DOMINICA FOREST NOTE
Using effective forest management to improve the flow of ecosystem services and benefit Dominica's economy

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Global Practice for Environment, Natural Resources, and the Blue Economy

Attribution

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Acronyms and abbreviations

CFN	Country Forest Note
CBD	International Convention on Biodiversity Conservation
CERC	Contingency Emergency Response Component
CNP	Cabrits National Park
CREAD	Climate Resilience Execution Agency for Dominica
CSO	Central Statistical Office
DVRP	Disaster Vulnerability Reduction Project
EALCRP	Emergency Agricultural Livelihoods and Climate Resilience Project
DOWASCO	Dominica Water and Sewerage Company Limited
DOMLEC	Dominica Electrical Service Limited
ECU	Environmental coordinating unit
EIA	Environmental impact assessment
ES	Ecosystem services
FAO	Food and Agriculture Organization of the United Nations
FWPD	Forests, Wildlife and Parks Division
GEF	Global Environment Facility
GDP	Gross domestic product
GHG	Greenhouse gas
GoCD	Government of Commonwealth of Dominica
IDA	International Development Association
INDC	Intended nationally determined contribution
IPCC	Intergovernmental Panel of Climate Change
IUCN	International Union for Conservation of Nature
MTPNP	Morne Trois Pitons National Park
MDNP	Morne Diablotin National Park
MECRDMUR	Ministry of Environment, Climate Resilience, Disaster Management, and Urban Renewal
MEA	Multilateral environmental agreements
MoF	Ministry of Finance
MPDE	Ministry of Planning and Economic Development
NGO	Nongovernmental organization
NRDS	National Resilience Development Strategy – Dominica 2030
NTFP	Non-timber forest products
PA	Protected area
PES	Payments for ecosystem services
PNDA	Post-Disaster Needs Assessment
REDD+	Reducing emissions from deforestation and forest degradation and the role of conservation, sustainable management of forests, and enhancement of forest carbon stocks in developing countries
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States dollar
WB	World Bank
WNT	Waitukubuli National Trail
WTP	Willingness to pay
XCD	East Caribbean dollar

Preface

This World Bank Country Forest Note has been prepared as part of the World Bank Group's Forest Action Plan, which is aimed at boosting the potential of forests to generate social, economic, and environmental returns.

The forest sector in the Commonwealth of Dominica has unique features that triggered the need for a detailed assessment. Forests cover a large share of the island and are very ecologically diverse, with more than half being primary forests. The character of forest use is unusual, with a low level of wood utilization balanced by the high impact of the forest on almost all human activities. Forest ecosystems are key for the high biological diversity and outstanding landscape of the country, the main attractions of an increasing ecotourism sector. The forest sector thus acts as an entry point for broader discussions on environmental issues, especially regarding the island's vulnerability to disasters.

This note provides some strategic guidance to help clarify the forest sector's role, define possible sector goals, and identify challenges and opportunities for future development. It is based on visits to Dominica, as well as available studies. The note has benefited greatly from the input received during stakeholder consultations held in Dominica in October 2019. The Bank team also very much appreciated the candor and willingness of forest sector staff to engage in discussions on a variety of topics such as the economic potential and development of the sector, as well as the role of Dominica's forests in climate change adaptation and mitigation.

The World Bank Emergency Agricultural Livelihoods and Climate Resilience Project supports Dominica's Forests, Wildlife and Parks Division to implement actions such as rehabilitation of tourism trails, propagation centers, and the preparation of a forestry ecological assessment. Moreover, the bank's Disaster Vulnerability Reduction Project—with objectives linked to investments in resilient infrastructure and improved hazard and climate change impact monitoring systems—includes resources for development of forestry propagation centers and forest inventory. The Country Forest Note provides additional evidence to support ongoing activities under these projects and also provides guidance for the preparation of the proposed additional Global Environment Facility funding for Leveraging Ecotourism for Biodiversity Protection.

The paper describes the goals of the government of the Commonwealth of Dominica as described in the National Resilience Strategy—Dominica 2030. Under the strategy, the government has established a goal of making Dominica the world's first climate-resilient economy, and plans to incorporate hazard and risk mitigation into infrastructure design and planning, social sectors, and all aspects of national development. The importance of forest resource management is explicitly noted in the National Resilience Strategy.

Executive Summary

The Commonwealth of Dominica is the most northerly and the largest of the eastern Caribbean countries, a large share of the island being covered by valuable forests. With a surface area of 750 km^2, Dominica is characterized by very rugged and steep terrain, with significant influences on climate, land use, and island development. Covering 60 percent of the country, Dominica's forests are rich and diverse thanks to the unique geography of the island. More than half of the forest is primary forest. Out of 45,000 ha of forests, the state owns approximately 60 percent.

Dominica is a small upper-middle-income country with an annual gross domestic product (GDP) of USD $504 million in 2018. **Weather-related events have significantly affected the country's economic stability as well as the population's well-being.** Average annual losses from weather-related events between 1996 and 2015 are estimated at 7.9 percent of GDP, making Dominica the second most affected country globally in terms of average GDP loss. In 2015 Hurricane Erika caused severe damage, estimated at 96 percent of GDP. In 2017 Hurricane Maria was Dominica's worst natural disaster, with damages and losses estimated at 226 percent of GDP.

With the agriculture sector's importance decreasing, tourism receives increasing attention as a means of economic development. Dominica's agriculture sector has declined due to weather-related events and fluctuations in world market conditions, but it is still vitally important for rural livelihoods and an important contributor to employment. Tourism is growing, largely based on ecotourism and government support. The Government of the Commonwealth of Dominica (GoCD) is promoting Dominica as a "nature island" destination.

The direct economic contribution of the forest sector to GDP is insignificant, but almost all human activities in Dominica depend on the full range of forest ecosystem services (ES). Presently, Dominica lacks a timber industry, and the use of non-timber forest products (NTFPs) is not significant. However, the indirect contribution of forestry is very important. Forest resources, especially in its national parks and ecosites, are a key source of the island's high biodiversity and play an important role in attracting tourists. There are close cross-sectoral connections with other sectors as well. Forests in Dominica also have important social dimensions: they have always been connected to the Kalinago (a unique population of pre-Columbian indigenous people) and are considered very important from a history/cultural perspective. Furthermore, an estimated 20 percent of jobs in Dominica are indirectly linked to forestry. **The forest sector has been neglected in recent years and there appears to be a perception among decision makers of limited potential for economic development**. Difficult trade-offs—such as balancing forest protection and conservation with economic and social goals—may be viewed as constraints to the development of Dominica's forest resources.

The forest sector regulatory framework is affected by important issues related to fragmentation, insufficient coordination, data-based decision support, and implementation effectiveness. Laws regulating the forest sector are dated and incomplete; clearer provisions regarding systematic forest management and monitoring are needed. The institutional framework is rather complicated and fragmented. It involves many entities—often attached to different ministries—with forest/land management responsibilities that are inadequately coordinated. These cross-cutting responsibilities require an improved coordination mechanism, better support systems, and better data collection and management. In some institutional assessments, significant institutional capacity gaps were identified. Although there are several major policies serving adjacent sectors that that link to forest resources, the sectoral policy is heavily fragmented and there is no official long-term strategic document that focuses specifically on the forest sector. Many of the programmatic documents are responses to perceived crises rather than data-informed policies based on impact assessments and part of a clear integrated approach. Implementation and monitoring are often ad hoc and, in large part, not effective on the ground due to the lack of financial resources and the frequency of natural disasters.

Management planning for protected areas (PA) is progressing, but there are implementation issues, while scientific forest management is almost absent. Three national parks benefited from the

preparation of management plans, but the implementation of these plans has been limited. None of the forest estate benefit from systematic evaluation of forest resources, and Forest, Wildlife and Parks Division (FWPD) does not have consistent forest management plans to guide their forestry-related activities. Therefore, these activities are extremely limited and only conducted on an ad hoc basis as emergency needs and resources permit.

Dominica is highly vulnerable to climate change, particularly impacts from increased frequency and intensity of hurricanes. Dominica also is one of the few carbon-neutral countries in the world, largely due to carbon sequestration. It is important to note that the forest disturbance regime is driven by storms. Wind damage to forests is not unusual, and the forest types in Dominica developed in the face of intermittent storms. Not the storms as such, but the increased frequency and intensity of storms constitute an unusual threat for Dominica's forests. Forest resources management should therefore aim at increasing the resilience of forests to climate change. Specifically, forest adaptation should focus mainly on natural regeneration, while plantations may help increase the value of abandoned agricultural land.

The GoCD National Resilience Development Strategy 2030 (NRDS) elevates disaster risk management and climate change adaptation to national priorities and establishes the vision of building the world's first climate-resilient country. NRDS established some important directions to be followed in managing forest resources: (a) scale up afforestation activities, (b) encourage the sustainable harvesting of timber products, (c) address biodiversity conservation threats, and (d) implement a resource inventory. However, implementation of the policy framework needs a coordinated operational planning and management effort to effectively meet the sector's potential in supporting the country's economic development and climate change agenda in the face of limited financial resources and technical capacity.

Although the Country Forest Note (CFN) has identified gaps in the regulatory, policy, and management framework, the problems faced by the forest sector in Dominica are manageable and not major compared with other countries with large scale commercial forestry and deforestation issues. Forests have been seriously disturbed by Hurricane Maria, but their recovery capacity is naturally high. Agriculturally driven deforestation is no longer a threat. There are no alarming degradation phenomena, no pressing unmet needs for wood, and no indications that forestry problems are closely linked to widespread poverty. Although forests themselves do not suffer from serious problems, there are opportunities for making better use of forests to support an important increase in revenues and economic activities, including tourism, and to rationalize the role and functions of the GoCD on forest management especially and environmental management generally, through policy integration, institutional coordination, and better management planning and implementation.

While forest sector issues are relatively limited, the potential exists for significant improvement based on low-cost interventions and modest policy reforms. The identified actions are mostly centered on forest resource conservation for environmental services linked to the ambitions of developing a nature-based tourism sector. The CFN identifies the most important intervention areas for short- and medium-term: a) PA visitation infrastructure rehabilitation; b) sustainable small scale salvaging for timber; c) forest resources evaluation and management planning (including planning for Kalinago territory); c) National Parks management planning; d) operational planning for reforestation program and e) capacity building for forestry-related institutions. The recommended priority long-term interventions include three areas: (1) policy, regulations, and institutions; (2) natural resources management; and (3) research.

Important identified key needs are going to be addressed (or at least supported) by a Global Environmental Facility (GEF) supported project proposal and by the ongoing Emergency Agricultural Livelihoods and Climate Resilience Project (EALCRP) and Disaster Vulnerability Reduction Project (DVRP): rehabilitation of trails and facilities within national parks or parts of Waitukubuli National Trail (WNT), sustainable salvaging for timber, better planning for forest resources usage, forest inventory, and better operationalization for increased effectiveness of the reforestation program. To accomplish some other identified needs, the CFN has proposed seeking additional grant financing under Global Environment Facility (GEF). However, the CFN suggests there is a yet unmet

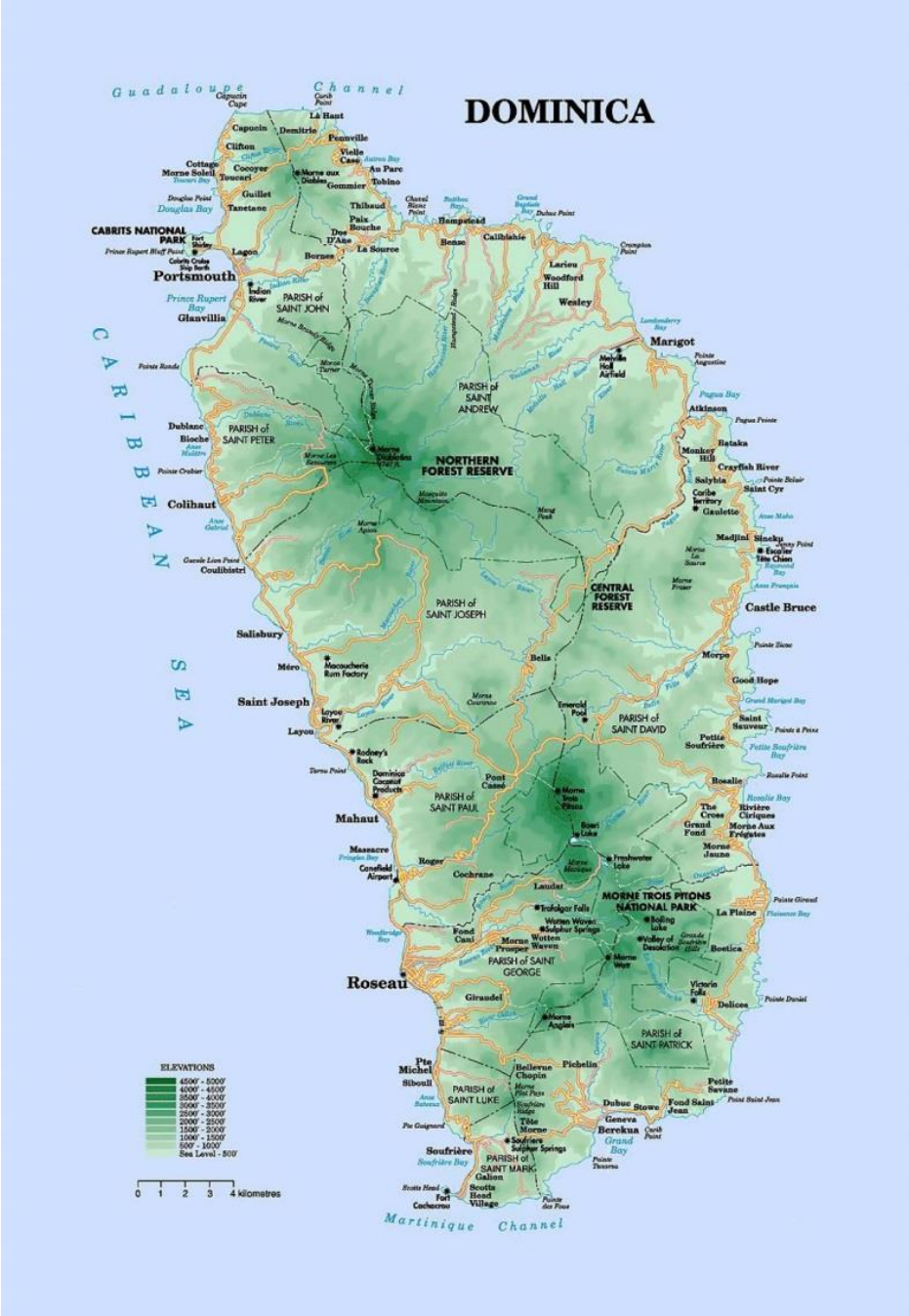
need for support for comprehensive environmental regulatory and management capacity building that would pull together land use planning, the nascent environmental assessment and clearance process, and, to the extent possible, domestic and international payment for environmental services (PES) schemes.

1. Commonwealth of Dominica: Country Context

Dominica, the most northerly and the largest of the eastern Caribbean countries, lies in the Windward Islands and has a unique geography. With a surface area of 750 km^2, Dominica is characterized by very rugged and steep terrain. The risk of soil erosion is high, and depends on many factors, including agricultural or silvicultural practices (CCA 1991).

Dominica has a humid tropical marine climate characterized by little seasonal or daily variations and strong and steady trade winds. Rainfall increases from the eastern side eastward toward the central parts of the island, where it reaches over 10,000 mm annually. On the western side of the island, in the shelter of the steep mountains, rainfall drops off to as little as 1,200 mm per year (CCA 1991).

Figure 1. Dominica—detailed elevation map with roads and cities



Source: https://www.mapsland.com

The specific relief conditions create significant variability of microclimates within very short distances.

Dominica's population totals 71,856 (UN 2019),[1] with a population density of 96 inhabitants per km^2, and 74 percent live in urban areas. The latest estimates on poverty indicate that the level of poverty fell from 39 percent in 2003 to 28.8 percent in 2009. Extreme poverty, as measured by the indigence rate, also declined from 10 percent in 2003 to 3.1 percent in 2009[2] (CDB 2009). Unemployment was estimated at 13.9 percent (CDB 2009).

Dominica was a French colony from 1715 to 1763, and then a British colony from 1763 to 1978.The island system of government—a parliamentary democracy—is marked by the British (Honychurch 1984). Dominica has a society richly imbued with colorful contributions from a multicultural past, from the base of Amerindian craft and botanical lore through African social elements and eighteenth century French patterns to more modern western influences (Honychurch 1988). Dominica is the only eastern Caribbean island that still has a population of pre-Columbian indigenous peoples called the Kalinago (previously called Caribs), who were driven from neighboring islands. As of 2011, there were around 2,200 Kalinago remaining. They live in eight hamlets—comprising the Kalinago Territory on the east coast of Dominica—on community lands that were granted by the British Crown in 1903 (OECS 2018).

Box 1. Commonwealth of Dominica: Key facts and figures	
Land surface:	750 km^2
Highest altitude:	1,447 m
Population:	71,895
Absolute poverty level:	3.1% (2009)
Unemployment:	14%
GDP:	504 mill USD (2018)
Travel & Tourism share of GDP:	26% (2014)
Agriculture share of GDP:	7% (2018)
Average GDP loss, extreme events:	7.9% (1996–2015)
Impact of Hurricane Erika:	96% of GDP (2015)
Impact of Hurricane Maria:	226% of GDP (2017)

Table 1. GDP and sector contribution for Commonwealth of Dominica

	2015	2016	2017	2018
GDP (market prices, mill. USD)	535	581	497	504
Change	-2.6%	+2.6%	-6.9%	+2.2%
Contribution to GDP per sector (%):				
Agriculture, livestock, and forestry	10.7	11.4	9.9	7.0
Mining and quarrying	0.7	0.9	0.9	0.9
Manufacturing	2.6	2.0	1.8	1.3
Electricity and water	5.0	5.0	4.2	3.1
Construction	3.4	4.4	4.5	7.2
Wholesale and retail trade	10.7	10.3	9.7	10.9
Hotels and restaurants	1.8	1.5	1.5	0.9
Transport, storage, and communications	12.4	11.4	11.9	11.9
Real estate, renting, and business activities	8.7	8.5	7.5	6.6
Public administration, defence, and compulsory social security	8.7	8.7	9.2	9.4
Education	9.6	9.8	9.8	4.3
Health and social work	3.3	3.4	3.5	3.6

Source: Central Statistical Office (CSO), Dominica, December 2018

Economic Profile

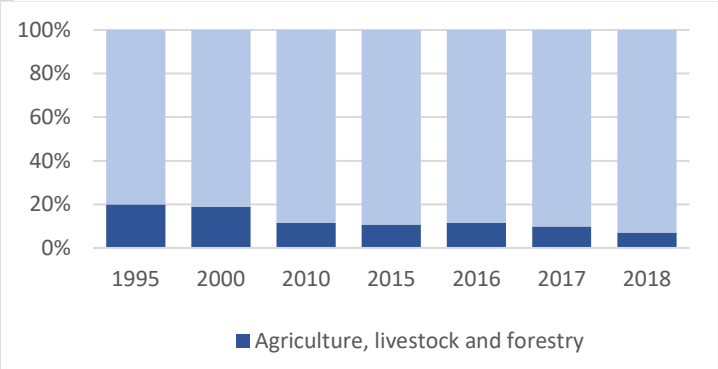
The Commonwealth of Dominica is a small upper-middle-income country with an annual GDP of USD $581 million in 2016 (the highest recorded value) and USD $504 million in 2018 (WB 2018).

The economy contracted in 2015 and recovered in 2016; the recovery was led by agriculture and tourism (Table 1).

The repeated pattern of disruption by natural disasters has perpetuated high fiscal instability, with public debt levels reaching over 74 percent of GDP.[3] As of 2018, these levels were higher than the average in the Latin America and Caribbean (LAC) region. Dominica also has had higher GDP losses in recent years than its neighbors (Vegh Gramont et al. 2018). Dominica's economy has always been based on land resources and on an educated and healthy labor force estimated at 40,000 in 2001 (BSAP 2001). The Dominican economy was dependent on agriculture in years past, but increasingly has been driven by tourism, as the government seeks to promote Dominica as an ecotourism destination.

Agriculture is an important part of Dominica's economy, but its contribution to GDP is decreasing. The sector has been vulnerable to hurricanes, fluctuations in world market prices, and especially to the decline in preferential trade access to European markets. Due to these factors, agricultural exports decreased dramatically (EI 2007) and the number of banana farmers fell from 4,366 in 1995 to 1,400 in 2003.[4] Agriculture is still recovering: in 2016, prior to Hurricane Maria, agricultural production accounted for 11.4 percent of total GDP, down from around 20 percent in 2000. While agriculture as a share of GDP is decreasing (Figure 2), it remains an important part of Dominica's economy still accounting for about 40 percent of the labor force by occupation and is vital for rural livelihoods. Nevertheless, Dominica is highly dependent on imports for approximately 55 percent (FAOb 2014) of all foods consumed, with tourism sector seemingly able to increase the food imports depending on the tourists' habits.

Figure 2. Agriculture, livestock, and forestry sector contribution to GDP (%)



Source: CSO Dominica, December 2018

The tourism sector is growing, largely based on eco-touristic activities and government support. According to the World Tourism & Travel Council (WTTC 2015), travel and tourism (including wider effects from investment, the supply chain, and induced income impacts) accounted for 26.4 percent of GDP in 2014.[5] In 2015, there were 243 tour guides, 20 tour operators, and 341 taxi operators who worked within the tourism sector, primarily on ecotourism and adventure tourism (FAO 2015). Direct employment in the Dominican tourism industry is estimated to have grown from 200 people in 1974 to roughly 2,500 in 2005 (Slinger-Friedman 2009), and 8,500 people—approximately 24 percent of the work force—in 2015 (WTTC 2015). Despite all this development, there are still issues that concerns the GoCD: a majority of tourists are only spending one day or less visiting the most attractive and accessible eco-sites and prepaid packages are seldom used by visitors coming to Dominica - four out of five visitors make their own travel arrangements (Slinger-Friedman 2009). The reduced number of stay-over arrivals convinced the GoCD that the *nature island* destination positioning is limited. The *National Tourism Policy 2020* focuses on expanding market positioning from of a nature destination only, to one that encompasses culture and heritage, beach resorts, yachting, golf, health and wellness and a range of other attractions. The government hopes to enhance the nature focus but add additional attractions to increase the number of stay-over arrivals from 79,000 in 2012 to more than 130,000 in 2022 (GoCD 2011).[6] At the same time as emphasizing nature-based tourism, the government's major regulatory actions in the tourism sector have been related to facilitating enclave, high-end projects based on citizenship by investment (GoCD, 2018c), that rise some environmental risks[31].

The conventionally measured direct economic contribution of the forest sector is insignificant, but almost all economic activities are highly dependent on the services provided by forest ecosystems. There is, for example, no timber harvesting sector on the island. Wood processing and wood-based manufacturing are similarly absent, and NTFP harvest and manufacturing is negligible. Nevertheless,

forests are essential, and widely recognized as such, for sectors like tourism and water management, while agriculture is also depending, in the relief conditions of Dominica, on the regulating services provided by forest ecosystems.

Climate vulnerability

Climate change has significantly affected the country's economic and fiscal stability as well as the population's well-being. Average annual losses from weather-related events between 1996 and 2015 are estimated at 7.9 percent of GDP, making Dominica the second most affected country globally in terms of average GDP loss. In addition, Intergovernmental Panel on Climate Change (IPCC) estimates include increases in average temperatures of up to 1.3ºC by 2050, and between 2–3ºC by the end of the century (IPCC, 2018). Such increases in average temperatures are associated with high risks, including increased drying and droughts, and likely increases in the intensity and frequency of extreme weather events (IPCC 2018). In its Intended Nationally Determined Contribution (INDC) (GoCD 2015), Dominica commits to progressively reduce total greenhouse gas (GHG) emissions below 2014 levels—a reduction rate of 44.7 percent by 2030.

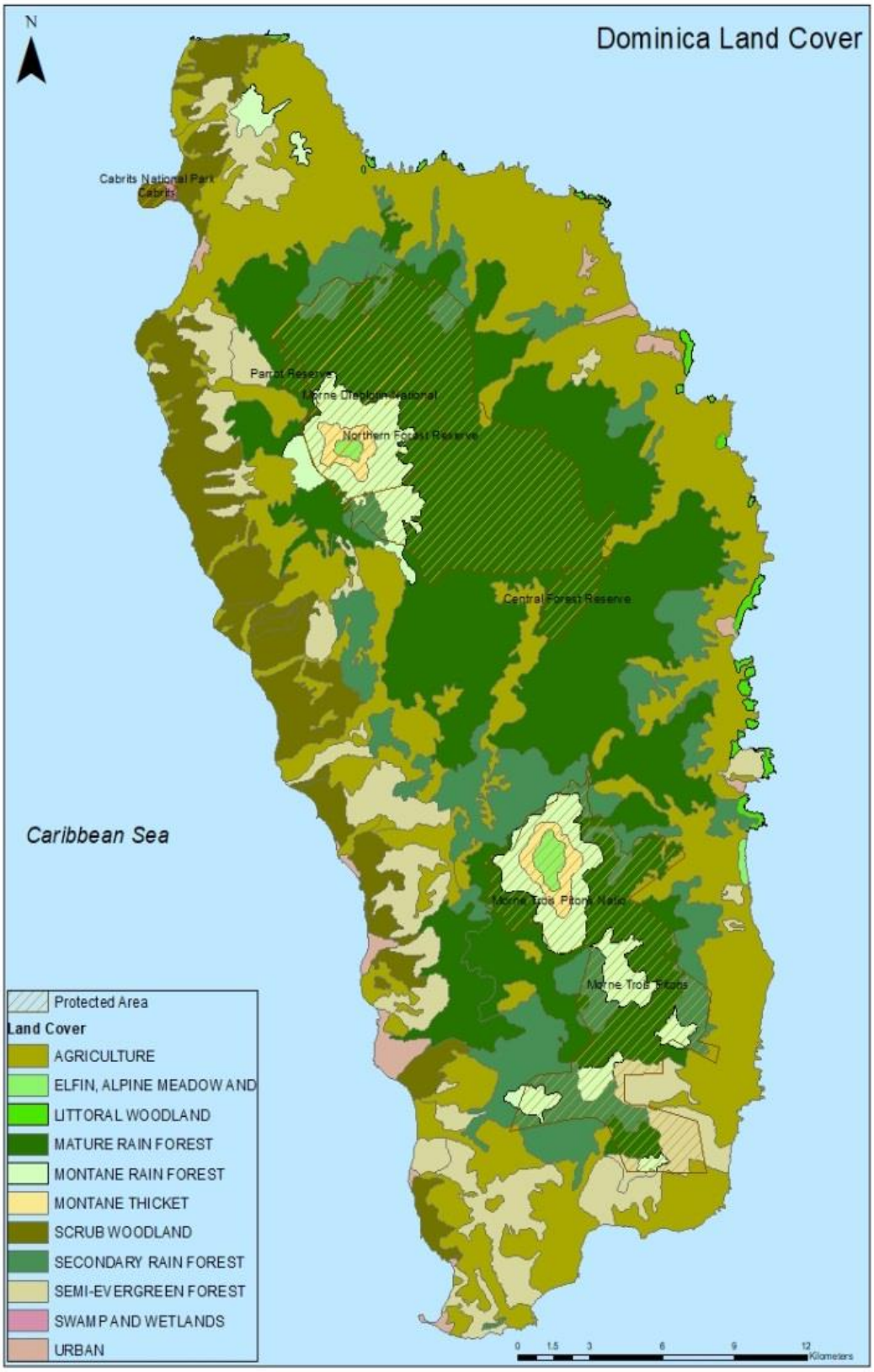
Strong storms affect Dominica on a regular basis. In just the past ten years, several major storms have significantly damaged the physical landscape of Dominica. Major landslides in the upper elevations, flooding in low-lying areas, and rivers overtopping their banks and changing course have resulted in the destruction of farms and the relocation of some communities. In turn, the relocation of communities and farms has required the clearing of new lands for farming, roads, housing, and water mains, all of which have produced additional land degradation on geologically young and fragile volcanic slopes. Besides the impacts on social and economic infrastructure, tropical weather systems also affect biodiversity (BSAP 2001). Hurricane Maria, a category 5 storm, hit Dominica on September 18, 2017, while it was still recovering from tropical storm Erika, which had damaged the island during August 2015. Erika caused severe damage, estimated at 96 percent of GDP. Maria was Dominica's worst natural disaster, with damages and losses estimated at USD $1.3 billion (226 percent of GDP) (IMF 2018). GoCD calculated the recovery needs after Hurricane Maria at USD $1.4 billion (GoCDb 2018).

2. Forest Governance in Dominica

2.1. Forest resource

Covering 60 percent of the country, or approximately 45,000 ha (FAO 2014a)**, the forests in Dominica are rich and diverse and home to important flora and fauna.**[7] Despite widespread conversion of forest to agricultural land in the last century (Geoghegan 1991) and some periods of relatively heavy logging, Dominica's forests remain remarkably intact, with perhaps as much as half of the land still under original forest cover (FAO 2014). The relief and climatic particularities allow a large diversity of vegetation types (Figure 3). The classification and change in national land cover/forest cover classes can be seen in Table 2 (in ha), and the description of classes can be seen in Annex 1. Forest ecosystems in Dominica have developed under wind-driven severe disturbances, which give a high recovery and adaptation capacity. The west lower part of the island is primarily scrub woodland, in the most xeric conditions on the island, and for these areas fire disturbances may be important.

Figure 3. Dominica land cover, national parks, and forest reserves



Data regarding forest resources are scarce, often outdated, and sometimes contradictory. Still, a clear overall picture can be compiled.

Table 2. National land cover/forest cover classes, 1,000 ha

National classes	1984 (EARTHSAT 1986)	2000 (Wood 2000)	2010 (estimates)
Elfin woodland	0.17	0.25	0.30
Montane thicket	0.80	1.06	1.23
Montane rain forest	3.64	3.02	2.64
Mature rain forest	24.49	23.48	22.85
Secondary rain forest	9.09	8.35	7.88
Semi-evergreen forest	7.17	5.65	4.70
Scrub woodland	6.24	5.51	5.06
Littoral woodland/swamp	0.17	0.25	0.30
Total Forest	**51.77**	**47.58**	**44.96**

Source: FAOa 2014; CCA 1991

Table 3. State-managed forested PAs and reserves under the jurisdiction of FWPD

	Surface (ha)	Establishment year	International Union for Conservation of Nature (IUCN) category
Central Forest Reserve	410	1972	IV. protected area with sustainable use of natural resources
Northern Forest Reserve (without MDNP)	5,364	1977	IV. protected area with sustainable use of natural resources
Morne Trois Pitons National Park	6,875	1975	II. National Park
Morne Diablotin National Park	3,450	2000	II. National Park
Cabrits National Park	75[8]	1986	II. National Park
TOTAL	**16,174**		

Source: CCA 1991; UNDP 2016

Table 4. Land use areas and ownership (ha)

	Total	State-managed	State unallocated	Private
Forest	45,000	15,830	10,451	18,719
Crop surface[9]	12,700	-	-	12,700
Other	17,300	-	-	17,300
Total Country area	**75,000**	**15,830**	**10,451**	**48,719**

Source: Shanks and Putney, 1979; CCA, 1991; Zamore, 1992; BSAP, 2001; FAOa, 2014; UNDP, 2014; OECS, 2017; 5,774 ha out of the 15,830 ha state managed forests are Forest Reserves where FWPD can manage forest commercially but under sustainable principles

The latest forest inventory—conducted in 1986/1987 by the FWPD with assistance from the United Nations Food and Agriculture Organization (FAO) (de Milde 1987)—indicates that the most important species are (a) gommier (*Dacryodes excelsa*), followed by (b) carapite (*Amanoa caribaea*), and (c) bois cote (*Tapura latifolia*). These are potentially commercially valuable indigenous species (for construction, furniture etc.) and accounted for 50 percent of the forest composition. Timber stocking was found to be 200 cubic meters/ha on an estimated 12,500 ha, and 600 cubic meters/ha on an estimated 3,500 ha (de Milde 1987; CCA 1991). Estimated total utilization volume (all species) was 4.9 million m^3, and the evaluated annual allowable cut was 9,180 m^3 (FWPD 2019).[10] These figures include some private land. While these would be considered quite high and commercially attractive, since the

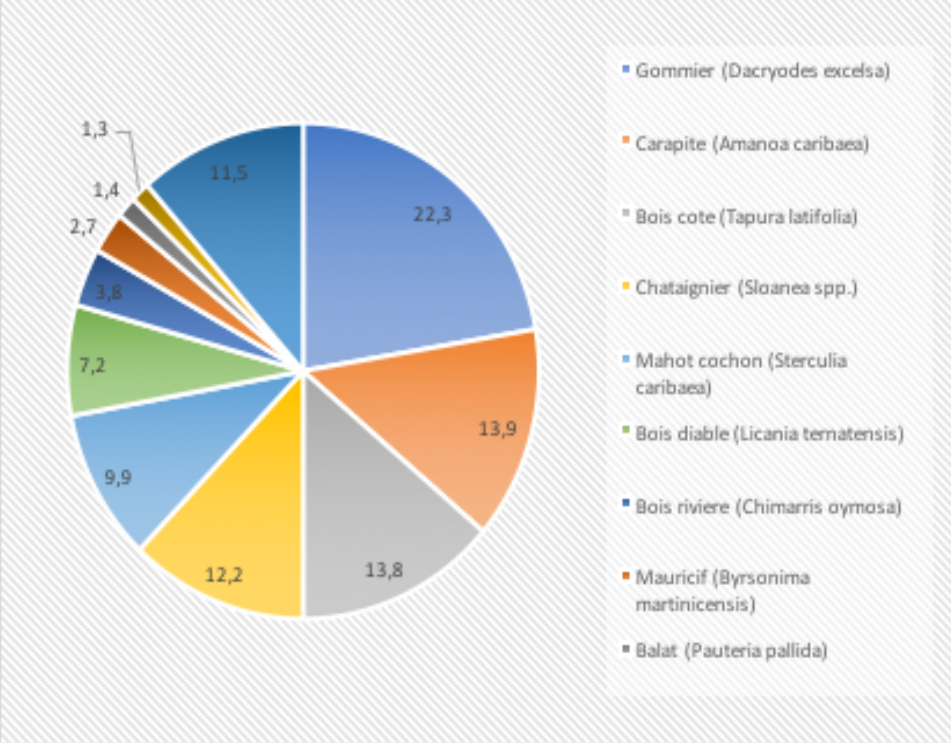
inventory was completed, extraction and other damages—including Hurricane Maria—may have contributed to a significant resource reduction. Recent studies (Brisbane 2019) indicate that up to 11 percent of the trees were uprooted and 20 percent were snapped by Hurricane Maria.[11]

The central mountainous zone remains heavily forested and provides critical watershed, landscape, and infrastructure protection services, while lower zones are in danger of losing some forest cover. Expanding agricultural lands by clearcutting the forest is not a major ongoing threat. Still, some clearance of forests for agriculture, especially in fragile steep-slope areas, pose some pressures on Dominica's forest cover. Regulations on selling the unallocated government forest land for agricultural conversion are still in place, although the demand for agricultural land has eased, with increasing amounts of agricultural land being abandoned (Eckelmann 2010).

Box 2. Forest resource in Dominica: Key facts and figures	
Forest area	45,000 ha (60% of the country surface)
Usable forest estate	Between 6,000 ha and 16,000 ha
Mature rain forest	50% of the forest
Forest Reserves	5,774 ha
Forest in National Parks	10,400 ha
Main indigenous species	gommier (*Dacryodes excelsa*), carapite (*Amanoa caribaea*) and bois cote (*Tapura latifolia*)
Main exotic species:	mahogany (*Swietenia ssp.*), blue mahoe (*Teliparti elatum*)
Hurricane Maria impact	90 % of the trees defoliated, 11% uprooted, 20% snapped

Scientific forest management is almost absent in the history of the island. Except for the already mentioned FAO-supported attempts in 1986/1987, Dominican forests have never been subject to forest management planning, or zoning based on forest functions. The only limited zoning has been based on water catchment protection and, recently, parks management planning.

Figure 4. Exploitable forest composition in the 1987 forest inventory



Source: de Milde 1987

Afforestation has not played a major role in Dominica. FAO (2015) has estimated that the total plantation surface in Dominica is less than 200 ha. The prevalence of natural regeneration, also in secondary forests, has been obvious. Still, some afforestation initiatives were implemented in Dominica, especially after Hurricane David, but they are rather ad hoc reactive reflexes. Although it was generally accepted that replanting with exotic species was undesirable, after Hurricane David it was critical to provide needed coverage for the seedlings were readily available (CCA 1991). Afforestation thus relied heavily on exotic species, especially mahogany

(*Swietenia ssp.*) and blue mahoe (*Hibiscus elatus*); some were valued for their rapid growth and industrial applications. Reforestation was done both on state-owned land (reserves but also unallocated forest land) and private land. Plantings were generally small, widely scattered, and undocumented. Despite the perceived economic advantages of some exotic species, most sources recommend the use of indigenous species and managed natural regeneration.

The Land and Survey Division[12] has no data regarding total private/state-owned land surfaces. Shanks and Putney (1979) indicate that the total privately owned/claimed land surface was around 52,901 ha, the allocated governmental land surface was 15,573 ha, and the total unallocated governmental lands totaled 10,526 ha. The Biodiversity Strategy and Action Plan (BSAP 2001)—citing an agricultural census done by the GoCD in 1995—estimates that 21,000 ha are in farms, but only 12,700 of them are cropped and the rest is covered with forest. Some other sources (Zamore 1992) indicate that the government-owned forest base included 9,224 ha of declared forest reserves and 5,369 ha of uncommitted state land available for allocation. This figure was based on the exclusion of all private forests, crown land settlements, crown lands likely to be sold in the immediate future, or small isolated blocks of state lands. By conservatively compiling data from these different sources and making some necessary assumptions,[13] it appears that the state owns around 26,000 ha (58 percent) of the forest, including both managed and unallocated forest land (Source: *CCA 1991; UNDP 2016*

Table 4), while the state forest land that can be used in a sustainable manner is between 5,774 ha (the cumulative surface of the forest reserves) and 16,225 ha (forest reserves plus unallocated governmental land covered with forest) (Source: FAOa 2014; CCA 1991

Table 3 and 4). There are significant forest areas under private ownership, as well as forest surfaces that are the property of the state but have not been yet designated for priority purposes.

2.2. Regulatory framework

Legal framework

Generally, **laws regulating the forest sector in Dominica are dated and fragmented; clearer provisions regarding systematic forest management and monitoring are needed.** It is commonly recognized that the legal framework requires revisions to address a range of issues, especially related to implementation effectiveness (OECS 2006).

Table 5. Description of the main laws and regulations related to the forest sector

Laws/ amendments/subsequent	Description
Forest Act (1959) **Subsequent:** Forest Ordinance Cap. 80 (1959), Forest rules (1972)	Establishes forest reserves on public lands and protected forests on private lands; designates private lands as protected forest for water or soil conservation or other public purposes; specifies prohibited activities in forest reserves; describes the issuing of licenses and permits for harvesting forest products.
Forestry and Wildlife Act no 12 (1976) **Amendments:** Forestry and Wildlife Act no.35 (1982)	Regulates the protection and management of wildlife within forest habitat.
National Parks and Protected Areas Act no 16 (1975) **Amendments** Act 54 (1986), Act 12 (1990), Act 8 (2001) and Act 1 (2015) **Subsequent:** National Parks and Protected Areas (ecotourist site) (user fee) Regulations (1997, 2008, 2013); National Parks and Protected Areas Orders (2000, 2001, 2003)	Establishes a system of national parks and protected areas; provides for the creation of a National Parks Service; authorizes the central authority in charge to set aside state lands for PAs in the form of national parks, historic sites, and recreational areas. Section 14 gives DOWASCO the authority to undertake, operate, and manage any work concerning provision of water. Section 15 provides the same to DOMLEC regarding the generation of electrical power.

Botanical Garden Rules (1932, 1934) Botanical Garden Ordinance (1898)	Standard enactments covering botanical gardens.
Physical Planning Act (2002)	Establishes EIA regulation; describes construction practices and provisions for prohibitions on land use activities that harm the environment or affect health or safety of persons; empowers the central authority to regulate the preservation of certain plants or groups of plants for biodiversity; regulates the surveys for PAs declaration.
Tourism (Regulations and Standards) Act (2005) Amendments: Act 11 (2008) and Act 16 (2016	Recognizes that the PAs form the base of ecotourism; creates standards to guide the development of the tourism industry and the regulation and certification of select tourism services.
Land Survey Act (2005)	Provides for the licensing and professional conduct of land surveyors and for the execution of land surveys (including forests).
Environmental Health Services Act (1997)	Governs the permitting required by the placement of sewage treatment and disposal facilities, including forest surfaces and eco-sites.
Crown Lands Ordinance (No. 60), Crown Lands Regulations (1961)	Governs the sales and release of government land, including forests.
Land Acquisition Act (1953)	Governs the acquisition of private land (including forests) and uses beneficial to the state.
Mines and Minerals Act (1996)	Regulates the establishment and operation of quarries (also in forest land).
Water and Sewerage Act (1998) Electricity Supply Act (2006)	Authorizes public utilities companies—one a statutory corporation (DOWASCO) and the other a privately owned company (DOMLEC)—to access Dominica's water resources without making payment.

The Forest Act (1958) includes provisions to declare protected forests and also addresses the issue of private lands within a protected forest. It established the basic mandate of FWPD. The Forest Act does not specifically address the need for systematic management/monitoring of state forest resources and has not been followed by any subsequent legislation focusing on these issues: there are no provisions regarding forest resource management or the system for keeping records on forest land ownership, thus the Forest Act and its subsequent normatives are unable to address current social, economic and environmental needs.

The Forestry and Wildlife Act no. 12 (1976) provides for the creation of wildlife reserves. The act established that all wildlife in the country is the property of the state and under the jurisdictional protection of FWPD. However, the act does not link to other legislation addressing species protection or to the national obligations under conventions (OECS 2016).

The National Parks and Protected Areas Act No. 16 (1975) is the main legislation relating to the management of national parks. This act contains provisions for the preparation of management plans for PAs, but there is no provision for the systematic planning or periodic reporting on the status of PAs. The specific regulations regarding PAs include rather confusing provisions regarding the institutional frame. There is room for improvement in terms of clearly defining the role and coordination of different state entities with mandates in the management of PAs.

Except for some provisions regarding the issue of private lands within PAs, certain limitations to land use activities that remove vegetation or disturb soils, and sales or acquisition of land by the government, owners of privately held land face very few restrictions compared with state-owned land. In general, even the enumerated provisions described above do not have proper monitoring and enforcement mechanisms in place.

Institutional framework[14]

The institutional framework for the forest sector in Dominica is rather complicated and fragmented. It involves many entities—often attached to different ministries—with forest/land management and environmental protection responsibilities. These cross-cutting responsibilities require an improved coordination mechanism, better support systems, and a better data collection and management system as a prerequisite for informed policy and management decisions. In some institutional assessments (OECD 2006; FWPD 2019), significant institutional capacity gaps were identified related to staffing levels, skills, financial resources, and institutional culture.

In the area of land use regulations, there are many blank spots in the legal framework that impair the effectiveness of national institutions. As previously mentioned, only part of the forests in Dominica are under national authority and receive the full protection of environmental protection laws, while private owners face far fewer restrictions.

Forest-related governance in Dominica falls within the mandate of several public-sector organizations (Table 6). Beside these public entities, there are numerous local[15] nongovernmental organizations (NGOs) that are increasingly involved and interested in forest resources governance. NGOs are involved in project based co-management arrangements that are considered successful (Sarrasin and Tardif 2012).

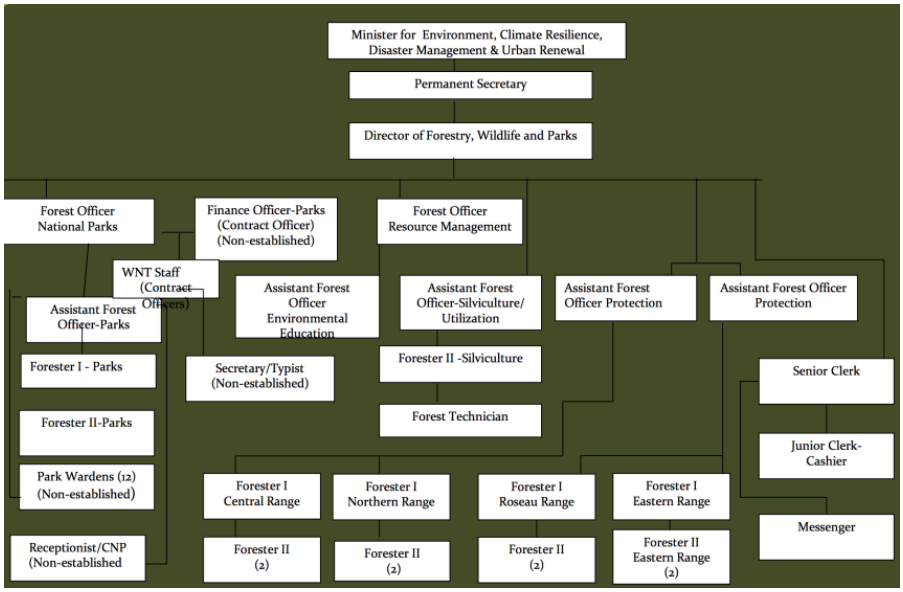
Table 6. Public entities and their role in forest-related governance

Government	Department/agency	Mandate related to forest sector
Ministry of Environment, Climate Resilience, Disaster Management and Urban Renewal (MECRDMUR)–	Forestry, Wildlife and Parks Division (FWPD)	Conservation, management, and sustainable resource use of all forest reserves, national parks, nature sites, and the WNT, as well as soil and water conservation, enforcement of forestry, wildlife and national parks legislation, research and monitoring, public relations, and environmental education
	Environmental Coordinating Unit (ECU)	Coordinating environmental and sustainable development programs
	Project Coordination Unit for DVRP	Implementing the forestry related DVRP measures: forest inventory and construction of forest nurseries
Ministry of Agriculture, Food and Fisheries	Division of Agriculture	Monitoring agriculture activities on farms, many of them having partial forest cover Monitoring the access and prevention of invasive species
	Project coordination unit for EALCRP	Implementing the forestry related EALCRP measures
	Fisheries Division	Oversees some aspects of management of CNP
Ministry of Finance and Economic Development		Allocates budgets for forestry Sets and manages protected areas and eco-site user fees
Ministry of Planning and Economic Development	Physical Planning Department	Manages land use planning and development control, including development projects relative to forest land Weak coordination mechanism with FWPD
Ministry of Housing and Lands	Lands and Surveys Division	Manages unallocated state lands Consultation with the FWPD over the allocation of these lands has been minimal and is not based on a formal mechanism for regular consultation (FWPD 2010)
Ministry of Tourism and Culture		Some responsibilities for management of World Heritage Site and several eco-sites

		There were attempts to establish intersectoral committees, but the level of coordination is rather minimal
	Community Tourism Organization	Promotes and develops ecotourism sites and activities in various communities in collaboration with the Ministry of Tourism
Discover Dominica Authority		Management of some protected ecotourism sites
Ministry of Health and Social Services	Environmental Health Department	Monitoring the quality of the recreational sites and ecotouristic facilities Advises Physical Planning Division in EIA
The Kalinago Council		Has custody, management, and control of Kalinago Territory lands, including forested lands
Public & private utility companies		
	Dominica Water and Sewerage Company Limited (DWASCO).	Directly interested in forest management around water catchments Makes decisions regarding management of forest areas without a formal coordination mechanisms with FWPD
	Dominical Electricity Services, DOMLEC	Authorized to harness water for hydroelectricity anywhere in Dominica, inclusive of the national parks

The main agency in charge of forestry is FWPD in the Ministry of Environment, Climate Resilience, Disaster Management, and Urban Renewal (MECRDMUR). The agency was moved from Ministry of Agriculture in 2018. FWPD covers a wide range of responsibilities—from national parks management to watershed management—while facing severe capacity constraints. It is responsible for the conservation, management, and sustainable resource use of all forest reserves, national parks, nature sites, and WNT. Those responsibilities are mandated by the Forest Act, Forestry and Wildlife Act, and the National Parks and Protected Areas Act.

Figure 5. Administrative structure of FWPD



FWPD's forest activities include (a) management of national parks; (b) forest utilization, including lumber and trees sales: (c) afforestation; (d) silviculture; (e) forest nurseries; (f) management of the botanical garden: (g) watershed management; (h) agro-forestry; and (i) research, monitoring, and environmental education (FWPD 2019). In executing its mandate, FWPD routinely collects revenues for tourists visiting national parks and ecotourism sites. It also manages enforcement activities, site development, trail rehabilitation and maintenance, environmental education, and monitoring of concessions at the ecotourism sites. Within FWPD, there are multiple units or sections (Figure 5). The National Parks Office is responsible for enforcing specific regulations for protected areas (including WNT management and collection of the park user fees[16]). The Resource Management Office mainly deals with forest-related prerogatives like permits for timber extraction, nurseries, and forest

products marketing. FWPD collaborates with external research organizations and intergovernmental institutions, reports under the relevant multilateral environmental agreements (MEAs), and interacts with private, public, and civil society stakeholders. According to their own assessment (FWPD 2019), many of the activities are affected by technical capacity and understaffing, as well as chronic underfinancing (Poyotte 2010; FWPD 2019).

MECRDMUR also has an Environmental Coordinating Unit (ECU), aimed at coordinating environmental and sustainable development programs. ECU works with government institutions as well as non-state stakeholders. It does not have a well-established jurisdiction, and therefore has limited enforcement powers. Its staffing levels are not sufficient to carry out its mandate. An institutional review of environmental management institutions in Dominica in 2006 resulted in the Cabinet's approval of a new management structure for the National Parks Service designed to place all national-parks-related activities under the same roof, but this integrating structure was never created (OECS 2006).

In 2018, GoCD created the Climate Resilience Execution Agency for Dominica (CREAD)[17] under direct supervision of the prime minister. The agency was given a four-year mandate to (a) ensure the climate-resilience of the physical and other infrastructure of Dominica; (b) coordinate recovery action following a climate-related disaster; and (c) execute projects aimed at building national climate resilience. CREAD also is mandated to identify and develop climate-resilience systems, to implement major capital projects, to establish and maintain a database on recovery needs and potential and existing projects, and to review relevant policies and plans. In October 2019, CREAD was expected to take over the coordination of all WB projects that pertain to recovery and resilience-oriented measures.

Policy framework

There are notable attempts by the GoCD to create an integrated policy framework for natural resources sustainability. Many of the programmatic documents are actually responses to a crisis rather than data-informed policies based on impact assessments and part of a clear integrated approach. Implementation and monitoring are often ad hoc and, in large part, not effective on the ground due to the lack of financial resources and the frequency of natural disasters. There is a need to ensure that resilience is built into public planning and that the rule of law is enforced. At the same time, there are numerous programmatic documents, many of them being elaborated with international assistance, that have never been considered by the government for approval and/or implementation.[18]

Although there are several major policies that are focused on forest resources, the sector is heavily fragmented from the policy point of view. Directions like increasing forest surface/afforestation, sustainable harvesting of forest timber products, and maintaining and enhancing biodiversity and ecological functions can be found in most of the relevant programmatic documents. However, there are other issues—like monitoring forest resources and implementing forest policy measures, regulating the use of private forest land, and developing sustainable forest-based industries—that are key for further development of the forest sector, but are generally missing from the official policy framework. These issues are often informally acknowledged, especially by many of the stakeholders, including FWPD.

Box 3. Directions established by National Resilience Development Strategy (2018)

- Implement a systematic resilient reforestation program in the medium and long term, oriented toward replacement of fallen trees in the forest, and planting fast growing trees for water catchment protection along rivers, streams, and slopes.
- Support sustainable harvesting of forest timber products and avoid wastage in lumber production; promote small-scale furniture production, sustainable thinning, and use of biomass.
- Increase domestic lumber production using the large quantity of felled trees and logs following the passage of recent storms.
- Encourage promotion of independent sawyers using chainsaw mills and the like, while engaging in practices that minimize environmental damage.

- **Implement a national forest inventory** to include a GHG inventory, for the country to be able to obtain relevant data, particularly as it relates to changes in the island's forest cover and carbon sequestration.
- **Address the biodiversity threats** identified in the International Convention on Biodiversity Conservation (CBD) programmatic documents.
- **Promote ecosystem-based approaches to adaptation, or the conservation, sustainable management and restoration of ecosystems to help communities adapt to the impacts of climate change** in the context of tailor-made national cost-effective measures that are accessible to local communities and indigenous peoples in the areas of intervention.

Source NRDS, 2018

After facing the tremendous effects of Hurricane Maria, the GoCD prepared the NRDS, which elevates disaster risk management and climate change adaptation to national priorities. The vision of this strategy is to build the first climate-resilient country in the world. It plans to incorporate hazard and risk mitigation into infrastructure design and planning, social sectors, and all aspects of national development. NRDS has a section dedicated to forest resource management that underlines the importance of forests in Dominica (a) as a source of recreation, (b) as a source of timber for small-scale industrial use, and (c) as an ecological entity for watershed protection and biodiversity. NRDS established some important directions to be followed in managing forest resources (Box 3). **NRDS was followed by sectoral strategies. One of them, MECRDMUR Strategic Plan (MECRDMUR 2018) includes a very ambitious implementation and monitoring plan for sustainable growth and development in the forestry sector**. It is aimed at (a) implementing reforestation strategies after Hurricane Maria, (b) sustainable timber salvage, (c) rehabilitation of trails and facilities within national parks and ecotourism sites, and (d) research and development on flora and fauna. From the forest sector perspective, this strategic plan was based on the National Forestry Strategy & Action Plan for Rehabilitation, Reforestation and Building Resilience in the Forestry Sector Post- Hurricane Maria, elaborated by FWPD in April 2018 (FWPD 2018). Both documents are generally in line with the NRDS objectives, with emphasis on the restoration strategies after Hurricane Maria. Details of the strategic plan are included in Annex 2.

Box 4. Goals considered by the The Draft Forest Policy Statement for the Commonwealth of Dominica

- **Maintaining or enhancing the biodiversity and ecological functioning of forests** through (a) conserving ecologically functional areas of all forest ecosystems found on both state and private lands; (b) protecting native genetic species and ecosystem diversity; and (c) addressing negative impacts from invasive species.
- **Maintaining or increasing the area of land covered by forest** through (a) implementing a "no net loss of forest" policy; (b) maintaining existing forested areas designated as protected areas on state lands; (c) promoting the maintenance of forests on private lands; (d) promoting, supporting, and conducting the rehabilitation and restoration of forest on degraded and deforested state and private lands; and (e) promoting the maintenance or increasing the land area for forest cover as a mechanism to sequester carbon.
- **Optimizing the contribution of forest resources to livelihoods and to the economy** through (a) ensuring the sustainable extraction of forest goods; (b) promoting the development of sustainable forest-based industries for both timber and non-timber forest products; (c) managing access to genetic resources and ensuring fair benefits from the use of forest genetic resources; (d) supporting traditional, subsistence, and small-scale extractive uses of forests and cottage industries that are legal, sustainable, and compatible with conservation objectives; (e) promoting forestry's contribution to food security through sustainable agroforestry; (f) supporting the development of nature-based tourism; and (g) managing forests for the provision of critical ecosystem services such as water production, carbon sequestration, erosion control, and coastal protection.

Source: FWPD 2010

There is no official long-term strategic document that focuses specifically on the forest sector, **although there were attempts to design such a document.** FWPD's 2010 Draft Forest Policy Statement for the Commonwealth of Dominica aims at "guiding the conservation, protection, management and wise use of the nation's forest resources, while ensuring that the productive capacity

of the forests for both goods and services is maintained or enhanced for present and future generations" (FWPD 2010). Before this attempt, the last time a formal policy was developed for managing Dominica's forest resources was in 1949. In some ways, the 1949 policy was forward-thinking, envisioning a land allocation and conservation policy and encouraging wise use of resources, including the protection of wildlife and areas of scenic or scientific interest (FWPD 2010), but the institutional, regulatory, and economic development since the 1970s requires a new approach. The 2010 document (FWPD 2010) established a set of objectives and policies to achieve them, but without a very precise resource assessment or impact assessments (Box 4). Although it doesn't include a monitoring mechanism, the document identifies numerous requirements for implementation. Many of the forest sector's policy-related issues were correctly identified, but the document was never officially adopted by the government.

Dominica ratified the Convention on Biological Diversity in 1994, and committed to biodiversity management through the preparation, approval, and submission to the CBD of its Biodiversity Strategy and Action Plans in 2001 (BSAP 2001). An updated version of this plan established strategic actions for 2014–20 (NBSAP 2013). The revised strategy included some targets, notably that at least 20 percent of terrestrial and 15 percent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, were to be conserved—through comprehensive ecologically representative and well-connected systems of effectively managed PAs—and integrated into the wider land and seascape.

Box 5. Forest resource policy references

- Dominica's agricultural policy is based on the need for preserving the natural resources base. Specifically, the National Agricultural Policy and Action Plan 2016–2025 is based on three pillars of (a) environmental sustainability, (b) competitive business, and (c) food and nutrition security. However, the document does not sufficiently underline the possible cross-coordination between forest and agriculture sectors in areas like agroforestry.
- Tourism-related policy documents have environmental-related tourism in the center. Tourism policy was designed recently and is covered by two important policy documents: National Tourism Policy (2013) and Tourism Master Plan 2012–2022. They rely on enhanced environmental management and physical planning, including the creation of an Environmental Protection Agency and a National Park Service agency (although these entities were never created). Both documents highlight the significance of Dominica's natural environment to its tourism product (GoCD 2013; GoCD 2011). Dominica has coined the title "Nature Island of the Caribbean " as its logo for ecotourism promotion and offers services such as adventure excursions, habitat research, hiking, river bathing, sightseeing, whale watching, and scuba diving (BSAP 2001).
- There are also other officially adopted policy documents that are impacting the forest sector in a rather limited way. These documents include the National Action Programme to Combat Land Degradation (2004), Growth and Social Protection Strategy (2012), National Land Use Policy (2015), National Physical Development Plan (2016), and the National Integrated Water Resources Policy (2011). The National Land Use Policy (2015) outlines the principle aims and objectives with respect to directing development and land uses in Dominica and supports, as one of its main pillars, "the enhanced forest, natural environment and agricultural vitality." The National Physical Development Plan (2016) outlines the objective of having at least 65 percent forest cover, bearing in mind the multitude of benefits to forests.

The climate change policy framework includes important measures regarding impacts on the forest sector. The Low Carbon Climate Resilient Development Strategy and the Strategic Program for Climate Resilience were approved by the Cabinet in April 2012 to facilitate Dominica's transformation to a low-carbon, climate-resilient economy while addressing pressing development, livelihood, and poverty issues. Enhancing the resilience of natural ecosystems and protecting carbon sinks are important aspects of the strategy. The National Climate Change Policy and Action Plan (2019–24) includes important provisions that are focused specifically on the mandate of FWPD, including (a)) undertaking research into and analysis of the relevant climate change processes on Dominica's terrestrial biodiversity; (b) undertaking measures in the short term to increase the resilience of terrestrial

biodiversity; and (c) developing a comprehensive national land use and management plan, which among other things incorporates climate change concerns. GoCD has also prepared a national REDD+ strategy (OECS 2017) aimed at assisting FWPD in streamlining and coordinating the various past and present efforts on REDD+. The strategy emphasizes proper channelling of funds at the national level by ensuring that REDD+ activities are designed and implemented in compliance with the requirements of the United Nations Framework Convention on Climate Change (UNFCCC), as well as defining an adequate national environment to include reductions in greenhouse emissions in the forestry sector. The goals and actions of the REDD+ strategy are outlined in Annex 4. Based on the potential to increase its carbon stock through forest conservation, the REDD+ strategy requires Dominica to determine its national reference emission level and its national reference level, which serve as the baseline for the monitoring mechanism. However, the Dominica case is recognized as being rather different, since the rate of deforestation and forest degradation are low.

2.3. Forest management planning, monitoring, and financing

The forest sector has been neglected in recent years and there appears to be a perception among decision makers of limited potential for economic development. Difficult trade-offs—such as balancing forest protection and conservation with economic and social goals—may be viewed as constraints to the development of Dominica's forest resources. Budget trends underscore the limited attention to the sector. Over the past nine years, the Forest Administration Program has had its approved budgets decrease slowly, from XCD $431,000 in 2009 ($147,000 USD) to XCD $367,000 in 2018 ($136,000 USD).[19] The approved budget—on a per hectare basis relative to forest area—is very small, between USD $3.3 /ha in 2009 and USD $3.0 / ha in 2018. Over the same period, the Conservation and Protection Program and the Parks Management and Preservation Program have had a relatively constant allocation of around XCD $1.2 million ($446,000 USD). Total budget allocation for the FWPD for the 2018/19 fiscal year was XCD $3.3 million ($1.2 million USD) (FWPD 2019). FWPD is fully dependent on the budgetary allocations because their annual revenues in the last year ranged from XCD $65,177 in 2017 ($24,370 USD) to XCD $105,714 in 2018 ($39,325 USD).[20] Many sectoral assessments (Poyotte 2010; FWPD 2019) also underline that FWPD is affected by understaffing and underfinancing. The current exchange rate (December 2019) is 0.3694 XCD = $1 USD.

Morne Trois Pitons National Park (MTPNT) and the Morne Diablotin National Park (MDNP), benefited from the preparation of management plans and recommended buffer zones (MTPNP 2010; MDNP 2009). None of the management plans were officially adopted by the GoCD, thus the implementation of these plans as well as the proposed buffer zones has been limited. There are issues with the monitoring and implementation of the plans, partially due to the lack of financial and human resources. The only plan that has been updated is the plan for the MTPNP World Heritage Site. The Improved Management Plan (MTPNT 2018), finalized in 2018 with funding from GEF, is comprehensive and includes a work plan and cost estimates. The work plan for 2019–20 includes maintenance and safety tasks as well as some monitoring of ecotourism sites. But the most difficult issue will continue to be the implementation of the plans on a consistent basis, since meeting the set targets is subject to staffing and cost limitations. Currently, fundraising for parks is inconsistent, since the proceeds from tourism are not used for the maintenance and protection of the parks. Fundraising also tends to be opportunistic and generally responds to donor initiatives rather than following a well-defined plan or policy.

Planning and management of public forests outside of parks is minimal. Except for the forest reserves, there is no clear knowledge of forest boundaries. This is a clear indication of the underrepresentation of forest resources in the land use management. None of the forest estate (state/non-state, forest reserves/unallocated governmental land) benefits from systematic evaluation of forest resources. FWPD does not have forest management plans to guide their forestry-related activities and projects such as tree planting, timber harvesting, and stand tending. Therefore, these activities are extremely limited and only conducted on an ad hoc basis as emergency needs and resources permit. The absence of forest management plans also limits the scope for independent oversight or holding FWPD to any kind of account. There are some initiatives regarding the forest inventory—for example, the participation of Dominica in the National Forest Inventories Group, established at the 16th Caribbean

Foresters Meeting—but they are limited to identification of training and equipment needs (Marcano-Vega et al. 2016). In addition, since the authority over land use regulation lies with the Physical Planning division of the Ministry of Planning and Economic Development (MPDE), environmental impact assessments are not sufficiently integrated into the planning process, and zoning is not consistently enforced.

While forestry is central to many policy documents or statements, including NRDS, environmental management and forestry are one of the few sectors for which monitoring is not specified as a priority. The lack of forest monitoring or integrated watershed monitoring systems is particularly harmful to the efforts to increase resilience.[21] Within the recent NRDS, monitoring was included as a priority within sectoral programs, but no such initiative was included in the environmental sector. The country is undertaking in-depth assessments of wildlife and of park trails with the aid of the World Bank (WB).[22] However, these offer snapshots, rather than a systematic approach that would provide data on an ongoing basis and allow for informed sustainable management decisions.

Development and management of privately owned forested land in Dominica is not subject to regulation or enforcement by the FWPD. Land development is subject to approval by the Physical Planning Division in accordance with the Physical Planning Act of 2002. There is no formal mechanism for consultation with the FWPD on developments that affect forest resources, although this does happen occasionally on an informal basis (FWPD 2010). Private landholders of forested areas have limited sustainable management knowledge and some of the practices employed may threaten ecosystems due to habitat fragmentation and poor agricultural/forestry practices. For instance, deforestation for agricultural purposes is not prohibited by any regulation; cutting trees on private land is demand driven, and not based on an approved management plan; and there are no regulations dealing with soil degradation control resulting from unsuitable agricultural practices.

2.4. Direct values from forests and ecosystem provisioning

Many forestry stakeholders in Dominica seem to have the (incorrect) impression that logging is necessarily bad for the forest and cannot be done over significant areas without adverse impacts. This may be one of the reasons for not encouraging a traditional activity that can have a positive impact on the economy without necessarily adversely affecting forest ecosystems.

Figure 6. Lumber production site in Dominica

Source: WB team, 2019

Presently, Dominica lacks a timber industry, although there are records about lumber production, harvesting for fuel, some charcoal production, and—in the wood processing industry—some limited production of furniture (FAO 2015). The value of exported wooden products decreased from XCD $95,070 in 2009 to XCD $3,084 in 2014, while imports of wood products increased from XCD $11 million to XCD $16.6 million for the same period (FAO 2015). This may not be very significant in terms of GDP percentages but is potentially very important in terms of jobs for vulnerable rural residents. Based on the interviews with representatives of small logging companies, there has been a decrease in employment in the sector that is roughly estimated at 50–200 jobs.

There is a significant discrepancy between the present use of timber and the value of timber resources, which is considered quite high, with a variety of quality hardwoods growing in large

number (Gheoghegan 1991; Eckelmann 2010). Presently, a very small amount of timber is harvested from the state-owned forest land, especially from forest reserves, where FWPD has the power to regulate cutting through a permitting system based on identification of individual trees.

Despite the potential economic contribution of chainsaw milling in Dominica, this is not an important revenue generation activity at the moment. Indeed, because of terrain and other limitations, much of the country's forest area is unsuited to logging and the scope for expansion of commercial logging is limited. However, there is an unexploited potential in terms of revenues and job creation. Presently, logging activities are undertaken by small logging companies or individuals; the number of such enterprises is estimated at 10–20.[23] There is no formal system to register sawyers, and it is believed that the numbers have declined over the years. They select those trees that can be used without considering the forest's silvicultural needs and this will lead to worsening forest degradation. Based on interviews with representatives of small chainsaw milling companies, the number of trees harvested from private lands can be estimated at anywhere between 1,500–5,000 annually (or possibly more due to salvage cutting following Hurricane Maria). For 2018, FWPD reported XCD $25,830[24] in annual revenues from selling trees (with an average price of XCD $200/tree, that would mean around 500 trees). FWPD also is operating a small sawmilling facility that uses logs for production, with quite intense use after Hurricane Maria. This facility is specialized in logs originating from salvage cuttings. FWPD reported XCD $25,940 in revenues from lumber selling in 2018.[25] Generally, small sawmilling entrepreneurs are seeking commercially viable species like mahogany or red cedar, but they also supply a wider variety of species, including gommier (*Dacryodes excelsa)*, bois diable (*Licania ternatensis)*, and balata (*Manilkara bidentata)*. A recent survey indicates that 90 percent of sawmillers have other sources of income, while only 10 percent are earning more than XCD $18,000/year.[26] The main issues are transport of lumber, marketing, and availability of raw material (FAO 2015). The potential of the sawmilling industry, however, is much higher: some conservative estimates (Eckelmann 2010) indicate that total possible sustainable annual revenues at the country level could reach as much as USD $1 million per year,[27] while present revenues can be estimated, in the absence of official governmental data, at maximum USD $100,000. Given the aftermath of Hurricane Maria, and the need for salvage cuttings, there is significant potential over the next 2–3 years, limited by financing and accessibility.

Figure 7. Basketry using lauroman reed in Kalinago territory

Source: WB team, 2019

Forests also provide raw materials for the craft industry and a host of products that contribute to the quality of life in Dominica. Non-timber forest-based businesses primarily trade in products such as handicrafts and woven baskets, mushrooms, medicinal plants (including bwa bandé, *Richeria grandis*), flowers, hunting and fishing products, and herbal soaps. Gommier (*Dacryodes excelsa*) trees also are tapped for gum, which has some commercial value (FWPD 2010). Within the craft sector, only 23 percent of businesses generated an income above the minimum annual income and around 70 percent of businesses were unregistered (FAO 2015). By comparison, the herbal soaps and furniture sectors tended to offer better average income, with over 80 perecent of businesses generating an annual income of over XCD $13,000 (FAO 2015). For the Kalinago population especially, the traditional handicraft industry (Figure 7)—based on certain indigenous species of trees or lianas—is an important revenue source. These handicrafts include basketry, jewelry, carvings, and small house items. Hurricane Maria

created some difficulties in supplying the lianas and other natural raw materials, including laurouman reed (*Ischnosiphon aruma*) for reed baskets.

2.5. Indirect values of forests

The direct economic contribution of the forest sector is insignificant, but forests in Dominica are essential for almost all sectors of the economy. Everything in Dominica is about forests**.** Dominica's tourism sector is driven by forest ecosystem biodiversity, recreation values, and landscapes. The country's steep slopes make forest protection indispensable for water catchment management. Agriculture also is heavily dependent on the regulation services provided by forest ecosystems. Importantly, forest ecosystems provide protective services to areas used for geothermal sector. Finally, forests have a high social and cultural value.

Forests and biodiversity

Forests are a key source for Dominica's rich biodiversity. Dominica is part of the Caribbean Islands Biodiversity Hotspot, which is defined as holding at least 1,500 plant species found nowhere else and having lost at least 70 percent of their original habitat extent.[28] Dominica's topographical diversity has produced a rich array of terrestrial ecosystems, with extensive primary rainforests and a multitude of rivers, streams, and cascading waterfalls that support a diverse flora and fauna, a number of which are endemic. Key biodiversity habitats are part of the forest system, one of the richest and most extensive systems in the Lesser Antilles. Dominica boasts a phenomenal flora and fauna diversity.[29] No survey of the flora and fauna has been completed since 1989, and there are no institutional/management arrangements to assure a proper continuous biodiversity inventory, evaluation, and mapping. There are some scientific initiatives in this area, but they are rather disparate and are not considered by the responsible agencies. There are no habitat or species-based wildlife management programs or plans and FWPD relies on blanket measures—such as bans on hunting— rather than controlled hunting seasons, territorial, harvest or gear restrictions, or fees or licenses.

Primary forests cover large areas where access is very limited. Nevertheless, human activity—together with natural hazards—is considered one of the main threats to biodiversity (BSAP 2001). The region's biodiversity is at serious risk of species extinctions, even though destruction occurs in relatively small patches of habitat. By percentage, amphibians and mammals are among the most threatened of the taxonomic groups assessed, at 73 percent and 25 percent respectively.[30] Species are currently facing habitat loss due to increasing tourism development, with the most recent hotel (scheduled to open in 2019) encroaching on turtle nesting sites and wetlands in the Cabrits National Park (CNP). Currently, most tourists are daily visitors arriving in Roseau, but the tourism sector in the north side of the island is expected to grow, with investments planned for an international airport and several international hotel chains. Agriculture and land degradation—including deforestation—are two important contributors to loss of indigenous biodiversity, according to stakeholder consultations for the Dominica NBSAP 2014–20. Private landholdings of forested areas threaten biodiversity due to habitat fragmentation and poor silvicultural/agricultural/ practices such as the use of agrochemicals. Furthermore, invasive species are on the rise, presenting a major challenge to forest biodiversity in Dominica. Invasive plant species, particularly bamboo and lemon grass, are linked to serious forest degradation and loss. The presence of invasive fauna—namely the striped-tail iguana (*Iguana iguana*) and Cuban tree frog (*Osteopilus septentrionalis*)—continue to be of major concern (NBSAP 2013).

NBSAP (2013) points to the weak regulatory framework as a significant obstacle to strong biodiversity management. The identified constraints were available budgets, the low contribution to economic growth by biodiversity, and the lack of environmental impact assessments (EIAs). Lack of a carrying capacity assessment of ecotourism sites and management of visitors were also cited as a constraint to biodiversity.

It has been estimated that nearly 90 percent of the country's faunal species (to include freshwater species) suffered severe damage to their ecosystem following Hurricane Maria. Dominica's exposure to extreme weather and to long-term climate change introduce additional complexities into

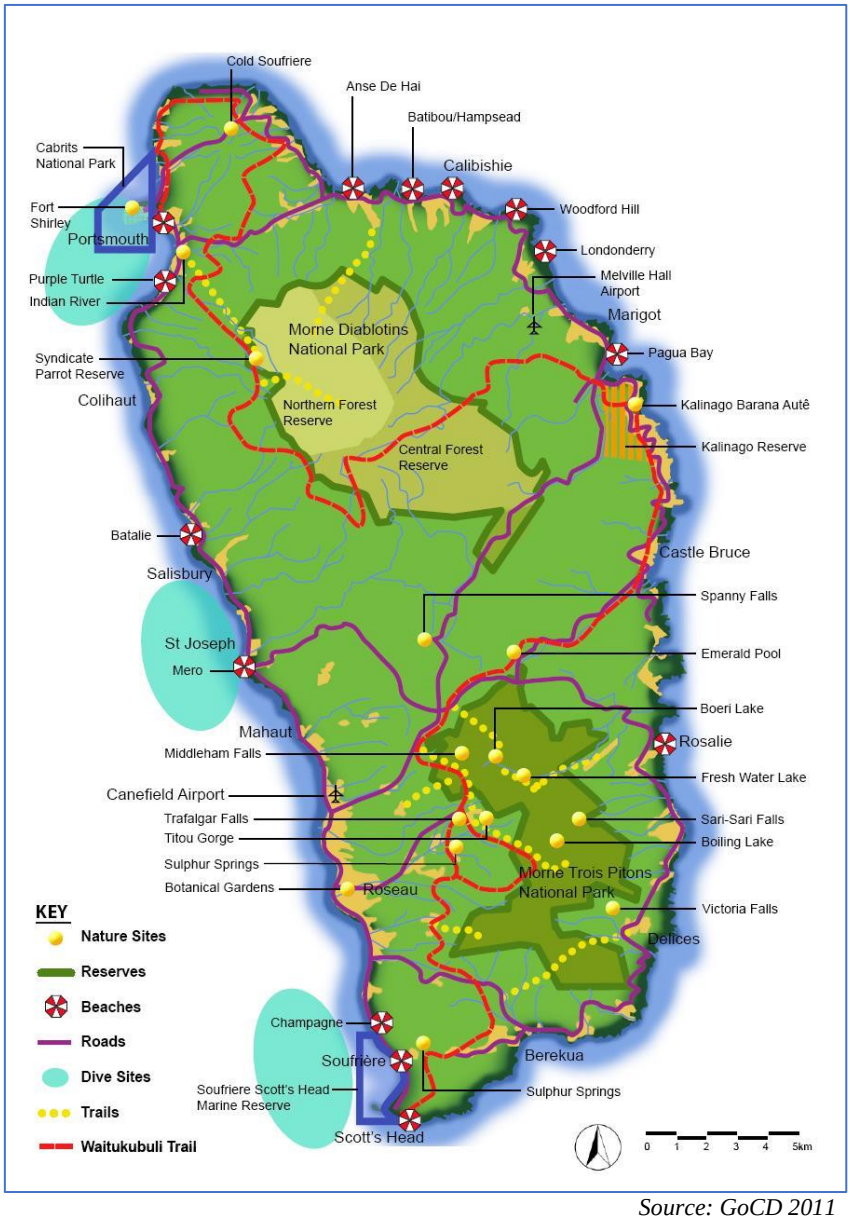
biodiversity management and conservation, essentially placing a great premium on the maintenance of healthy ecosystems in anticipation of perturbations (BSAP 2001; FWPD 2010; NBSAP 2013).

Forests and ecotourism

The most visible part of the value of Dominica's forest ecosystems is captured through ecotourism and associated services, which also support the nation's economic development, environmental protection, and cultural conservation. Dominica's rugged topography, rural ambience, and limited urbanization make it an ideal nature destination.

Forest resources and, in particular, the national parks eco-sites and WNT are key components of Dominica's tourism allure and potential. The extensive network of trails, most notably the WNT (Figure 8), allows access to nature sites and attracts many eco-tourists. The WNT is the first Caribbean long-distance hiking trail. It spans 184 km, in 15 segments, following generally north to south the ridgeline of the two major mountains of the island, each of which are integral national parks. The trail crosses all the major ecosystems of Dominica and provides unmatched opportunities for observing the country's biodiversity. It also passes near waterfalls, hot springs, wildlife viewing opportunities and other natural attractions, and crosses the Kalinago Territory.

Figure 8. Tourism map of Dominica



Source: GoCD 2011

The number of site visitors (including those using WNT) increased from 108,010 in 2013 to 165,215 in 2016.[31] The gross revenues from entrance fees/WNT passes varied between XCD $0.3 million (2017/2018) and $2.8 million (2010/2011) (see Annex 3), representing a small contribution to the economy.

Eco-site visitors contribute to a wide variety of tourism-based enterprises ranging from hotels and guest houses to restaurants and guide services. Most tourists visiting Dominica do so to enjoy its natural beauty and tranquility. Visitors whose primary interest is in nature tend to also spend more per person when compared to those on a general vacation (Slinger-Friedman 2009).

The interdependence of forest ecosystems and ecotourism must be noted. Most protection initiatives (establishment of PAs, forestry and PA-specific laws) are, at least partially, a consequence of ecotourism development. People involved in the Dominican tourism industry overwhelmingly see nature as both the main attraction for visitors and the resource base for their own livelihoods. Tourism businesses also see the maintenance of the natural environment as a high priority. Consequently, 85 percent of the interviewed individuals in the tourism industry claim to have conservation initiatives (Slinger-Friedman 2009). There are essentially no privately developed attractions, such as "zip lines", swings, or other facilities.

The whole ecotourism sector benefits from forest management, but ecotourism-related revenues are completely divorced from the budget of the FWPD. The only PES mechanism is the entry fees for the parks and WNT. The fee represents central budget revenue, is set by Ministry of Finance (MoF), and collected on site by FWPD employees. During interviews with FWPD officers, some were of the view that the fees are too low.[32] In the absence of updated surveys on the willingness of tourists to pay (WTP), it is difficult to assess this question. There are no clear assessment surveys containing estimates of visitors, WTP, eco-tourist profiles, infrastructure needs, or ecotourist flow management arrangements.

Forests and climate change

Dominica's climate change commitments rely significantly on the capacity of forests to sequester carbon. Although Dominica is a carbon-neutral country, one of the government's main priorities is to implement the comprehensive Strategic Program for Resilience contained in the Dominica Low Carbon Climate Resilient Strategy (2012). Dominica intends to progressively reduce total GHG emissions 44.7 percent below 2014 levels by 2030. Dominica's forests can continue to sequester 100 Ggs of national GHG emissions on an annual basis during the period 2020 to 2030 (GoCD 2015; FAO 2018). Dominica INDC clearly indicates that the contribution of the forest sector to national development and mitigation of climate change are among the nation's key priorities.

Forests and waters

Dominica has abundant sources of freshwater, with over 365 streams flowing down from the mountains (Menhinick 1989). There are 41 water supply areas (Figure 9), many of which are vulnerable to damage during natural disasters due to strong winds, flooding, landslides, and falling trees. Watershed management falls institutionally under DOWASCO, which is charged under the Water and Sewerage Act with the responsibility of water resource monitoring and assessment as well as planning and organizing for efficient management of the island's water resources.

Watershed and water supply areas are heavily dependent on the regulation services provided by forest ecosystems. The two forest reserves and the two larger national parks protect the upper watershed of several of Dominica's larger rivers, including the Roseau River (Figure 9). However, only a small number of water catchments are included totally or partially within the PAs. Importantly, the water catchment area providing water for hydroelectricity generation is partially included in the MTPNP (DOWASCO 2000). Coastal areas and the marine environment are also benefiting from the protection and regulatory services provided by forest ecosystems.

Improper land management and natural hazards affect the quantity and quality of water. Forest clearing for agriculture, as well as planting on steep slopes and tillage practices that do not promote soil conservation, have resulted in ongoing soil erosion and land slippage problems in the watersheds and especially in the catchment areas. Soil erosion causes an increase in turbidity that affects the quality of the water supply, and the riverbanks continue to deteriorate in the absence of supporting structures like vegetation cover or head drains. The heavy flooding caused drastic changes in the watercourse and parts of the wider watershed, and also triggered land slippage causing localized damage in certain points.

There are ongoing measures aiming at diminishing/preventing improper land management in

Figure 9. Water catchments in Dominica

Source: Physical Planning Division

Water catchment areas. DOWASCO is trying to limit the agricultural use of lands in the catchment areas and promote afforestation measures and sustainable forest management, regardless of the landowner. Besides owners' awareness, in some water catchment areas DOWASCO is applying PES mechanisms that pay the landowners annually for not using the land. Private land acquisition[33] on behalf of the state is also a tool that is used by DOWASCO to ensure proper land management around the catchments. These acquisitions are followed by afforestation measures. PES amounts and land

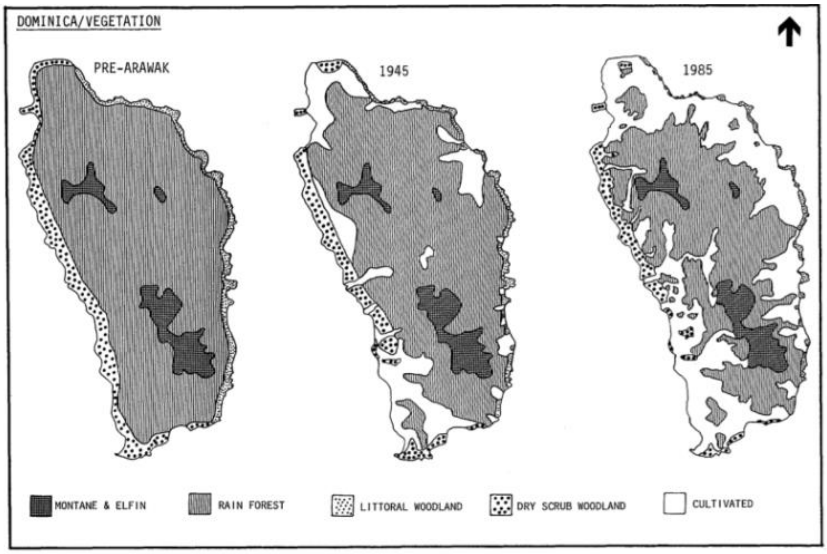
acquisition values are subject to intense negotiations with landowners and often—due to DOWASCO's budget scarcity—even the land acquisition values are paid on an annual basis.

Developing forested water catchment areas requires a close and formal collaboration with FWPD for new catchments identification, sustainable forest land management in the water catchment, and promoting sustainable afforestation measures. Despite a quite close semiformal[34] collaboration, there is room for better defined and more effective coordination mechanisms between the two entities in the overlapping areas of their mandates.

Forests and agriculture

Dominica's economy relied heavily on agriculture in the past, triggering deforestation. With bananas as the principal crop, agriculture was the economic mainstay of Dominica (Bonnerjea and Weir 1996). Consequently, there was an agricultural land hunger that triggered deforestation (Figure 10) and caused removal of vegetation on both private and public land (CCA 1991). These practices utilized inadequate controls to protect against soil erosion and other forms of land degradation, while increased human encroachment on previously wild and uninhabited areas triggered the human-wildlife conflicts. According to Dominica's National Action Programm to combat Land Degradation (GoCD, 2004) unsustainable agricultural and irrigation practices—especially related to movement of agriculture to steeper slopes and the setting of bush fires during the dry season—are still potential threats for forest cover. The same source also mentions mining and quarrying as affecting, to some extent, the island's forest cover. However, data on the magnitude of such practices are missing in quantitative terms; the majority of sources indicate a reduction trend.

Figure 10. The evolution of forest coverage in Dominica



Source: CCA 1991

The decline of agriculture has diminished the threat of deforestation and expanded opportunities for increasing forest land surface. Agriculture is still considered a major pillar of the economy, but the number of people engaged in agriculture has been steadily declining over the past 20 years. Because of this decline, agriculture is no longer considered a serious threat to forest resources, but is still a threat for biodiversity (FWPD 2010). Areas of agricultural land are increasingly abandoned. If these areas are not converted to alternative land uses, they naturally revert to secondary forest (Eckelmann 2009) or can be subject to afforestation activities.

Social implications of forests

Forests in Dominica have always been connected to the Kalinago people. Within the Kalinago Territory, legal residents share communal ownership of the land, with their local government in place. Unfortunately, the land is affected by soil erosion, especially in areas where forests are depleted. Forest depletion also has affected streams and river flows. The Kalinago people use tree species such as larouman reed *(Ischnosiphon arouma),* vetiver *(Chrysopogon zizanioides),* and screwpine *(Pandanus sp.)* to produce crafts for the tourism market, but also for boat building. These have been harvested extensively at lower elevations, so harvesting has been moving higher up into the forest in areas where

erosion is more likely to occur. Furthermore, overharvesting of the main raw materials has led to an increase in purchase prices.

The nation's forests also are important from a history/cultural point of view. Recently, for example, there have been efforts to document the history of the runaway fighting slaves in Dominica**.** The rugged mountains and natural forests gave shelter to maroons—escaped slaves that organized small settlements within the forested areas in the interior of the island. Unlike the Creole, Dominican-born slaves, these *maroons* had once lived in and experienced a society other than the plantation society (Honychurch 2014).

Indirectly, the forest sector is providing a significant number of jobs. Although direct jobs in forestry are rather limited (to the employees of the FWPD and some small sawmilling companies), forests, as eco-tourism attractions, are indirectly influencing the number of tourism related jobs. There are sources estimating that more than 20 percent of the jobs on the island are related to attractive nature-based site visitation, including earnings in ecotourism (Slinger-Friedman 2009; WTTC 2015). Tourism businesses see maintenance of the environment as a high priority, which has prompted changes in tourism business models by incorporating or increasing their conservation practices since being involved in Dominican tourism (Slinger-Friedman 2009).

3. Challenges and Opportunities Related to Forests in Dominica

Forest resources in Dominica are not utilized to their full potential to support social development. The problems faced by Dominica's forests are not major when compared with other countries with large scale commercial forestry and deforestation issues. Forests, like the entire island, have been seriously disturbed by Hurricane Maria, but the recovery capacity is naturally high. Agriculture-driven deforestation is no longer a threat. There are no alarming degradation issues, no pressing unmet needs for wood, and no indications that forestry problems are closely linked to widespread poverty. The most relevant issue is that forests in Dominica, through better data collection and use, planning and management can be used in a much better way to increase revenue and economic activity, especially in connection with the tourism sector. In the following sections, we describe a series of opportunities and challenges for better use of forest resources in Dominica.

3.1. Challenging areas

The GoCD faces various challenges in continuing effective biodiversity conservation initiatives, and better using the land / forest resources to benefit the island's inhabitants. Several thematic areas for these challenges include (a) promoting recovery of the forest sector after Hurricane Maria; (b) working in a challenging regulatory and institutional framework; (c) overcoming limited cross-sectoral coordination and data to support effective management planning and decision making; (d) preventing deforestation, forest degradation, and improper agricultural practices; and (e) reducing vulnerability to climate change and natural disasters. If effectively addressed, these challenges can turn into opportunities.

Forest sector recovery after Hurricane Maria

Following Hurricane Maria, the Post-Disaster Needs Assessment (PDNA) estimated total damages and losses at USD $1.3 billion. Most of the gains from recovery efforts after Hurricane Erika (2015) were reversed and the identified recovery needs incorporating the principle of "building back better" are estimated at USD $1.37 billion. For the forestry sector only, the damages were estimated at USD $30 million and the recovery needs at USD $15 million. The PDNA triggered a process of planning for recovery and building resilience (GoCDa 2018). In 2018 MECRDMUR elaborated a strategic plan, including an action plan for the forest sector (Annex 2). Although the needed actions have been

identified and there are clear attempts to create proper frames for monitoring and implementation, there are some issues regarding the identified objectives/actions of the strategic plan.

Table 7. Challenges accompanying the actions of the MECRDMUR action plan

Strategic action	Brief description	Challenge/opportunity
Implementation of reforestation strategies.	The plan proposes that 1 million trees be planted in one year (2018–19) by developing combined forest/agricultural nurseries for production of seedlings and engaging the population in massive planting actions.	While this goal seems appealing, no special planting actions have been organized and the rehabilitation and development of nurseries[35] is not yet complete. Implementation and effectiveness of an afforestation program on this scale would require further issues to be addressed: (a) identifying the sites/areas/land surfaces for afforestation (both on state and private estate); (b) assessing the quantity and quality (forest, ornamental or fruit trees) of seedlings to be produced; (c) identifying phenotypically-suited seed sources for forest tree species;[36] and (d) presenting detailed implementation plans, including cost estimates and financing source identification. Addressing these issues would allow for more efficient resource allocation. Of particular importance is the use of suitable planting material and techniques: trade-offs between the use of exotic species instead of indigenous valuable species, as well as costly artificial regeneration instead of natural regeneration. Afforestation should consider that planting trees can contribute to protection of watersheds, catchments, coastal areas and valuable agricultural land, as well as slope stabilization to protect downstream assets and infrastructure. Another important opportunity is the afforestation of abandoned agricultural land.
Rehabilitation of trails and facilities within national parks and ecotourism sites	Assessing the damages and needs, effective construction, and rehabilitation works. GoCD put a high priority on these actions and works are in progress within EALCRP.[37]	The assessment of the trail rehabilitation needs creates the opportunity to undertake new trails development based on the findings regarding ecotourists' expectations, site attractiveness, and updated plans for development of support services.[38]
Sustainable salvaging of timber	Assessing the damages, salvaging operations, storage and sale of lumber, and undertaking building capacity of chainsaw operators.	FWPD identified a significant number of sites for salvaging operations, performed tree inventories,[39] and even engaged small sawmilling companies to operate in the field. Unfortunately, the process was interrupted due to financial shortages. Salvage cuttings in state-owned forest land can create some opportunities, including increasing small sawmillers' capacity by engaging them in medium-term predictable contracts and using the lumber for commercial purposes, thus bringing additional revenues to FWPD and supplying the island with construction materials. However, there are also significant challenges. First, the operations must be initially focused on damaged trees because these trees can degrade, with unwanted consequences on the quality of the timber. Second, although some sawmillers have experience, they need practice guidelines for such a specific activity. And third, the salvage cutting is raising important work safety issues that must be addressed in order to avoid accidents.

Research and development on flora and fauna	Conducting forest inventories, wildlife and invasive species research, revising the boundaries of PAs, and developing proposals for buffer zones around national parks.	Although DVRP (for forest inventory) and EALCRP (for wildlife inventories) have allocated resources for these actions, there are still difficulties in clearly defining needs and devising detailed planning for the actions. Identifying the needs for these activities should emphasize practical approaches. There is a good research opportunity to study the effects of Hurricane Maria on forests as the basis for future propagation of resistant species or habitats. There has been progress in several areas, including identifying the park buffer zones under the United Nations Development Programme (UNDP) project called Supporting Sustainable Ecosystems by Strengthening the Effectiveness of Dominica's Protected Areas System. A new edition of the MTPNP management plan—including new proposals for buffer zones (MTPNP 2018)—has been prepared but is not yet approved by the GoCD.

Challenging regulatory and institutional framework

The forestry-related law in Dominica is rather old, with positive effects in terms of predictability, but also lacking adaptation to recently arising issues. These issues include (a) integrating obligations under MEA; (b) supporting regulations for forest and PAs management plans enforcement; (c) devising a system plan or annual reporting on the status of PAs and more broadly forest lands to enhance monitoring and evaluation; (d) integrating effective EIAs: and (e) providing guidance and support for the private sector in forestry. Privately owned lands (both forests and agricultural) are facing very few restrictions, so the regulatory framework should impose a set of not very prescriptive, minimal, and easy-to-monitor requirements to ensure the continuous flow of basic ES that would benefit all island inhabitants (land degradation control, sustainable agricultural /forestry practices). Land usage regulations should also be revised to create an enabling environment for a better use of land resources, especially those owned by the state.

There are many governmental entities, often attached to different ministries, with mandates pertaining to forest areas that are not clearly defined. Some of these mandates are not clearly delimited. Forest reserves fall within the mandate of FWPD (MECRDMUR). Unallocated government-owned forest land is, at least theoretically, under the mandate of the Land and Survey Division (Ministry of Housing and Lands). In the absence of clear regulations for private forest lands, FWPD has nothing to do with them. DOWASCO, for those lands that are overlapping with water catchment areas, has certain obligations and powers. Although day-by-day management of national parks is under FWPD, still there are certain jurisdictions that are assigned to tourism authorities. Overlapping and often unclear mandates, without formal cooperation mechanisms in place, are a serious barrier toward attaining institutional synergy.

Many of the governmental entities that are involved in forest governance have identified needs for institutional capacity building. Areas like forestry, biodiversity conservation, PA management, environmental protection, and monitoring requires skilled personnel. FWPD has prepared a training needs assessment, mentioning areas like forest management planning, forest economics, forest engineering, biodiversity management, natural resources management, wildlife conservation, plant propagation, and landscaping. Limited technical capacity also is an institutional challenge (Poyotte 2010; FWPD 2019).

Challenges in financial management of the forest sector are significant. Almost all analysis done for the forest sector (FWPD 2019) identified issues related to (a) mechanisms for revenue generation, (b) funds allocation to park management, (c) monitoring of financial resources allocation, (d) linkage between visitation fees and parks management budget, and (e) identification and planning for additional non-budgetary funding. There are elements of the forest sector that can generate financial returns

capable of being self-supporting (timber production). There are others that are economically and socially viable (water catchment services, some aspects of ecotourism), but which are difficult to manage as financially self-sustaining activities. Designing institutional arrangements with a judicious mix of self-finance and subsidy will require careful analysis and selectivity.

Limited cross-sectoral coordination and data to support effective management planning and decision making

Limited coherence and cross-sectoral coordination in policy elaboration

There are clear indications of fragmentation and a certain lack of coherence in policy formulation. Forestry issues are addressed in numerous policy documents without clear coordination of proposed strategic actions, nor proper prioritization of the proposed measures. There are strategic measures that can be found in many policy documents, but also certain issues that, despite being informally acknowledged, are not addressed in any programmatic document: for example, regulating the use of private forest land, and the development of a sustainable forest-based industry. There is no strategy that refers only to the forest sector. Government policies have often noted the importance of nature as the tourism focus in Dominica, yet government actions have lacked coherence in promoting nature-based tourism over mass tourism. Other government actions—such as seeking to attract foreign investors, including large hotel chains—solidify this concern (Slinger-Friedman 2009).

Policy and programmatic connections between biodiversity, forestry, and tourism planning and management are weak and undeveloped. Despite the labeling of Dominica as the "Nature Island," there are few ways in which biodiversity, forests and tourism are systematically linked. In particular, budgetary provisions for parks and the WNT are entirely divorced from the revenues realized by these assets and from the realistic costs of sustainable long-term management and protection. There are weaknesses in the implementation of safeguard provisions intended to ensure adequate protection of environmental and cultural resources from adverse impacts of tourism development investments (UNDP 2014).

Need for data to support management planning and decision making

The policy framework analysis has revealed the ad hoc feature of the policy elaboration process. Many policies are based more on the necessity to respond to a crisis rather than in-depth needs and impact assessments. Often, policy objectives are not supported by accurate data collection and interpretation and the strategy documents are not followed by detailed and informed action/management plans that include reliable monitoring indicators. This is a consequence of data scarcity.

Data on land use and ownership are very scarce. There are limited possibilities for the government to decide over land use policy, assess and regulate the use of private forest land, or the possible use of unallocated government-owned forest land. On a wider scale, mapping the land ownership and land use categories is a prerequisite for making informed policy and management decisions.

Forest resource information is very limited and could be exorbitantly costly if not collected through a well-designed and technology-based inventory scheme. As noted, no national forest inventory has been conducted since the 1980s and estimates of basic forest resource parameters (area, stocking, growth, species composition, etc.) are severely out of date, unreliable and potentially meaningless and misleading. Despite the relatively small forest area various constraints, including accessibility, equipment, skills, and analytic capacity, make the conduct of a traditional forest inventory unrealistically expensive. This will be especially so if efforts are to be made to collect data on novel forest values (e.g. carbon), wildlife and other forest characteristics (recreational, cultural and tourism values). Fortunately, a variety of appropriate technologies, sampling designs and valuation methods are available and potentially suited to the information needs of decisionmakers.

There is a clear need for the introduction of management practices for forest resources to ensure that decline does not continue and the resource is used to its full potential. Although timber harvesting is rather limited, the needs-based selection of trees to be cut may lead at least to a decline in forest quality. There are indications that the consequences may be even worse for privately owned forest lands, as there are no regulations in place regarding the management of timber stocks on private lands.

This wood resource was considered close to depletion by some sources (CCA 1991). The last coordinated forest data collection process dates from 1987 (De Milde 1987), when a detailed inventory based on statistical sampling was done in commercially usable forest areas. Effective decisions for forests must be supported by forest management plans relying on accurate data on forest resources in terms of species composition, age, volume, and carbon sequestration. Detailed data on usable forests and land use and ownership (including unallocated governmental forest land) could create a better base for assessing usable forest resources, and thus promote a more efficient use of forests. In many cases, effectively managed forest areas also can increase resilience.

National parks management plans are not effectively implemented due to the absence of official endorsement and lack of resources. As a result, PA management is weak and not able to address important challenges to biodiversity such as habitat loss due to increasing development for tourism, and inadequate management of agriculture, tourism and forestry. In the absence of biodiversity mapping, the tourism development program can't be sure it is protecting biodiversity. Although there are quantitative inventories on habitats and species, they may have suffered in the meantime from extreme events or human influence. Effective conservation measures require data on habitats and species distribution and conservation status, as well as a permanent biodiversity monitoring process to understand the effectiveness of conservation measures and potential threats and pressures. Ecotourism management within PAs also is weak, lacking a proper assessment of ecotourists (visitor profiles, expectations, WTP) and without capacity assessments for PAs or for the most popular eco-sites. As the number of visitors continues to grow, congestion in some eco-sites is becoming more of an issue, while other sites that are less publicized remain unutilized. The WNT has fifteen segments, for example, but the most extensively used are those closest to the capital. This adds congestion in some parts of the year and also triggers resource degradation, in the absence of proper management of visitor flows.

Preventing deforestation, forest degradation, and improper agricultural practices

Deforestation, forest degradation, and improper agricultural practices have been identified as potential contributors to land degradation, although they tend to diminish. The improper agricultural practices indicated by the Dominica's National Action Program to combat Land Degradation (GoCD 2004) have been reduced but they are still a potential threat, especially if proper regulations, monitoring, and data collection systems are not in place.

Forest cover loss is a less significant threat today than it was during the period of agricultural development. Data on deforestation are very scarce, but some sources (GoCD 2004; DOWASCO 2000; FWPD 2010; GEF, 2014) mention that there are still minor cases of clearance of forests for agriculture—especially in fragile steep-slope areas, and accompanied by housing, roads, and other infrastructure development[40]—that all pose some pressures on forest cover, especially if proper EIA regulations are not enforced. Accidental or unsupervised forest fires also pose some threats to current forest cover (GoCD 2004).

In terms of forest quality, present logging practices using needs-based selection of trees to be harvested can be considered a threat, especially for privately owned lands. Some data sources (Gheoghegan 1991; BSAP 2001) and the interviews with local sawmillers pointed out that a disproportionate amount of harvesting may take place on private land, where the GoCD has no regulatory control and no accounting is done. The threat is amplified by the damages caused to forests by hurricanes, which may increase the scarcity of certain tree/plant species that are now harvested from higher forests.[41] As mentioned in section 2.2, forestry on private land is unregulated, and owners often lack the capacity and knowledge to apply sustainable practices.

Many farmers don't pay attention to land degradation control. Especially for steep slopes or marginal soil conditions, this results in wind and water erosion, reduced soil porosity, increased soil erosion and aridity, and in some cases, uncontrolled spread of fires and reduced debits for mountain streams, even in water catchment areas. Bad agricultural practices have already been addressed in water catchment areas using compensatory payments and/or private land acquisition by DOWASCO. Some agricultural practices are triggering also human-wildlife conflicts, (for example parrots are foraging

aggressively on expanding agriculture) and there is need for measures like integrated pest management or agriculture buffer zones (RSCF, 2018).

Forest vulnerability to climate change and natural disasters

Dominica's forests and forest-related infrastructure are vulnerable to current and future impacts from climate change. The most likely climate change impact is the increase in intensity and frequency of extreme weather events. Hurricane Maria severely affected or destroyed most forested areas (including all vegetation classes, both state and private ownership). An estimated 90–95 percent of forest trees were defoliated (FWPD 2018). In addition, there was significant soil erosion in many areas. Consequently, major hiking trails— including WNT and ecotourism sites—were compromised. A great deal of damage was inflicted on fauna and their habitats. Watersheds also were critically damaged (FWPD 2018).

Although forest ecosystems in Dominica developed in the face of intermittent storms, the increased frequency and intensity of hurricanes is the most preeminent significant climate change threat for forests in Dominica. The preponderance of primary forests is a testament to the natural resilience of Dominica's forest ecosystems. Over time they have adapted to resist intense hurricanes and have a high natural recovery capacity. The forest disturbance regime is driven by storms. Wind damage to forests is not unusual, and the forests types in Dominica developed in the face of intermittent storms. It is the increased frequency and intensity of the storms that may have the potential to exceed the natural resilience and recovery capacity of forest ecosystems. The lack of monitoring exacerbates this challenge. Climate change also can determine habitat shifts due to high levels of variation in temperatures and precipitation. These shifts may cause changes in species composition, increased forest fire incidents, and deceased water availability, with consequences for wood and NTFP availability, wildlife and plant diversity, and increased incidence of pests. Forest resources management should therefore aim at increasing the resilience of forests to climate change. Specifically, forest adaptation should focus mainly on natural regeneration, while plantations can be a way to increase the value of abandoned agricultural land.

3.2. Opportunity areas

There are numerous and important forest-related opportunities. These opportunities include (a) increasing the direct economic contribution of the forest sector; (b) expanding payments for ecosystem services, especially in the tourism sector; and (c) increasing afforestation of abandoned agricultural land.

Increasing the direct economic contribution of the forest sector

Dominica's forestry sector can be more productive and its contribution to livelihoods of Dominicans can be much higher without jeopardizing the nation's ambitious biodiversity conservation goals and its land forest cover. Better planning can improve the resource efficiency of the forest sector. Improved management planning for state managed forests will allow sustainable timber harvesting by promoting small sawmilling enterprises and the wood processing industry. That will not only create new job opportunities, but also an enabling environment for long usage wood products production. The fact that very limited small-scale wood harvesting is taking place is an indication of a potential market for niche wood products. The potential increase in the utilization of domestic wood products and the impact that these products can have on the livelihoods of inhabitants should be further investigated, as well as the possible development of a small processing industry for value addition. Capacity assessments will do the same thing for NTFPs, allowing Dominica's forest sector to move to a market-based approach for trading timber and NTFPs.

PES mechanisms potential

PES mechanisms, especially in the tourism sector, should be expanded. One distinctive particularity of the country is the dependence of most economic sectors on the forest ecosystem. Forest ecosystems are key for tourism, offer essential protection to watersheds and regulate surface water streams, support

agricultural activities by preventing soil erosion and landslides and diminishing water floods, and have deep cultural implications for the Kalinago people. Proper forest ecosystem management has important potential for building resilience for natural hazards. Even though systematic monetary evaluation of the total economic value of ecosystem services hasn't been done, it is obvious that this value is very high. Normally, these values would have been captured using PES mechanisms. Until now, except for the attempts implemented by DOWASCO, the only PES mechanism that has been implemented in Dominica's forest sector is the usage fee for PAs. This fee generates important revenues, but it could be improved based on proper assessment of visitor's preferences, including WTP surveys. Fees should be estimated by the park management structures and approved by the MoF. Modernizing and adapting the present PES mechanism, plus planning and implementing other smart and accurate data-based PES mechanisms, could substantially increase revenues. This could create a financial basis for financing forest ecosystem management, including PAs management, ecotourism infrastructure, and biodiversity conservation measures.

Box 6. Current World Bank engagement in forests

- **Disaster Vulnerability Reduction Project (DVRP).** An International Development Association (IDA) credit of USD $17 million, a Pilot Program for Climate Resilience Grant of USD $12 million, and a credit of USD $9 million were approved in 2014 for the implementation of DVRP. The project's objectives are linked to investments in resilient infrastructure and improved hazard and climate change impact monitoring systems. Shortly after Hurricane Maria, the Contingency Emergency Response Component (CERC) of the DVRP was triggered, channeling US $10 million to unconditional cash transfer programs to provide immediate support to commercial and small farmers and aid in the recovery of small and microenterprises. The project has four components: (1) prevention and adaptation investments; (2) capacity building and data development, hazard risk management and evaluation; (3) natural disaster response investments; and (4) project management and implementation support. DVRP includes resources for development of propagation centers and forest inventory.
- **Emergency Agricultural Livelihoods and Climate Resilience Project (EALCRP), with a total budget of USD $29.5 million, is supporting the FWPD to implement urgent immediate actions such as rehabilitation of tourism trails, propagation centers, and the preparation of a forestry ecological assessment.** This support was designed in the context of an emergency operation that did not permit thorough analysis of overall sector needs. Therefore, an updated assessment of the priority interventions can bring significant benefits to the operationalization of the project. Examples of areas needing further analysis and in-depth needs assessment are: (a) the coordination of planned investments in production of planting material with the NRDS reforestation strategy in terms of location, production capacity, seedlings assortment, and investment timing; (b) effective planning for government support for ongoing operations and maintenance of various facilities that are planned for rehabilitation and/or expansion; and (c) designing forest data collection in a manner that will help the prevention of human-wildlife conflicts and the development of forest-based tourism. The description of potential intervention areas—included in the CFN—provides additional evidence to guide these activities and program the next phase of this engagement, as well as seek additional grant financing under GEF.

Management/afforestation of abandoned agricultural land

Abandoned agricultural land presents an opportunity to increase forest surface and forest resilience. Because of the decreased economic attractiveness of agricultural activities, the abandonment of agricultural land is increasing. If these areas are not converted to alternative land uses, they naturally revert to secondary forest (Eckelmann 2009) or can be subject to afforestation activities. The evolution of agricultural surfaces also increases the opportunity to adopt agro-forestry practices, with a less intensive use of the land, but offering many co-benefits in terms of regulation services. Because these lands are privately owned, tapping this opportunity will require regulations/incentives for the owners, as well as specific practical guidelines regarding managing the secondary forests or afforestation activities (including species choice).

4. Intervention Areas and Activities

Several intervention areas have been selected based on their high potential to transform the forest sector in Dominica into a modern and economically viable sector, and enhance its support for other sectors. The interventions have been classified based on necessity, estimated time for being carried out, as well as the available financing. Some of the identified intervention areas are already, at least partially addressed by current World Bank engagement (Box 6).

Short- and medium-term interventions include a focus on nature-based solutions that are largely achievable with available resources, while trying to reach the untapped potential for economic growth, job creation, social stability, and addressing climate change. All interventions in this category are of high priority.

Long-term interventions include actions targeted at cleaning up the institutions, regulations, policies, and management practices relevant to the forest sector and require a longer period for implementation.

4.1. Short- and medium-term interventions

Rehabilitate trails and facilities within national parks and WNT. This high priority intervention should be speeded up, using the already allocated resources. The rehabilitation action should also consider making some improvements to the former WNT to address newly identified opportunities in terms of new and attractive sites or optimization of trails to better address the communities' ability to provide connected touristic services.

Evaluate forest resources: plan for forest resource management through a general national inventory. A forest-management-oriented forest inventory should be performed, on a pilot basis, for the Central Forest Reserve. International assistance will be required for methodological design, but the process should be based on knowledge transfer that would benefit FWPD. The result will be a fully operational forest management plan that will guarantee a sustainable, yet economically viable, use of the Central Forest Reserve, as well as increased institutional capacity for FWPD to undertake larger forest-inventory-related initiatives. The data that will be collected and processed during the pilot forest management plan—and the increased institutional capacity of FWPD—are important prerequisites for a much easier process of designing a sample methodology for data collection from other forest areas in preparation for a wider forest inventory for carbon evaluation purpose**s**. Considering the special situation of Dominica, with forests impacting almost all human activities, the forest inventory initiatives should also consider natural capital valuation, to better understand and valuate the benefits of forests to catchment management, soil quality, regulation services, carbon, climate change, resilience, and biodiversity. The data resulted from evaluating forest resources can and should be integrated with data on biodiversity and ecotourism in an effective management information system.

Sustainable salvaging of timber. This is a priority activity that creates important opportunities with a quite high potential positive economic impact, in Dominica's conditions: a small-scale forest-based industry can be developed with minimum efforts, based on already existing expertise. The costs are limited because the process can benefit from the opportunity of the needed salvage logging, and the future benefits of this small economic activity may be relevant for Dominica in terms of jobs, internal consumption, and stopping degradation of private forest land. The intervention is not envisaged to promote a full-scale salvage logging but to use this opportunity for encouraging a limited number of small-scale companies to conduct salvage logging in already accessible areas carefully chosen by the FWPD, with no need for infrastructure investments. If the forest management plans for accessible areas will be elaborated as recommended, it will align with the built harvesting capacity and create an environmentally and economically sustainable arrangement. The GoCD should identify and allocate resources to undertake the salvaging activities, but the process must be coherently prepared and implemented, including (a) careful site selection and inventories; (b) transparent selection of sawmilling operators; (c) elaboration and dissemination of a code of practice for sawmilling operations; and (d) addressing possible work safety issues, and e) make sure that proper EIA is undertaken. Resources

should be made available for undertaking timber salvage not only in accessible sites, but also in the higher and less accessible areas that have a higher volume of fallen timber.

Proper forestland management plans should be encouraged for Kalinago territory. Considering the importance and the unique features of Kalinago territory and the increased difficulties in supplying raw materials for the specific manufacturing industry, forestland planning should be undertaken in order to better assess the remaining resource and find solutions for sustainable wood supply.

Updating management plans for national parks, including visitation strategies and action plans. Updating management plans (a) can help identify the pressures that tourism is posing on biodiversity; (b) can provide accurate data on the conservation status of important protected species and habitats; (c) can help design permanent biodiversity monitoring systems; (d) can improve flow management of visitors and e) can identify proper frames and designs for improved or new PES mechanisms. Of course, the updated management should benefit from specific regulatory conditions that would ensure the implementation of national parks management plans.

Better operational planning for efficient use of resources and increased effectiveness of the reforestation program. An afforestation program should focus on abandoned agricultural land and areas that are threatened by soil erosion and landslides, especially in connection with water catchment management issues. For these areas, possible approaches include: (a) slope stabilization efforts and the establishment of improved drainage; (b) establishment of buffer zones at the edges of streams and waterways and planting of appropriate vegetation in these zones; and (c) reforestation using both tap root and fibrous root systems. In the forested areas, the focus should be on encouraging natural regeneration of indigenous species after the salvage cuttings are done. In these areas, it would be more appropriate for FWPD to establish cutting prescriptions, which would ensure proper site preparation and the availability of quality seed trees for the natural regeneration of desirable species (e.g. gommier), as has been suggested by credible studies (Miller et al. 1988). Gommier and other high-quality native timber species grow slower, but there is greater probability for increased resilience. If natural regeneration is out of the question due to the degree of damage, costly artificial regeneration should be considered as an option.

Capacity building for forestry-related institutions is a high priority. Training needs assessments undertaken by FWPD should be updated and training programs in areas like forestry, silviculture, biodiversity conservation, PA management, and forest management planning should be implemented. Proper assessments of needs in terms of technical capacity also should be done, followed by acquiring the necessary equipment.

Table 8. Short- and medium-term intervention areas and activities

Interventions	Proposed activities	Implementation frame
Rehabilitation of trails & facilities within national parks and WNT	- Assess the rehabilitation needs and design the work in detail - Allocate the resources and do the rehabilitation work	Ongoing operations - EALCRP
Sustainable salvaging for timber	- Identify the sites that are suitable for such interventions, based on accessibility and degree of damage - Undertake tree inventory and establish cutting prescriptions - Encourage small sawmillers to perform salvage cuttings - Elaborate practice code for sawmillers and salvage cuttings - Ensure proper lumber marketing	Sources identified in EALCRP

Better planning for forest resources usage	- Evaluate forest resources for management purposes in Central Forest Reserve - Elaborate, on a pilot base and with professional international assistance, the forest management plan of Central Forest Reserve - Replicate the forest management planning process for the Northern Forest Reserve	Sources have been allocated in DVRP. Specific needs identification would help funds effectiveness.
Complete the Forest Inventory for carbon evaluation purposes	- Design a minimal methodology to get additional data that, together with the data collected for forest management planning, will help obtain a reliable status of carbon stocks	
Capacity building for forest-related institutions	- Assess the training and equipment needs - Implement training and procurement programs	Proposed GEF additional finance
Update management plans for national parks, including visitation strategies and action plans	- Inventory, mapping, and conservation status evaluation for target habitats and species within national parks - Conduct surveys to gather data regarding ecotourism - Assess the tourism support capacity of PAs - Elaborate management plans, including a permanent biodiversity monitoring system, provisions for visitors flow management (including improved entry fee mechanisms), and actions for ecotourism infrastructure improvement - Assess/design PES mechanisms to improve the income flow for the Parks management	Proposed GEF additional finance
Create regulatory and institutional conditions for national parks management plans implementation	- Define responsibilities for parks management implementation (including implementation monitoring and reporting mechanisms) - Create proper financial mechanisms for park management plans implementation - Define a clear frame for permanent update of parks management plans	Proposed GEF additional finance
Better operational planning for efficient use of resources and increased effectiveness of the reforestation program	- Identify sites that are suitable for or need afforestation - Assess the quantitative and qualitative seedlings needs - Plan for seedlings production capacity - Plan the seedling production - Plan the afforestation process and allocate the resources - Implement the afforestation plan	Seedlings production supported by DVRP and EALCRP

	- Make sure that plantation maintenance is properly done	

The most important identified short-term interventions are going to be supported by ongoing operations of DVRP and EALCRP. Still, there are some areas that need immediate intervention, for which GEF additional financing is proposed. Needs related to parks management should be addressed by a project proposal aimed at improving the tools for Dominica's national parks planning and management, but also at directly supporting biodiversity management operations in close relation with ecotourism development and sustainable livelihoods. Both ongoing projects (DVRP and EACRP) and the planned GEF project are focusing on identifying best practices that will make these interventions sustainable in the long term. The proposed GEF interventions will especially focus on enhancing eco-tourism activities looking also at options to more efficiently structure the park fee system, which could provide a sustainable and consistent stream of income.

4.2. Long-term interventions

For addressing the identified challenges and opportunities, the GoCD might also consider undertaking some long-term interventions that can contribute to the creation of an enabling environment for all activities related to forest management. These interventions have been grouped in three areas: (1) policy, regulations, and institutions; (2) natural resources management; and (3) research. Although the time-frame for their implementation is longer, many of these interventions are of significantly high priority (see Table 9). Most of them need data collection and assessment, impact studies, consultations etc. that should be carefully planned and initiated as soon as possible. The policy related actions, especially, are in this situation, with a notable opportunity of using the results of the implementation of short- and medium–term interventions; for instance, sectoral strategy development can be significantly supported by the short-term actions towards forest resource evaluation and inventory and capacity building.

Table 9. Long-term intervention areas

Intervention areas	Recommended interventions	Priority
Policy, regulations, and institutions	- Integrate natural resources strategies/policies; elaborate a sectoral strategy for forest sector	High
	- Improve institutional coordination	High
	- Regulate the use and agricultural/silvicultural practices in privately owned land; elaborate guidelines for private forest land containing minimal forest management practices; implement educational programs for private forest landowners	High
	- Regulate the use of unallocated government-owned forest lands	Low
	- Continuous capacity building for forest-related institutions, including training and marketing of forest products for increased revenue	Medium
Natural resources management	- Implement a natural resources management information system; develop a land use and landownership data base	High
	Develop an updatable data base on tourism and visitation (including surveys on WTP, tourism profiles, expectations, etc.)	High

	- Implement permanent monitoring systems for forest resources usage, lumber and NTFP (forest cuttings in private/state forest land, lumber markets, other forest products markets); continue to encourage sustainable use of wood and NTFP resources, including sawmilling and wood processing and spread of good practices	Medium/Low
	- Implement permanent monitoring systems for effectiveness of biodiversity conservation measures	Medium
	- Assess the opportunity, necessity, and possible implementation arrangements for broader PES mechanisms in the tourism sector, targeting visitors	High
Research and development	- Silvicultural studies, including monitoring of permanent vegetation plots for regeneration, seedling survival, identification of seed sources, increment studies, storm resilience etc.	Medium
	- Biodiversity-related studies	Medium
	- Research for policy formulation purposes	High
	- Ecotourism studies	High

Annex 1. Vegetation classes in Dominica

Vegetation class	Description (EARTHSAT 1986, Evans 1986)
Mature rain forest[1]	Vegetation types occurring toward the interior of the island, generally not below 1,000 feet and having few periods without precipitation—customarily only a few weeks between April and June. The canopy is dominated by *Dacryodes excelsa, Sloanea* spp., and *Amanoa caribaea.* Undercanopy species include *Licania ternatensis* and *Tapura antillana* and numerous epiphytes and lianas.
Montane thicket and elfm woodland	Vegetation type occurring at high elevations, approximately 3,500 feet. The tree stratum is severely reduced at these elevations as a result of wind exposure. Characteristic species are *Richeria grandis, Byrsonima martinicensis,* and *Podocarpus coriaceus,* with *Heliconia bihai,* the tree ferns *Cyathea imrayana* and *Hemitelia* spp., and razor grass *Seleria latifolia* forming the understory. Montane thicket includes elfm woodland, which occurs at higher elevations, where exposure to wind is high, and is characterized by *Clusia venosa* and *Lobelia cirsifolia.*
Littoral woodland	Community occurring along the eastern and northeastern coastline. The tree canopy is subjected to nearly constant onshore winds yielding asymmetrical tree crown development shaped by pressure from sea breezes. The species of this community, which are salt-spray tolerant, are characterized by *Coccoloba uvifera, Chrysobalanus icaco, Tenninalia cattapa,* and *Tabebuia pallida. Cazophyllum antillanum* is conspicuous.
Swamp and wetlands	Restricted to an area immediately east of the Cabrits Peninsula in the northwest of the island, an area experiencing a seasonal supply of freshwater. Characteristic species are *Pterocarpus officinalis* (which also occurs in narrow strips along stream banks, particularly between Blenheim and Calibishie), *Laguncularia racemose,* and *Avicennia genninans.* In the larger swamps such as Cabrits and Glanvillea, the semi-aquatic vegetation is dominated by the fern *Acrostichum aureum* and various sedges, particularly *Cyperus* spp., *Eleocharis mutate,* and *E. interstincta.*
Scrub woodland	Vegetation type occurring at lower elevations on the west coast. Community is dominated by a shrub layer and represents the most xeric conditions on the island. Characteristic species are *Lonchocarpus pentaphyllus, Pisonia fragrans, Haematoxylon campechianum, Myrsia atrifolia, Chrysophyllum argenteum,* and *Erythroxylum ovatum.*
Secondary rain forest	Areas previously occupied by mature rain forest that have experienced disturbance, primarily logging and shifting agriculture. Characterized by *Miconia* species *(Miconia mirabilis* in particular), *Cecropia schreberiana,* and, in the smaller gaps, *Simaruba amara.* Canopy climax forest trees such as *Sloanea* exist but are not dominant.
Semi-evergreen forest	Really a transition vegetation zone with species characteristic of dry and rain forest. In many Lesser Antillean islands, it occupies a moderate area. In Dominica (because of its steep slopes leading quickly into high rainfall areas), it is very narrow in extent, with indistinct boundaries; therefore, it is not useful to classify this as a separate vegetation type.

Note: [1] Differentiation between mature and secondary rain forest is not well-defined (there is an element of secondary growth throughout the rain forest areas); also, "montane rain forest" may prove difficult to distinguish in some locations from "mature rain forest" (CCA 1991).

Annex 2. Implementation and monitoring plan for sustainable growth and development in the forestry sector

The recovery needs identified in the PDNA for the forestry sector amounts to USD $15 million, of which $12 million is in the first year. The Strategic Plan 2018–23 of MECRDMUR (elaborated on the base of PDNA) includes an ambitious implementation and monitoring plan with precise activities and monitoring indications. Still, there are issues regarding the identified actions that require dedicated planning and resource allocation. They limited the success of action plan implementation, most of the actions being already late (e.g. afforestation actions) or interrupted due to limited financial resources (e.g. salvaging actions).

STRATEGIC OBJECTIVES	ACTIVITIES	TIMELINE	RESPONSIBILITY	OUTPUT	INDICATORS	MEANS OF VERIFICATION
To implement reforestation strategies after Hurricane Maria	Plant 250,000 trees per quarter	July 2018– December 2019	Forestry, Wildlife and Parks Division	250,000 trees planted per quarter; 1 million trees planted by December 2019	Number of trees planted	Progress reports, photos, inventory list
	Development of eight (8) ex situ and two (2) in situ nurseries for preparation of planting material	July 2018–December 2019		Eight ex situ and two in situ nurseries developed	Number of ex situ and in situ nurseries developed	Progress reports, photos
	Engage 240 students in the summer volunteerism program	July 2018–December 2019		240 students engaged	Number of students engaged	Progress reports, photos
	Work with tour operators on tree planting volunteer initiative and NGOs, private sector, CSOs in tree planting activities	July 2018–December 2019		Tour operators trained	Number of tour operators participated Number of sessions held	Progress reports, photos
	Reforestation at three (3) model pilot sites	July 2018–December 2019		Three model pilot sites reforested	Number of model pilot sites used for reforestation	Progress reports, photos
	Collection, storage, and broadcasting of local forest trees species	July 2018–December 2019		Local forest trees species collected, stored, and broadcast	Quantum of local forest trees species collected, stored, and broadcast	Progress reports, photos
	Train communities, schools, village councils to encourage development of private timber sector	July 2018–December 2019		Communities, schools, village councils trained	Number of communities trained Number of village councils trained	Progress reports, photos
Sustainable salvaging of timber	Conduct physical assessment of damaged timber species	July 2018–June 2020	Forestry, Wildlife and Parks Division	Physical assessment conducted	Percentage (%) complete	Assessment reports
	Actual salvaging of timber species by engaging private timber operators	July 2018–June 2020		Timber species salvaged	Value of timber species salvaged	Sales receipts.
	Storage, grading, and sale of timber	July 2018–June 2020		Salvaged timber graded and sold	Value of sales	Sales receipts.
	Chipping of vegetative matter	July 2018–June 2020		Vegetative matter chipped	Weight of chipped material	Inventory report

	Produce charcoal	July 2018–June 2020		Charcoal produced	Number of bags produced	Inventory report
	Undertake capacity building in chainsaw operations	July 2018–June 2020		Chainsaw operators trained	Number of chainsaw operators trained	Progress reports
Rehabilitation of trails and facilities within national parks and ecotourism sites	Continue conducting physical and engineering assessments of trails and facilities	July 2018–June 2023	Forestry, Wildlife and Parks Division	Physical and engineering assessments completed	Number of ranges assessed	Contracts, reports, payment certificates
	Construction and maintenance of bridges, platforms, railings	July 2018–June 2021		Bridges, platforms, and railings constructed and maintained	Value of construction and maintenance costs	
	Complete rehabilitation of the Waitikubuli National Trail. Complete rehabilitation and upgrade of the Botanic Gardens	July 2018–June 2021 July 2018–June 2020		Waitikubuli National Trail rehabilitated Botanic Gardens rehabilitated	Percentage (%) of trail rehabilitated Percentage (%) complete	
Research and development on flora and fauna	Conduct forest inventory	December 2018–June 2019	DVRP, Forestry, Wildlife and Parks Division	Forest inventory completed	Percentage (%) complete	Progress reports, photos, forest inventory data
	Continue work on REDD+ on carbon sequestration matters	July 2018–June 2023	Forestry, Wildlife and Parks Division	Progress on REDD+ carbon sequestration updated	Number of activities completed	Progress reports, photos
	Continue wildlife research and monitoring	July 2018–June 2023	Forestry, Wildlife and Parks Division	Wildlife research and monitoring completed	Percentage (%) complete	Progress Reports, Photos
	Continue research on invasive species	July 2018–June 2023	Forestry, Wildlife and Parks Division	Research on invasive species completed	Number of invasive species identified Number of action plans prepared	Progress reports, photos
	Reestablishment of protected areas boundaries and proposals for buffer zones around national parks	July 2018–June 2023	Forestry, Wildlife and Parks Division	Protected areas boundaries re-established Proposals for buffer zones prepared	Percentage (%) complete Percentage (%) complete	Progress reports, photos

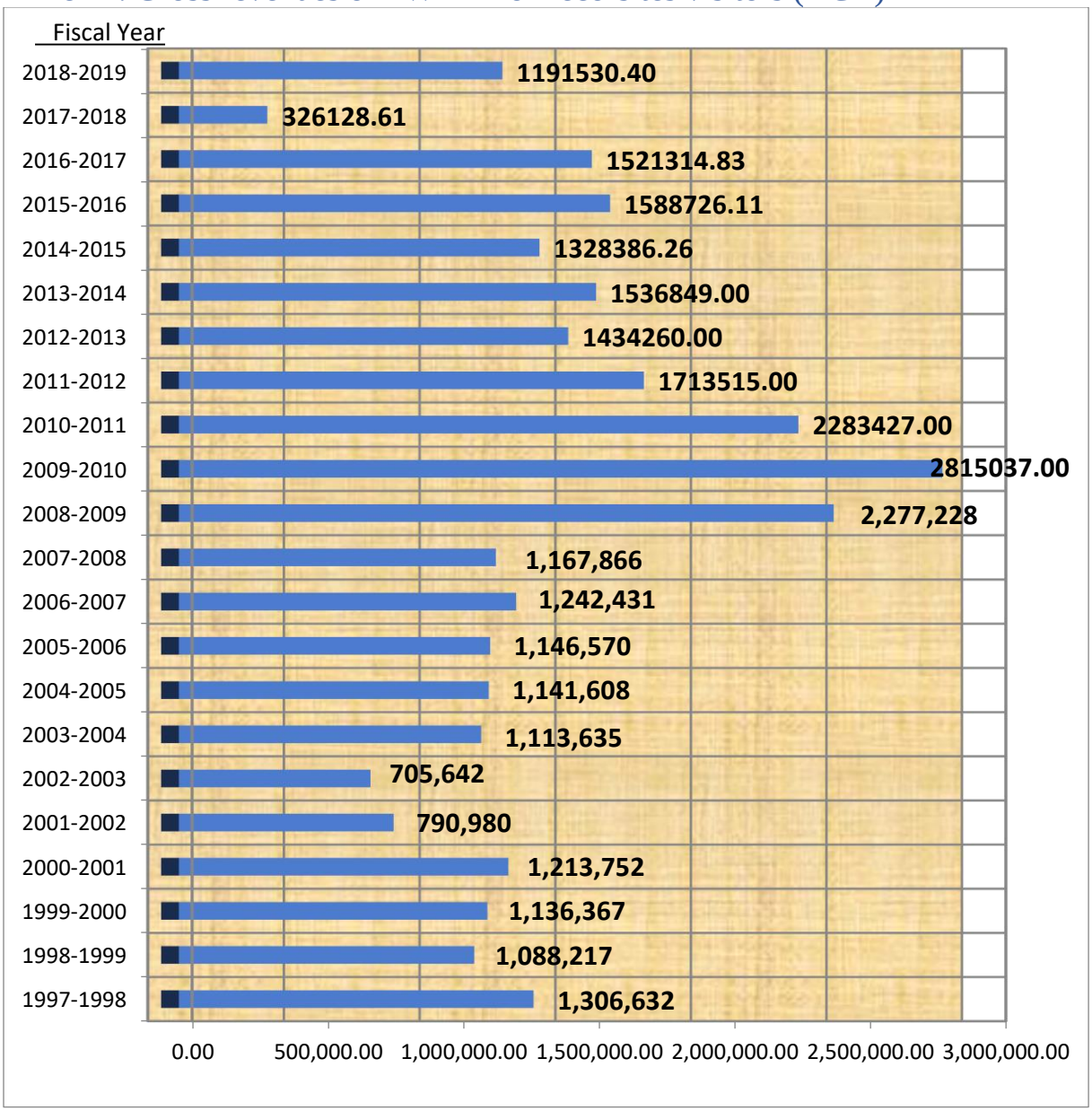
Source: MECRDMUR 2018

Annex 3. Forest timber exploitation in Dominica

There were two distinct technologies used for forest exploitation in Dominica. One is mechanized harvesting, with machines like skidders, or other heavy equipment, using forest roads constructed for accessibility purposes (Shanks and Putney 1979). In the late 1980s this wood harvesting technology was still in place, with the use of concessions mechanisms. There were two main operators involved in industrial forestry—Dominica Timber Ltd. and Northeastern Timber Cooperative Ltd.—but their economic sustainability was seriously in question (CCA 1991). The total environmental costs of this kind of forest resource utilization have never been assessed. In some of the cases, the concessionaires were also undertaking reforestation, using mainly exotic species (especially mahogany). Nevertheless, all enterprises in industrial forestry went out of business in the early 1990s; since then, all timber harvesting in Dominica have been carried out by small-scale sawyers.

Sawmilling represents the second type of forest exploitation. It is derived from the traditional pit sawing, replaced by the use of chainsaws to cut boards and scantlings (Eckelmann et al. 2010). The operators use the same chain as for felling the tree, although some use a special ripping chain or adapt a felling chain. Small-scale sawmillers can work in areas that are less accessible to mechanized operators and with minimal damage to the resources because they essentially bring their sawmills into the forest instead of dragging out huge logs. In 1991, there were 114 small-scale sawmillers with an annual output estimated at 1–2 million board feet (CCA 1991). There were attempts to better organize chainsaw milling in Dominica by establishing cooperative organizations for using drying and marketing facilities. They organized an NGO called Cottage Forest Industry, but the initiative was not successful (Eckelmann 2010). The chainsaw milling operators played an important role in salvage cuttings after Hurricane David in 1979. A steep reduction in the demand for locally produced lumber, due to imported furniture, contributed to the decline of this activity.

Annex 4. Gross revenues of FWPD from eco-sites visitors (XCD)



Source: FWPD, October 2019

Annex 5. Goals and actions under the national REDD+ strategy for Dominica

Goal	Action
Goal 1 National determined contribution to the Paris Agreement	1.1 Ensure the correct understanding and implementation of INDCs/NDCs in a coordinated and coherent manner
	1.2 Review NDC regarding the forest sector with the view to ensure consistency with existing documents and plans on REDD+
	1.3 Promote activities to increase understanding of NDC and commitments and requirements under the Paris Agreement
	1.4 Prepare a detailed plan for the implementation of the NDC as far as the forest sector is concerned
	1.5 Ensure NDCs implementation progress is tracked in full compliance with UNFCCC and Paris Agreement rules
Goal 2 Adapting the institutional and legal framework	2.1 Establish a framework climate change law with the view to provide clarity about institutional arrangements, governance, and responsibilities
	2.2 Create a permanent team of experts with a dedicated office to deal with all REDD+ activities related to REL/RL, NFMS, MRV, GHG inventory, and REDD+ implementation and to monitor the implementation of the REDD+ strategy
	2.3 Define the meaning of forest for REDD+ with the view to ensure consistency and maintain that interpretation for all forest-related issues
	2.5 Establish a permanent GHG inventory team with the view to build national capacity and ensure ownership
Goal 3 Fulfilling international requirements for REDD+	3.1 Adopt a National REDD+ Strategy to be endorsed at the highest political level. Define all forest-related activities within the targeted area to identify REDD+ potential, having in mind that conservation of carbon stocks is the core activity of the national REDD+ strategy
	3.2 Ensure accuracy of data. On the basis of the new cover, map historical forest data to be reconstructed at least for the last 10/15 years using Openforis methodology
	3.3 Develop a Forest Reference Emission Level and Forest Reference Level (once new historical forest data are developed)
	3.4 National Forest Monitoring System. Train a team that can monitor defined forest field plots for carbon pool chosen in order to provide information on activity data within PAs and to gain experience over time to improve GHG inventory AFOLU sector
	3.5 Summary Information System for Safeguards. Implement the national REDD + strategy, taking into account the national circumstances, and including all actors that supported conserving the country's forests
Goal 4 Consultation with stakeholders and engaging the private sector	4.1 Respect national legislation and practices about stakeholders and local consultation when defining the REDD+ strategy and implementing REDD+ activities
	4.2 Review and improve REDD+ national priorities and documents after inclusion of all comments as a result of stakeholder consultations so that a final version is presented to private owners in the land sector
	4.3 Integrate the carbon concept as described in the national REDD+ strategy into all forest-related projects such as the Iyanola Natural Resource Management of the NE Project. Engage in the establishment of additional protected areas owned by the public and private land sector
Goal 5 Verification of results	5.1 Create a national GHG accounting system tracking ownership of REDD+ credits nationally and internationally. Once the national REL/RL is constructed, results should be reported in the national GHG accounting system supporting the improvement of the information for future verification
	5.2 Establish a national registry that reports to UNFCCC, changes accounts for international transfers should be developed
	5.3 Develop forest plots within protected areas with the aim to start monitoring how biomass is behaving in order to demonstrate in future verification that forest is still sequestering carbon. Dominica should follow a methodology in line with IPCC guidelines as agreed under UNFCCC REDD+ decisions
	5.4 Dedicate sufficient attention and resources to enhance regional/national access to climate finance through the GCF and bilateral/multilateral financial institutions

Source: (OECS, 2017)

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Notes

[1] Total population estimated to be consistent with the population of the (a) 1960, 1970, 1981, 1991, 2001, 2011 censuses; (b) official estimates through 2014; and the assumed subsequent trend in the growth rate of the population.
[2] The poverty line represents a monetary measure of the minimum annual consumption, in dollar terms, that is needed to meet the basic food and non-food requirements of an average adult, at prevailing prices.
[3] https://countryeconomy.com/national-debt/dominica. Some other sources indicate even higher public debt at 83% (http://finance.gov.dm/index.php/national-development-strategies/economic-and-social-review).
[4] Encyclopaedia of the Nations, 2008; Progressive Policy Institute, 2004.
[5] 7% direct contribution, 14% indirect contribution and 5,4% induced contribution (WTTC 2015).
[6] According to Slinger-Friedman (2009) the number of stayover visitors reached 85,000 in 2006. Between 1996 and 2009 stayover tourist arrivals to the island have grown annually by almost 7% and they generate as much as 88% of tourism revenues for the island when compared to cruise ship visitors. Another issue that is causing concern is the large number of cruise ship passengers who are taken primarily to two/several sites, both within protected areas (FWPD 2010).
[7] FAO (2014) gives measured surfaces (for 2000) – 47,270 ha and estimated data (for 2010) – 44,960 ha.
[8] The total surface of Cabrits National Park is 531 ha (NBSAP 2013), of which 421 ha are marine areas and 35 ha are swamps (OECS 2007).
[9] BSAP (2001) is mentioning that Dominica’s land resources have been classified as unsuitable for agriculture mainly because of erosion risk, water saturation due to heavy rainfall, or poor soils. In 1995, only 27% of the total area (20,902 ha) was agricultural land, but only 12,650 ha were cultivated, the rest being actually forests.
[10] According to FAO (2015) the average above ground volume for forests in the Caribbean is around 120 m^3/ha. Average forest coverage is 25%, Dominica being the second after Bahamas with 84% (FAO 2010).
[11] These numbers were not taken into account by the Post-Disaster Needs Assessment (GoCDb 2018).
[12] Under the Ministry of Housing and Lands, GoCD.
[13] Assumptions: (a) All MTPNP and MDNP surfaces are forests; (b) 95 percent of MTPNP surface is state-owned (MTPNP 2018); (c) all unallocated governmental land is also forest; (d) the forest area in CNP is state-owned; (e) all agricultural lands are privately owned; and (f) all other land (except for agricultural land and forests) is privately owned. These assumptions don’t take into consideration possible encroachment from agriculture into areas demarcated as forest reserves.
[14] This section relies on the information provided by FWPD (2019)
[15] Examples of local NGOs: Dominica Organic Agriculture Movement, National Youth Council and National Association of Youth in Agriculture, Community Councils and Community Improvement Groups, Eco-balance – Biodiversity Center for Learning and Training, Bellevue Chopin Organic Farmers, Giraudel Women’s Group, Society for Heritage, Architectural Preservation & Enhancement, Waitukubuli Ecological Foundation.
[16] Established by the Ministry of Finance (MoF)

[17] Act no. 16 in 2018 (https://www.creadominica.org).
[18] Some examples: Protected Areas Bill (draft in 2014) was expected to *harmonize existing laws and regulations regarding PAs and help to improve management efficiency and effectiveness*, Forest Policy Statement (2010), A New Physical Planning Bill, PAs Policy and Surveillance Plan (UNDP 2014), National Environment Management Strategy etc.
[19] Numbers taken from the budget tables shared by the GoCD in June 2019.
[20] These revenues don't include the PAs and WNT fees that are cashed by FWPD but are directed to the national budget. The main sources of revenues are: hunting and fishing licenses; timber royalties – lumber and tree sales; compost sales; licenses issued to vendors; sale of plants; sale of literature and paraphernalia; rental of facilities for events; rental fees/ concessionary fees; export permit; research permit; film permit (FWPD 2019).
[21] On-the-ground monitoring can provide insight into the stresses experienced by trees and the nature and direction of ecosystem change, thus providing information to guide management responses.
[22] There are specific components dealing with WNT rehabilitation needs as well as biodiversity inventories under EALCRP.
[23] Based on interviews with forest officers from FWPD.
[24] Data delivered directly by FWPD officials.
[25] The average price for lumber is between XCD 6 and XCD 12/square feet depending on the species.
[26] Average take-home earning in Dominica is around XCD 34,000 (https://www.averagesalarysurvey.com/dominica).
[27] 6000 m^3 of harvested wood, meaning approximately 2,400 m^3 of chainsawn lumber, 2010 prices.
[28] Concept Note on a proposed grant to the Commonwealth of Dominica for Leveraging Ecotourism for Biodiversity Protection.
[29] Dominica's National Biodiversity Strategy describes approximately 155 families, 672 genera and 1,226 species of vascular plants and rich fauna, including 179 species of birds, 55 species of butterflies, 20 species of crabs, 3 species of amphibians, 17 species of reptiles (4 snakes), 18 mammal species, 11 stick insect species, and around 45 species of inland fish.
[30] Concept Note on a proposed grant to the Commonwealth of Dominica for Leveraging Ecotourism for Biodiversity Protection.
[31] Based on the data provided by FWPD in 2019. The numbers for 2017 and 2018 have dropped significantly due to Hurricane Maria.
[32] FWPD is charging USD $5 for a site pass and USD $12 for week pass allowing entrance to all sites. For cruise ships passengers, the site pass is USD $3. The entry fees are in line with more or less similar sites in the Caribbean Islands, for instance USD $5 for day pass in Virgin Islands or Grand Bahama Parks.
[33] This may be a way to determine the market value of the regulatory ES provided by forest ecosystems to urban water system.
[34] DOWASCO has signed a memorandum of understanding with FWPD establishing a cooperative agreement to undertake a joint management approach for all lands forming part of the Stewart Hall water catchment and other protected forest and supporting a forest management system for the areas (FWPD 2019).
[35] Facilities for one propagation center were already build under DVRP, but the center is not functional yet; some steps were also made within EALCRP for Point Casse propagation center to be rehabilitated.
[36] In lieu of a genuinely scientifically based program of genetic tree improvement.
[37] Works are in progress in several segments of WNT, while technical assessment are in progress for future works contracting.
[38] There have been discussions regarding how to better include the Kalinago Territory in the future planning and development of WNT.
[39] Based on the information received during field trips in October 2019 and interviews with FWPD officers.
[40] This includes quarrying industry, increasing in recent years: there are currently nine mining operations approved by the Physical Planning Division, which is responsible for their periodic monitoring. Eight of the operations are near the coastline, and only one is located near the Emerald Pool area, of the MTPNP. It also includes hotels development.
[41] In particular, for Kalinago Territory, as resulted during the interviews done by the WB team in October 2019.