Report on the framework to support LDN target-setting and implementation in Barbados *(DRAFT FINAL)*

Introduction

Barbados has been a Party to the United Nations Convention to Combat Desertification (UNCCD) since 1997. In 2002, Barbados formulated a National Action Programme to Combat Desertification and Land Degradation, and to Mitigate Against the Effects of Desertification, Land Degradation and Drought. This National Action Programme was designed to implement the UNCCD through activities to "comprehensively and holistically address land degradation in the Barbadian context".

Since the development of the 2002 National Action Programme the global policy and conceptual framework for implementation of the UNCCD has advanced considerably. Major milestones in this regard have been the adoption of the UNCCD 2018-2030 Strategic Framework and the endorsement of a scientific conceptual framework for land degradation neutrality (LDN) as a fundamental component of UNCCD implementation.

The 2018-2030 Strategic Framework establishes a vision of

> *a future that avoids, minimizes, and reverses desertification/land degradation and mitigates the effects of drought in affected areas at all levels … to achieve a land degradation-neutral world consistent with the 2030 Agenda for Sustainable Development, within the scope of the Convention.*

The Strategic Framework is designed to support achievement of Sustainable Development Goal 15 on Life on Land. Implementation of the Strategic Framework contributes specifically to progress towards SDG Target 15.3:

> *By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world.*

In 2015, the UNCCD Secretariat, in collaboration with multiple international partners, established the LDN Target-Setting Programme to assist countries in setting voluntary national LDN targets. Over 122 countries have participated in the LDN Target-Setting Programme and have made progress towards setting national baselines, targets, and

associated measures to achieve LDN. Of the 33 Parties to the UNCCD in the Latin America and Caribbean region, Barbados is one of only three countries that have not yet embarked on the LDN target-setting process.

This report examines the national framework to support LDN target-setting and implementation of LDN and sustainable land management (SLM) measures in Barbados. It addresses:

- biophysical and socio-economic baseline information about desertification, land degradation, and drought (DLDD);
- the state of land degradation, plans and programmes relating to land degradation and SLM;
- status and trends in mobilization of financial resources for UNCCD implementation, and barriers and opportunities to increase resource mobilization for UNCCD implementation; and
- mechanisms for monitoring and data management related to SLM and LDN.

The Scientific Conceptual Framework for Land Degradation Neutrality

Land degradation is defined in the UNCCD as:

> *reduction or loss, in arid, semi-arid and dry sub-humid areas, of the biological or economic productivity and complexity of rainfed cropland, irrigated cropland, or range, pasture, forest and woodlands resulting from land uses or from a process or combination of processes, including processes arising from human activities and habitation patterns, such as soil erosion caused by wind and/or water; deterioration of the physical, chemical and biological or economic properties of soil; and long-term loss of natural vegetation.*

The UNCCD definition of LDN is:

> *a state whereby the amount and quality of land resources necessary to support ecosystem functions and services and enhance food security remain stable or increase within specified temporal and spatial scales and ecosystems.*

LDN programmes should take a two-pronged approach of:

- avoiding or reducing new land degradation; and
- reversing past degradation.

The aim is that any new land degradation is balanced by planned positive actions to reverse past degradation, such that there is no overall net loss of land-based natural capital and ecosystems services. It must be noted that a country may set more ambitious

targets that go beyond neutrality and aim for an overall positive gain in healthy and productive lands.

A key element of the LDN conceptual framework is that the counterbalancing of loss and gains should take place within the same land type[1].

Losses and gains are to be monitored through changes, measured against a defined baseline, in values of three globally-established indicators (and associated metrics):

- Land cover class/type (land cover change);
- Land productivity (net primary productivity in tDM/ha/yr);
- Carbon stocks (soil organic carbon in tC/ha).

There are six UNCCD-defined land cover classes used in LDN assessments: tree-covered areas, grassland, cropland, wetland, artificial surfaces, and other land. The matrix below shows which land cover changes are generally considered positive (gain), negative (loss), and neutral (no change) in the LDN context.

		Final class					
		Tree-covered area	**Grassland**	**Cropland**	**Wetland**	**Artificial surfaces**	**Other land**
Original class	**Tree-covered area**	No Change	Loss	Loss	Loss	Loss	Loss
	Grassland	Gain	No Change	Gain	Loss	Loss	Loss
	Cropland	Gain	Loss	No Change	Loss	Loss	Loss
	Wetland	Loss	Loss	Loss	No Change	Loss	Loss
	Artificial surfaces	Gain	Gain	Gain	Gain	No Change	Gain
	Other land	Gain	Gain	Gain	Gain	Loss	No Change

Decreases in net primary productivity and decreases in soil organic carbon are also considered indicative of degradation.

The “one-out, all-out” principle is applied: if, for a given area of land, any one of the three indicators shows a significant negative change, that land is considered to be degraded (a

[1] *Land type* is defined in the UNCCD Knowledge Hub as “Class of land with respect to land potential, which is distinguished by the combination of edaphic, geomorphological, topographic, hydrological, biological and climatic features that support the actual or historic vegetation structure and species composition on that land.” However, illustrations of the concept of LDN seem to use land type interchangeable with land cover class.

loss). Correspondingly, if any of the indicators shows a significant positive change, and none shows a significant negative change, that is counted as a gain in the LDN balance sheet.

UNCCD guidance proposes ten steps for national LDN target-setting, as follows:

1. Government leadership and stakeholder engagement
2. Setting LDN baselines
3. Assessing land degradation trends
4. Identifying drivers of land degradation
5. Defining national voluntary LDN targets
6. Mainstreaming LDN into land use planning
7. Identifying measures to achieve LDN targets
8. Facilitation of action towards LDN
9. Monitoring progress towards LDN
10. Reporting on LDN

This report presents information on the current national framework for steps 2, 3, 6, 9, and 10. Further guidance with respect to all steps in the target-setting process can be found in the UNCCD guidance document *Land Degradation Neutrality Target Setting — A Technical Guide*.

Land degradation baseline information

The recommendation from the UNCCD is that the baseline for LDN target-setting should be, rather than a single year, a 10 to 15 year epoch, ending in 2015 (to correspond with the adoption of the SDGs). Countries are free to set other baselines that are more suitable to national context and conditions, particularly with respect to the availability of relevant data.

The core set of globally-relevant indicators recommended for use in calculating the baseline are

- land cover
- land productivity (metric: net primary productivity)
- carbon stocks above and below ground (metric: soil organic carbon).

These are recommended, and described as “globally-relevant”, because they are already being used by UNCCD to track progress in the implementation of the Convention through national reporting. They are also being used as sub-indicators to calculate the SDG

indicator “Proportion of land that is degraded over total land area” as a measure of progress towards SDG target 15.3. Together, these three indicators are considered to be reasonable proxies for assessing the quantity and quality of land-based natural capital and associated ecosystems services.

As part of the UNCCD national reporting process, countries have been provided with default data—derived from global earth observation and geospatial information and modelling, and covering the period 2000 to 2015—on the metrics associated with these three indicators. As such, the most recent national report to the UNCCD includes the required national bio-physical baseline data. It also contains baseline data relevant to established UNCCD socio-economic indicators.

However there are some constraints to using these global datasets to calculate national LDN baselines.

The principle consideration is the resolution of the global earth observation data relative to the scale at which LDN actions are likely to be implemented in Barbados. According to UNCCD technical documents, the resolution of the various datasets ranges from 250m to 1km. This introduces anomalies that are significant for LDN monitoring. For example, the Graeme Hall Swamp, with an approximate area of 0.33 sq. km., does not show up on any of the global dataset land cover maps. (Peculiarly, the land cover map for 2000 shows a large wetland in the area of Bridgetown, where no wetland is known to exist.) Another, perhaps more significant example is that the global data appears to significantly overestimate the amount of cropland in Barbados. The global dataset for 2015 shows that approximately 72% of the island’s total land area is cropland. However, according to national data, the proportion of land classified as being in agricultural use is only 26.5%. As a result of these discrepancies, the global default data is of limited use as a baseline for monitoring the effectiveness and impact of local-scale LDN measures and actions.

Another constraint is that the dataset provided as part of the UNCCD reporting process does not include quantitative data with respect to soil organic carbon/carbon stocks above and below ground. A map is provided showing the change in soil organic carbon over the period 2000 to 2015, but the corresponding measures of soil organic carbon (in tonnes per hectare of carbon, t/ha C) are not available. It is possible that the relevant data can be obtained from the UNCCD upon request.

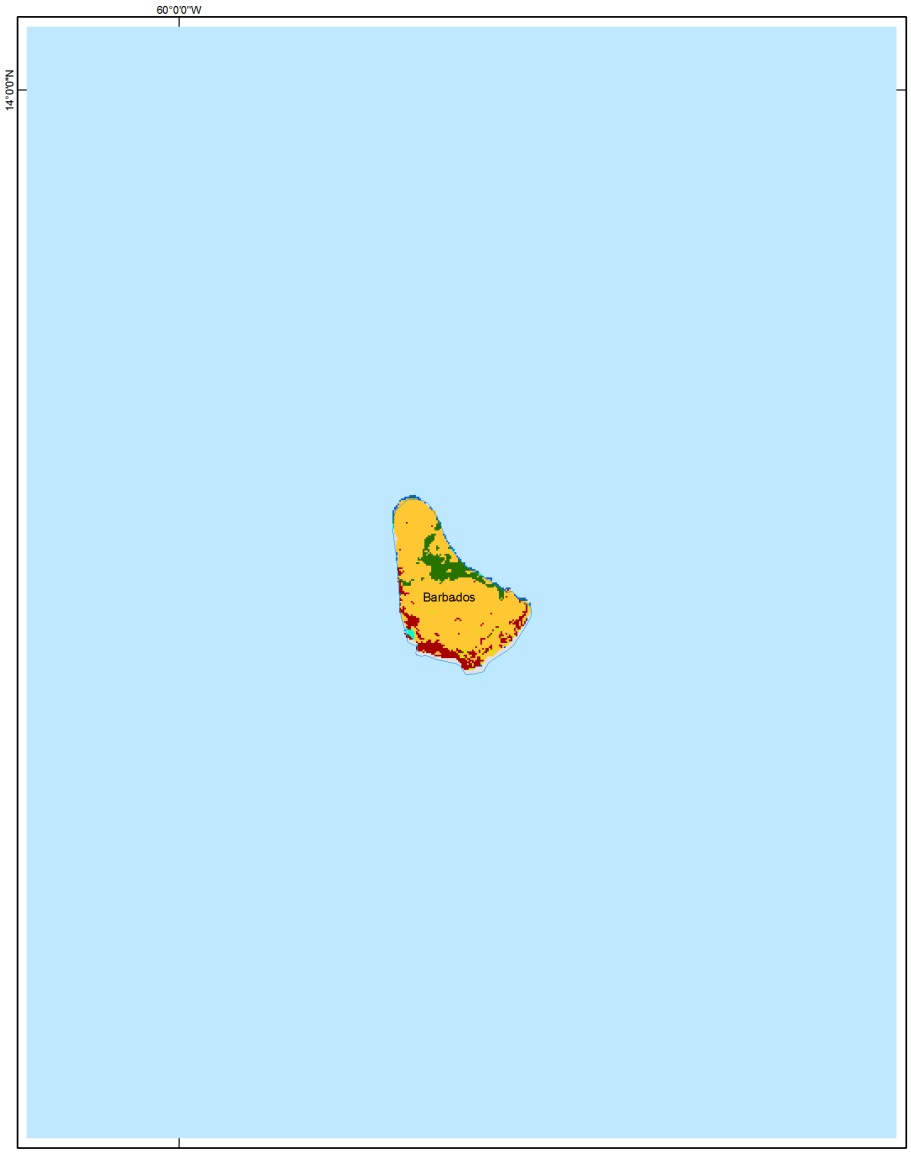
The land productivity data (both quantitative and spatial) provided relates to land productivity dynamics (i.e. whether land productivity is improving, declining, or remaining steady), rather than to the actual metric of net primary productivity (in tDM/ha/year). That is, it provides information about current land degradation trends, rather than the current status of land productivity. To inform baseline-setting, efforts should be made, with the assistance of the UNCCD Secretariat, to obtain the relevant status data.

It is recommended by the UNCCD that global data and indicators should, where possible, be complemented by national and sub-national level data and indicators.

In 2006, the Lands and Surveys Department produced aerial photographs and associated land cover maps of Barbados that would be a useful complement to the available global data on land cover. The aerial photographs were produced using a considerably higher resolution (25 cm ground resolution) than the global default data, allowing for a more detailed snapshot of the baseline situation with respect to land cover, vegetation, and habitat fragmentation. The 2006 maps use land cover categories that roughly correspond to the six UNCCD land cover classes as follows:

UNCCD land cover classes	**Land cover categories on the 2006 Lands and Surveys maps**
Tree-covered areas	Trees
	Palm trees
Grassland	Trees and bush
	Bush
Cropland	Cultivation
	Sugar
	Pasture
Wetland	Ponds
Artificial surfaces	Roads
	Buildings
Other land	Quarry
	Recreational
	Sand
	Rock
	Outcrop

The default data land cover map for 2000 from the UNCCD and the national land cover map for 2006 from the Lands and Surveys Department are shown below for purposes of comparison.



Barbados

Land Cover

2000

Legend

Land Cover

- Tree-covered areas
- Grassland
- Cropland
- Wetland
- Artificial surfaces
- Other land
- Water bodies

UN Boundaries

- Coastline
- International Boundary
- Special Boundary line
- Armistice International Administrative line
- Other line of Separation
- Autonomous region boundary

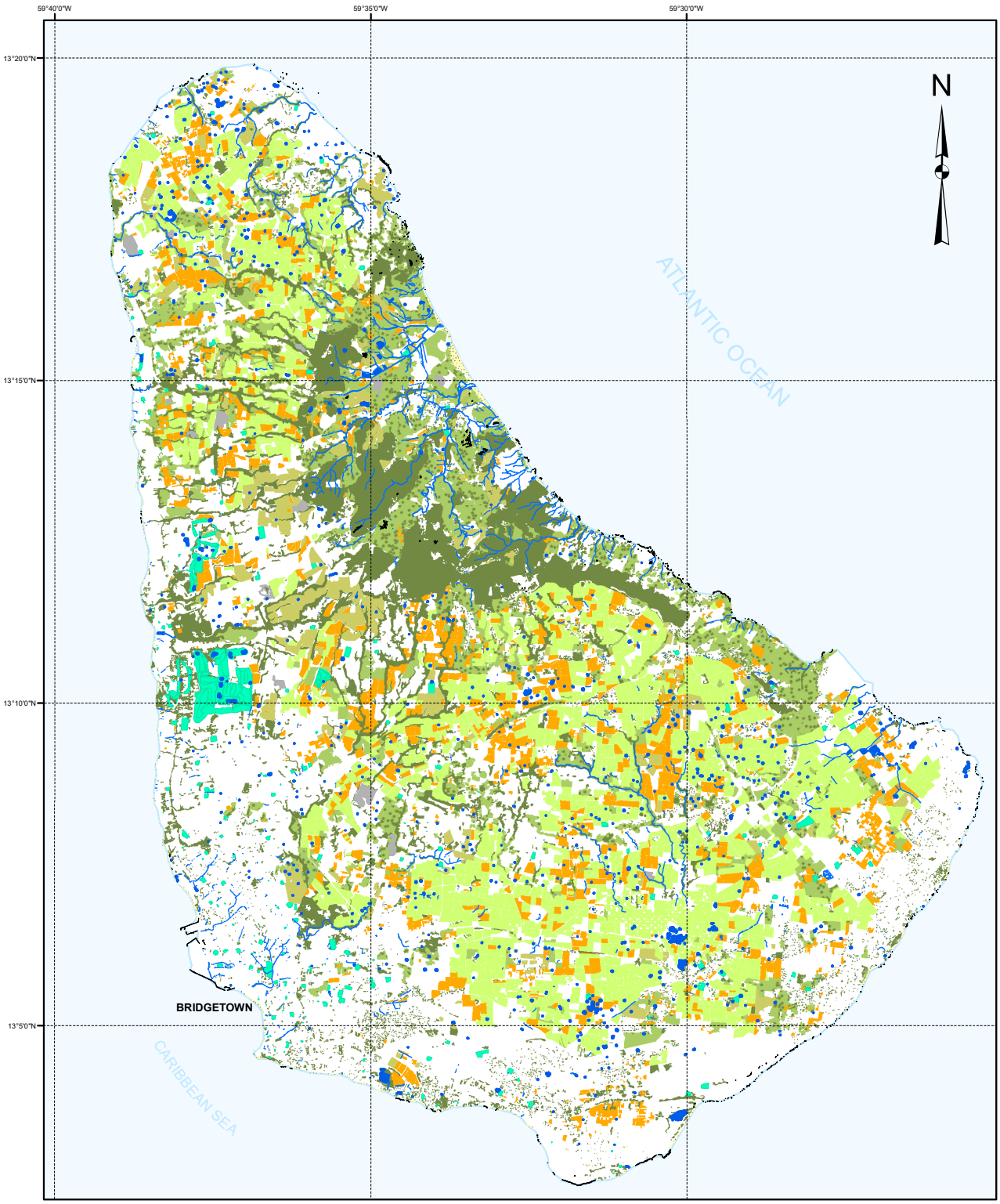
Projection: Decimal Degrees, WGS84

0 10 20 km

N

United Nations
Convention to Combat Desertification

Data Sources:
The ESA Climate Change Initiative Land Cover (CCI-LC) annual global land cover time series dataset from 1992-2015, released in April 2017 (v 2.0.7).
URL: https://www.esa-landcover-cci.org/



Land Cover Map

BARBADOS

Scale: 1:100,000

Meters
0 2,000 4,000 8,000
0 7,000 14,000 28,000
Feet

Legend

- Stream
- Pond
- Trees & Bush
- Trees
- Bush
- Recreational
- Pasture
- Cultivation
- Sand
- Sugar
- Rock
- Quarry
- Coastline

Published by the Lands and Surveys Department
Ground Floor East
Warrens Office Complex
Warrens, St. Michael
Tel: [246] 310 2000
Lsdept@barbados.gov.bb

This map data was digitised using aerial photography procured in February 2006 for the Lands and Surveys Department.

There are also 2015 aerial photographs produced by the Coastal Zone Management Unit, at a 1m ground resolution. The land classes (see table below) in the resulting maps are of land use, rather than land cover, but can be adapted for use as part of a land cover baseline.

Land use class	Definition
Agriculture	Crop fields
Commercial	Areas supporting large scale commercial activity/business
Community services	Government buildings, hurricane shelters, cemeteries, hospitals
Defence	Military installations, prisons
Industrial	Industrial areas, factories, refineries
Institutional	Government headquarters
Natural resources reserves	Quarries, oil fields
Natural vegetation	Non-crop vegetation between 0.5 and 12m
Ports	Airports and seaports
Recreation	Golf courses, stadia, race tracks, cricket grounds
Residential	Low, mid and high density buildings (high density = urban)
Tourism	Major hotel areas
Transportation	Bus terminals, major car parks, roundabouts
Utilities	Power generation, telecoms facilities
Waste disposal	Major bulk and liquid waste disposal sites

There appear to be no national data options available to complement global data on land productivity and carbon stocks above and below ground.

Given that land cover change from cropland to artificial surfaces is one of the leading land degradation modalities in Barbados, an additional complementary national indicator for LDN could be “the proportion of land designated as agricultural land”. The indicator could be further developed to include the proportion of agricultural land in each agricultural land category (i.e. super prime, prime A, prime B, sub-prime). This indicator is relevant to national physical development and land use planning priorities, as outlined in the 2017 (Draft) Amendment to the Physical Development Plan (PDP), which include protecting “an adequate supply of viable agricultural land … to ensure the food security of Barbados.” It is also relevant to SDG indicator 2.4.1. “proportion of land under productive and sustainable agriculture”. The PDP indicates that as of 2017, 26.5 % of the island was

designated as agricultural land. Baseline data relative to this indicator over a 10 to 15 year epoch is available from the Town and Country Development Planning Office.

Establishment of the LDN baseline should be accompanied by an assessment of current trends in land degradation and the driving forces behind these trends. The three globally established baseline indicators can also be used to assess trends. The global datasets made available through the UNCCD reporting process include data that allows evaluation of trends in land cover change, land productivity, and soil organic carbon, over a 10 to 15 year period. The UNCCD provides guidance on using these data to identify trends. The guidance emphasises that trends should be interpreted and assess via national participatory processes, to determine whether the data corresponds with local knowledge and observations and assessments from the field. This participatory validation is essential, given the issues noted above related to the accuracy of the global datasets. While the global data can be used to assess broad national trends, it is of limited use for identifying land degradation hotpots and priority areas for LDN action. Local knowledge is likely to be a more helpful resource in this regard[2]. The most recent report to the UNCCD can be used as a starting point for stakeholder engagement as part of the LDN process.

With respect to the proposed additional national indicator "proportion of land designated as agricultural land", the 2017 PDP identifies a clear declining trend over the period 1991 to 2013, due to the conversion of land for non-agricultural (residential, commercial, industrial) purposes. The Town and Country Development Planning Office would be the key source of more detailed trend data.

National Land Degradation Policies and Programmes

The 2002 National Action Programme, which delineated a number of activities deemed critical to "comprehensively and holistically address land degradation in Barbados", is not being actively implemented. Despite the absence of an active, officially designated land degradation policy/programme of action, there are still policy frameworks and programmes that are of relevance to LDN.

Physical Development and Land Use Planning

One of the guiding principles of LDN is that LDN planning and implementation should be integrated into existing land use planning processes, and that the counterbalancing necessary to achieve LDN should be managed at the same scale as land use planning.

[2] For example, in interviews carried out as part of the preparation of this report, officers from the Town Planning Department identified areas of prime agricultural land that are being converted for residential use, and officers of the Soil Conservation Unit identified areas in the Scotland District that are being degraded via over-grazing. Neither of these changes could be identified from the global datasets produced by the UNCCD.

The key existing policy relevant to LDN for Barbados would therefore be the national PDP. An essential step to LDN target-setting would be to examine the opportunities for mainstreaming and integrating LDN into the physical development planning framework.

The 2017 PDP includes several objectives and actions that are compatible with and highly supportive of an LDN approach. These include (but are not limited to):

- conservation, protection and restoration of irreplaceable core assets and man-made resources;
- advancing implementation of the National Park and the Barbados System of Parks and Open Spaces, to preserve and expand natural systems;
- protecting the agricultural land base from fragmentation and alienation of land to non-agricultural uses;
- prioritizing and protecting the use of the highest classes of agricultural land for the growth of food crops;
- ensuring that agricultural practices are sustainable and designed to protect and preserve natural resources;
- encouraging the return of idle lands to food and agricultural production;
- conserving, restoring, and managing the Barbados Natural Heritage System;
- implementing restorative actions, such as increasing vegetative cover, to enhance water security;
- developing and implementing restoration plans for open land areas within Groundwater Protection Zones;
- restoration and enhancement of wetlands and coastal protection areas;
- reforestation of open gullies;
- maintaining, managing, and increasing forest cover, including through the development of National Forest Sites;
- minimizing habitat modification and loss in gully ecosystems.

There are also established concepts and mechanisms within the Town and Country Development Planning framework that are aligned with LDN objectives. For example, the concept of “no net negative impact” of development: as per the 2017 PDP, in instances where it is not possible to achieve “no net negative impact” at a given development site, the conditions of development approval may include “compensation measures taken at other locations, to “achieve an overall benefit to the natural features and associated functions that are predicted to be affected”. The “no net negative impact” concepts and the mechanisms by which it is implemented are well aligned with the principle of “no net loss” of land-based natural capital, and with the use of counterbalancing approached to achieve no net loss. The concept of “planning gains”, the application of conditions

requiring the restoration of mineral extraction sites “to the highest possible standards”, and requirements for remediation of industrial sites, including “potential conversion to open space or renaturalisation”, are also highly consistent with LDN principles and objectives.

On this basis, it is strongly recommended that a programme of LDN target-setting and implementation in Barbados should be designed to align with national physical development policies and plans. Areas of congruence could be identified via a thorough review of the PDP.

LDN targets may be set at the national scale (e.g. LDN relative to a 2015 baseline is achieved by 2030), for specific areas in the country (e.g. LDN relative to a 2015 baseline is achieved in the National Park by 2030), or to address land degradation issues of specific concern to the country (e.g. halt the conversion of agricultural land to other land uses by 2030). The PDP provides a basis for setting sub-national area specific LDN targets, keeping in mind the aim to manage LDN at the same scale as land use planning. Such targets for selected components and sub-components of the growth management framework, e.g. specific targets for the Rural Working Landscape, for the Soil Protection Overlay, for the National Park, etc. This would facilitate the integration of LDN into decision-making related to land use and physical development.

A key next step would be to work with the Town and Country Development Planning Office to determine how to operationalise the concept of counterbalancing. In this respect, it should be noted that LDN principles involve counterbalancing *anticipated* losses with interventions to generate corresponding gains. Ideally this should involve forecasting losses and gains at the planning stage, analysing the balance between anticipated losses and gains, and assessing the implications for achieving LDN. The PDP, which gives a broad overview of the kinds of planning decisions likely to be taken in various areas of the country, provides a basis for *ex ante* LDN assessment, and for development of a rough LDN balance sheet.

Consideration should be given to how to align the LDN target timelines with the current timelines for implementation, review and amendment/update of the PDP, such that the amendment of the Plan provides an opportunity to assess progress towards LDN. Ideally, LDN should be integrated into the next amendment of the PDP as a core planning principle, so that land use and development decisions are made explicitly taking into account both national and sub-national LDN targets and the general land degradation response hierarchy of *avoidance (i.e. protective measures) >> minimization (i.e. SLM) >> reversal (i.e. restoration and rehabilitation)*.

Soil Conservation in the Scotland District

The 2002 National Action Programme focused almost exclusively on addressing land degradation in the Scotland District The high rate of erosion, soil loss, and land slippage in the Scotland District, as compared to the rest of the island, make it a national land degradation hotspot and a clear priority for LDN action. LDN targets and action should be designed to build on the work of the Soil Conservation Unit, which was established in 1957 to ameliorate erosion and land slippage in the Scotland District.

The objectives of the Soil Conservation Unit are to:

- reduce the incidence of landslides;
- reduce infrastructural damage;
- control surface erosion;
- control stray livestock;
- rehabilitate degraded and unproductive lands.

To achieve these objectives, the Unit undertakes action in three complementary areas: soil engineering, agronomy, and forestry. The World Overview of Conservation Approaches and Technologies identifies four categories of SLM measures, as shown in the table below. The Unit's departments of action correspond directly to three of these four: structural, agronomic, and vegetative.[3]

Structural measures:	E.g. terraces (bench, forward/backward sloping), bunds, banks (level, graded), dams, pans, ditches (level, graded), walls, barriers, palisades
Agronomic measures:	E.g. measures that improve soil cover (e.g. green cover, mulch), measures that enhance organic matter/soil fertility (e.g. manuring), soil surface treatment (e.g. conservation tillage)
Vegetative measures:	E.g. plantation/reseeding of tree and shrub species (e.g. live fences, tree crows), grasses and perennial herbaceous plants (e.g. grass strips)
Management measures:	E.g. change of land use type (e.g. area enclosure), change of management/ intensity level (e.g. from grazing to cut-and-carry), major change in the timing of activities, control/change of species composition

A notable aspect of the work of the Soil Conservation Unit is the extent to which it involves cooperation and partnership with farmers, private land owners, and other stakeholders. The Unit works with land owners to encourage good land husbandry,

[3] The Unit also engages in actions, e.g. advising on land development issues in the District, controlling stray and roaming livestock, that could be considered management measures.

promote mixed cropping and agroforestry, and stabilise eroded land via revegetation and reforestation. The Unit also engages in educational outreach programmes with schools, colleges, and universities. Such activities increase awareness and knowledge of SLM practices to combat LDN.

Essentially, the Soil Conservation Unit is a significant institutional asset for LDN target-setting and implementation in Barbados: it is a long-established entity with considerable experience in the implementation of the kind of specific technical measures and interventions that are necessary to achieve LDN. Staff of the Unit can bring their practical expertise and experience to the process of LDN target-setting, to inform the development of technical interventions, the incorporation of socio-economic considerations, and the identification of commonly encountered obstacles and constraints that would need to be overcome.

Consistent with the 2002 National Action Plan, the Scotland District and the work of the Soil Conservation Unit should be a core element of a national LDN programme, for example by:

- active engagement of the Soil Conservation Unit in the LDN planning and implementation process;
- setting specific LDN targets for the Scotland District;
- enhancing the Unit's capacity to implement SLM action in all of its three action areas (soil engineering, agronomy, forestry);
- harmonizing and improving implementation of legislation and policies (e.g. the Soil Conservation (Scotland District) Act, the Livestock (Control of Strays) Act) that underpin the achievement of LDN in the Scotland District;
- applying and replicating best practices and success stories from the Scotland District in other parts of the country.

This would be consistent with the recognition in the 2017 PDP that "the successful conservation and restoration practices of the Soil Conservation Unit provide precedent for implementation of the Natural Heritage System in other areas of Barbados".

Financing

The UNCCD Secretariat recommends that countries explore a variety of options for sustainable financing of LDN, including public expenditures, donor resources, subsidies and incentives for SLM, and private sector contributions.

The Soil Conservation Unit, as the main agency with government with a mandate directly related to mitigating land degradation, reports that their programme budget has decreased in recent years as a result of overall national fiscal constraints. However, the

Unit recognises that there are opportunities to access financing from other sources, such as international donors and grant agencies. To this end there is a need for a broader perspective on the work of the Unit, and for greater collaboration with other relevant agencies in the context of SLM. Identifying and strengthening synergies with other environmental issues and with international commitments in areas related to biodiversity conservation, protected areas management, preservation of ecosystems services, and climate change mitigation and adaptation, would enhance the ability to leverage financial resources to support the Unit's work.

One of the principal sources of international donor funding for LDN and SLM is the Global Environment Facility (GEF), under its Land Degradation focal area. One of the land degradation focal area strategies for the seventh replenishment of the GEF (GEF-7, covering the period 2018 to 2022) is to provide support for the development of national frameworks for implementing, monitoring, and evaluating LDN targets, for countries that are interested in doing so. Activities in this regard are considered enabling activities for UNCCD implementation and projects developed in this regard are likely to be regional/ global projects rather than national ones.

There may be the possibility for developing a national project related to the GEF's other land degradation focal area objective: *Support on-the-ground implementation of SLM to achieve LDN*. There are three defined impact programmes related to this objective:

- Food Systems, Land Use and Restoration;
- Sustainable Forest Management;
- Sustainable Cities.

These programmes are intended to achieve positive outcomes in the areas of:

- dryland sustainable landscapes;
- diversified agro-ecological food production systems;
- integrated landscape management and restoration.

The Food Systems, Land Use, and Restoration Impact Programme, with outcomes related to food production systems and landscape management and restoration, would likely be the best fit for a national GEF-funded project in the land degradation focal area in Barbados. Such a project could be designed to complement and support implementation of the 2017 PDP (policies on food and agriculture, the natural heritage system, and the system of parks and open space), the work of the Soil Conservation Unit (particularly in the areas of agronomy and forestry), and private sector initiatives related to SLM (such as the restoration works being undertaken at the Walkers Reserve). Consideration should be given to taking advantage of synergies with other GEF focal areas, such as biodiversity and climate change.

With respect to the use of incentives and subsidies, the main scope for the use of such mechanisms appears to be in the agriculture sector. The Ministry of Agriculture and Food Security offers agricultural rebates and duty-free concessions for organic agriculture. The Enterprise Growth Fund Ltd's Agricultural Development Fund provides loans, grants and incentives to help the farming sector become more competitive; there may be an opportunity for the Fund's criteria to be expanded to explicitly include provisions related to SLM.

There is scope for encouraging private sector entities to incorporate LDN and SLM action into their suite of corporate social responsibility actions, for example by supporting the reforestation and maintenance of landscape and ecosystems, particularly within the National Park. Existing examples of relevant initiatives include the One Tree for Every Bajan Programme, spearheaded by WIRRED and supported by Flow Barbados and other partners, and the Future Centre Trust's Future Trees programme, which allows individuals and businesses to sponsor the planting of trees, with an emphasis on fruit-bearing trees, in public areas around Barbados.

Monitoring and data management

A necessary component of any LDN programme is tracking gains and losses in order to determine progress towards the overall gain of no net loss.

Is it expected that the UNCCD Secretariat will, as part of its reporting process, continue to provide countries with default data that can be used to monitor changes in the three global indicators (land cover class, land productivity, and carbon stocks).

In the case of changes in land cover, the global data can be supplemented by national spatial data. The key agency generating and holding such data is the Land and Surveys Department. The Coastal Zone Management Unit also generates national land use maps. The Lands and Surveys Department aims (depending on availability of resources) to update its land cover maps via aerial mapping/satellite imagery every five to ten years. In setting LDN targets and determining an associated monitoring programmes, consideration should be given, in consultation with the Lands and Surveys Department, to the intervals at which national data will be available for monitoring.

There is the opportunity for the LDN focal agency to liaise with the Lands and Survey Department prior to each aerial mapping exercise to ensure that the exercise captures the features and information (in terms of land cover classes) that are required for LDN monitoring. In this regard, UNCCD guidance should be take into account. Consideration should also be given to ensuring that the new data sets are backward compatible with the 2006 and 2015 data that would provide the national baseline, i.e. if new land cover

classifications are used, there should be a straightforward correspondence with the classifications used in the baseline data.

With regard to the Lands and Surveys data, and to spatial data generally, the agency responsible for LDN monitoring and reporting should have, or have access to, the capacity to use and manipulate the data. This might involve, for example, overlay analysis to compare global and national data sets, to evaluate land cover class changes in areas designated for food and agriculture, or to evaluate increases in tree cover in the National Park or other areas specifically targeted for restorative action.

In addition to the overall goal of achieving LDN at the national level, additional national, sub-national, or area-specific targets may be established and measures implemented to achieve these targets. In such cases, indicators and metrics should be determined to monitor both effectiveness of specific measures and overall progress towards the targets. For example, if a target is to reduce soil erosion by *x* % in the Scotland District via reforestation, there should be monitoring related to both the number of trees planted/ established (the measure) and the rate of erosion in the Scotland District (the target).

An effort should be make to strengthen the capacity of the Soil Conservation Unit and other LDN implementing agencies to collect/generate data for monitoring effectiveness of measures and progress towards LDN and SLM targets. Officers of the Unit report that monitoring currently takes place mainly via visual field observation. An effective national LDN programme will require providing resources (including staff, equipment, computer hardware and software) to generate, store, and manage qualitative and quantitative data for target-setting, strategic planning, and monitoring. Specific requirements will need to be determined based on the targets set.

The PDP includes provision for periodic monitoring and review via preparation of Sustainable Development Monitoring Reports]to address:

- changes in key demographic and economic considerations;
- trends in development activity;
- impacts of climate change and risk adaptation;
- conformity of new development with the PDP; and
- impacts on core assets including the National Heritage system, cultural heritage, food and agriculture, and core communities.

To the extent possible, monitoring for national LDN targets should be designed to be complementary to the PDP monitoring system.

Overall, a broad recommendation that can be made even prior to determining specific national targets, is that emphasis should be placed on the use of geographic information

systems (GIS) for monitoring LDN. GIS can play an important part in detection, analysis, extrapolation, interpretation, and presentation of LDN-relevant data for monitoring, reporting, and decision-making. The Soil Conservation Unit recognises, but has not yet been able to fully take advantage of, the benefits of GIS for planning, monitoring, and evaluating their work in the Scotland District. GIS systems should complement and enhance, rather than replace, existing systems for gathering field data.

Conclusions

Despite lagging behind regional neighbours in LDN target-setting, Barbados has several policy and institutional arrangement in place that could contribute to establishing, implementation and monitoring an LDN programme.

The global framework for monitoring implementation of the UNCCD provides some baseline information for national LDN target-setting. This can be supplemented by national spatial data on land cover, which is available via the Lands and Surveys Department. National information on other key land degradation indicators (land productivity and carbon stocks) is not available, and so global data must be used.

The principal national policy framework that provides a basis for LDN planning and implementation is the PDP. In keeping with best practice recommendations from the UNCCD, the LDN process should be designed to integrate into existing arrangements for land use planning. The most recent amendment to the PDP includes several policies, objectives, and principles that are consistent with an LDN approach. Existing policy frameworks for land use planning and management as they relate to water resources management (e.g. the groundwater protection zoning system) and agriculture should also be examined for potential complementarity with a national LDN programme.

The Soil Conservation Unit of the Ministry of Agriculture and Food Security is a key institution for LDN planning and implementation. The Unit has clear established objectives and functions related to combatting land degradation in the Scotland District, and implements a variety of agronomic, management, structural, and vegetative SLM measures. An LDN programme for Barbados should seek to support and enhance the Soil Conservation Unit's SLM work in the Scotland District (which is also part of the Barbados National Park) and to replicate the Unit's successful SLM approaches in areas outside the Scotland District. Capacity-building for the Unit should be an essential part of LDN implementation in Barbados.

The GEF is a major international sources of funding for LDN action, and under GEF-7 there may be opportunities for Barbados to access funding for LDN target-setting and relevant enabling activities. Consideration could also be given to developing a national GEF project in the land degradation focal area. Such a project should be designed to

maximise synergies with relevant national policies and objectives for sustainable land use, and with other GEF focal areas such as biodiversity and climate change.

Relevant existing frameworks for LDN monitoring include the PDP monitoring and review process and periodic preparation of land cover maps by the Lands and Surveys Department. The Soil Conservation Unit would benefit from capacity-building, particularly in the use of GIS, to improve collection and management of data with which to assess effectiveness of their SLM actions. Other specific mechanisms and needs in relation to LDN monitoring will depend on the targets that are set and the measures that are identified to achieve the targets.

References

Global Mechanism of the United Nations Convention to Combat Desertification, n.d. *Achieving Land Degradation Neutrality at the country level: building blocks for LDN target setting*. United Nations Convention to Combat Desertification. Accessed at https://www.unccd.int/sites/default/files/documents/18102016_LDN%20country%20level_ENG.pdf

Economic Affairs Division, 2013. *Barbados Growth and Development Strategy 2013-2020*. Government of Barbados Ministry of Finance and Economic Affairs. Accessed at http://www.economicaffairs.gov.bb/archive-detail.php?id=327

Global Environment Facility Secretariat, 2018. *GEF-7 Replenishment Programming Directions*. Global Environment Facility. Accessed at https://www.thegef.org/sites/default/files/publications/GEF-7%20Programming%20Directions%20-%20GEF_R.7_19.pdf

Land Degradation Neutrality Target Setting Programme, 2016. *Land Degradation Neutrality Target Setting – A Technical Guide (Draft for consultation)*. United Nations Convention to Combat Desertification. Accessed at https://knowledge.unccd.int/sites/default/files/2018-08/LDN%20TS%20Technical%20Guide_Draft_English.pdf

Land Degradation Neutrality Target Setting Programme, 2017. *Methodological note to set national voluntary Land Degradation Neutrality (LDN) targets using the UNCCD indicator framework*. United Nations Convention to Combat Desertification. Accessed at https://knowledge.unccd.int/sites/default/files/2018-08/LDN%20Methodological%20Note_02-06-2017%20ENG.pdf

Ministry of Agriculture, n.d. *Soil Conservation Unit, Ministry of Agriculture* [Pamphlet]. Government of Barbados Ministry of Agriculture.

Moore and Associates, 2002. *Barbados National Action Programme to Combat Desertification and Land Degradation, and to Mitigate Against the Effects of Desertification, Land Degradation and Drought (Working Draft).* Government of Barbados Ministry of Physical Development and Environment. Accessed at https://knowledge.unccd.int/sites/default/files/naps/barbados-eng2001.pdf

Orr, B.J., Cowie, A.L., Castillo Sanchez, V.M., Chasek, P., Crossman, N.D., Erlewein, A., … Welton, S., 2017. *Scientific Conceptual Framework for Land Degradation Neutrality. A Report of the Science-Policy Interface*. United Nations Convention to Combat Desertification. Accessed at https://www.unccd.int/sites/default/files/documents/2019-06/LDN_CF_report_web-english.pdf

Reporting manual for the 2017-2018 UNCCD reporting process, 2017. United Nations Convention to Combat Desertification. Accessed at https://prais.unccd.int/sites/default/files/helper_documents/2-Manual_EN_1.pdf

The UNCCD 2018–2030 Strategic Framework, 2017. United Nations Convention to Combat Desertification. Accessed at https://www.unccd.int/sites/default/files/inline-files/ICCD_COP%2813%29_L.18-1716078E_0.pdf

UNCCD/Science-Policy Interface, 2016. *Land in balance. The scientific conceptual framework for land degradation neutrality (LDN)*. Science-Policy Brief 02. September 2016. United Nations Convention to Combat Desertification (UNCCD). Accessed at https://www.unccd.int/sites/default/files/documents/18102016_Spi_pb_multipage_ENG_1.pdf

Urban Strategies Inc., and EcoIsle Consulting, 2017. *(Draft) Barbados Physical Development Plan Amendment: Towards a Green, Prosperous and Resilient Nation*. Government of Barbados Town and Country Development Planning Office, Barbados. Accessed at http://www.townplanning.gov.bb/pdp/Downloads/

Annex: Organisations consulted

Barbados Statistical Service

Barbados Water Authority

Caribbean Institute for Meteorology and Hydrology

Coastal Zone Management Unit, Ministry of Maritime Affairs and the Blue Economy

Land and Surveys Department

Ministry of Environment and National Beautification

PEG Farm

Soil Conservation Unit, Ministry of Agriculture and Food Security

Town and Country Development Planning Office

Walkers Institute for Regeneration Research Education and Design