendable equipment and items procured for the project; and
- Copies of project meeting reports or minutes and participant lists, as well as other technical outputs submitted to the project PCU.

The monitoring information will then be compiled and submitted as part of the reporting for the project, and integrated in the periodic reporting by the executing agencies to the PCU. The collection of information at the national and regional levels will be part of the project's knowledge management efforts.

Periodic Monitoring through site visits: UNEP/DEPI Task Manager and the UNEP Car/RCU will conduct visits to sub-project sites based on the agreed schedule in the sub-project's Inception Report/Annual Work Plan to assess first hand project progress. Other members of the NPSC may also join these visits. A Field Visit Report will be prepared by the Task Manager and UNEP Car/RCU and will be circulated no less than one month after the visit to the sub-project team and NPSC members.

Mid-term Evaluation of sub-project cycle: The sub-project will undergo an independent Mid-Term Evaluation at the mid-point of sub-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 sub-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 sub-project document. The Terms of Reference for this Mid-term evaluation will be prepared by the UNEP based on guidance from the Regional Coordinating Unit. The relevant GEF Focal Area Tracking Tools will also be completed during the mid-term evaluation cycle.

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

During the last three months, the sub-project team will prepare the Sub-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 sub-project's results.

Learning and knowledge sharing: Results from the sub-project will be disseminated within and beyond the project intervention zone through existing information sharing networks and forums. The sub-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, analyse, 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 sub-project and other projects of a similar focus.

Table 7: Monitoring and Evaluation Matrix for Sub-project 1.8

Sub-Project 1.8: ***Reduce and reverse land degradation at selected Quarry site(s) around the North East area by an integrated water, land and ecosystems management approach, Trinidad***				
Project Outputs	**Description of indicator**	**Baseline level**	**Mid-term targets**	**End-of-project targets**
Sub-Component 1 Objective: To develop and foster the implementation of targeted innovative, climate-change resilient approaches to integrated sustainable land and water resources management and enhanced management and maintenance of ecosystem services at selected quarry site(s) in the project area				
Sub-component 1.1.1 : A (rapid) water and land-related diagnostic analysis (using a community participatory approach) for the project area and surrounding watersheds conducted to inform definition of the innovative interventions (based as appropriate on the outputs and lesson learnt of the GEF-IWCAM project and other relevant interventions).	• Comprehensive report on all impacts and concerns such as increased vegetative cover, improved water quality at outfall points, increased presence of wildlife (tracks, droppings, camera traps) increased local employment.	• Input by community groups, research institutions and ecotourism operators, on opportunities for improving operations of quarries • Low levels of engagement and information sharing among operating quarries. • Project designed based on expert knowledge and in some cases baseline information to match technology options may not be available. Additional data requirements include inter-alia surface and groundwater hydrology -hydrogeological characterization, ambient water quality; species richness and diversity in target areas, social acceptance of technology options; economic/financial feasibility.	• Planning consultations - inputs from community groups, research organizations, agriculturists to guide project inception • Consultative report with recommendations	• Information forms basis for detailed project implementation plan over project life • Analysis guides project implementation
Sub-component 1.1.2 Restoration and reforestation plan and investments in	• Restoration and reforestation plan produced	• Rehabilitation plans exist within licenses issued by the Ministry	• Approved restoration and rehabilitation plan • At least 20 hectares restored/reforested	• Restoration and rehabilitation plan used to guide and monitor their

Sub-Project 1.8: ***Reduce and reverse land degradation at selected Quarry site(s) around the North East area by an integrated water, land and ecosystems management approach, Trinidad***				
Project Outputs	**Description of indicator**	**Baseline level**	**Mid-term targets**	**End-of-project targets**
reclamation/rehabilitation of quarry areas in the project area	• Area of reforestation and restoration (hectares) • visible signs of surface erosion – rill and gully erosion	of Energy and Energy Industries • Large areas of cleared and quarried lands within quarries left exposed. The majority of these lands are unproductive and undergoing heavy erosion. • Several denuded pits are very noticeable from Valencia road and impacts negatively on aesthetics. • Inefficient control of storm water runoff from rivers leading to high sediment and suspended solids loading into the Valencia, La Seiva and Quare Rivers	• At least 20% reduction in visible evidence of sheet, rill and gully erosion at remediation sites	implementation in quarries around Valencia • At least 40 hectares restored/reforested • At least 50% reduction in visible evidence of sheet, rill and gully erosion at remediation sites.
Sub-component 1.2.1: Opportunities for economic livelihoods analysis and related enterprise generated through GEF-SGP	• SGP project launch and successfully implemented • Estimated annual revenues (US$/yr) (disaggregated by gender and socio-economic group) • number of new enterprises (disaggregated by gender and socio-economic group)	• Community-based investments in natural resources management remains relatively low - keyed and few in number in consideration of the potential that exists; limited capacity within community groups to tap into resources	• Consultations and adopted proposal for a community-based small-scale initiative and commencement of implementation	• At least two community-based investment that is integrated within the national project with focus on livelihood-building.
Sub-Component 2 Objective: To strengthen Sustainable Land Management (SLM), Integrating Water Resources Management (IWRM) and ecosystems Monitoring and Indicators frameworks in Trinidad and Tobago, particularly the project area and surrounding watersheds				
Sub-component 2.1.1: Monitoring protocol for periodic assessment of identified environmental indicators (vegetation recovery, in particular) at intervention sites with participatory engagement of stakeholders	• All existing data collated and assessed • Monitoring protocol & instrumentation installed	• Little data and reports on the operation and environmental quality within and around the quarry sites beyond NQCL exist and these are not collated. • lack of or slow rate of progress toward integration or mainstreaming indicators within formal national reporting frameworks • environmental indicators generally not applied along with conventional socio-economic	• Compilation report on environmental condition at quarry sites in project area based on available information. Gaps in data/information identified • All indicators for project monitoring adopted (SDG 6.6.1 and SDG 15.3 and SDG 15.3.1) (identified based on UNCCD Convention reporting requirements and GEF Tracking Tools) • Project monitoring framework (including appropriate instrumentation) installed	• Gaps in data and information largely filled • Successful reporting on project achievements based on indicators framework and deployment of monitoring system • Suite of accurate data generated

Sub-Project 1.8: ***Reduce and reverse land degradation at selected Quarry site(s) around the North East area by an integrated water, land and ecosystems management approach, Trinidad***				
Project Outputs	**Description of indicator**	**Baseline level**	**Mid-term targets**	**End-of-project targets**
		developmental indicators • Monitoring protocols beyond NQCL are generally weak or non-existent; difficult to make periodic baseline assessments • lack or poor level of knowledge to support decision-making	• Suite of accurate data generated • core stakeholders trained on application of framework	
Sub-Component 3 Objective: To strengthen policy, legislative and institutional reforms and capacity building to support Sustainable Land Management (SLM), Integrating Water Resources Management (IWRM) and ecosystem services management taking into consideration climate change resilience building in Trinidad and Tobago, particularly the project area and surrounding watersheds.				
Sub-component 3.1.1: Legal requirements of the Environmental Management Act Chapter 35:05 including the Certificate of Environmental Clearance (CEC) Rules, and the Water Pollution Rules, effectively enforced in quarries in the project area	• Environmental Conditions for quarries mandated by the EMA enforced	• Some quarries operate with requirements from the EMA through CECs and Water Registration Certificates. Some quarries not subject to EMA controls. Conditions sets by the EMA not satisfactorily enforced.	• At least 10% of quarries operate within EMA compliance framework	• At least 20% of quarries within the project area meet compliance requirements under the EMA legislation/regulation
Sub-component 3.2.1: Training programme and resources, and built capacity among professionals and technical staff in relevant lead agencies, primary CSO and individual stakeholders (in bio-engineering, erosion control, storm water and wastewater management, rehabilitation)	• Number of training activities convened; • number of persons trained (disaggregated by gender and socio-economic status) • Best quarry management manual produced to international standards and available for training • Training events held; level of attendance	• Not enough trained personnel in key agencies; private sector and communities not sufficiently engaged and informed. • NQCL has recently been certified as ISO14001:2004 compliant • No training given; no guidelines (e.g. best practice manual) for good practices available	• At least 30% of core target audiences are trained in the tools, techniques and technologies advanced • at least 1 national technical workshop convened. • Best quarry management manual produced to international standards and available for training • At least 30% of selected quarry operators trained	• At least 60% of core target audiences are trained in the tools, techniques and technologies advanced • at least 2 national technical workshops convened • Best quarry management manual applied for work within project and at national level • At least 50% of selected quarry operators trained by end of year 4
Sub-Component 4 Objective: To enhance knowledge exchange, promotion of best-practices, replication and expanding stakeholder involvement in Trinidad and Tobago, particularly the project area and surrounding watersheds				
Sub-component 4.1.1: Best practice guidelines / code of practices for practitioners and awareness resources for wider audiences	• Approved/endorsed guidelines by target users • Country visits	• Limited formal capture of workable methods, tools and techniques • land, water and ecosystems management guidelines are not currently integrated within physical planning and development protocols	• At least 1 best practice guideline published in various media formats and used by stakeholders sedimentation ponds use in quarries, rapid assessment environmental monitoring for quarries, land/soil restoration/conservation measures).	• At least 2 best practice guidelines published. • At least 2 technical exchanges within the Caribbean and 2 between other SIDS regions

Sub-Project 1.8: ***Reduce and reverse land degradation at selected Quarry site(s) around the North East area by an integrated water, land and ecosystems management approach, Trinidad***				
Project Outputs	**Description of indicator**	**Baseline level**	**Mid-term targets**	**End-of-project targets**
		• Routine technical exchanges amongst practitioners tends to be limited due to financing constraints	• At least 1 technical exchange between countries within the Caribbean • At least 1 technical exchange between other SIDS regions (target a maximum of 5 persons to participate)	
Sub-component 4.1.2: Technical exchange visits between professionals, civil society organizations to share knowledge directly over the duration of the project	• Participation and major conference events • Publications and media products widely disseminated	• Opportunities for showcasing tools and techniques exist through conferences and meetings including UNEP's IGM, the OECS TAC, the CWWA and the CARICOM COTED • Research articles and published outputs tend to be limited in circulation to target stakeholders and may not be in most appropriate format to be considered relevant	• Core stakeholders participate in at least 1 major event to present findings from national project (target max of 5 persons to attend such events)	• Stakeholders participate in total of at least 2 major events to present findings from national project.

3 PROJECT ANNEXES

Annex 3.1: Logical Framework and Objectively Verifiable Impact Indicators

Goal: Reduce and revert land degradation at selected Quarry site(s) in the North East area by an integrated water, land and ecosystems management approach					
Results Level	**Indicator**	**Baseline**	**Target**	**Sources of verification**	**Risks and Assumptions**
Sub-Component 1 Objective: To develop and foster the implementation of targeted innovative, climate-change resilient approaches to integrated sustainable land and water resources management and enhanced management and maintenance of ecosystem services at selected quarry site(s) in project area					
Outcome C1.1 Measurable stress reduction at project sites through appropriate sustainable water, land and ecosystems management interventions that account for climate change.	(**i**) Movement toward a favourable change in status in the condition of vegetative cover in the project area as evidenced by scientific observation and tracking. (**ii**) interventions successfully demonstrate stress reduction and replication is taking place based on lessons learnt	(**i**) Limited use of targeted interventions to prove measurable benefits; critical areas where land and water and/or biodiversity degradation is occurring are not being addressed (**ii**) assessments are very sporadic - cannot assess change over time; (**iii**) information tends not to be analysed; (**iv**) reports generated are not shared - info lost; (**v**) limited capacity to utilize information - data is sometimes not used to make decisions - data is not available so hampers use in decision-making	**(i**) interventions in land degradation control over 40 hectares triggers improved practices in quarry management and restoration in the project area that is basis for replication and up-scaling	(**i**) internal agency reports; (**ii**) national reporting to conventions and other international and regional frameworks; (**iii**) project reports	**Risks:** (i) frameworks for monitoring are established that exceed national level capabilities for long-term support; (ii) established systems are not maintained as a result of resource commitment **Assumptions:** governments and quarrying sector will continue commitment and investments in monitoring systems; (ii) stakeholders will recognize and value benefits of monitoring systems and will contribute towards maintenance of such systems; (iii) results/information from monitoring systems will be effectively communicated toward effecting meaningful change in practice; (iv) design of systems will be sensitive to capacities of stakeholder agencies to mainstream systems;
Sub-component 1.1.1 : A (rapid) diagnostic environmental analysis for the project area and surrounding watersheds	• Comprehensive report on all impacts and concerns as well as ideas for solutions.	• Little input by community groups, research institutions and ecotourism operators, on opportunities for improving operations of quarries • Low levels of engagement and information sharing among operating quarries. • Project designed based on expert knowledge and in some cases baseline information to match technology options may not be	**Mid-term** • Planning consultations - inputs from community groups, research organizations, ecotourism enterprises, agriculturists to guide project inception • Consultative report with recommendations • Technical and economic feasibility analysis and recommendations	(**i**) Consultation report; (**ii**) Feasibility Analysis Reports of project; (**iii**) project reports	

Goal: Reduce and revert land degradation at selected Quarry site(s) in the North East area by an integrated water, land and ecosystems management approach					
Results Level	**Indicator**	**Baseline**	**Target**	**Sources of verification**	**Risks and Assumptions**
		available. Additional data requirements include inter-alia species richness and diversity in target areas, social acceptance of technology options; economic/financial feasibility.	**End of project** • Information forms basis for detailed project implementation plan over project life • Analysis guides project implementation		
Sub-component 1.1.2 Restoration and reforestation plan and investments in reclamation/rehabilitation of quarry areas in the project area	• Restoration and reforestation plan produced • Area of reforestation and restoration (hectares) • visible signs of surface erosion – rill and gully erosion	• Rehabilitation plans exist within licenses issued by the Ministry of Energy and Energy Industries • Large areas of cleared and quarried lands within quarries left exposed. The majority of these lands are unproductive and undergoing heavy erosion. • Several denuded pits are very noticeable from Valencia road and impacts negatively on aesthetics.	**Mid-term** • Approved restoration and rehabilitation plan • At least 20 hectares restored/reforested • At least 20% reduction in visible evidence of sheet, rill and gully erosion at remediation sites **End of project** • Restoration and rehabilitation plan used to guide and monitor their implementation in quarries in the project area • At least 40 hectares restored/reforested • At least 50% reduction in visible evidence of sheet, rill and gully erosion at remediation sites.	(**i**) Restoration and reforestation plan document; (**ii**) scientific/technical assessment reports; (**iii**) project reports; EMA and partner agency reports; (**iv**) media releases	
Outcome C1.2 Enhanced livelihood opportunities and socio-economic co-benefits for targeted communities from improved ecosystem services functioning for climate change.	(**i**) Communities are engaged in elements of project implementation; (**ii**) INRM practices involving community groups strengthen livelihood opportunities within the quarrying	(**i**) Relatively low engagement of community groups and CSOs in active natural resources management; low local awareness of assets; (**ii**) Limited understanding of how investments in recovery management contributes to improved economies and sustainable livelihoods.	(**i**) Successfully implemented 2 small grants community-based projects ; (**ii**) Positive change in the communities in the project area in the socio-economic (including health) status of communities under project influence based on socio-economic indicators;	(**i**) SGP implementation reviews; (**ii**) national grantee reporting;(**iii**) national planning and development reporting; (**iv**) national reporting to conventions and other international and regional frameworks	**Risks:** (i) challenges related to capacity limitations within targeted communities; (ii) low level of buy-in amongst targeted interest groups within communities; (iii) lack of support by local counterpart state agencies

Goal: Reduce and revert land degradation at selected Quarry site(s) in the North East area by an integrated water, land and ecosystems management approach					
Results Level	**Indicator**	**Baseline**	**Target**	**Sources of verification**	**Risks and Assumptions**
	sector; (**iii**) Evidence of income generation and/or economic benefits (for community, private sector) beyond the direct investments of the project		(**iii**) good knowledge of economic dimension of resource use - valuation of ecosystem services		**Assumptions:** (i) communities are motivated and perceive livelihood and other benefits; (ii) continued support by local agencies post-project; (iii) lessons learnt and positive experiences are built on for replication

Goal: Reduce and revert land degradation at selected Quarry site(s) in the North East area by an integrated water, land and ecosystems management approach					
Results Level	**Indicator**	**Baseline**	**Target**	**Sources of verification**	**Risks and Assumptions**
Sub-component 1.2.1: Opportunities for economic livelihoods analysis and related enterprise generated through GEF-SGP	• SGP project launch and successfully implemented • Estimated annual revenues (US$/yr) (disaggregated by gender and socio-economic group) • number of new enterprises (disaggregated by gender and socio-economic group)	• Community-based investments in natural resources management remains relatively low -keyed and few in number in consideration of the potential that exists; limited capacity within community groups to tap into resources	**Mid-term** • Consultations and adopted proposal for a community-based small-scale initiative and commencement of implementation • At least 10% Increase in annual revenue among target stakeholders (disaggregated by gender and socio-economic group) **End of project** • At least two community-based investment that is integrated within the national project with focus on livelihood-building. • At least 25% Increase in annual revenue among target stakeholders.	(**i**) Agency-community MOUs and/or co-management arrangements; (**ii**) project documentation; (**iii**) community surveys (including beneficiary economic analysis); (**iv**) consultation meeting proceedings; (**v**) media releases	**Risks:** (i) senior policy makers and other stakeholders do not regard investments in improved environmental management within national development priorities; (ii) private sector are not sufficiently integrated, perceive limited gains and adopt a 'business-as-usual' approach **Assumptions**: (i) governments integrate environmental considerations within mainstream planning in respect to contributions to improved health and livelihood attainment; (ii) the benefits of investments in environment is adequately reflected in national accounts and standard development indices; (iii) development partners continue to support investments in improved environmental management towards improved community welfare and economic livelihoods
Sub-Component 2 Objective: To strengthen Sustainable Land Management (SLM), Integrating Water Resources Management (IWRM) and ecosystems Monitoring and Indicators frameworks in Trinidad and Tobago, particularly the Valencia area and surrounding watersheds					
Sub-Component 2 Outcomes	**Indicator**	**Baseline**	**Target**	**Sources of verification**	**Risks and Assumptions**

Goal: Reduce and revert land degradation at selected Quarry site(s) in the North East area by an integrated water, land and ecosystems management approach					
Results Level	**Indicator**	**Baseline**	**Target**	**Sources of verification**	**Risks and Assumptions**
Outcome C2.1 Strengthened national and regional systems for monitoring of environmental status with respect to key international agreements.	(**i**) heightened awareness amongst policy makers and national stakeholders of the value of monitoring systems for informed decision making; (**ii**) Improved understanding of the impacts of project investments on change of environmental status through monitoring and tracking the relevant indicators; (**iii**) Decision makers and technical personnel are using the data and information generated to strengthen the evidence base and apply it in future decision making	(**i**) Air, water and noise pollution not monitored regularly;(**ii**) Decisions not based on quantitative data	(**i**) NQCL's 2006 Environmental Policy and Environmental Management System (EMS) implemented on smaller quarries; (**ii**) local data used in reporting to international Conventions	(**i**) Technical reports; (**ii**) national reports to Conventions; (**iii**) project reports; (**iv**) scientific reports and other technical publications	**Risks:** (i) senior policy makers and other stakeholders do not recognize value of quantitative reporting; (ii) private sector perceive limited gains and adopt a 'business-as-usual' approach; **Assumptions**: (i) governments integrate environmental considerations within mainstream planning in respect to contributions to improved health and livelihood attainment; (ii) the benefits of investments in environment is adequately reflected in national accounts and standard development indices; (iii) development partners continue to support investments in improved environmental management towards improved community welfare and economic livelihoods; (iv) adequate buy-in from smaller quarries can be generated
Sub-component 2.1.1: Monitoring protocol for periodic assessment of identified environmental indicators (vegetation recovery) at intervention sites with participatory engagement of stakeholders	• All existing data collated and assessed • Monitoring protocol & instrumentation installed	• Only few data and reports on the operation and environmental quality within and around the quarry sites in project area beyond NQCL exist and these are not collated. • lack of or slow rate of progress toward integration or mainstreaming indicators within formal national reporting frameworks • environmental indicators generally not applied along with conventional socio-economic developmental indicators	**Mid-term** • Compilation report on environmental condition at quarry sites in project area based on available information. Gaps in data/information identified • All indicators for project monitoring adopted (identified based on UNCCD Convention reporting requirements and GEF Tracking Tools) • Project monitoring framework (including	(**i**) Environmental quality reports; (**ii**) scientific reports; (**iii**) project reports; (**iv**) monitoring instrumentation data logs	

Goal: Reduce and revert land degradation at selected Quarry site(s) in the North East area by an integrated water, land and ecosystems management approach					
Results Level	**Indicator**	**Baseline**	**Target**	**Sources of verification**	**Risks and Assumptions**
		• Monitoring protocols beyond NQCL are generally weak or non-existent; difficult to make periodic baseline assessments • lack or poor level of knowledge to support decision-making	appropriate instrumentation) installed • Suite of accurate data generated • core stakeholders trained on application of framework **End of project** • Gaps in data and information largely filled • Successful reporting on project achievements based on indicators framework and deployment of monitoring system • Suite of accurate data generated		
Sub-Component 3 Objective: To strengthen policy, legislative and institutional reforms and capacity building to support Sustainable Land Management (SLM), Integrating Water Resources Management (IWRM) and ecosystem services management taking into consideration climate change resilience building in Trinidad and Tobago, particularly the project area and surrounding watersheds.					
OutcomeC3.1 Strengthened policy and legislation for the effective management of water, land and ecosystems resources that account for climate change.	(**i**) Policy assigning lands for quarrying informed by Strategic environmental impact assessment; (**ii**) Revised national land-use plan takes into consideration multiple uses of resource base in project area and environs	(**i**) Two main pieces of legislation exist that govern quarry operation - The Environmental Management Act, and the Minerals Act. May require revision to be more effective; (**ii**) No Environmental Compliance Certificate (ECC) required for quarries of less than 150 acres; (**iii**) Weak enforcement of existing laws and regulations; (**iv**) Relatively low level of awareness and understanding; (**v**) Land use conflicts exist,(**vi**) Best practice not being applied.	(**i**) ECC required for all quarries; (**ii**) National project refined in the context of addressing priority needs and targeting most appropriate methodologies and technologies for select quarry(ies) in project area; (**iii**) Quarries within the project area operate within designated areas in accordance with zoning of land for quarrying; (**iv**) Quarrying within the project area operating in tandem with other resource use	(i) project progress reports	**Risks:** (i) Low level of stakeholder buy-in; (ii) changes in implementation arrangements at national level; (iii) conflicts of interest **Assumptions:** (i) there is sufficient cohesion amongst stakeholders in approach for project implementation; (ii) regional and international partners are engaged in project design and perceive mutual benefits

Goal: Reduce and revert land degradation at selected Quarry site(s) in the North East area by an integrated water, land and ecosystems management approach					
Results Level	**Indicator**	**Baseline**	**Target**	**Sources of verification**	**Risks and Assumptions**
Sub-component 3.1.1: Legal requirements of the Environmental Management Act Chapter 35:05 including the Certificate of Environmental Clearance (CEC) Rules, and the Water Pollution Rules, effectively enforced in quarries in project area	• Environmental Conditions for quarries mandated by the EMA enforced	• Some quarries operate with requirements from the EMA through CECs and Water Registration Certificates. Some quarries not subject to EMA controls. Conditions sets by the EMA not satisfactorily enforced.	**Mid-term** • At least10% of quarries operate within EMA compliance framework **End of project** • At least 20% of quarries within the project area meet compliance requirements under the EMA legislation/regulation	(**i**) Water pollution registration certificates, (**ii**) water pollution permits, (**iii**) CEC certificates where applicable; (**iv**). EMA compliance reports; (**v**) project reports	
Outcome C3.2 Strengthened capacity of national and regional institutions and other stakeholders for water, land, and ecosystems management, taking climate change into account.	(**i**) The Environmental Management Authority and the Ministry of Energy and Energy Industries have added capability and capacity to enforce respective legislation under their jurisdiction; (**ii**) Local institutional capacity developed sufficiently to implement long-term sustainable land and ecosystem management investments	(**i**) Capacities in relevant state and non-state agencies are not sufficiently strong to sustain interventions in resource management; (**ii**) capacity within CBOs and other relevant stakeholder groups is limited	(**i**) improved capacity - continual training; more structured programmes;(**ii**) planning, development and implementation of SLM, and BD management interventions at the national level are enhanced by improved capabilities	(**i**) national reporting to conventions and other international and regional frameworks; (**ii**) project reports; (**iii**) training reports and training resources	**Risks:** (i) Shifting government priorities resulting in human resource deployment away from resource management. **Assumptions:** (i) governments will continue commitment toward investment in human resource and institutional capacities within both state and non-state agencies - find alternative avenues to address issues through re-tooling, redeployment of human resources; (ii) the donor community and other partners will continue to support

Goal: Reduce and revert land degradation at selected Quarry site(s) in the North East area by an integrated water, land and ecosystems management approach					
Results Level	**Indicator**	**Baseline**	**Target**	**Sources of verification**	**Risks and Assumptions**
Sub-component 3.2.1: Training programme and resources, and built capacity among professionals and technical staff in relevant lead agencies, primary CSO and individual stakeholders	• Number of training activities convened; • number of persons trained (disaggregated by gender and socio-economic status) • Best quarry management manual produced to international standards and available for training • Training events held; level of attendance	• Not enough trained personnel in key agencies; private sector and communities not sufficiently engaged and informed. • NQCL has recently been certified as ISO14001:2004 compliant • No training given; no guidelines (e.g. best practice manual) for good practices available	**Mid-term** • At least20% of core target audiences are trained in the tools, techniques and technologies advanced • At least 1 national technical workshop convened. • Best quarry management manual produced to international standards and available for training • At least 30% of selected quarry operators trained. **End of project** • At least 50% of core target audiences are trained in the tools, techniques and technologies advanced • at least 2 national technical workshops convened • Best quarry management manual applied for work within project and at national level • At least 50% of selected quarry operators trained by end of year 4	(**i**) training needs assessments; (**ii**) course material; (**iii**) training reports; (**iv**) progress reports; (**v**) media releases	stakeholder groups in building capacity building and empowerment; (iii) the private sector will be engaged in capacity building, contribute resources and share responsibilities

Goal: Reduce and revert land degradation at selected Quarry site(s) in the North East area by an integrated water, land and ecosystems management approach					
Results Level	**Indicator**	**Baseline**	**Target**	**Sources of verification**	**Risks and Assumptions**
Sub-Component 4 Objective: To enhance knowledge exchange, promotion of best-practices, replication and expanding stakeholder involvement in Trinidad and Tobago, particularly in the project area and surrounding watersheds					
Outcome C4.1 Improved information access and enhanced engagement of practitioners and other stakeholders via targeted knowledge sharing networks.	(**i**) Decision makers and technical personnel are using the data and information generated to strengthen the evidence base and apply in future decision making; (**ii**) Technologies and approaches are being adapted and replicated through effective knowledge management methods and tools	Limited sharing of best practices in a structured manner within and between countries so as to facilitate learning and adaptation.	(**i**) Best practice guidelines are disseminated as widely as possible and countries are actively using the guidelines in project and programme development; (**ii**) endorsement by countries of best practices through formal regional mechanisms; (**iii**) Enhancements of and application/uptake of existing tools and new tools.	(**i**) Endorsed and published national and regional best practices that serve as references for IWRM, SLM, BD and SFM in the Caribbean region and other SIDS regions (**ii**) national reporting; (**iii**) conference and meeting proceedings; (**iv**) publications across knowledge networks	**Risks:** (i) diminished investment and promotion at the national level post-project; (ii) low buy-in by regional partners agencies to lend support during and post-project **Assumptions:** (i) stakeholders and project beneficiaries are engaged from the onset in contributing perspectives; (ii) information capture is achieved in manner that lends to easy translation to many audiences; (ii) Trinidad and Tobago actively use and promote best practices through regulatory avenues and practice codes at the national level; (iii) stakeholders are involved in sharing and advancing improved practices
Sub-component 4.1.1: Best practice guidelines / code of practices for practitioners and awareness resources for wider audiences	• Approved/endorsed guidelines by target users • Country visits	• Limited formal capture of workable methods, tools and techniques • land, water and ecosystems management guidelines are not currently integrated within physical planning and development protocols • Routine technical exchanges amongst practitioners tends to be limited due to financing constraints	**Mid-term** • At least 2 best practice guidelines published in various media formats and used by stakeholders (possible subject areas: bioengineering for rehabilitation of steep slopes, dust reduction technology application, storm water management for quarries, sedimentation ponds use in quarries, rapid assessment environmental monitoring for quarries, land/soil restoration/conservation measures). • At least 2 technical exchanges between	(**i**) Published guideline documents; (**ii**) technical reports; (**iii**) national planning/development/environmental management codes/regulations	

Goal: Reduce and revert land degradation at selected Quarry site(s) in the North East area by an integrated water, land and ecosystems management approach					
Results Level	**Indicator**	**Baseline**	**Target**	**Sources of verification**	**Risks and Assumptions**
			countries within the Caribbean • At least 1 technical exchange between other SIDS regions (target a maximum of 5 persons to participate). **End of project** • At least 4 best practice guidelines published. • At least 4 technical exchanges within the Caribbean and 2 between other SIDS regions.		
Sub-component 4.1.2: Technical exchange visits between professionals, civil society organizations to share knowledge directly over the duration of the project	• Participation and major conference events • Publications and media products widely disseminated	• Opportunities for showcasing tools and techniques exist through conferences and meetings including UNEP's IGM, the OECS TAC, the CWWA and the CARICOM COTED • Research articles and published outputs tend to be limited in circulation to target stakeholders and may not be in most appropriate format to be considered relevant	**Mid-term** • Core stakeholders participate in at least 1 major event to present findings from national project (target max of 5 persons to attend such events) **End of project** • Stakeholders participate in total of at least 1 major events to present findings from national project. •	(**i**) Media releases (all kinds; television, radio, internet); books; (**ii**) project reports; (**iii**) conference proceedings	

Annex 3.2: Letters of Co-financing

EMA TO PROVIDE at project inception

Annex 3.3Terms of Reference for Partners and Consultants

To be elaborated at project inception

Partner/Consultant

Background (common to all partners' TORS)

Description of Work

Outputs

Timeline (indicative)

Provisional budget

GEF increment	Partner Co-financing

Contacts

Annex 3.4. Carbon accounting – Trinidad & Tobago

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

Project Name	*IWECO Trinidad & Tobago*	
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	40	ha
2.2 Afforestation/reforestation conversion of "degraded areas" to "plantation zone 2"	**36**	**ha**
2.3 Other land use changes conversion of "degraded areas" to "perennial tree crop"	**4**	**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	-3,445.6	0.0	-689.2	-689.2
Other	0.0	-119.2	0.0	-23.8	-23.8
Agriculture					
Annual	0.0	0.0	0.0	0.0	0.0
Perennial	0.0	-103.8	0.0	-20.8	-20.8
Rice	0.0	0.0	0.0	0.0	0.0
Grassland & Livestock					
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**	-3,668.6	**0.0**	-733.8	-733.8
Per hectare	0.0	-183.4	0.0		
Per hectare per year	**0.0**	-36.6	**0.0**	-36.6	-36.6