



Government of Dominica

ANNEX

**CLIMATE RESILIENCE AND RECOVERY PLAN (CRRP)
DOMINICA: DISASTER RESILIENCE STRATEGY**

DOMINICA: DISASTER RESILIENCE STRATEGY

EXECUTIVE SUMMARY

Context. Dominica is among the countries most vulnerable to natural disasters and climate change. During 1997-2017, it was the country with highest GDP losses to climate-related natural disasters and ranked in the top 10 percent among 182 countries for climate-related fatalities. Following a huge devastation, owing to back-to-back major storms in 2015 and 2017, Dominica announced its intention to become the first climate resilient nation. In 2019, it was agreed with the government that the Fund, in consultation and collaboration with other development partners, would provide support for preparing a Disaster Resilience Strategy (DRS), a comprehensive plan including policies, cost, and financing to build resilience against natural disasters.

Recent progress. Following hurricane Maria in 2017, with estimated damage of 226 percent of GDP, there was a significant increase in public investment to rebuild public infrastructure resilient to natural disasters, financed mainly with Citizenship by Investment (CBI) revenues. In addition, the government developed a strategy for disaster preparedness and response with itemized investments and policies and estimates of resource requirements. The Covid-19 pandemic caused significant economic and social hardship owing to Dominica's dependence on tourism receipts, which plummeted in the wake of the pandemic leading to a sharp decline in tax revenues. At the same time, Dominica was forced to increase and reprioritize public spending to address immediate health needs and make transfers to the unemployed. As a result, the fiscal and debt situations came under further strain leading to changes in plans and priorities, because of which a draft DRS prepared just ahead of COVID-19 had to be modified.

Disaster Resilience Strategy (DRS). The DRS is an umbrella document, which draws upon existing government plans and proposals, elaborating a strategy for Dominica to build resilience against natural disasters that is integrated into a credible macro-fiscal framework. It is organized around three pillars: structural resilience, financial resilience and post-disaster resilience. The total cost of transforming Dominica into a disaster-resilient state over a twenty-year period is estimated at US\$2.8 billion (five times Dominica's GDP). Model-based estimates calibrated to the Dominica economy indicate that the return to resilient investment outweigh the cost in the long term by supporting higher private investment and employment. However, debt would increase in the medium term as the cost of resilient investments and policies accrue up-front, but returns materialize only in the medium to long-term with a gradual increase in resiliency, which in the DRS takes two decades.

The support of the international community is an imperative. Dominica would be unable to finance the cost of building resilience without concessional financing from the international community. Integration of the cost and returns from DRS policies and investments indicates an annual financing gap of 8 percent of GDP, after incorporating a phased fiscal consolidation of 5.7 percent of GDP anchored by measures which have been fully identified. Attaining resilience



Government of Dominica

with fiscal and external sustainability crucially depends on an increase in donor grants of about US\$63 million per year, 3-4 times above recent levels.

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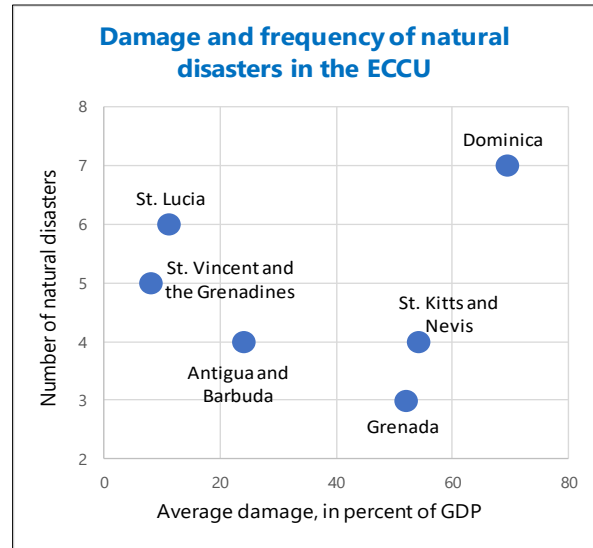
Prepared by the Dominica Ministry of Finance, in consultation with the Climate Resilient Execution Agency of Dominica (CREAD), with support from the International Monetary Fund. The report benefitted of comments from other partners, including the World Bank, and the Caribbean Development Bank.

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DOMINICA: DISASTER RESILIENCE STRATEGY

A. Introduction

1. Dominica is among the countries most vulnerable to natural disasters and climate change. Due to its location within the Atlantic Hurricane Belt, weather events such as high winds, excess rainfall, and hurricanes, often of extreme intensity, have a significant adverse impact on the population and the economy. According to the Climate Risk Index, Dominica was the country with highest GDP losses to climate-related natural disasters during 1997–2017, and among 182 countries, was in the top 10 percent of climate-related disaster fatalities.¹ In 2017, Hurricane Maria devastated the island with an estimated loss and damage of 226 percent of GDP, following soon on the heels of damages from Hurricane David (1979) and Tropical Storm Erika in 2015 (Annex 1). The hurricanes caused severe infrastructure damage in the transportation, housing, tourism and agriculture sectors. Moreover, due to its geological conditions, Dominica is also prone to earthquakes and volcanic hazards (Table 1).



Source: Climate Risk Index

Table 1. Dominica: Economic Impact of Natural Disasters
(in US dollars million)

	Hurricane Event	Loss	Earthquake	Loss
Most severe	2017 (Maria)	1316	2004	19
Second-most severe	1979 (David)	523	1839	7
Third-most severe	2015 (Erika)	483	1906	7

Source: CRIFF, Dominica Country Risk Profile

2. Against this backdrop, the government of Dominica has set the objective of becoming the world's first climate resilient country. This requires elaborating a comprehensive strategy that internalizes the macroeconomic impact of various types of disaster-related risks and the costs and returns of investment in building resilience to natural disasters in a credible macro-fiscal framework.

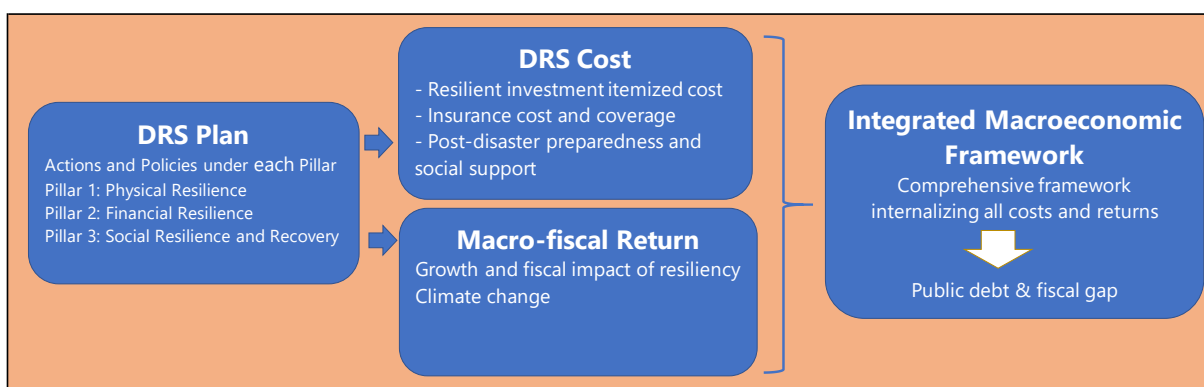
3. The rest of the Disaster resilience Strategy (DRS) is organized in five sections. Section B specifies the three Pillars around which the DRS is organized. Section C presents the DRS plan, including references of progress made in each of the Pillars and the status of the plan going forward. Section D provides the cost of the three Pillars and section E the evaluation of

¹ Global Climate Risk Index 2017/2018. <https://germanwatch.org/en/14638>.

macroeconomic and fiscal implications of DRS investment and policies. Section F integrates all costs and macroeconomic effects into a comprehensive macroeconomic framework that specifies the government plan to create fiscal space for a DRS and estimates financing needs and debt implications. Section G presents some considerations on the way forward, with emphasis on need for international cooperation to address climate change and support disproportionately affected small states such as Dominica.

B. Pillars of a Disaster Resilience Strategy

4. The DRS integrates the costs and returns from investment to build resilience against natural disasters in a consistent macroeconomic framework. This enables identification of financing needs and public debt sustainability implications, critical for planning, prioritization, and identification of financing sources. It can help coordinate development partners' financial and technical assistance and catalyze donor support.



5. The DRS is organized around three Pillars²:

- **Pillar I. Structural resilience.** Specifies appropriately chosen and prioritized investments that limit the impact of disasters, including “hard” policy measures (e.g., upgrading infrastructure, developing irrigation systems, ensuring resiliency of roads, bridges, buildings and public service infrastructure), and “soft” measures (e.g. early warning systems, customizing building codes and zoning rules).
- **Pillar II: Financial Resilience.** Includes the use of fiscal buffers and pre-arranged financial instruments to manage recovery and reconstruction costs in the wake of a disaster. Even with resilient structures, the impact of disasters can be partially contained but not eliminated. Time-to-build constraints, and immediate post-disaster financing needs for social support and rehabilitation of key services and infrastructure require a comprehensive insurance framework for rapid access to financing.

² See <https://www.imf.org/en/Publications/Policy-Papers/Issues/2019/06/24/Building-Resilience-in-Developing-Countries-Vulnerable-to-Large-Natural-Disasters-47020> .

- **Pillar III: Post-Disaster Resilience.** Specifies detailed action plans, emergency protocols, and community awareness and preparation to coordinate the response of the different government agencies and the general population in the wake of a disaster. The emergency response plan clarifies institutional arrangements, and distribution of responsibilities to rapidly mobilize financial and physical resources and contain disruption of critical public services including water, electricity, medical services, schools, citizen security, and financial services.

C. Recent Progress on the DRS Pillars and Plan

6. For years, Dominica has been planning and adopting policies to strengthen natural disaster adaptation, mitigation, and risk management. The country is part of the Pilot Program for Climate Resilience (PPCR)³, a targeted program of the Climate Investment Fund. Under the PPCR, Dominica developed the Low Carbon Climate-Resilient Development Strategy, including the Strategic Program for Climate Resilience (SPCR), a five-year plan launched in 2012 to become a climate-resilient and low-carbon economy, as well as to address climate change impact on agriculture, food security, infrastructure and vulnerable communities. The National Disaster Plan, which includes policy guidance on prevention, mitigation and response, was developed in 1998 and revised in 2006. These legislative and policy efforts were complemented by the National Climate Change Adaptation Policy (2002) and the Disaster Preparedness Plan for the Agriculture Sector (2006). The National Resilient Development Strategy (NRDS), launched in 2018, integrates climate resilience and disaster risk management into the national growth and development planning framework. Dominica’s Climate Resilience and Recovery Plan (CRRP), approved in early 2020, operationalizes the NRDS with itemized investments and policies, and estimates of resource requirements (Annex II).

7. Devastation after tropical storm Erika and hurricane Maria heightened the sense of priority for natural disaster preparedness among all Dominicans. After these storms there was a significant increase in the Public Sector Investment Plan in the annual government budget to rebuild public infrastructure with resiliency to natural disasters, under the premise of “building-back-better”. This has been done in consultation with technical experts, and development partners, including comprehensive analysis of exposure and vulnerability, resulting in several feasibility studies in different areas of disaster resilience. Progress has also been made with in-depth analysis of the topography, allowing for the identification of vulnerable areas.

8. The Climate Resilience Execution Agency of Dominica (CREAD) is making progress to estimate the total cost of resilience structures and policies. CREAD was created in 2018 under the Prime Minister’s mandate to make Dominica the first climate resilient nation. It is a DFID (now Foreign, Commonwealth & Development Office), Canada and Government of Dominica funded agency managed and staffed by technical experts with a mandate to identify, plan, cost, and manage the execution of large resilience projects and policies. It is supporting the Ministries to

³ The Pilot Program for Climate Resilience (PPCR), is one of three targeted programs that make up the Strategic Climate Fund (SCF) of the Climate Investment Funds (CIFs). It supports national governments in integrating climate resilience into development planning across sectors and stakeholder groups. It also provides funding to put these plans into action and pilot innovative public and private sector solutions to pressing climate-related risks.

develop a comprehensive resilience plan. The plan is organized in 10 priority areas, guided by the overarching objectives of building strong communities, a sustainable economy, and well-planned durable infrastructure. With those objectives, strategic actions in different sectors have been identified, with prioritization based on cost and impact of the strategies (Text Table).

Top Ten CRRP Initiatives

- (1) Enhanced Social Safety Net
- (2) Community Emergency Readiness Initiative
- (3) Resilient Housing Scheme
- (4) Koudmen Dominik - National Volunteer Initiative
- (5.i) Resilient Dominica Physical Plan
- (5.ii) Hydrology Survey and Flood/Landslide Risk Management
- (5.iii) Resilient Modern ICT Network
- (6) Innovative Approach to Insurance
- (7) Dominica as a Global Center for Agricultural Resilience
- (8) Revised PSIP allocation process and enhanced public sector performance management framework
- (9) Data Center for Resilience Decision Making
- (10) "ResilienSEA" in the Blue Economy Investment Fund

Source: CRRP.

Pillar I: Structural Resilience

9. Physical resilience requires extensive investment in infrastructure. Dominica's mountainous and rugged landscape creates engineering challenges that require significant financial and human resources. Given the severity of hurricane Maria, initial efforts focused on rehabilitation, reconstruction, with resiliency building now underway. The long-term plan is to expand and upgrade the existing infrastructure, so it is resilient to natural disasters. The early stage of this plan was detailed and costed in the Public Sector Investment Plan (PSIP) of the FY2019/20 budget, and new investments and policies are being identified and costed by CREAD and the government ministries.

Recent Progress and Policies

10. The destruction brought by tropical storm Erika and hurricane Maria required extensive rehabilitation and reconstruction of the road network. A total of 19 bridges and 15 sections of damaged roads were repaired, and several sections were re-built for resilience including slope retention walls and expansion to increase capacity and facilitate movement of large construction machinery. These included rehabilitating Goodwill Road, one of the main roads in Roseau, reconstructing the E.C. Loblack, and York Valley bridges, and building the retaining wall at Riviere Cyrique. Financing was available with large deposits accumulated under the CBI program.

11. The reconstruction of air and seaports included new structures to ensure resilience and quick return to operations in the event of a disaster. The reconstruction and rehabilitation cost of Douglas Charles Airport after Erika was EC\$48 million, under the “building back better” principle.

12. River dredging, key to mitigating flooding, required large spending which needs to be periodically redone in light of strong and frequent rainfall. Large levels of siltation and debris in the higher parts of the rivers exacerbate the risk of flooding. The mountainous terrain coupled with large number of rivers, creates significant flooding risk. Maria caused unprecedented flooding in several areas with overflowed rivers and high sea swells. Between 2015-2019, the government allocated US\$65 million (12 percent of GDP) to dredge rivers in 11 different locations. The dredging along with other river protection measures such as building river walls and river draining were funded with CBI resources. To minimize this cost and contain possible adverse environmental implications of recurrent dredging, a watershed management, watershed planning, and flood risk management will be conceptualized and integrated into the resilience strategy.

13. Progress has also been made to increase the resilience and sustainability of the energy sector. The country’s power distribution network was severely disrupted after Maria, with an estimated damage of 75 percent of its capacity. Damages also included disruption of a significant portion of hydro-generation, and extensive damage to the electric infrastructure of private homes and businesses. After Maria, the Dominica Electricity Services Ltd. (DOMLEC) made investments to restore generation capacity and the distribution network, with electricity becoming available in over 95 percent of the island a year after the storm. Capacity constraints necessitated more time to ensure safe connections of homes and businesses that had been damaged, but steady progress allowed re-connection of all buildings.

14. Housing rehabilitation and reconstruction has been significant. Public expenditure to support housing construction and repair has increased steadily in recent fiscal years, totaling 15 percent of GDP through 2017-19. The government rehabilitated 7,000 homes in the past 5 years, around a quarter of the housing stock. In addition, the towns of Petite Savanne and Dubique were relocated to non-vulnerable areas.

15. Government polices also addressed resilience of agriculture and fisheries, which are particularly vulnerable and of social importance. In the agriculture sector, projects have been aimed at increasing food production and security, specifically banana, coffee, cocoa plantations, and the modernization of traditional crops (cassava, touloma, bay leaf, herbs and spices). Support to farmers also included restoration of irrigation systems and land and soil management, as well as projects to increase diversification into root crops, more resistant to natural disasters. For the livestock industry, there are ongoing projects for the operationalization of the national abattoir and support of the small ruminant industry.

16. The rehabilitation of access roads for agriculture is also a priority in the short and medium terms. Recently, the government launched the 5-year World Bank Emergency Agriculture Livelihoods and Climate Resilience Project (US\$25 million), to contribute to restoring agricultural livelihoods and enhancing climate resilience of farmers and fishers affected by Hurricane Maria. This project aims to invest in: (i) the adoption of new technologies and use of climate-smart practices for increasing diversification and climate resilience in crop, livestock, and fisheries sectors; (ii) reconstruction and climate proofing of key agriculture infrastructure, including buildings, training

facilities, propagation centers, eco-trails and irrigation systems; and, (iii) restoration of forests and vulnerable watershed areas. The project will also assist in strengthening the policy and institutional frameworks to facilitate the implementation of priority climate change measures and the mainstreaming of climate change activities into national, sectoral and community planning/development for the sectors.

The DRS Plan

17. Road network. The road network plan includes: i) revision of road standards; ii) planning and design of the road network considering mapping and vulnerability assessments; iii) realignment of existing roads to minimize flooding and land slippage; iv) improvement of slope stability, by adjusting side slopes, benching and retaining structures; and v) adequate drainage along and through the roads. These strategies will be complemented by regular road maintenance, proven to be an effective way to reduce the impact of natural disasters.

18. Air transport and connectivity. Resiliency of air communications requires alternative options and the capacity to operate larger airplanes typically used to deploy food and medicine supplies and relief structures for shelter. The existing airport will continue to benefit from investment and dredging of adjacent rivers, which have already proved key during hurricane Maria. In addition, albeit not formally part of the resilience plan, the government is planning to build a new international airport in the north-eastern part of the island as an alternative connection point with capacity to operate larger airplanes. Collateral benefits will include support to growth in the tourism sector with enhanced connectivity at lower cost.

19. Sea port. The government is planning the construction of a new seaport with capability for transport and tourism services. Improvement in sea port capacity is critical to provide additional and more resilient structures for uploading and storage—the capacity of the existing port was completely exceeded with the large inflow of imports for reconstruction, food supplies, and restocking after hurricane Maria, which resulted in logistical problems and delayed recovery.

20. Flood prevention. River dredging and reinforcement of riverbanks and hillsides to mitigate flooding risk will remain a recurrent activity. This activity implies significant cost also outside natural disaster events because of abundant and frequent rainfall.

21. Energy. To make the electrical grid more resilient, DOMLEC is preparing a plan to invest in underground transmission and distribution lines in urban centers, increase the penetration of renewable energy, and establish mini grids for isolated communities. The construction of a new 7MW geothermal electricity plant will replace most diesel generation needs, lowering electricity prices, and reducing carbon emissions significantly—the island will eliminate carbon emission except during peak demand periods, with diesel generation becoming a backup system. The project, part of the country's Low-Carbon strategy, will be implemented by the Dominica Geothermal Development Company Ltd, and is financed by the International Development Association (IDA), the Clean Technology Fund (CTF), and grants from the UK's Department for International Development. It is benefitting from technical assistance of the Government of New Zealand and the Agence Française

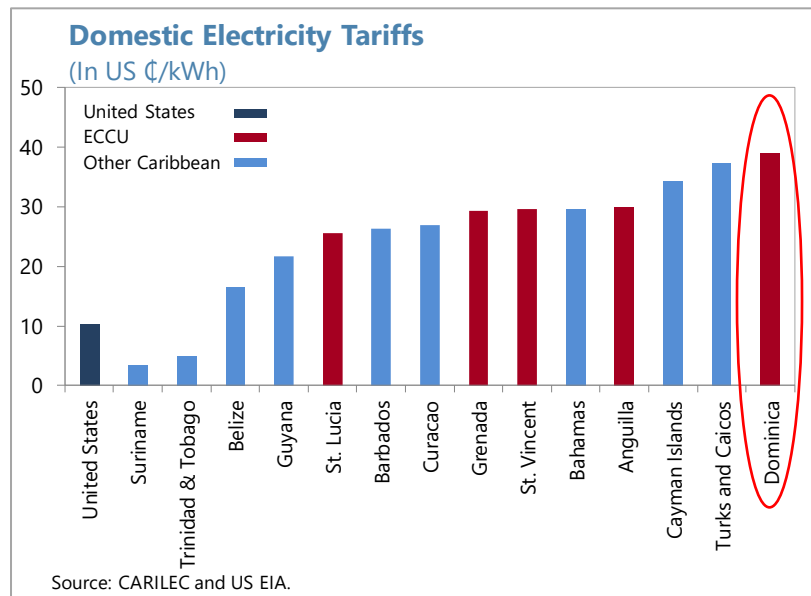
de Développement. In addition, the government launched the Sustainable and Resilient Energy Plan which outlines the future of electricity generation with secure, affordable, resilient and renewable sources (Box 1).

Box 1. Dominica: Making the Energy Sector Disaster Resilient

As part of Dominica’s goal to become the first climate-resilient nation in the world, CCI and the Government of Dominica, DOMLEC, CREAD, and other technical partners developed a Sustainable and Resilient Energy Plan (S-REP). The Cabinet officially endorsed the S-REP outlining four energy priorities: 1) cost-efficient generation; 2) increase target share of renewable sources (hydro and geothermal would cover the bulk of needs); 3) improve the reliability of the electrical grid; and 4) significantly upgrade the resilience of homes and buildings in all towns and communities.

The S-REP targets: i) 90 percent of electricity generated by renewable energy sources by 2029; ii) reduction in the annual cost of diesel fuel by 94% by taking advantage of geothermal resources and projects; and iii) a 44% reduction in the total cost of electricity generation between 2020 – 2038.

These targets, if met, could yield significant dividends in terms of competitiveness and growth if the reduction in electricity cost generation is passed to consumers and businesses, especially considering that Dominica is one of the countries with highest electricity cost in the world.

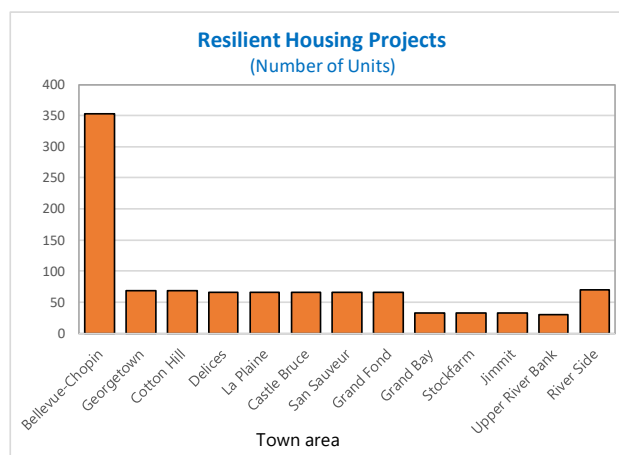


22. Health. A new hospital with significant upgrade of medical services is being constructed. After hurricane Maria the project has been revised for resiliency to natural disasters, including in terms of structure, energy self-reliability, and preparedness to respond in case of a disaster emergency. Financing and construction is being provided in the form of a grant by the government of China.

23. Housing. There are several ongoing housing projects, located in the East Coast (5), the West Coast (2) and Roseau City (2). The projects have been designed for disaster resiliency, using modern structures specifically designed to withstand hurricanes and seismic shocks; reinforced concrete

walls and roofs; resistant glass windows; shelters with water and food supplies; and solar water heating structures.

- A significant share of resilient housing has been constructed or is at an advanced stage, and numerous finished units are already inhabited. Construction of near 1000 new homes has been possible with financing from the CBI program revenues. The government is targeting the construction of 5,000 new homes resilient to natural disasters, including shelter structures.
- The World Bank approved the Housing Recovery Project (\$40 million) designed to contribute to the recovery of housing for households affected by Hurricane Maria; improve the application of resilient building practices; and ensure resiliency of homes constructed under the loan program.
- The development of the housing sector in the medium term integrates planning for natural disasters, as part of the NRDS. The ongoing revision of building codes, with technical support from the OECS, is essential in making the housing sector more resilient, with strong enforcement commitment by the government.
- A new National Shelter Sector Strategy has been prepared.
- The Dominica National Bank, in coordination with the government, will consider financing mechanisms to incentivize middle-income households to retrofit their homes to be hurricane resistant. Government transfers to support rehabilitation and reconstruction of private homes after disasters will include resiliency requirements, including for example on roof construction and reestablishment of public services, particularly electricity. The government is also committed to upgrade insurance sector regulation and supervision to ensure reliable coverage of homes and businesses in case of a natural disaster.



Source: Housing Dominica

24. Zoning and land use. The National Land Use policy launched in 2014 will be revised to incorporate zone plans identifying high-risk areas for housing development. Remaining communities in vulnerable areas will be resettled. The government will finalize preparation of disaster risk maps indicating permitted areas for new construction and related infrastructure needs. Hazard, vulnerability and risk information will be required to incorporate risk into land use decision-making. To this end, clear definition of roles in the process of generation of disaster risk knowledge will be developed, along with training and capacity building and development of standards and guidelines to prepare hazard, vulnerability and risk studies.

- Including hazard and risk information in urban plans, building standards, and protocol for the issuance of permits is crucial. This may require the strengthening of the Physical Planning Division and other institutions as well as a high level of institutional coordination.
- Dominica has developed land use and development plans that are applied voluntarily. The development of the required normative frameworks to enforce the use of the plans, to define roles and responsibilities, and to establish controls is key. Building of technical and operative capacity to transform the plans into practical instruments in the territory is also necessary.

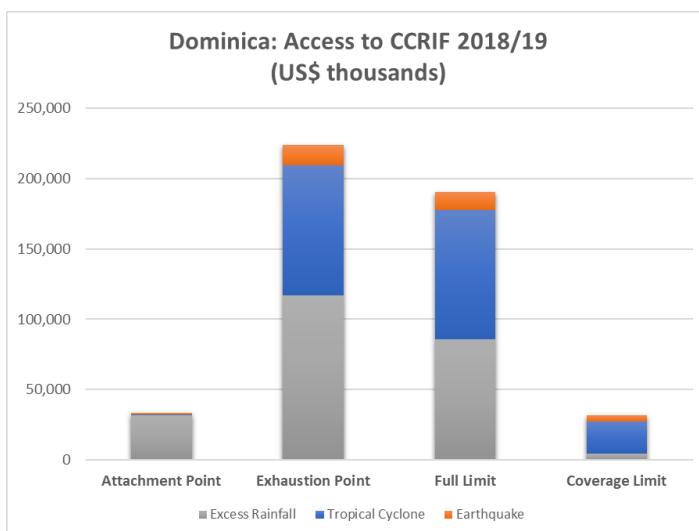
25. Water and sanitation. The Dominica Water and Sewerage Company Ltd., the provider of water and sewage services, is preparing a strategic development plan that will address key factors related to resiliency to disasters of water supply, including analysis of risks and hazard to infrastructure performance, and operational and maintenance practices.

Pillar II: Financial Resilience

Recent Progress and Policies

26. Dominica has been purchasing natural disaster insurance from the Caribbean Catastrophe Risk Insurance Facility (CCRIF), albeit below desirable levels due to high cost. In FY 2018/19 the government of Dominica purchased coverage for Tropical Cyclone (TC), Earthquake (EQ) and Excess Rainfall (ER).

The gross premium was paid to CCRIF by the Canadian government, including an increase in coverage with premium of \$1.5 million, up from \$1 million in the previous year. Coverage for Tropical Cyclone was augmented, implying an increase of the risk ceding percentage from 21 to 25 percent. Earthquake risk premium and coverage more than doubled (text table and chart).



Coverage under CCRIF Insurance

	Tropical Cyclone	Earthquake	Excess Rainfall
Attachment Point (years)	10	50	5
Exhaustion Point (years)	100	175	25
Ceding Percentage	25%	33%	5%
Gross Premium (US\$)	\$885,263	\$100,000	\$531,690

27. CCRIF payouts have been critical to finance post-disaster need and rehabilitation cost, especially considering its fast disbursement, just two weeks after a disaster. Over US\$23 million in payouts have been received thus far, the majority following hurricane Maria (text table). However significant, the payouts have been vastly below the post-disaster need, and not always aligned with the extent of damage considering its parametric nature.

CCRIF Payouts to Dominica

Event	Payout (US\$)
Earthquake, 29 November 2007	528,021
Tropical Storm Erika, 27 August 2015	2,402,153
Tropical Cyclone Maria, September 2017	20,303,822
Total	23,233,996

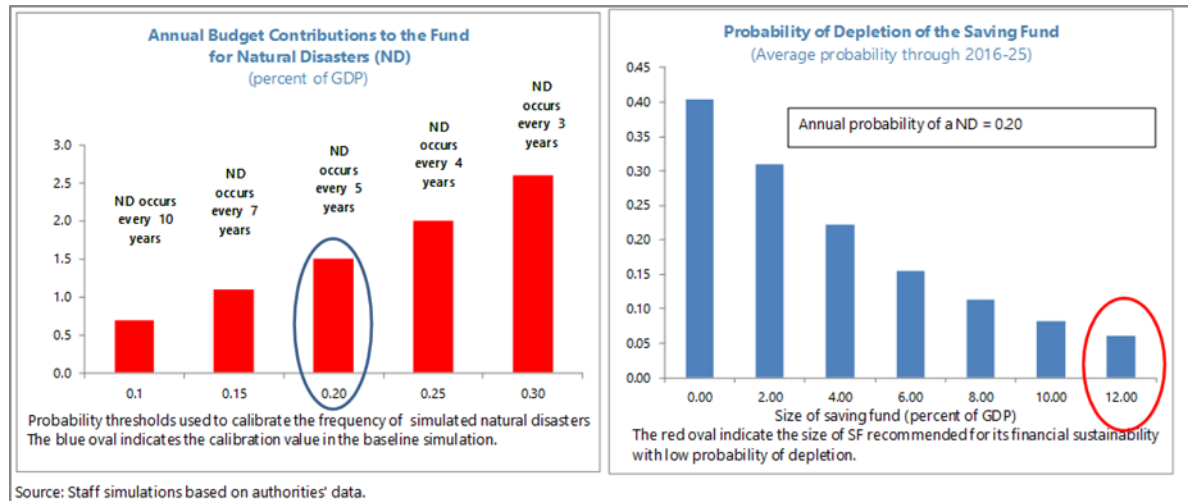
DRS Plan

28. Dominica plans to implement a comprehensive insurance strategy with a risk layering framework. Insurance layers' coverage will be decided to efficiently address risk and damage for an incremental range of disaster intensities, targeting coverage of 99 percent of estimated fiscal costs related to natural disasters⁴:

(i) Layer 1. Small and medium disasters. The first layer will be used to cover losses from small and medium but more frequent natural disasters. This layer will include a savings fund for self-insurance, financed by CBI revenues for start-up cost, plus annual budget contributions to make it sustainable. Given large financing needs for reconstruction after Hurricane Maria, the start-up cost of Layer 1 would also consider contingent credit lines from development partners. Simulation analysis accounting for disasters' frequency, intensity and the dynamic responses of output and government revenue and expenditure indicates that a saving fund of 12 percent of GDP plus annual savings of 1.5 percent of GDP in years with no natural disaster would be sufficient to cover the expected fiscal cost of rehabilitation and reconstruction (text charts).⁵

⁴ Calculated based on a Monte Carlo experiment simulating the impact of natural disaster shocks on output and fiscal accounts. It includes related explicit cost, implicit contingent liabilities, and budget reallocation to create fiscal space for priority rehabilitation and reconstruction expense.

⁵ Based on a Monte Carlo experiment that simulates the impact of natural disaster shocks on government revenue and expenditure. The simulation accounts for re-prioritization of investment towards rehabilitation and reconstruction activities after a natural disaster. See 2018 ECCU regional consultation report.



(ii) Layer 2. Large disasters. This will be covered with high access under (CCRIF). This implies a change relative to recent CCRIF access choices, which were more attuned to trigger with small and medium disasters—setting aside significant saving for self-insurance was not possible after two consecutive disasters. With high-frequency low-intensity disasters covered in Layer 1, CCRIF parametric options will be re-calibrated to trigger under large disasters, while also considering CCRIF innovations such as Aggregated Deductible Covers to enhance efficiency. This would increase insurance cost efficiency, considering CCRIF's high cost⁶, and the probability of disbursement—the correlation of damages and triggers is imperfect for small and medium disasters, a limitation of parametric insurance⁷. CCRIF insurance would therefore top up revenue for large disasters when instruments under Layer 1 are likely to be insufficient. The plan is also to increase coverage from 25 percent to maximum risk ceding. Dominica will continue to pledge for financial support for CCRIF premium—the government of Canada has provided grant financing for CCRIF premia in FY2019/20. High coverage after FY2020/21 would increase net fiscal cost of insurance (premium cost minus expected payouts) by 0.5 percent of GDP per year, thereby worsening debt sustainability in expected terms. This is justified, however, because it reduces uncertainty about debt outcomes, with larger payouts reducing the need for debt issuance after large disasters (Text Table).⁸

⁶ CCRIF insurance multiplier, the ratio of annual premia / expected payout, is around 2, depending on parametric options.

⁷ CCRIF covers emergency losses, plus a ceding percentage. In the case of Dominica, coverage is only 3.75 percent of total loss (15 percent earthquake and tropical cyclone times 25 percent excess rainfall). For large disasters it is important to target financing of all recovery phases (emergency, recovery and reconstruction). Notice that, for the reconstruction phase, insurance payout does not need to be immediate.

⁸ This is also justified on theoretical grounds. Insurance theory indicates that purchase of non-negative amounts of insurance is optimal, even if less than actuarially fair, provided social preferences address "prudence" considerations—that is, risk aversion is increasing in the amount of the loss.

Active Scenario with Alternative CCRIF Insurance Coverage

(In percent of GDP)

	Hurricane impact in Primary Balance	Insurance Payout (US\$ m)	Public Debt in 2030 ^{1/}	Unidentified measures needed for debt target
High CCRIF insurance ^{2/}				
No major hurricane	0.0	0.0	60.0	3.6
With major hurricane in 2020 ^{3/}	-12.9	127.0	67.5	4.5
Low CCRIF insurance ^{4/}				
No major hurricane	0.0	0.0	55.8	3.1
With major hurricane in 2020 ^{3/}	-12.9	20.3	72.7	5.6

Source: IMF staff calculations based on government and CCRIF data.

1/ Assumes implementation of unidentified fiscal policies/financing of 3.6 percent of GDP.

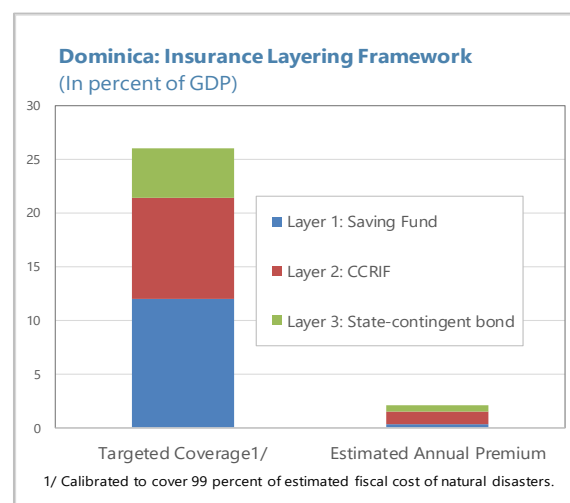
2/ Assumes 1 percent of GDP per year of CCRIF insurance premium that is not included in the baseline scenario, with expected annual payouts of 0.5 percent of GDP.

3/ Impact on fiscal balance and GDP similar to the impact of 2017 Hurricane Maria. The initial shock includes output decline of 15 percent in FY2020/21. Afterwards it is assumed a gradual recovery until FY2023/24.

4/ CCRIF annual premium and annualized cost of natural disaster as in baseline scenario.

(iii) Layer 3. Extreme disasters. A third insurance layer with issuance of Catastrophe (CAT) bonds for extreme events could also be considered, albeit at a cost exceeding expected payouts. This option would require regional issuance pooling considering the high administration cost to enable market demand; it is therefore considered a strategy to be developed in the medium term.

29. This risk layering framework would target total coverage of up to 26 percent of GDP, with estimated annual fiscal cost of 2.1 percent of GDP.⁹ It could trigger disbursements of up to about US\$150 million in an extreme event—smaller payouts for relatively milder disasters for which upper layers are not triggered. The coverage amount has been calibrated to cover 99 percent of estimated fiscal cost of natural disasters, at a gross annual premium of US\$12 million annually. This strategy implies 7-8 times the CCRIF coverage compared with when Dominica was hit by hurricane Maria. However, it is below the amount of government deposits from CBI revenue that has so far been used to finance rehabilitation and reconstruction. The simulations indicate that a relatively small amount of CAT bond issuance would be needed to reach 99 percent coverage of natural



⁹ This cost is calculated as the gross annual premium for the insurance instruments, and the opportunity cost in terms of interest on public debt for the saving fund. Notice that net insurance costs would be lower in light of insurance disbursements after natural disasters.

disasters' fiscal cost. However, issuance of this instrument would not be considered in the near-term considering the high cost and the need to prioritize reconstruction and resilient investment.

30. The government has taken steps to legislate the establishment of the self insurance fund. An amendment to the Public Financial Management Act has been prepared with technical assistance from the International Monetary Fund, which provided the institutional framework to formalize the creation of a Vulnerability and Resiliency Fund (VRF). Savings of over 1 percent of GDP have been set aside in the 2019/20 fiscal year despite the large fiscal need for reconstruction, and in 2020/21 additional 0.4 percent of GDP has been saved despite the financial challenged posed by the Covid-19 pandemic. To operationalize the VRF, an option under consideration is to establish an automatic allocation of CBI revenue, maintain savings of at least 12 percent of GDP, enforce a minimum saving contribution every budget cycle, and allow any excess above 12 percent of GDP to be used to finance resilient investment and to meet public debt service commitments. In this way, the VRF will strengthen fiscal sustainability, critical in light of the recurrence of natural disasters. VRF disbursements after natural disasters will be triggered by a government declaration of national emergency.

31. The government is advancing additional institutional fiscal reform to strengthen the government's financial resiliency. This reform is part of a World Bank budget support operation expected in early 2021. The reform will contribute to the creation of fiscal space to finance the cost of resiliency, while strengthening debt sustainability, with reforms in several key institutional fiscal areas:

- Address PFM weaknesses in basic budget processes, including budget preparation and execution, as well as developing and clarifying emergency-related PFM procedures.¹⁰
- Adoption of a Fiscal Rules and Responsibility Framework that will establish fiscal targets, and to reduce the gap between the budget, budget projections and actual execution.
- Strengthening of the annual Medium-Term Economic and Fiscal Framework (MTEFF) and budget preparation process through a revision of the Financial Administration Act.
- Improve domestic revenue mobilization, including with better auditing and collection of tax arrears.
- Strengthen transparency in debt reporting including the annual publication and presentation of a Debt Portfolio Review.
- Operationalization of the VRF.
- Address constraints and delays in public procurement through a new Public Procurement Bill—Dominica spends significant fiscal resources on goods, civil works and services, particularly in post- natural disaster periods. A greener and more effective and efficient procurement system

¹⁰ The reform needed have been identified in the Dominica Post-Disaster Public Financial Management Review (World Bank, 2019).

will enable a more climate resilient approach, greater competition, improved transparency, better value for money, and generate efficiencies and fiscal savings over the medium term.

32. Private sector insurance will be strengthened, including a government program to cover low-income households. A significant share of the population remains uninsured or underinsured, especially the most vulnerable segment for which insurance is not affordable. Households with mortgages are insured as per legal mandate, and most large businesses insure buildings and other productive assets. However, the severity of hurricane Maria, with simultaneous and extensive damage across the entire country, revealed weaknesses that resulted in payment delays and liquidity shortages in the domestic insurance sector.

- *The government is considering alternative ways to insure low income households.* The doubling of insurance cost after hurricane Maria, makes market insurance unaffordable for vast segments of the population. This is important for the internalization in fiscal accounts of expected government financial support to poor households after natural disasters, creating fiscal space and ensuring resources are available to support private recovery and reconstruction. Two policies are being considered: government purchase of parametric insurance for the most vulnerable sectors with instruments such as the Caribbean Oceans and Aquaculture Sustainability Facility (COAST) policy for the fisheries sector. This insurance offers coverage for losses caused by adverse weather on fisheries and direct damages caused by tropical cyclones to fish vessels, fishing equipment and fishing infrastructure. Similar instruments are being considered for the agriculture sector. To maximize the fiscal space to support low income households and incentivize insurance coverage of the non-poor, the government is committed to introduce proxy means-tested post disaster support, minimizing moral hazard. The Government will develop a fisheries' community insurance model to build resilience and reduce the potential risks, with World Bank financing support under the Emergency Agriculture Livelihoods and Climate Resilience Project will support this initiative.
- *Strengthening the Insurance sector.* The Eastern Caribbean Currency Union is advancing a plan to harmonize and consolidate regulation and supervision at a regional level, with full support of the Dominica government. The regional harmonization will enable efficiency gains and effectiveness by pooling financial resources and technical capacity, while also strengthening the independence of supervisors. This will enhance competition and can reduce the cost of insurance premia, which nearly doubled after hurricane Maria, by favoring participation of strong market players who are appropriately capitalized, diversified, and re-insured.

Pillar III: Post Disaster and Social Resilience

Recent Progress and Policies

33. The enormity of the challenges after hurricane Maria made clear the need to significantly upgrade post-disaster preparedness of the government and communities. Food distribution was challenging with loss of agricultural output and productive capacity, destruction of secondary and feeder roads critical to accessing towns and communities (some of which become isolated). Food and water donations and distribution by friendly nations were critical for survival after hurricane Maria. The government followed advice of international development partners and prioritized resumption of schooling just a month after the hurricane Maria, important to restore some degree of normalcy to children's lives. As several school buildings had to be repurposed as shelters for families whose homes became inhabitable, the government had to set up provisional school facilities, which in some cases were below the authorities' desirable standards. Distribution of roofing and construction materials accelerated rehabilitation of homes, supported by a 6-month suspension of VAT on construction inputs. Insufficient information about population numbers, socioeconomic conditions, and location limited the government response effectiveness—population needs were largely addressed upon direct requests to cabinet and the Ministry of Finance, resulting in inefficiencies from inability to identify priority support and minimize possible duplication of benefits.

34. The agriculture sector benefitted from significant technical and financial support with government programs for crop resiliency and food security. This included the promotion of root crops more resilient to heavy rain and wind, farmer training programs, and government assistance with provision of seeds and fertilizers. The government is working on a plan to strengthen food security, including specific policies for the resiliency of agriculture and fisheries. The reforms are included in a loan by the World Bank approved in June 2020—an operation that followed the Rapid Credit Facility disbursement by the International Monetary Fund in April 2020 to cover projected fiscal and external financing gaps caused by the Covid-19 pandemic.

35. Extreme social conditions after Hurricane Maria triggered some episodes of looting and social unrest, highlighting the need to strengthen civil security. The government rapidly declared a curfew and deployed all security forces to ensure peace and order. Protection of property, however, remained insufficient and slowed recovery as key businesses critical for the recovery, such as food distribution and access to savings, could not be fully protected, and some of the related losses would typically not be insured against crime.

36. Dominica has received support through the Global Facility for Disaster Reduction and Recovery (GFDRR) in risk reduction and post-disaster recovery and reconstruction assistance. The activities supported include data collection for a better understanding of landslide and flood hazards; disaster shelter; transport and road infrastructure management for resilience; post-disaster prioritization of rehabilitation activities; and development of vulnerability maps and mitigation plans (Box 2).

Box 2. Dominica: Activities supported by the Global Facility for Disaster Reduction and Recovery (GFDRR)

- Improvement in the government's ability to collect, store, and share geospatial data through the development of a risk data management platform, DomiNode. Due to these efforts, there is a greater understanding among ministries and better availability of information about landslide and flood hazards. The DomiNode platform was strengthened in 2014 with additional datasets that help increase climate change adaptation measures in development planning.
- Revision of the approach to assess shelters in Dominica that better account for vulnerability. In addition, GFDRR facilitated knowledge exchange related to shelter building standards, helping improve the government's capacity to identify and retrofit vulnerable shelters, and design and construct resilient new structures.
- Facilitate development of a risk-based transport Infrastructure Asset Management System in Dominica since 2016. These efforts will enable the government to systematically track infrastructure conditions, perform comprehensive and detailed vulnerability disaster assessments of the road network, and prepare a disaster mitigation action plan.
- Dominica has participated in the regional Caribbean Risk Information Program. This led to the creation of flood and landslide hazard maps for the country, as well as the development of a handbook that supports hazard and risk analyses for physical and infrastructure planning.
- Training on prioritizing reconstruction investment decisions to support reconstructing critical infrastructure damaged by disaster. With support from the African Caribbean & Pacific (ACP)-European Union (EU) Natural Disaster Risk Reduction program, GFDRR has also facilitated engagements following major disaster events. This includes supporting the government to conduct a rapid damage and impact assessment following 2015's Tropical Storm Erika, which led to support from several regional and international organizations for reconstruction of damaged infrastructure. Similarly, a rapid damage and loss assessment in response to Hurricane Maria, jointly conducted with the Caribbean Development Bank, the Eastern Caribbean Central Bank, the European Union, the United Nations, and the World Bank, is informing a planned financial package of over \$100 million for Dominica to provide immediate support to farmers, rebuild resilient public infrastructure, strengthen resilience, and help create financial buffers.
- Identify vulnerable locations estimating upstream risks, including debris flow and landslide risks, using aerial imagery and soil sample data. These efforts aim to identify locations for construction of potential mitigation measures which will support Dominica to address the risks that have caused major infrastructure failures in the past and to develop an adequate mitigation plan.

DRS Plan

37. The government CRRP has a strong focus on food security. The CRRP identifies food supply as a critical high-impact climate resilience activity, specifying the accumulation of 15 days of food self-sufficiency in each community before the beginning of hurricane season every year. To this end, emergency shelters being built as part of the housing program will be equipped with water and food storage facilities. The plan also targets a reduction in the food import dependency ratio to below 40 percent by 2030 (currently above 60 percent). This includes plans to transform agriculture and fisheries for resiliency to natural disasters, including crops more resilient to high and persistent wind and rain (i.e. root crops), and infrastructure for the protection of fishing equipment. The Responsible Land Stewardship Initiative will seek to improve access to land for agricultural use. In addition, the Global Centre for Agricultural Resilience will seek to develop appropriate policy and legislation to improve capacity for data and information management and risk profiles for main

hazards affecting agriculture, increase expertise in agro-meteorology, support adoption of more resilient crops and livestock, develop both Agriculture and Fisheries Disaster Risk Management Plans, explore options for hurricane insurance for fishing/farming communities in collaboration with appropriate support agencies and financial institutions, and develop protocols for the safe shelter of fishing boats during a storm and educate fishers on safe practices before and during a storm.

38. The Effective Disaster Response and Recovery in the Climate Resilient National Plan will minimize disaster impact and accelerate the recovery. Effective procedures to assess damage loss and to identify the supports and resources to be mobilized are critical. To this end, the government will establish a Disaster Management and Preparedness Fund to empower and facilitate the disaster committees at the community level. More coordination and cooperation are crucial at the community, district and national levels. Building on lessons learned from Erika and Maria, this plan develops a best-practice model for post-disaster response and recovery, including:

- Efficient systems for search and rescue, relief coordination, restoration of roads and ports, clean up and sanitation and the preservation of law and order.
- Development of networks to guarantee food, water supply, and medical services.
- Cooperation among telecommunication service providers for the dissemination of vital and life-saving information.
- Business continuity measures for the public sector to ensure essential operations resume quickly.
- Business continuity plans for key private subsectors to ensure rapid availability of food supplies, particularly food wholesale and retail, agriculture, and fisheries.

39. Building strong communities that are well prepared to withstand shocks is a key component of the CRRP. The objective is to reduce overall vulnerability of all Dominicans by building mental and physical preparedness, enhancing social cohesion, ensuring continuity of access to education and health services, as well as welfare. Some specific goals include:

- Increase the participation of marginalized individuals and groups.
- Strengthen the capacity of the local authorities to manage resources before, during and after and event.
- Develop a transparent, data driven method for social welfare distribution.
- Minimize mortality and morbidity as the result of a natural disaster through access to a well-equipped, safe shelter.
- Increase the effectiveness of community health and education systems to build preparedness and respond to disasters.
- The estimated cost of the strong communities' initiatives, to be delivered within the next 10 years is \$87 million (Text table).

Each One Reach One (EORO)-Youth Resilience Initiative	EC\$11 M	2025
Responsible Land Stewardship Initiative	EC\$ 250.000	2021
Kalinago Territory Development Strategy	EC\$45 M	2030
Community Emergency Readiness Initiative	EC\$11 M	2020
Modern Village Council Initiative	EC\$100.000	2022
Enhanced Social Safety Net Initiative	EC\$20 M	2022

40. The government is preparing a National Action Plan for Disaster Risk Reduction under the NDRS. Disaster preparedness will include the participation of all concerned parties in government, development partners, private sector and civil society organizations. It will be spearheaded by the Office of Disaster Management (ODM). The plan, targeting completion by 2022, includes five components:

- Strengthening of disaster management institutions at the national, sub-national, and local community levels.
- Enhancement of disaster risk assessment and monitoring and improving early warning systems.
- Developing knowledge and innovation on vulnerabilities and building a culture of safety and disaster resilience.
- Reduce the risk factors and strengthen recovery plans in vulnerable sectors and populations.
- Strengthen preparedness for effective emergency response at the national and local community levels.

41. The DRS plan includes improvement of population data collection and coverage for comprehensive assessment of disaster social impact and design of safety net programs. The roll-out of several cash transfer programs after Hurricane Maria pointed to critical gaps in services, capacities and resources, due to a lack of an effective information system. These gaps created data errors at the beneficiary, programmatic and systemic levels. To modernize social service delivery, the government is planning to: (i) establish a social and beneficiary registry and a management information system for social programs; (ii) design an electronic post-disaster household assessment system with tablet support; (iii) modernize payment delivery for social safety net programs to promote financial inclusion; and (iv) introduce a multi-purpose unique identification system to facilitate better data management, post-disaster household identification, and further the financial and economic inclusion of the poor and vulnerable. The Disaster Vulnerability Reduction Project, a government program financed partially by the World Bank, includes a component to improve hazard data collection and monitoring systems.

D. DRS Cost

42. The estimated total cost of transforming Dominica into a disaster-resilient state is US\$2.8 billion, five times the size of its GDP. Despite the fast pace of reconstruction to date, costs ahead are larger than those incurred thus far. The costs of the three DRS pillars is as follows:

- Pillar 1. Structural Resilience.* The government CRRP preliminary estimate indicates total investment need in resilient infrastructure in the range of US\$2.1-2.6 billion, spread over a 20-year period (averaging 13 percent of GDP per year); the DRS projections are based on the upper bound of this range (text table). This would require investment rates above historical levels of 15 percent of GDP per year until 2041, of which resilient physical structures would reach at least 10 percent of GDP. The initial phase of resilient infrastructure investment was included in the Public Sector Investment Plan (PSIP) of the 2019/20 and 2020/21 budgets.
- Pillar 2. Financial resilience.* Building additional financial resilience would cost around US\$ 65 million, spread over a 20-year period (averaging around 1 percent of GDP per year). Costs of a layered insurance framework include: (i) opportunity cost of government saving fund for self-insurance of US\$2.5 million per year (0.4 percent of GDP), part of which could be covered with access to World Bank CATDDO (insurance layer 1); and (ii) high-CCRIF access for medium and large disasters, at an estimated annual net cost of US\$4 million per year (0.7 percent of GDP, net of expected disbursements). This cost estimate includes an increase of risk ceding for Tropical Cyclones to maximum available and will require a calibration of CCRIF's attachment point to medium and large disasters –current policy triggers for relatively small and frequent disasters. Importantly, the cost of Layer 3 with market instruments such as CAT bonds is not included in the DRS framework due to its high cost. The net present value of this insurance cost for the next 20 years, net of estimated expected payouts, is US\$65 million, or 12 percent of GDP.
- Pillar 3. Post-Disaster Relief and Social Resilience.* Building additional post-disaster and social resilience would cost around US\$270 million, spread over a 20-year period. This includes policies with total cost of US\$15-20 million annually (2 percent of GDP on average per year) for the development of resilient agriculture and food security, integration of CREAD functions into the Ministry of Finance regular operations, promotion of renewable energy use, and development of sustainable ecosystems. This cost would gradually decline in the long term as initial programs have been established to about 1 percent of GDP.

		DRS Cost	
		US\$ bn	Percent of GDP
Pillar 1	Physical Resilience	2.5	450
Pillar 2	Financial Resilience	0.1	12
Pillar 3	Social and Post-disaster Resilience	0.3	49
DRS Total Cost		2.8	510

E. A Comprehensive Macro-Fiscal Plan Incorporating DRS Cost

43. This section develops a macroeconomic framework incorporating the DRS policies and investments' cost and return. It includes the estimated cost of the three DRS pillars stated in Section III, and the anticipated economic response of higher public investment with resilience, including the feedback effects on output and tax revenue from private investment and employment. Simulation analysis indicates that the economic returns of investment in resiliency outweigh the cost, not only as a result of reduced cost or rehabilitation and reconstruction after natural disasters, but also because it reduces private sector expected losses, in turn increasing investment and employment (Box 3). Given the high DRS cost, particularly of Pillar 1, the macroeconomic framework assumes DRS execution is spread until 2041, an ambitious target considering possible execution capacity and financing constraints (text table).

DRS Pillars Projected Execution (Percent of GDP and US\$ million)								
	2021	2022	2023	2024	2025	2026/41	Total	Total (NPV) ^{1/}
Pillar 1	13	13	13	13	13	10		
Pillar 2	1.1	1.1	1.1	1.1	1.1	1.1		
Pillar 3	2	2	2	2	2	1		
Total	16.1	16.1	16.1	16.1	16.1	12.1		
Pillar 1 Cumulative (US\$mn)	75	158	248	346	449	2018	2467	2467
Pillar 2 Cumulative (US\$mn)	6	13	21	29	38	220	258	65
Pillar 3 Cumulative (US\$mn)	12	24	38	53	69	200	269	269

1/ Net Present Value of the insurance cost, net of estimated expected payouts. Cost declines over times as the country builds resiliency.

44. The total cost of Pillar 1 requires sustaining public investment rates of 17 percent of GDP until 2041. This includes 13 percent of GDP until 2025 in resilience-specific projects (Pillar 1) and 2-1 percent of GDP for ex-post social resilience (Pillar 3)—the remaining is investment not related to resiliency. In the DRS macroeconomic framework, investment rates are above 17 percent of GDP in the near term to account for the remaining reconstruction after hurricane Maria.

Box 3. Does It Pay to Invest in Resiliency?

Simulation analysis using a Dynamic Stochastic General Equilibrium Model calibrated to the Dominica economy indicate that the real and fiscal returns of resilient investment outweigh the cost. Economic performance improves with positive responses to resilient investment of private investment and employment, ultimately strengthening fiscal performance. The results incorporate increased expected damages from disaster intensification under global warming.

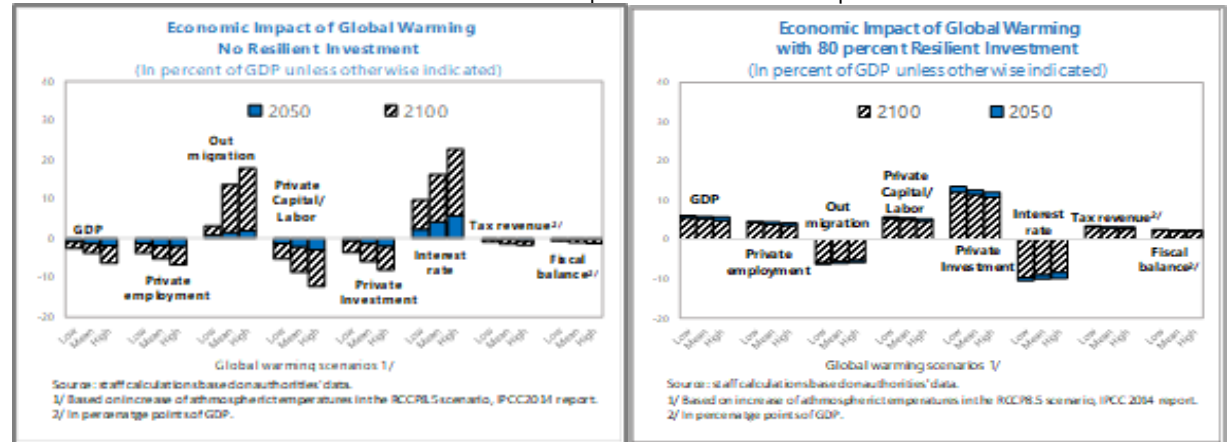
Climate change is expected to increase NDs' expected Average Annual Loss (AAL) by 8-18 percent by 2050 and by 25-49 percent by 2100 under RCP8.5 global warming scenarios –increase in atmospheric temperatures of 1.2-2.2 degrees Celsius by year 2050 and 3.0-5.6 degrees Celsius by 2100. This is based on CCRIF—estimated AAL to calibrate the amount of capital destruction with NDs, augmented by the percent increase in estimated annual damage, based on estimates in Acevedo (2016).

Economic cost of climate change is significant. Model simulations assuming higher Average Annual Losses (AAL) to account for increased intensity of natural disasters (NDs) with climate change indicate an output decline in the range of 1-2 percent by 2050 and 3-6 percent by 2100. Absent resilient investment, higher expected losses with climate change reduce private investment and thus capital per worker, putting downward pressure on wages, and inducing labor out-migration and a decline in employment. The decline in output reduces tax revenues by about 0.5 percentage points of GDP by 2050 and 1 percentage point by 2100, with a commensurate worsening of the fiscal balance.

Dominica: Increase in Natural Disaster Damage with Global Warming			
RCP8.5 Scenario	Increase in atmospheric temperature (Degrees Celsius)	Average Annual Loss in Simulations (Percent increase)	Average Annual Loss in Simulations (Percent of GDP)
Low			
2050	1.2	7.9	2.2
2100	3.0	25.0	2.5
Mean			
2050	1.7	14.1	2.3
2100	4.3	36.9	2.7
High			
2050	2.2	17.9	2.4
2100	5.3	48.8	3.0

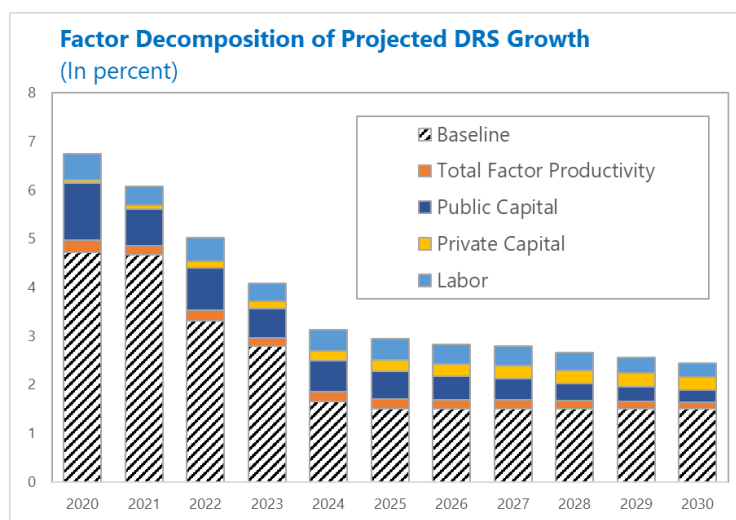
Source: author calculations based on IPCC (2014) report and estimates in Acevedo (2016).

Investment in resilient infrastructure outweighs the cost in the long term. Model simulations assuming climate change increased loss and a shift to resilient investment of 80 percent of total investment show a net positive effect (text chart). Lower expected NDs damages when infrastructure is resilient support private investment, employment and output in the long term, offsetting the negative effect of the increase in expected losses with global warming. The increase in tax revenues underpinned by higher output, labor, and consumption more than offsets the higher fiscal cost in the long-term, with the overall fiscal balance improving by over 3 percentage points of GDP. These benefits, however, accrue in the long-term, as resiliency is gradually built; the high cost of resilient investment worsens the fiscal balance and results in an increase in public debt in an initial phase.



45. The high projected investment rates and the estimated output return to resilience imply long-term output growth of around 3-2.5 percent. With resilient investment financing expected to

come from external sources, high public investment in the DRS will boost aggregate demand in the near term and increase productive capacity in the long term, with multiplicative effect on private investment and employment. Using a production function estimate including public capital, private capital, employment, and total factor productivity, and assuming the public investment rates in the CRRP plus the anticipated response of other factors of production, output growth would increase by about 3 percentage points of GDP in an initial phase, and then

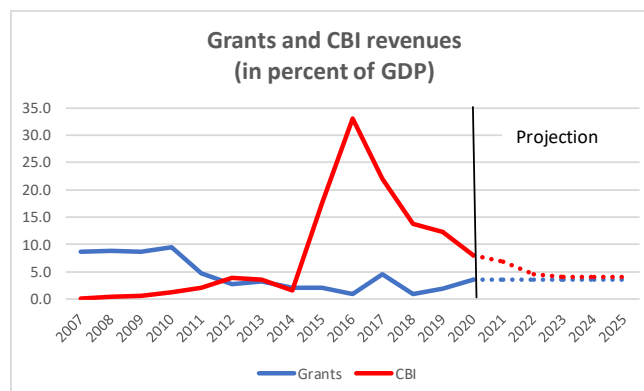


gradually decline to an increase of 2 percent in the long term, relative to a baseline with public investment in line with historical trends (text chart). In the near-term, growth rates are below potential owing to the impact of the Covid-19 pandemic, and a somewhat negative impact of fiscal consolidation in the DRS plan. In the long-term, projected growth gradually declines to near 2 percent, but remains above historical potential output growth estimates of 1.5 percent based on investment, employment and productivity trends in the absence of the DRS. On the external front, enhanced resilience investment would boost total imports, thus widening the current account deficit during the period of investment.

46. The projection incorporates committed external financing for post-Maria reconstruction. Financing envelopes allotted to Dominica of about US\$200 million from the World Bank and the Caribbean Development Bank (CDB) to fund Post-Maria reconstruction and structural reform, including fiscal institutions, remain largely untapped. Adding other sources, commitments for reconstruction and development of resilience add up to near 40 percent of GDP. The World Bank is supporting resilient housing and geothermal energy generation and has provided financing to support health spending during the Covid-19 pandemic that also includes components of infrastructure resiliency and food security with policies that address vulnerabilities to natural disasters in the agriculture and fisheries sectors. The CDB is preparing a Policy-Based Loan anchored on structural fiscal reform and resilience to natural disasters; roads and bridges rehabilitation remains largely funded by the People's Republic of China government and the World Bank. Financing the front-loaded path of capital expenditure of the DRS requires accelerating the disbursement of committed loans and grants.

47. The DRS fiscal plan includes conservative CBI revenue projections implying upside risk, and the establishment of the VRF for insurance, resilient investment, and debt reduction. CBI program revenue has shown significant historical variability and are difficult to predict. The DRS macro-framework assumes that CBI-program revenue gradually declines, converging to 3 percent of

GDP in the long term. If CBI resources remain high, a share will be allocated to a Saving Fund for NDs to start up layer 1 of the insurance framework. Additional revenue could also be used to support the annual saving contributions for self-insurance, and to invest in resilient infrastructure after a disaster. To ensure an allocation of unpredictable CBI program revenue to resilience to natural disasters, the government will establish a VRF with strong governance framework and transparency standards. In addition to contributing to physical and financial resiliency, the VRF will support fiscal sustainability by ensuring CBI revenue is not used in recurrent government spending, while reducing debt issuance after disasters and reducing infrastructure rehabilitation and reconstruction cost. The government will also consider using VRF excess resources above the insurance need for debt service, further supporting fiscal sustainability. Grants are similarly projected moderately at 3.5 percent, in line with the average during the 2010s, but at a much lower level than in the previous decade. As seen below, an upscale in external grant financing would be key to secure financing of the DRS in a manner consistent with macroeconomic sustainability.

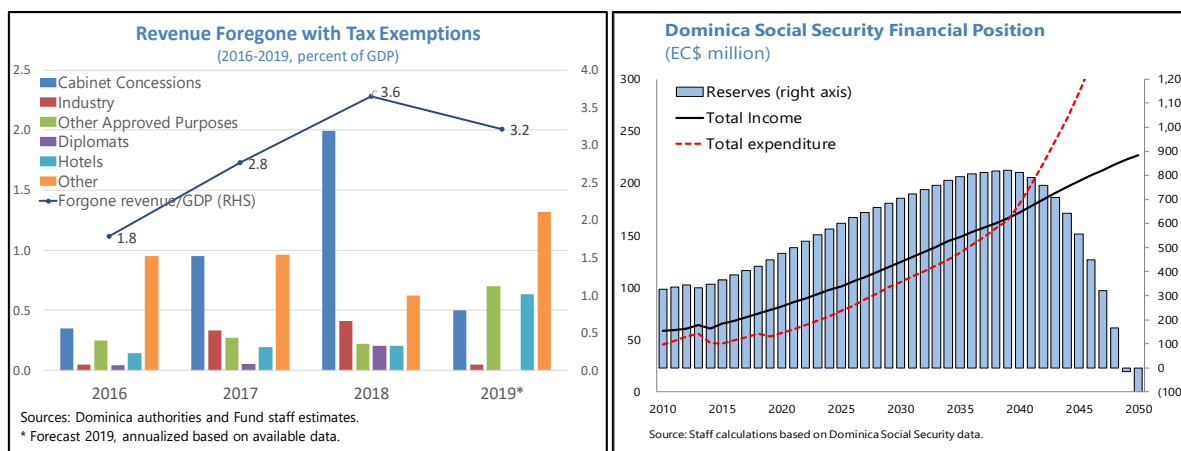


Source: Fund staff calculations, authorities data. Grants exclude additional DRS financing.

48. To address fiscal sustainability, the government will implement a fiscal consolidation plan targeting savings of near 6 percent of GDP. The consolidation will be phased over the next 6 years to smooth the impact on domestic demand, especially considering the economy is still recovering from Hurricane Maria. The measures under consideration include structural reforms to increase revenue collection efficiency and expenditure cost-effectiveness:

- *On the revenue side*, the main measure is restructuring of tax incentives to maximize returns while minimizing revenue loss through an annual cap on discretionary concessions, with prioritized allocation to support investment, job creation, and social needs (text chart). In addition, increases in tax auditing resources will boost revenue, as observed by recent experience. Acceleration of pension reform with: (i) increase in contributions and retirement age; and (ii) increase in contribution years to qualify for pension would improve sustainability, affected by labor emigration and population aging (text chart).
- *Other structural revenue* measures to increase allocative efficiency include: (i) property tax reform; (ii) a solid waste charge; (iii) review of preferential rate of diesel consistent with carbon emissions reduction; (iv) targeted cost recovery fees on health care services¹¹; (v) personal income tax reform to broaden the tax base, including implementation of presumptive taxation; and (iv) remove exemptions on water and sewage tariffs (text table).

¹¹ This reform, developed with support from the Pan-American Health Organization, was interrupted after the hurricane.



- On the expenditure side*, the government will maintain public wage restraint by ensuring that the wage bill growth is below inflation in the long term and with civil service reform including public employment reclassification and rationalization of allowances. The hurricane allowed identification of nonpriority projects in the public sector investment plan of about 5 percent of GDP, which have been discontinued after hurricane Maria and are not related to rehabilitation and reconstruction of critical infrastructure. These projects will be scrutinized to identify additional efficiency saving. Further review of the pension calculation formula commensurate with contribution effort and increased life expectancy will contribute to the sustainability of the pension system, complementing the ongoing reform to increase pension contributions and retirement age. Rationalization of capital transfer programs would also increase efficiency. Social transfers will be better targeted with proxy means testing and better household and social information systems planned under Pillar 3 of the DRS, which will increase efficiency in allocation according to need and facilitate identification of beneficiaries to minimize possible duplication

Fiscal Measures in the Disaster Resilience Strategy ^{1/ 2/}					
	FY 2020/21	FY 2021/22	FY 2022/23	FY 2023/24	FY 2024/25
Cumulative Fiscal consolidation	0.2	3.6	4.5	4.9	5.7
Revenue measures	0.0	2.3	2.9	3.2	3.6
Restructuring of tax incentives for allocational efficiency	0.0	1.0	1.3	1.6	1.9
Better tax auditing and collection of arrears	0.0	0.4	0.6	0.6	0.6
Property tax reform	0.0	0.0	0.0	0.0	0.1
Solid waste charge for environmental preservation	0.0	0.1	0.1	0.1	0.1
Environmental reduction of preferential rate of diesel fuel	0.0	0.1	0.1	0.1	0.1
Health care and expenditure financing reform	0.0	0.1	0.1	0.1	0.1
Personal and corporate income tax reform and presumptive tax	0.0	0.3	0.4	0.4	0.4
Review cost and income structure of water and sewage service	0.0	0.3	0.3	0.3	0.3
Expenditure measures	0.2	1.4	1.6	1.7	2.1
Review of wage allowances and civil service reform 2/	0.0	0.5	0.5	0.5	0.8
Review of pension benefits 3/	0.0	0.5	0.5	0.6	0.7
Increase capital transfers efficiency	0.2	0.4	0.6	0.6	0.6
Fiscal gap to reach regional debt target by 2030	7.8	7.8	7.8	7.8	7.8
Public sector debt with fiscal or financing gap	97.0	102.5	105.7	110.0	111.1
Public sector debt with measures	95.5	94.4	91.1	89.2	84.3

1/ In fiscal years (July-June).
2/ Increase in public employment efficiency with category reclassification and rationalization of allowances.
3/ Review of pension formula commensurate with contribution effort.

49. The commitment to fiscal consolidation, however, is insufficient to sustain the execution of the DRS plan, underscoring the role of donor assistance for sustainability. With the inclusion of the DRS costs and return, and despite full implementation of the fiscal consolidation plan, public debt would take an increasing trajectory, reaching 120 percent of GDP by 2030. This means that the cost of resiliency implies an unsustainable debt burden for Dominica, eventually stalling the ongoing progress to build a disaster-resilient state (text table and charts). Therefore, attaining resilience with fiscal and external sustainability crucially depends on donor support. With full implementation of the fiscal consolidation plan, reaching the regional debt target (of 60 percent of GDP by 2030) with the DRS cost would still result in a fiscal gap of close to 8 percent of GDP per year. This implies the need for “additional” donor grants, which would increase to near 11 percent of GDP per year (US\$63 million). This amount is higher than the average in the 2010s, which were in the range of US\$ 5-15 million per year, but similar to the grant support received in the 2000s.

DRS Macroeconomic Framework

	Est.		Projections							
	2017	2018	2019	2020	2021	2022	2023	2024	2025	2030
Output and prices										
Real GDP 1/	-9.5	0.5	7.6	-10.5	3.4	9.0	7.3	5.7	5.5	3.1
Overall fiscal balance 2/	0.3	-19.9	-10.3	-4.3	-6.0	-5.5	-5.3	-2.0	-1.7	0.1
Overall fiscal balance, excl. CBI 2/	-21.8	-33.7	-21.1	-10.8	-11.4	-8.6	-7.8	-4.5	-4.3	19.6
Public debt 2/ 3/	83.8	79.1	90.2	95.5	94.4	91.1	89.2	84.3	80.0	60.0
Current account balance	-8.8	-44.6	-26.0	-18.7	-28.5	-26.7	-25.9	-20.0	-19.5	-13.5
Credit to the private sector growth 4/	-3.0	-2.7	-1.5	-2.1	-1.1	-0.3	0.3	0.8	1.0	2.9

Sources: Dominican authorities; Eastern Caribbean Central Bank (ECCB); and Fund staff estimates and projections.

1/ At market prices.

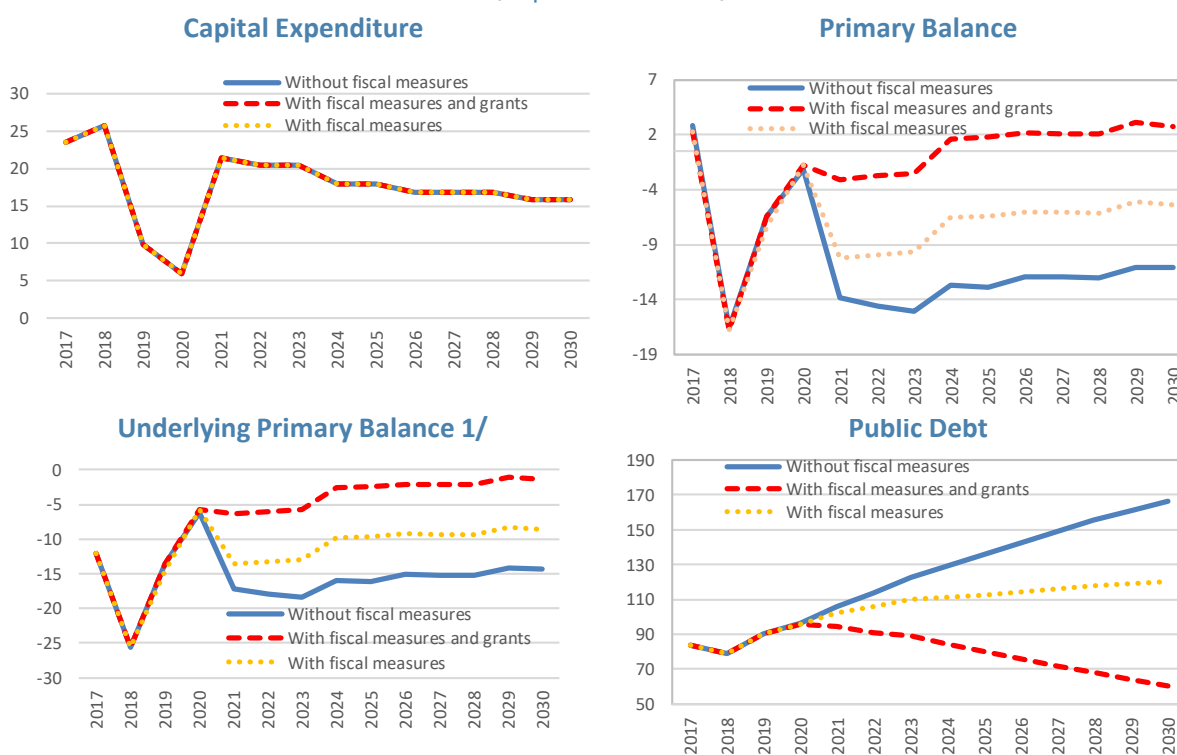
2/ Data for fiscal years from July to June.

3/ Includes estimated commitments under the Petrocaribe arrangement with Venezuela.

4/ Annual percent change.

DRS Fiscal Framework: Fiscal Consolidation and Grant Financing Need

(in percent of GDP)



1/ Primary balance excluding CBI revenues, grants, and transitory increase in public investment after Hurricane Maria.

F. The way forward

50. The DRS will be updated periodically to update the framework with recent economic developments, resilience cost revisions and additions. A share of the cost amounts used in the scenarios are still broad estimates, and specific infrastructure and insurance needs may continue to be identified. However, the DRS does include specific investments under all three pillars that could help mobilize financing, including from donor assistance, with clarity and transparency about the allocation of financing and the contribution of each project and financing component to the overall strategy.

51. Materialization of a DRS requires a cultural change of the Dominicans towards resilience, and also a strong support from the international community. The people of Dominica are committed and determined, understanding that becoming a resilient state is not an option but a survival imperative, especially considering disaster intensification with climate change. The fiscal gap identified in the DRS, however, shows that a small state like Dominica, which had negligible contribution to the causes of global warming and climate change, cannot become resilient without substantial technical and financial support. A concerted effort from the international community is therefore necessary for the DRS to materialize.

52. Access to donor financing could be facilitated with streamlined requirements and application process. The government of Dominica understands the importance of due-diligence procedures and is fully committed to satisfy all transparency and accountability requirements of financial assistance and donor grant. However, complicated and diverse administrative processes for grant application and disbursement impose disproportionate burden on small state such as Dominica affected by limited capacity and human constraints. Dominica continues to support regional initiatives to pool resources for access to grant financing, including with accreditation in regional institutions such as the Caribbean Development Bank and the Organization of Eastern Caribbean States. However, streamlining of qualification, application, and disbursement requirements remains key to facilitate mobilization of globally available donor funding, requiring coordination among the international donor community and global political commitment.

DRS Macroeconomic Framework

I. Social and Demographic Indicators									
Area (sq. km.)	Adult literacy rate (percent, 2016)		94						
Population (2016)	Unemployment rate (2016)		23						
Total									
Annual rate of growth (percent)									
Density (per sq. km.)	Gross Domestic Product (2016)		1,554						
Population characteristics	Millions of E.C. dollars		575						
Life expectancy at birth (years, 2016)	Millions of U.S. dollars		7,870						
Infant mortality (per thousand live births, 20 ¹ U.S. dollars per capita									
II. Economic Indicators									
	2018	Est. 2019	Projected						
	2020	2021	2022	2023	2024	2025	2030		
Output and prices	(annual percent change, unless otherwise specified)								
Real GDP 1/	0.5	7.6	-10.5	3.4	9.0	7.3	5.7	5.5	3.1
Nominal GDP 1/	1.9	9.3	-10.4	5.0	11.2	9.5	7.8	7.6	5.1
Consumer prices									
Period average	1.4	1.6	0.1	1.6	2.0	2.0	2.0	2.0	2.0
End of period	1.4	1.8	-0.2	2.0	2.0	2.0	2.0	2.0	2.0
Central government balances 2/	(in percent of GDP, unless otherwise specified)								
Revenue	46.4	39.8	34.2	42.9	40.3	40.1	40.2	40.2	39.3
Taxes	28.6	24.2	21.5	23.6	23.4	23.6	23.7	23.7	22.8
Non-tax revenue	16.9	13.7	9.2	8.6	6.3	5.8	5.8	5.8	5.8
Grants 3/	0.9	1.9	3.5	10.7	10.7	10.7	10.7	10.7	10.7
Expenditure	66.3	48.7	37.1	47.4	44.4	43.9	40.7	40.4	37.7
Current primary expenditure	38.5	36.4	29.2	23.7	21.7	21.2	20.8	20.7	20.7
Interest payments	2.0	2.5	2.1	2.4	2.3	2.2	2.1	1.9	1.2
Capital expenditure	25.8	9.8	5.8	21.3	20.4	20.4	17.8	17.8	15.8
Primary balance	-17.9	-6.3	-0.8	-2.1	-1.8	-1.5	1.6	1.7	2.7
Overall balance (incl. ND cost buffers), of which:	-19.9	-10.3	-4.3	-6.0	-5.5	-5.3	-2.0	-1.7	0.1
Central government debt (incl. guaranteed) 4/	79.1	90.2	95.5	94.4	91.1	89.2	84.3	80.0	60.0
External	54.7	57.3	67.6	69.5	74.0	73.8	72.6	70.6	54.9
Domestic	24.5	33.0	27.9	24.9	17.1	15.5	11.8	9.4	5.1
Money and credit (annual percent change)									
Broad money (M2)	0.7	-0.4	0.1	0.5	0.4	0.4	0.5	0.6	0.3
Real credit to the private sector	-2.7	-1.5	-2.1	-1.1	-0.3	0.3	0.8	1.0	2.9
Balance of payments									
Current account balance, of which:	-44.6	-26.0	-18.7	-28.5	-26.7	-25.9	-20.0	-19.5	-13.5
Exports of goods and services	29.6	37.9	21.3	19.6	28.3	31.7	34.6	36.4	36.4
Imports of goods and services 5/	78.7	69.4	44.1	50.1	57.2	61.0	58.2	59.4	53.5
Capital and financial account balance	15.8	1.3	2.5	8.6	1.4	-2.6	-1.7	1.6	14.3
FDI	-14.3	-6.2	-2.1	-4.5	-4.8	-4.8	-4.8	-5.9	-5.9
Capital grants	27.6	13.7	9.5	17.8	14.3	11.9	9.4	10.8	14.1
Other (incl. errors and omissions)	2.5	-6.2	-4.9	-4.8	-8.2	-9.7	-6.3	-3.3	6.1
External debt (gross) 6/	104.9	107.5	120.1	119.4	117.7	117.5	112.5	108.5	80.8
Saving-Investment Balance	-44.6	-26.0	-18.7	-28.5	-26.7	-25.9	-20.0	-19.5	-13.5
Saving	-10.9	-2.2	-7.3	-6.5	0.0	-2.7	2.5	1.6	5.7
Investment	33.7	23.7	11.5	22.0	26.7	23.3	22.5	21.2	19.2
Public	26.2	17.2	8.5	15.0	21.7	21.3	20.0	18.7	16.7
Private	7.5	6.5	3.0	7.0	5.0	2.0	2.5	2.5	2.5
Memorandum items:									
Nominal GDP (EC\$ millions)	1,440	1,574	1,410	1,480	1,646	1,802	1,943	2,090	2,738
Nominal GDP, fiscal year (EC\$ millions)	1,507	1,492	1,445	1,563	1,724	1,873	2,017	2,154	2,807
Net imputed international reserves:									
End-year (millions of U.S. dollars)	189.2	190.3	178.8	170.8	174.2	177.6	181.2	185.6	207.4
Months of imports of goods and services	5.4	5.6	9.3	7.5	6.0	5.2	5.2	4.8	4.6

Sources: Dominican authorities; Eastern Caribbean Central Bank (ECCB); and Fund staff estimates and projections.

1/ At market prices.

2/ Data for fiscal years from July to June.

3/ Does not include grants received but not spent.

4/ Includes estimated commitments under the Petrocaribe arrangement with Venezuela.

5/ Includes public capital expenditure induced imports from 2019 onwards to account for possible mitigation of natural disasters.

6/ Comprises public sector external debt, foreign liabilities of commercial banks, and other private debt.

Annex I. Cost and Damage in Recent Tropical Storms

1. Tropical Storm Erika hit Dominica in August 2015, resulting in significant economic losses and high reconstruction costs. The storm produced extraordinary rainfall that caused intense and rapid flooding. As a result, the country suffered severe infrastructural damage, primarily in the transportation, housing and agriculture sectors. A total of 7,229 people (out of a 72,340 population) were affected by the storm, with 713 evacuated, 574 homeless, 22 missing and 11 dead. A summary of the damages is presented in Table 2.

Table 1. Tropical Storm Erika: Summary of Damages and loss by Sector (in US\$ millions)

Sector	Damage (US\$ m)	Loss (US\$ m)	Total (US\$ m)
Productive			
Agriculture, Fisheries and Forestry	42.46	4.87	47.33
Tourism	19.48	11.70	31.18
Industry and Commerce	9.13	0.56	9.69
Infrastructure			
Water and Sanitation	17.14	2.38	19.52
Air and Sea Ports	14.90	0.08	14.98
Roads and Bridges	239.25	48.28	287.53
Electricity	2.19	0.33	2.52
Telecomm	10.0	0.00	10.0
Social			
Housing	44.53	9.61	54.14
Education	3.55	0.45	4.00
Health	0.64	1.30	1.94
Total	403.28	79.56	482.84

Source: Commonwealth of Dominica. Rapid Damage and Impact Assessment.

2. Hurricane Maria hit Dominica in 2017 while it was still recovering from tropical storm Erika. Maria has been Dominica's worst natural disaster, affecting almost every household and economic sector. 58 percent of losses and damage fell on the private sector, where private housing damage was equivalent to 61 percent of GDP. Losses and damage in the tourism sector, amounted to about 16 percent of GDP, heavily concentrated in hotels. Labor-intensive sectors sustained substantial loss and damage, particularly agriculture, transport, and commerce. The remaining damage fell on the public sector, with infrastructure carrying the brunt (43 percent of GDP).

Table 2. Damage, Losses, and Recovery Costs after Hurricane Maria

Sector	Damage ^{1/}			Losses ^{2/}			Recovery Cost ^{3/}		
	Public	Private	Total	Public	Private	Total	Public	Private	Total
	(in millions of U.S. dollars)								
Agriculture	38	18	55	0	124	124	50	23	73
Forestry	28	0	28	0	0	0	15	0	15
Fisheries	0	2	3	0	1	1	0	2	2
Commerce/Microbusinesses	0	70	70	0	7	7	0	73	73
Tourism	0	20	20	0	71	71	0	26	26
Education	49	25	74	2	1	3	61	32	93
Health	11	0	11	7	0	7	22	0	22
Transport	162	39	201	49	8	58	261	64	325
Roads	144	39	182	44	8	53	238	64	302
Ports and Airports	19	0	19	5	0	5	23	0	23
Water and Sanitation	24	0	24	13	25	38	56	0	56
Electricity	33	0	33	33	0	33	51	0	51
Telecommunications	0	47	48	0	8	8	0	47	48
Housing	0	354	354	3	25	28	260	260	520
Other ^{4/}	26	-20	6	75	-71	4	38	-26	12
Total	372	556	928	183	199	382	815	501	1316
	(in percent of GDP) ^{5/}								
Agriculture	6.5	3.0	9.5	0.0	21.4	21.4	8.6	4.0	12.5
Forestry	4.9	0.0	4.9	0.0	0.0	0.0	2.6	0.0	2.6
Fisheries	0.1	0.4	0.5	0.0	0.1	0.1	0.0	0.3	0.4
Commerce/Microbusinesses	0.0	12.1	12.1	0.0	1.2	1.2	0.0	12.6	12.6
Tourism	0.0	3.5	3.5	0.0	12.2	12.2	0.0	4.5	4.5
Education	8.4	4.3	12.7	0.4	0.2	0.6	10.5	5.4	16.0
Health	1.9	0.0	1.9	1.2	0.0	1.2	3.8	0.1	3.8
Transport	27.9	6.6	34.6	8.5	1.4	9.9	44.8	11.0	55.8
Roads	24.7	6.6	31.3	7.6	1.4	9.0	40.9	11.0	51.9
Ports and Airports	3.2	0.0	3.2	0.8	0.0	0.8	3.9	0.0	3.9
Water and Sanitation	4.1	0.0	4.1	2.3	4.3	6.6	9.7	0.0	9.7
Electricity	5.7	0.0	5.7	5.7	0.0	5.7	8.8	0.0	8.8
Telecommunications	0.1	8.1	8.2	0.0	1.4	1.4	0.1	8.2	8.2
Housing	0.0	60.9	60.9	0.6	4.3	4.9	44.7	44.7	89.4
Other	4.5	-3.5	1.1	12.8	-12.2	0.6	6.6	-4.5	2.1
Total	64.0	95.6	159.6	31.4	34.3	65.7	140.1	86.2	226.3

Source: Commonwealth of Dominica Post-Disaster Risk Assessment, November 2017.

1/ Includes mainly replacement cost of structures.

2/ Includes flow losses, typically in terms of output foregone.

3/ Captures the costs of reconstruction of structures with resilience to natural disasters.

4/ Includes costs for disaster-risk reduction and other cross-cutting costs.

5/ Based on 2016 GDP.

Annex II. CRRP Estimated Cost

Dominica Climate Resilience and Recovery Plan 2020-2030	
<i>Strong Communities</i>	
<i>1.1B</i>	
Initiative	Estimated cost (XCD)
1. Each One, Reach One	11M
2. Responsible Land Stewardship	250K
3. Community Emergency Readiness	25-29M
4. Modern Village Council Initiative	100K
5. Enhanced Social Safety Net	35M
6. Resilient Housing Scheme	1B
7. Kalinago Territory Development Plan	42M
8. National Shelter Plan	Applied to Infrastructure
9. SMART Health Care	Applied to Infrastructure
10. SMART Schools	Applied to Infrastructure
<i>Robust Economy</i>	
<i>218-528M</i>	
Initiative	Estimated cost (XCD)
1. Global Centre for Agricultural Resilience	200-500M
2. Support for Resilient Tourism	100K
3. Rehabilitation of Essential Oils Sector	3-7M
4. Development of High Value Export Sector	10-15M
5. Development of Knowledge and Technology Sector	1-2M
6. Unlocking Local Finance	100K
7. Crowd Funding Platform	100K
8. Venture Capital Investment - Women's Agriculture	1.2M
9. Innovative Approach to Insurance	500K
10. MSME Capacity Building	1M
11. Innovation Award	500K
<i>Well-planned and Durable Infrastructure</i>	
<i>4.6-5.5B</i>	
Initiative	Estimated cost (XCD)
1. Resilient Dominica Physical Plan (RDPP)	36.4M
2. RDPP - (Capital Works Program based on double cost of PDNA damage cost assessment to build back better)	4.5-5.4B
3. Centre of Excellence for Data in Resilience Decision-making	6.75M
4. Procurement Capacity Building	1.35M

<i>Strengthened Institutional Systems</i>	<i>320-550M</i>
Initiative	Estimated cost (XCD)
1. Centre of Excellence for Data in Resilience Decision-making	Applied to Infrastructure
2. Resilient Dominica Physical Plan (RDPP)	Applied to Infrastructure
3. Updated Policies & Regulations	400K
4. Revised PSIP Allocation Process and Performance Management Framework	100K
5. Enhanced Disaster Risk Management Agency	8M
6. Government Continuity Plan	200K
<i>Enhanced Collective Consciousness</i>	<i>4M</i>
Initiative	Estimated cost (XCD)
1. Koudmen Domnik Volunteer Initiative	2.5M
2. Respect for All	1.5M
3. Community Emergency Readiness Initiative	Applied to Community
<i>Protected and Sustainably Leveraged Natural and other Unique Assets</i>	<i>93M</i>
Initiative	Estimated cost (XCD)
1. Blue Economy Investment Fund	20M
2. Geothermal Export	TBC
3. Debt for Nature Swap	Success fee
4. Forest/Ecosystem Audit	2.2M
5. Plant One Million Trees	10M
6. Marine Environment Audit/Plans	2.3M
7. Mangrove Stabilization	2.1M
8. Waste Management	4M
9. Post Disaster Waste Management	2.1M
10. Renewable Energy	30M
11. Museum/Hurricane Experience Knowledge Centre	20.25M
12. Export Resilience in a Box	N/A