



# ST. KITTS AND NEVIS

## SELECTED ISSUES

March 2023

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# ST. KITTS AND NEVIS

## SELECTED ISSUES

February 28, 2023

Approved By  
**Western Hemisphere  
Department**

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# LABOR MARKET DIAGNOSIS AND POLICIES

## A. Introduction

- 1. The economy of St. Kitts and Nevis has been on the regional frontier but faced headwinds in recent years.** The waning competitiveness is accompanied by labor market challenges characterized by stagnant labor productivity and a disconnection between wage and labor productivity growth across sectors. The economy also has a large public sector—with the highest share of public sector employment in the ECCU. Strengthening the labor market holds the key to strengthening job opportunities, restoring competitiveness, and supporting sustainable growth. Labor market policies are a key part of this agenda.
- 2. This chapter reviews anecdotal evidence on labor market conditions and discusses policy options to strengthen the labor market and support growth.** A diagnosis of labor market conditions reveals challenges and opportunities in wages, productivity, and labor allocation across sectors. Against this background, two broad sets of policy considerations are discussed: policies to leverage sectoral linkages and labor market policies.

## B. Labor Market Diagnosis

- 3. This section performs an overall labor market diagnosis, drawing on cross-sectoral and cross-country evidence on employment, labor costs, wages, and productivity.<sup>1</sup>**

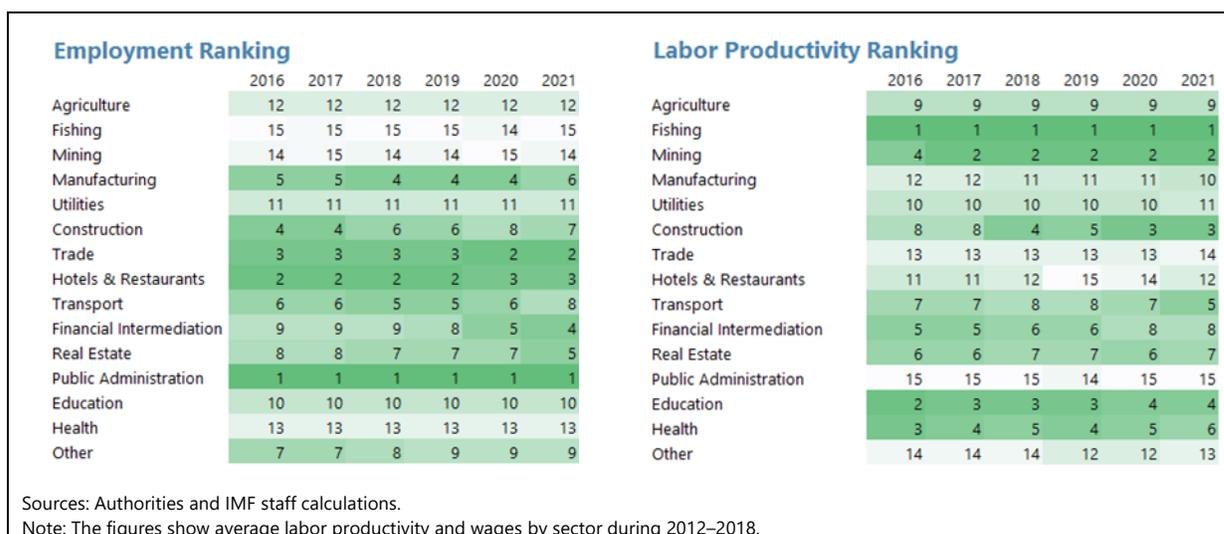
### Employment

- 4. Most of formal employment in St. Kitts and Nevis comes from three sectors:** public administration, hospitality, and trade. These three sectors accounted for over 60 percent of total registered employment in 2019, with each sector contributing 38, 12, and 11 percent, respectively. The COVID-19 pandemic led to a higher concentration of employment in the public sector (43 percent in 2021) due to large job losses in the private sector, with employment in the hospitality and trade sectors in 2021 at 69 percent of their 2019 level.
- 5. Most of the formal labor force is employed in labor intensive sectors with relatively low labor productivity.** The three largest sectors—public administration, hospitality, and trade—have relatively low labor productivity in terms of real output per employee. Sectors such as fishing, mining, education, health, financial intermediary, and real estate services have the highest labor productivity but account for only 14 percent total employment. This sectoral

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<sup>1</sup> The lack of updated labor market survey or census presents a data challenge for labor market analysis. The main data source used in this analysis is from the St. Kitts and Nevis Social Security Board, which provides monthly employment and wage data at the sectoral and federal level. One caveat of the Social Security Board data is that it does not cover the informal labor market, which is estimated to be small in St. Kitts and Nevis (Elgin et al. 2021).

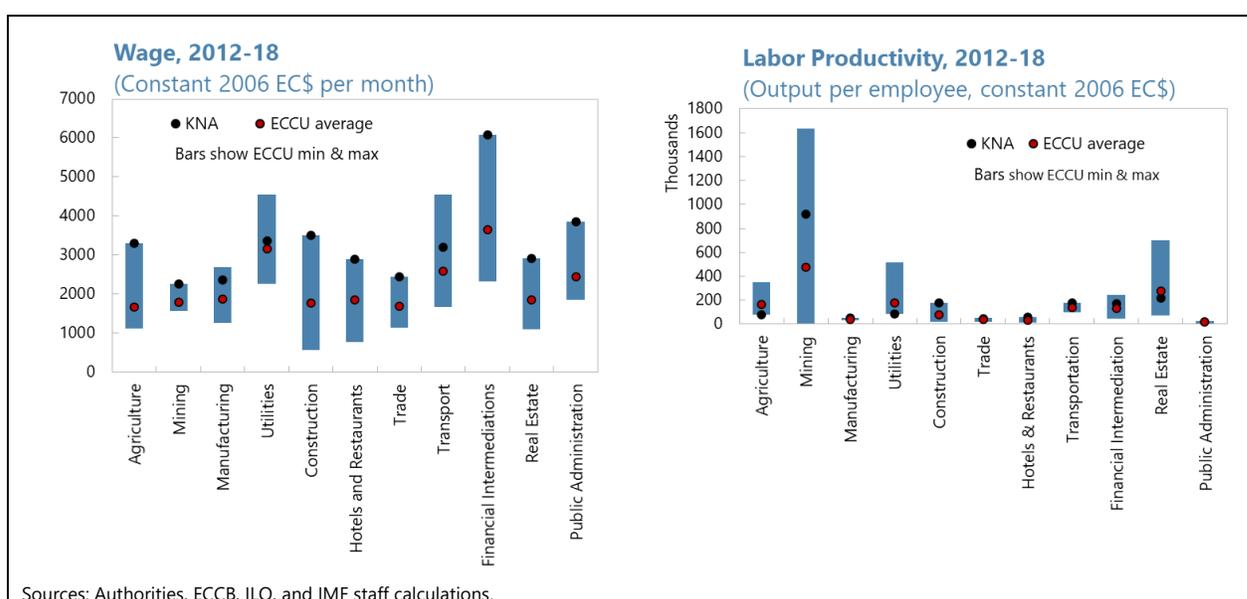
allocation is not problematic *per se*—because it partially reflects the labor-intensity nature of the key sectors of the economy (hospitality and trade)—yet it suggests a scope for improving aggregate productivity. This could be achieved by increasing value added in services, developing job opportunities in more productive sectors (e.g., education and health), and improving the efficiency of the public sector.



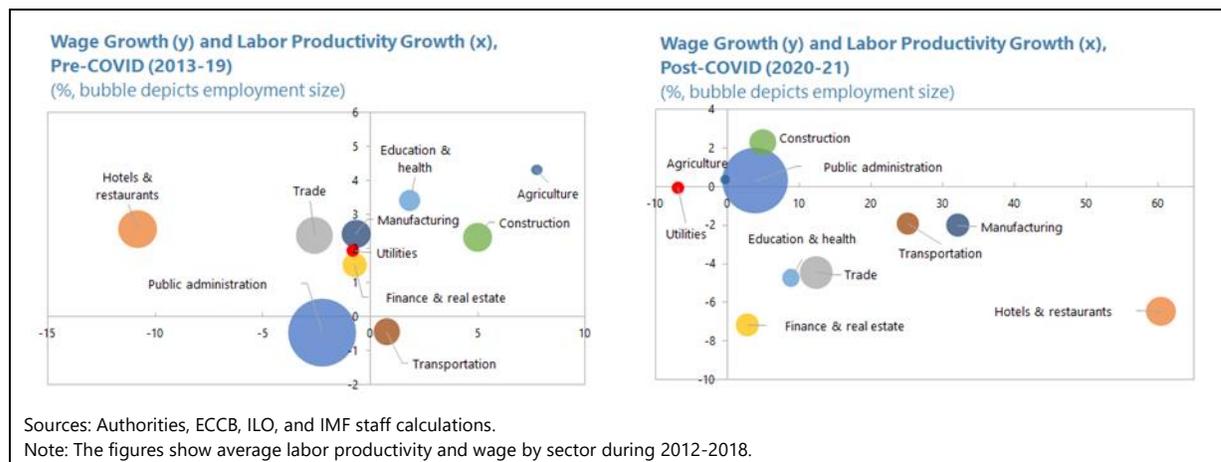
## Labor Costs, Wages, and Productivity

### 6. Labor costs in St. Kitts and Nevis are high compared to other ECCU countries.

Sectoral average wage is the highest in the ECCU for all sectors, except manufacturing, utilities, and transportation. Yet labor productivity is close to the ECCU average in many sectors. This implies higher unit labor costs in many sectors including hospitality, finance intermediation, real estate, and public administration.

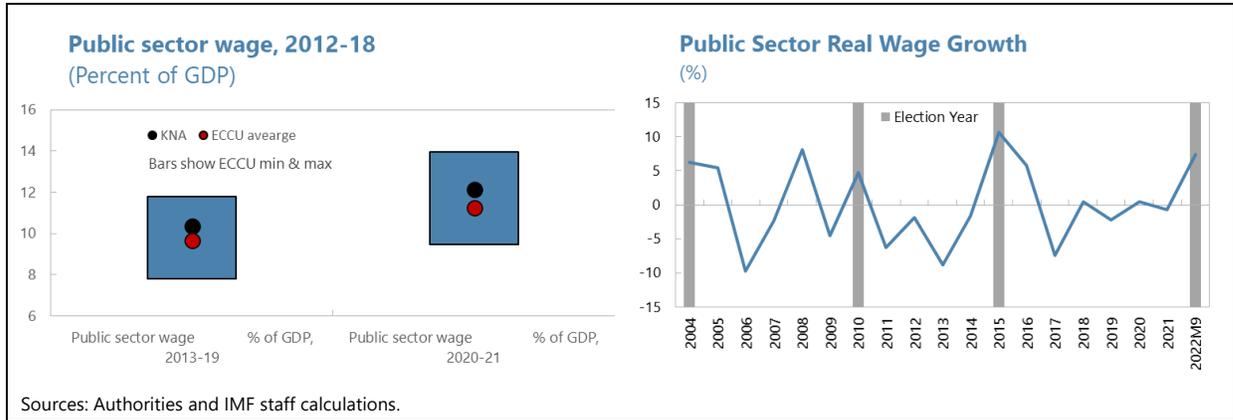


**7. Sectoral wage growth seems only loosely connected to labor productivity.** Wage was growing faster than labor productivity in most sectors before the COVID-19 pandemic, making labor cost in St. Kitts and Nevis one of the highest among ECCU countries. The trend was reversed after the pandemic. Real wages in 2021 was below the 2019 level in most of the private sector and slightly above the 2019 level in the public sector. Overall, real wage growth lagged labor productivity growth in the private sector but outpaced labor productivity growth in the public sector over the decade of 2012–2021. High overall labor costs and the disconnection between wage and productivity present challenges for competitiveness which would ultimately impede job and growth opportunities.

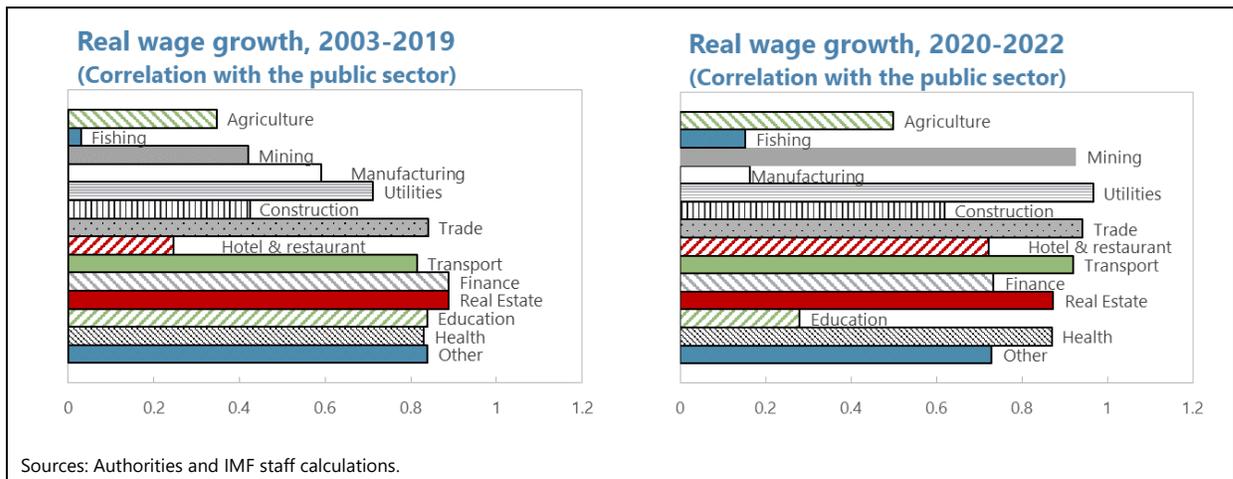


## Public Sector

**8. The public sector in St. Kitts and Nevis is the largest in the ECCU.** Public sector employment constituted 38 percent of total employment in St. Kitts and Nevis in 2018, compared to the ECCU average of 24 percent. Public sector wage bill in St. Kitts and Nevis is also one of the highest in ECCU. It was on average 10.3 percent of GDP during 2013–19, compared to the ECCU average of 9.7 percent. It increased to 12.1 during 2020–21 after the pandemic, compared to the ECCU average of 11.2 percent. The large public sector wage bill reflects a large public sector as well as two large nominal increases in wages whose announcements preceded general elections in 2015 and 2022. In 2014–16, public sector wages increased by 10 percent (implemented as 4 percent, 3 percent, and 3 percent increase over three years). In 2022 H1, public sector wages were increased by 10 percent, retroactive to January 2022.



**9. Public and private sector wage linkage.** Before the COVID-19 pandemic during 2003–19, monthly real wage growth in the trade, transportation, finance, real estate, education, health, and other services were highly correlated with that in public sector (with a correlation above 0.8). Co-movement with the public sector is smaller in other sectors. Notably, real wage growth in the hospitality sector had little co-movement with that in the public sector (with a correlation of 0.2). One possible explanation for the sectoral differences in wage growth is skill composition. It is possible that the overall skill composition in the public sector is different from that in the hospitality sector, which in turn creates barrier for labor mobility across sectors and a weak linkage in wages. After the COVID-19 during 2020–2022, co-movement in the real wage growth of the hospitality and public sectors increases to above 0.7 likely because the recovery of the hospitality sector in 2022 coincided with a public sector wage increase.



**Summary**

**10. The diagnosis of labor market conditions reveals challenges and opportunities in wages, productivity, and labor allocation across sectors.** These include strengthening jobs and growth opportunities across sectors, enhancing the wage setting system to support

competitiveness, and increasing the efficiency of the public sector. The next two sections discuss policy consideration in more detail.

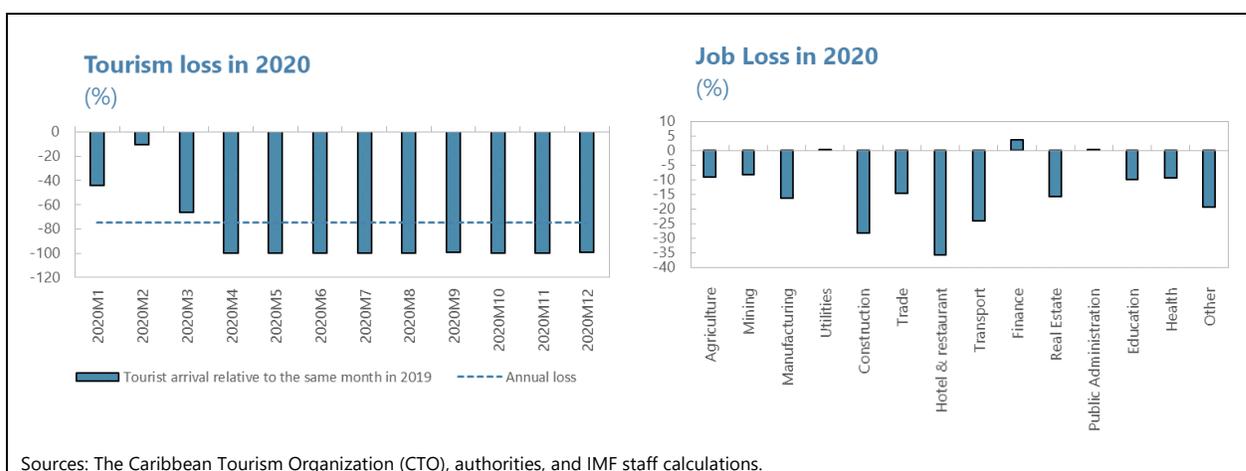
## C. Leveraging Sectoral Linkages for Jobs and Growth

### Analyzing Sectoral Linkages

#### 11. The hospitality sector has the potential to be a stronger lever for jobs and growth.

Understanding the linkage between the hospitality sector and the rest of the economy is key to unleashing the full potential of the hospitality sector in the economy.

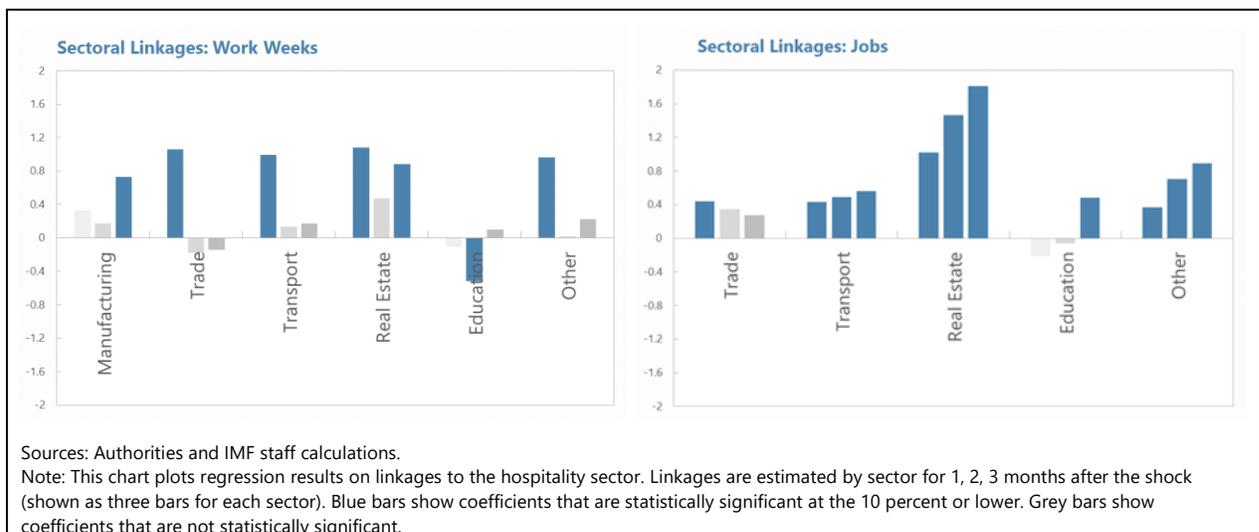
**12. Experience from the COVID-19 pandemic shows that shocks to the hospitality sector could spill over to the broader economy.** The pandemic led to a near halt in tourism in 2020. In March, stayover tourists and cruise passengers both fell more than 60 percent compared to the same month in 2019. Between April and December, stayover arrivals fell by more than 90 percent and cruise passengers fell by 100 percent. Total tourists, including stayover tourists and cruise passengers, recorded a 75 percent loss in 2020 compared to 2019. The decline in tourism is mostly strongly felt in the hospitality sector. In 2020, jobs in the hospitality sector were hit the hardest with a 36 percent loss in the number of jobs. Other sectors also experienced large losses, with construction, transportation, real estate, manufacturing, and trade recording losses of 28, 24, 16, 16, and 15 percent, respectively. Other service sectors including education and health services also recorded a 10 percent loss.



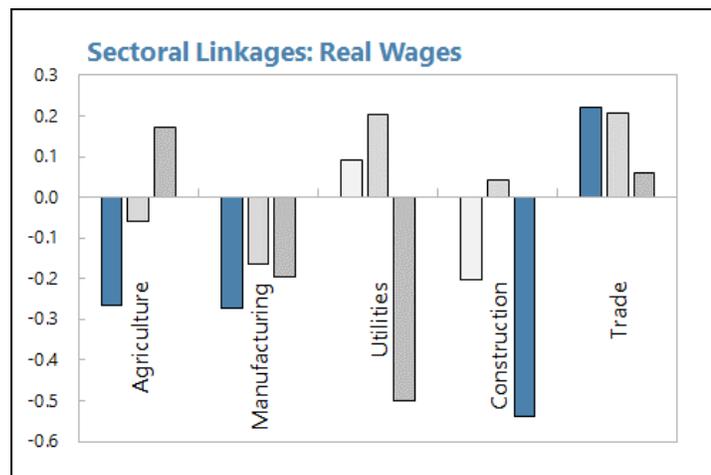
#### 13. The dynamic linkages between hospitality and other sectors are examined formally with historical data.

The analysis aims to understand the extent to which external shocks to employment and wage in the hospitality influence those in other sectors. A regression analysis is performed using 18 years of wage and employment data from social security records. The analysis exploits external shocks to the hospitality sector in an instrumental variable regression. Tourist arrivals—including cruise passengers and stayover tourists—and tourism expenditure are used as instruments for employment and wages in the hospitality sector.

**14. Linkages between job opportunities in the hospitality sector and other sectors are found to be strong.** Shocks to job opportunities in the hospitality sector are found to have large and immediate effects on job opportunities in several sectors including trade, transportation, real estate, and other services. Two results are worth noting. First, job growth in these sectors is strongly linked to job growth in the hospitality sector. A 1 percent growth in the number of jobs in the hospitality sector is associated with more than 0.4 percent growth in the number of jobs in trade, transportation, and other services within a month, suggesting a pass-through of 0.4. The pass-through to the real estate sector is the strongest at 1. The effects are also found to last for up to 3 months in real estate, transportation, and other services, with 3-month cumulative pass-through estimated at 0.6, 1.8, and 0.9, respectively. Second, work hours in these sectors are also linked to work hours in the hospitality sector, suggesting that the linkages in job opportunities on the extensive margin (through jobs) as well as the intensive margin (through work hours within a job) (see Annex for details).



**15. In contrast, linkages in real wages are found to be weaker.** Real wage growth in the hospitality sector is found to have a significantly positive effect on the real wage growth in trade within a month. The pass-through is small at 0.2. In other words, wage gains in the hospitality sector have not resulted in wage gains in the rest of the economy despite strong linkages in job opportunities. These results point to the scope for leveraging sectoral



linkages for earning opportunities, for example, by generating diversified and high-quality job opportunities.

### Policy Considerations

**16. The hospitality sector is well-positioned to become a stronger pillar of the labor market.** Being a relatively late comer to the international tourism market, St. Kitts and Nevis has developed into a unique destination in the past two decades drawing on its tourism resources that combines top-notch natural scenery, rich biodiversity, vibrant cultural heritage, and solid tourism infrastructure. The hospitality sector is well positioned to accommodate new travel demands in the post-COVID world.

**17. Sectoral linkages can be leveraged to provide more diversified and higher-quality job opportunities.** A promising strategy is to develop niche tourism, such as agricultural tourism, cultural tourism, and entertainment-related tourism. This could support employment and growth in the hospitality sector by creating a unique tourism brand and diversifying the sources of tourism revenue. It could also enhance the indirect contribution of tourism to the economy, supporting employment and wage growth in other sectors by generating demand for local agriculture and services. This strategy requires a coordination of local farmers and communities with hotels, restaurants, and tourism agencies. Inter-agency collaboration between tourism, agricultural, and cultural and entertainment authorities could play a role in facilitating this coordination. Support for local small and medium enterprises in related sectors could play a key role integrating them into tourism and the broader economy.

## D. Wage Policies

**18. Strengthening labor market policies and institutions are a key part of the post-COVID policy agenda to enhance the labor market.** As the economy is recovering from the pandemic that led to broad employment loss and wage contractions, labor market policies have come to the fore of policy discussions.<sup>2</sup> This section draws on the state of theory and evidence to discuss policy considerations for St. Kitts and Nevis.

### Unemployment Insurance and Employment Protection Legislation

**19. Unemployment insurance can enhance worker welfare and improve labor market efficiency.** By providing an income to the unemployed, it helps smooth their consumption. The income loss insurance also enables workers to seek jobs that match their skills and take greater risks to seek higher-paying but higher-unemployment-risk jobs, which can ultimately improve productivity and aggregate output.

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<sup>2</sup> Public sector wages and pensions were increased by 10 percent in 2022 H1, retroactive to January 2022. An increase in statutory minimum wage was proposed during the 2022 general election campaign.

**20. The choice of benefit levels and duration should strike a balance between income loss insurance and maintaining job search incentives.** The latter is more relevant in economies where unemployment insurance eligibility is worse monitored and enforced, or informal job opportunities are more prevalent. In this case, low benefit generosity and short duration is found to enhance rather than weaken job search efforts (Bardey et al. 2015). Benefit and duration can be increased gradually as administrative capacity improves and informality declines.

**21. The efficiency of the unemployment benefit system also depends on complementary policies.** These include structural policies to reduce informality, redistributive policies to protect the unemployed from poverty without discouraging informal workers to take up formal jobs, and active labor market policies to support job search and skill match. These complementary policies help to reduce the economic distortion caused by unemployment insurance and allow the system to increase coverage and provide more generous benefits.

**22. A central objective of employment protection legislation is to provide insurance to protect workers against the risk of dismissal.** The literature has a consensus on the positive role of the legislation on addressing noneconomic motives for dismissals by protecting workers against abuse and discrimination. But the literature is unsettled on how the legislation should be used to address economic motives for dismissals. The legislation is found to reduce productivity, although the effect is generally found to be small. Some evidence suggests the legislation has a small effect on raising unemployment duration by lowering job turnover. An overly stringent employment protection legislation can foster labor market dualism (i.e., formal and informal labor markets). In an extreme case, a large informal market could have adverse implications for efficiency and income inequality.<sup>3</sup>

**23. Unemployment insurance and employment protection legislation can be designed in a complementary way.** One approach is to expand unemployment insurance gradually as the economy grows and administrative capacity develops. At the same time, employment protection legislation can be made less stringent to minimize its economic costs; simpler to reduce administrative burden; and more homogeneous to protect different segments of the work force evenly, for example, both regular and temporary workers.

### **Minimum Wages**

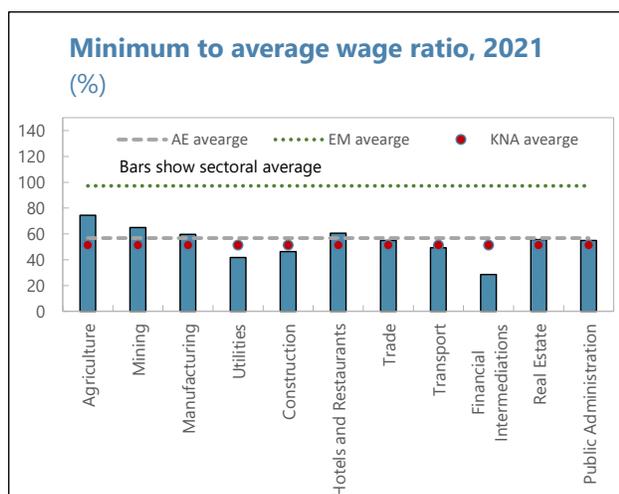
**24. Well-set minimum wages help achieve important socio-economic objectives.** One key objective is to promote economic efficiency. It can alleviate risks of excessively low wages and full employment with sluggish labor efforts due to market power of the firms (Shapiro and Stiglitz 1984). The other objective is to reduce overall poverty through a guarantee on worker compensation.

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<sup>3</sup> See IMF 2019 b. for a summary of the literature.

**25. Minimum wages are less effective in achieving the poverty reduction objective when they are poorly targeted.** For example, when they target individuals rather than households, when they target formally employed workers but not people that are unemployed or employed in informal jobs or when they focus on income (as is the case most often) but not expenses. Minimum wages are found to reduce inequality to a lesser extent when the share of informal workers in total employment is large, or when the starting level of minimum wage is high (which determines how binding it is for low-income households) (Cunningham 2007).<sup>4</sup> The impact of minimum wages on inequality also depends on its employment effect. Minimum wages that are set too high can have adverse effects on the employment opportunities of less productive workers such as the less educated youth. They may also hamper the competitiveness of small firms or firms with low productivity.

**26. Common yardsticks could be used to gauge whether minimum wages are too high or too low.** The ratio of minimum wage to median (or average) wage is a useful one. In advanced economies, the minimum wage to median wage ratio is in the range of 40 to 60 percent. It is higher in emerging and developing countries (from 40 percent to above 100 percent), which might reflect low absolute median wage in these countries, which means that minimum wage needs to be set at a higher level to fulfill its antipoverty objective. Another factor might be that minimum wage is often used as a substitute for collective bargaining (IMF, 2019). The current minimum wage in St. Kitts and Nevis is 360 EC dollars a week, about half the of the median wage (as in January to May 2022).



**27. The risks of adverse employment effect should be considered when setting statutory minimum wages.** One way to address these is to allow for differentiation. This could be done across population groups, regions, industries—dimensions along which productivity vary. Minimum wages also need to be flexible to ensure the resilience of employment to changes in economic conditions.

**28. A formal wage bargaining process could play a key role in enhancing the flexibility of the wage system.** In principle, decentralized collective bargaining (e.g., at the firm level) can be a useful tool for setting wages and working conditions. Bargaining at a higher level (e.g.,

<sup>4</sup> In principle, to achieve inclusion goals without compromising efficiency, statutory minimum wages should be combined with targeted policy tools.

industry or regional) could play a role in enhancing equity but undermine efficiency by making wage and labor allocation decisions inflexible. Minimum wages set through collective bargaining rather than statutory decisions could facilitate differentiation and flexibility. For collective bargaining to achieve this goal without undermining equity, it needs to be rooted in an effective social dialogue and to be carried out with a high degree of representativeness, coordination, and trust between bargaining parties.

## Public Sector Wages

**29. Public sector wages can influence private sector wages and employment through various channels.** They can directly affect private sector wages if private sector wages use the public sector wages as a reference. Public sector wages that are set too high can increase reservation wages and crowd out private sector employment. Through taxation and government expenditure, public sector wages does have direct and indirect effects on growth.<sup>5</sup>

**30. Public sector wages and employment need to be set at a level consistent with the effective delivery of public services.** A large public-private wage premium is found to adversely impact public service delivery, fiscal sustainability, and private sector competitiveness (IMF 2016). To avoid these adverse effects, public sector compensation needs to be competitive and not overly generous relative to the private sector. The public sector also needs the flexibility to adjust the level of compensation and the size and skill composition of employment to be in line with growth and fiscal objectives.

**31. Strong institutions are needed to effectively manage public sector wages over the medium term.** Several institutional arrangements can facilitate this goal including regular comparison between public and private sector wages, regular wage negotiations as opposed to ad hoc adjustments, and using medium-term wage bill forecasting to support better fiscal outcomes. Several policy tools could be combined to contain an overall increase in the public sector wage bill in the short term, including worker attrition and redeployment, as well as a restraint on wage increase.

## E. Conclusion

**32. Labor market conditions in St. Kitts and Nevis present challenges and opportunities to wages, productivity, and labor allocation.** Labor market and growth policies could play a key role in strengthening jobs and growth in the post-COVID era, including by leveraging sectoral linkages to provide more diversified and higher-quality job opportunities, enhancing labor market policies, and increasing the efficiency of the public sector.

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<sup>5</sup> For example, a large public wage bill needs to be financed by higher tax or lower government expenditure on items such as infrastructure or social protection that are crucial for growth.

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## ANNEX I. EMPIRICAL METHODOLOGY

To analyze the extent to which employment and wage in the hospitality influence those in other sectors, the regression specification relates employment opportunity and real wage growth in all non-hospitality sectors to those in the hospitality sector. The approach follows a local projection framework of Jordà (2005). The following regression is estimated at the monthly level:

$$y_{i,t+h} = \alpha^h + \sum_{k=0}^1 \theta^h H_{t-k} + \sum_{k=0}^1 \Gamma_k^h X_{i,t-k} + u_{i,t}^h, \quad (1)$$

where the subscripts  $i$  and  $t$  index sector and time respectively, and the superscript  $h = 1, \dots, 3$  denotes the horizon (number of months after  $t$ ) being considered. The dependent variable  $y$  is the number of jobs.  $y_{i,t+h}$  measures growth for sector  $i$  at time  $t+h$  (calculated as the first difference of logs, relative to  $t$ , multiplied by 100).  $H_t$  is growth in the number of jobs in the hospitality sector at time  $t$ .  $\alpha^h$  is a constant. The vector  $X_{i,t-k}$  is lagged 1- and 2-month growth in the number jobs in all non-hospitality sectors. We control for year fixed effects to absorb common factors in economic conditions. To mitigate the concern that growth in the hospitality sector is endogenous to domestic conditions, growth in the hospitality sector  $H_{t-k}$  is instrumented with lagged 1- and 2-month growth in the number of total tourist arrivals and stay-over tourist arrivals and in total tourist expenditure. The identification assumption is that tourist arrivals and tourist expenditure are driven by external factors on tourism demand from source markets that are unrelated to the economic conditions in St. Kitts and Nevis. They have a direct impact on jobs in the tourism sector, but do not have an impact on jobs in other sectors except through the tourism sector. The regression is estimated using monthly data from January 2003 to September 2022. The same regression is used to analyze other depending variables including the number of work weeks and real average wage.

## References

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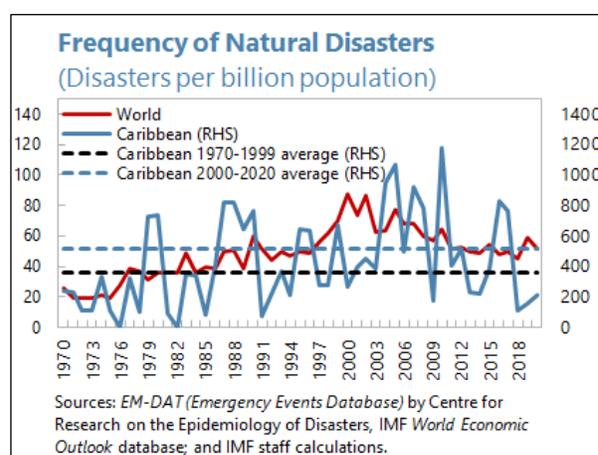
# CLIMATE CHANGE ADAPTATION AND RESILIENT INVESTMENT

## A. Introduction: Historical Impact from Natural Disasters

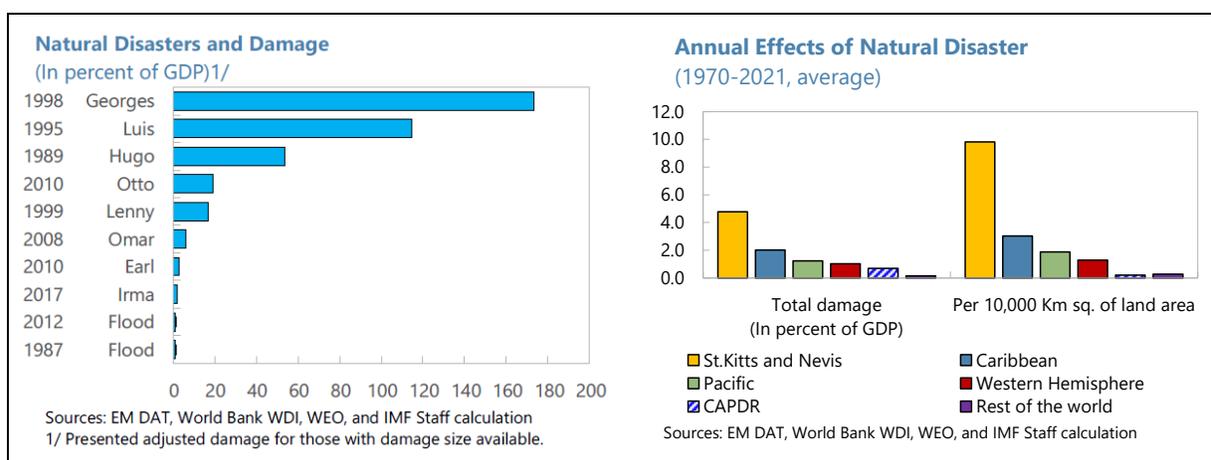
**1. St. Kitts and Nevis is a two-island country with lowlands and volcanic mountain ranges.** The coastal and marine waters include coral reefs, freshwater lagoons, seagrass beds and mangroves. The population is 53,192 (2020), of which over 60 percent reside in coastal areas, where tourism is the main industry. Because of the considerable number of people living in and deriving their livelihood from coastal areas, the country is vulnerable to the impact of climate change, including sea level rise, coastal erosion, and flooding. These threats are exacerbated by human-induced deforestation and steep slopes throughout the country.

**2. St. Kitts and Nevis is most vulnerable to hurricane, flood, and drought.** The country lies on the southern edge of the Atlantic hurricane belt where tropical hurricanes occur throughout August, September, and October. During 1995–1999, the country was hit by 5 major hurricanes. In St. Kitts, the southwestern seafront and the waterfront of Basseterre (the capital city) are at risk of storm surge. Basseterre is also at risk of overflow from heavy rainfall. In Nevis, the northeastern to southeastern seafront, including the Charlestown Port, have high risk of storm surge. Drought is an additional hazard in Nevis, with over 50 percent of the island receiving less than 50 inches of rainfall per year. The south and southeast areas of the island are the most vulnerable. Extended periods of drought are often experienced from February to April.

**3. The historical impact of natural disasters (ND) on St. Kitts and Nevis has been large.** Severe storms resulted in significant economic and humanitarian losses (figure)<sup>1</sup>. Compared to other disaster-prone Small Developing States (SDS), St. Kitts and Nevis has experienced more frequent NDs with more severe damage on average (figure). From 1970 to 2021, the country had an annual average impact from ND of 4.2 percent of GDP compared to the average of 2.0 percent for SDS and had about three times more NDs than other small islands (IMF, 2016). With climate change accelerating (WMO 2021), the intensity and frequency of NDs could worsen and will continue to pose an ever-present and even growing risk to the country (Acevedo 2016; IMF 2022b).

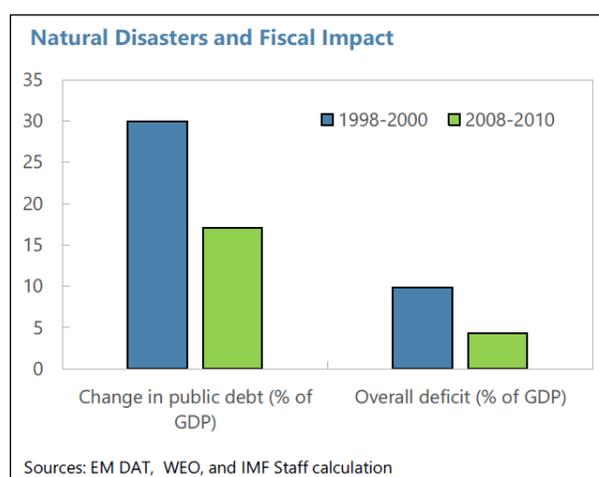


<sup>1</sup> For alternative estimates for all the events since 1950, see Annex Table 1.



**4. The country's large reliance on the tourism sector has exacerbated the economic impact of NDs and left long-lasting scars to the economy.** NDs has led to large losses in the tourism sector which also spillover to other sectors. For example, hurricanes Luis and Marilyn in 1995 destroyed a tourist site and parts of the housing stock, and severely affected the agricultural sector as the ensuing soil erosion washed out a sugar cane railway. Hurricane Georges in 1998 destroyed several hotels, schools, and houses; beaches were eroded; and half of the sugar harvest in 1999 was lost ([EKACDM uwi.edu](http://EKACDM.uwi.edu)). It took 3 years to the tourism sector to recover fully from the hurricane. The sugar industry continued to perform poorly for several years (IMF, 2000). Hurricane Omar in 2008 damaged Nevis's Four Seasons resort, the largest employer and revenue earner on the island. Its two years closure negatively affected 700–800 employees and resulted in large losses in the tourism sector (UNCFF, 2015).

**5. ND shocks often have outsized fiscal impact.** The government, especially in SDS, often becomes the main bearer of ND costs incurred by the economy. In the event that NDs destroy capital stock and lower economic growth, reconstruction is urgently needed to re-build the capital stock, especially infrastructure, to support recovery. Resources are also needed for humanitarian purposes in the immediate aftermath of the event and to support vulnerable households and, in some cases, key enterprises during the recovery. In St. Kitts and Nevis, large NDs in the late 1990s and late 2000s coincided with large fiscal deficits and a sizeable accumulation of public debt. Public debt increased by about 30 and 16 percentage points of GDP in the late 1990s and late 2010s, respectively.



**6. A broad strategy for climate change adaptation and fiscal preparedness for ND is of critical importance.** Fiscal preparedness should include an effective use of fiscal resources and securing additional fiscal buffers against future shocks. The country has successfully lowered public debt and has accumulated deposits over the last decade, two welcome steps towards ND preparedness. In what follows, the paper presents regional best practices in terms of climate change adaptation and resilience (Section B), St. Kitts and Nevis's own climate and energy strategy (Section C) to draw lessons and key priorities going forward. Two strategic pillars for ND preparedness are then discussed in detail: investment in resilience (Section D) and a multi-layered insurance framework (Section E). The paper concludes with key policy takeaways (Section F).

## B. Adaptation and Resilience: Best Practices in the Region

**7. An increasing body of literature has highlighted the macroeconomic benefits of investing in resilient infrastructure to ND and climate change.** Using a theoretical model of small open economy, Fernandez-Corugedo et al. (forthcoming) find that investment in resilient infrastructure support higher GDP and that the return to investment is net positive (see Section E for details). In the short run, resilient investment reduces output decline (resulting in a flow return) and reconstruction cost (resulting in a stock return).<sup>2</sup> In the long run, resilient investment supports higher output and tax revenues, the increase in tax revenue more than offsets the cost of resilient infrastructure.<sup>3</sup> The long-term return of resilient investment will increase significantly if the intensity of NDs increases.

**8. In the ECCU, Dominica and Grenada have formulated Disaster Resilience Strategy (DRS) and promoted adaptation to climate change and NDs as comprehensive national strategies across government agencies, the private sectors, and donors.** Drawing upon existing government plans and proposals, the DRS elaborates a strategy to build resilience against NDs and climate change and integrate it into a credible macro-fiscal framework. It is organized around three pillars: structural resilience, financial resilience, and post-disaster resilience.

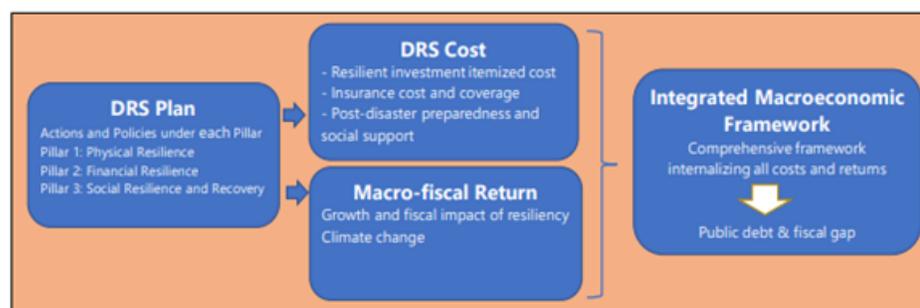
**9. Investment in resilience will likely have a profound impact on a small country's debt profile.** In the case of Dominica, the total cost of transforming the country into a disaster-resilient state over a 20-year period is estimated at US\$2.8 billion (five times Dominica's GDP). Debt would increase in the medium term because of the upfront costs of resilient investment. Return would materialize in the medium to long term with a gradual increase in resiliency, which in the DRS takes two decades. In the case of Grenada, the cost of ND resilience is estimated at US\$1.3 billion

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<sup>2</sup> Under the assumption of 80 percent resiliency (i.e., the damage of NDs with resilient investment is reduced to 20 percent of the damage without resilient investment), model simulation for Dominica shows that the output decline after a ND is reduced by over 2 percentage points of GDP.

<sup>3</sup> Model simulation for Dominica shows that output level increases by over 6 percent, while tax revenues increase by 1.9-6.7 percent depending on the tax type.

over 15 years, or 5½ percent of GDP annually. The cost for structural resilience (Pillar 1) is estimated at US\$1 billion, or 4 percent of GDP



annually. The cost for financial resilience (Pillar 2) is estimated at ½ percent of GDP annually. The cost of post-disaster (Pillar 3) is estimated at 1 percent of GDP annually.<sup>4</sup>

**10. Both Dominica and Grenada’s DRS stress that they would be unable to finance the effort without concessional financing from the international community.** In the case of Dominica, the annual financing gap is 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 with fiscal and external sustainability crucially depends on an increase in donor grants of about US\$63 million per year, or 3 to 4 times above recent levels.

**11. Dominica has plans to implement a comprehensive insurance strategy with a risk layering framework.** This includes a saving fund of 12 percent of GDP and annual savings of 1.5 percent of GDP in years with no natural disasters, which is expected to cover the fiscal cost of rehabilitation and reconstruction. The plan also includes insurance coverage with high access under the Caribbean Catastrophe Risk Insurance Facility (CCRIF) for high-frequency low-intensity disasters and World Bank Catastrophe (CAT) bonds for catastrophic events (see Section F for details).

### C. Climate Change Adaptation and Energy Plans in St. Kitts and Nevis

**12. St. Kitts and Nevis’ National Climate Change Adaptation Strategy was established in 2018.** Its [first version](#) is now under review for update. The country 2021 Nationally Determined Contributions (NDC) to the United Nations Framework Convention on Climate Change (UNFCCC) gave an overview of the progress in implementing this strategy and on this ongoing update. The country now aims at a 61 percent CO<sub>2</sub> emission reduction by 2030 (base year 2010)—a goal that assumes a 100 percent transition to renewable energy for power generation and the electrification of 2 percent of the total vehicle fleet.

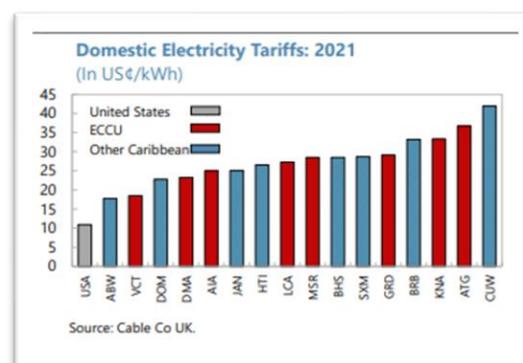
**13. The National Climate Change Adaptation Strategy details adaptation objectives and measures across sectors.** Agriculture, coastal and marine ecosystems, human health, tourism,

<sup>4</sup> In Grenada, the government are also advancing soft measures to strengthen the institutional framework for resilient infrastructure. The implementation of these measures is a key precondition for the envisioned scale-up of public investment.

and water resources have been identified as key priority areas. The NDC however recognizes limited progress in implementation—due to funding constraints or inadequate technical and human resources—and evaluates the level of completion for key sectors at less than 50 percent. Some progresses are noted in the area of Disaster Risk Reduction, with the implementation of (i) an enhanced data collection for adaption decision making and planning, (ii) the setting-up of a spatial database of critical infrastructure and hazard mapping, (iii) the implementation of land reclamation techniques to reverse costal erosion and (iv) the revision of the National Multi Hazard Disaster Management and Response plan.

**14. St. Kitts and Nevis aims “to become an island nation with a sustainable energy sector where reliable, renewable, clean, and affordable energy services are provided to all its citizens” (St. Kitts and Nevis Energy Plan, 2011).** The 2011 Energy Plan envisioned that by 2020, 100 percent of the electricity supplied in the country would be produced from renewable energy sources. Although the renewable energy goal has not been met, the government has communicated a plan to build a 30MW geothermal plant that will service both islands (St. Kitts and Nevis), to be completed in 2025.

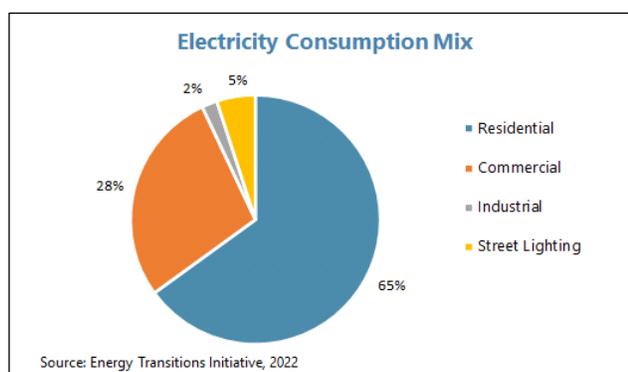
**15. Currently, the country is highly dependent on fossil fuels for electricity generation.** Over 95 percent of its energy is generated by diesel, 3 percent by wind, and 2 by solar. The country has two diesel-based power plants: one in St. Kitts (SKELEC) and another one in Nevis (NEVLEC).<sup>5</sup> All the population has access to electricity. Both utility companies, SKELEC and NEVLEC, manage the production, transmission, and distribution of electricity. Most of the consumption is residential (65 percent), followed by commercial (28 percent), street lighting (5 percent), and industrial (2 percent). As in other ECCU countries, energy prices are among the highest in the world.<sup>6</sup>



<sup>5</sup> The total installed capacity of the country is 66MW (45.4MW in St. Kitts and 20.6MW in Nevis). Peak demand in St. Kitts is 26MW and in Nevis 9.5 MW. The plants work independently and are not interconnected.

<sup>6</sup> The average electricity tariffs in St. Kitts and Nevis are \$26 cents/kWh for residents and \$28 cents/kWh for commercial and industrial use. These are the third highest rates in the ECCU and the Caribbean, compared, for example, to the average residential rate of \$14 cents/kWh in the United States.

**16. Significant vulnerabilities stem from fossil fuel dependency.** St. Kitts and Nevis buys oil and derivatives from different international suppliers. The private sector and general consumers are served by private distributors. St. Kitts obtains oil and petroleum derivatives for energy generation and transportation through the Petro-Caribe deal with Venezuela. The government benefits from a credit from Petro-Caribe of up to 60 percent of the value per barrel, with an interest rate of 1 percent over a period of 25 years. Nevis does not participate in the Petro-Caribe deal because it does not have sufficient storage capacity. NEVLEC buys fuel oil at international market prices from a private entity with its own storage capacity located in Nevis.

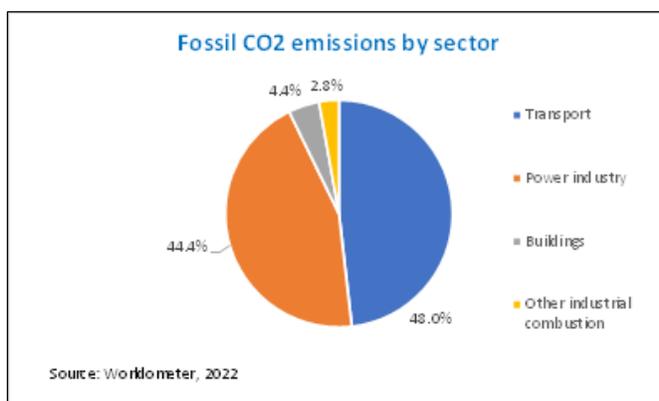


**17. St. Kitts and Nevis has considerable renewable energy potential for its current and future energy needs.** Beneath the coastal water of Nevis, a volcanic island, there is an active and exceptionally large reservoir of geothermal heat (CARICOM, 2017). Furthermore, St. Kitts and Nevis has average wind speeds of 6.6 meters per second and the solar resource average 5kWh per square meter (Energy Transition Initiative, 2018). A feasibility study done in 2017 showed that St. Kitts and Nevis could develop a geothermal plant of about 36MW, which is 55 percent of the current installed capacity (Teranov, 2017). With the planned use of geothermal, wind and solar energy, the country could be self-sufficient.

**18. In this context, the government plans to build a 30MW geothermal plant.** The plan is to construct 3 wells of 10MW each, as well as an accompanying hydrogen production plant. The current needs of the country are 28MW, implying that the country could potentially export energy to neighboring islands. The project is estimated at a total USD 150 million, including the cost of the wells and the transmission lines, which in some areas should be underground for resiliency. The goal is to start test drilling in June 2023, with an estimated completion date in 2025.

**19. The government has been discussing financing options for Nevis' geothermal project with development partners.** In December 2022, the Caribbean Development Bank (CDB) approved USD 17 million under a contingency recoverable grant modality, whereby the grant will turn into a loan only if the drilling is successful. This contingent structure was designed to de-risk the later phases of the project and facilitate private sector participation. The authorities completed the environmental and social environment assessment and have been in frequent discussions with the CDB.

**20. Solar and wind energy projects are also underway.** A solar plant of 0.75 MW was constructed and is currently operated by the St. Christopher Air and Sea Ports Authority. Solar panels in the government headquarters building producing around 30 percent of its electricity needs (100 KW) and solar-powered streetlights have been installed in a portion of the main road serving the rural area. A wind farm was also established. The government has also reviewed several proposals related to “Waste-to-Energy” projects. In Nevis, a wind power plant of 2.2 MW, which represents around 20 percent of the installed capacity of the island, has been established and it is operated by a private power producer.



**21. St. Kitts and Nevis carbon emissions are limited.** In 2016, St. Kitts and Nevis emitted 203,036 tons of CO<sub>2</sub>, 1.5 percent higher than in 2015. CO<sub>2</sub> emissions per capita are equivalent to 3.93 tons per person (Worldometer, 2022). The sectors with the most emissions are transportation (48 percent) and power industry (44.4 percent). Although St. Kitts and Nevis contributed only a minute amount of CO<sub>2</sub> to the global output, the impact of global warming on small island states is greater than the impact on industrialized countries (St. Kitts and Nevis National Energy Plan, 2022).

### Box 1. Defining the Right Renewable Energy Mix for St. Kitts and Nevis

St. Kitts and Nevis authorities have announced their intention to achieve 100 percent of renewable energy (RE) generation by 2030. The potential for geothermal, solar, and wind energy has been known for many decades in the country and it should be able to deploy all three. The current cost of electricity in St. Kitts is 28 cents per kWh, which is relatively expensive even in the Caribbean, where energy costs are among the highest in the world. Achieving the replacement of fossil fuel-powered generator by renewable sources could bring substantial economic gains by reducing the unit cost of electricity. This will also drastically increase energy security of the country which currently relies on shipments of fuel.

	Energy generation costs	Reliability	Execution risk, speed
<b>Geothermal</b>	Generally low but high project cost (building utility, drilling) can reduce savings.	High, good alternative to fossil fuel baseload, no need for storage solutions.	High execution risk. Potential difficult to ascertain without costly and lengthy test drilling phases.
<b>Solar</b>	Solar panel generated electricity costs have been falling for two decades now in the low single digits.	Solar energy is little reliable: it is weather dependent, and generation stops at night.	Low execution risk, fast implementation.
<b>Wind</b>	The cost of wind turbine is limited if installed onshore, also in the low single digits. <sup>1</sup>	Wind energy is little reliable (weather dependent).	Low execution risk, fast implementation.
<b>Solar or wind plus storage</b>	The use of BESS generates higher electricity costs but make both wind and solar possible reliable alternatives to fuel generated baseload.	High, good alternative to fossil fuel baseload.	Low execution risk, fast implementation.

**Which renewable energy?** The profusion of potential RE projects raises the question of which project should be pursued in priority. International experience shows that countries that invested massively in geothermal generation have achieved the biggest reduction in electricity costs (e.g., Ethiopia, Iceland, and [Kenya](#)). Yet

Countries	Share of renewable electricity generation and cost per user types		
	Renewable share (in %)	Electricity cost per kWh (USD cents)	
	Households	Corporations	
Kenya	90.7	18	14
Suriname	58.3	1	1
Iceland	100	14	7
Ethiopia	93.6	1	2
Canada	65	12	10
Brazil	80.4	20	15
Paraguay	100	5	5
St-Kitts	10	33	33

Source: [globalpetrolprice.com](http://globalpetrolprice.com)

<sup>1</sup>Data collected for the US energy market (source: [Wind Technologies Market Report](#) Lawrence Berkeley National Laboratory) indicates that the Levelized Cost Of Electricity (LCOE) for wind energy sold to the grid, a measure correcting for the effect of subsidies, has averaged about 5 cents per KW/h over the last 20 years.

### Box 1. Defining the Right Renewable Energy Mix for St. Kitts and Nevis (Concluded)

geothermal, while reliable and cost effective in the long run, requires substantial upfront investment, and has high execution risk (the presence of underground steam even in large quantity is an indication, not a guarantee of geothermal potential). In comparison, solar and wind projects present low execution risks, but do not match the level of reliability of geothermal, and do not represent an effective substitute to fossil fuel generated baseload. To use solar and wind for baseload electricity supply requires investing in a Battery Electricity Storage System (BESS) that increases considerably the cost of the investment, raising the final cost per KW/h.

**Financing trade-offs.** Private sector financing is often available in the form of Purchasing Power Arrangements (PPA), long-term contracts whereby private sector companies involved in the construction of the electricity generation facility bear the cost of the investment but recover it over, say, 20 years by selling the electricity at a cost covering the initial investment. For instance, while the cost of electricity produced through solar panels is [on average](#) 6 to 8 cents, a [solar plus storage project](#) might result, through a PPA, in a cost between 20 and 30 cents per KW/h. Conversely, geothermal projects financed through PPAs can result in single digits electricity costs (since they do not require storage component) but face longer project executions and higher risks. This suggests that the cheapest options may also bear more risk in the short run.

**Future power grid needs.** The optimal mix of projects should reflect that electricity consumption going forward will likely grow faster than GDP. Cheaper electricity will generate structural changes in the economy, and a likely decline in the use of fossil-fuel powered thermal engines through broader electrification (for instance with the universalization of electrical vehicles). In addition to the investment in upgrading the power grid, the country considers burying the power lines underground which will initially add to the final cost of electricity but drastically improve the resilience of the power grid to NDs and will ultimately save costs in the long run. The potential increase in the relative electricity intensity of growth pleads for developing all potential sources of RE simultaneously. The use of multiple RE sources will enhance energy diversification and the resilience of the power system to climate change. With the development of RE projects the country may turn from fossil fuel importer to exporter of clean energy. The planned development into “green” hydrogen and other chemicals production, as green electricity production exceeds the needs of the grid, would raise the value added of the country’s energy sector and increase its export and growth potential.

## D. Modelling the Costs and Benefits of Resilient Investment

**22. This section presents a cost-benefit analysis of investment in resilient structure for the case of St. Kitts and Nevis.** The authorities have started making investments in resilience, for example, by investing in underground electric lines and in more robust coastal housing. Some resilience work has been done to prevent floodings and has yielded results, decreasing potential damages from flooding, including from Tropical Storm Nicole in November 2022. The analysis that follows suggests that additional, much greater investments in resilience will benefit the country even more.

**23. The literature on resilient investment uses stochastic models to estimate both the impact of NDs on the economy and the return on investment in infrastructure resilient to ND.** Fernandez-Corugedo et al. (forthcoming, thereafter FGG) employ a Markov-switching dynamic stochastic general equilibrium model to assess the macroeconomic return of adaptation investment to NDs for SDS and the impact of climate change. The paper adds or incorporates several elements from the literature in both the transition and steady-state phases:

- The model assumes that *NDs destroy a share of the public and private capital stocks and that the government can invest in more expensive resilient structures as an adaptation strategy*. In addition to the stock destruction, a *ND affects growth and long-term output level*.
- *Labor migration and remittances* are included and affect returns to adaptation investment. Incomplete markets and financial frictions with collateral constraints are also featured and affect returns to adaptation investment.
- With respect to *fiscal policy*, a full set of tax and government pending instruments is included.
- *The impact of climate change* is evaluated based on estimates of an increase in the intensity NDs as well as the gains from adaptation.
- *Incomplete markets and financial frictions* with collateral constraints on credit access by Ricardian (who access financial markets) households are included in the model. This implies that NDs destroy collateral and hence limits borrowing, slowing the recovery.
- The model is calibrated to country-specific and global parameters, including the probability and intensity of NDs.

**24. The FGG model describes a small economy with key sectors.** The model comprises four sectors: households, firms, government, and the external sector.

- There are two types of *households*: hand-to-mouth and Ricardian ones. All *households* are affected by NDs since these tend to lower output, employment, and wages.
- There are two types of *firms*. *Final good firms* produce a homogenous good and are directly affected by NDs since these destroy a share of the public and private capital stocks and are also assumed to temporarily reduce total factor productivity. *Investment and consumption firms* transform the final good to both investment and consumption goods and are not directly affected by NDs.
- The *government* collects tax revenues, receives external grants, and can raise debt in markets. It spends on purchases of goods and services, transfers to households, public capital, and interest on public debt. Public investment can be of two types: *resilient and non-resilient to NDs*. It is assumed that investment in resilient public capital is costlier relative to the non-

resilient type (assuming a premium of 25 percent over non-resilient investment).<sup>7</sup> Both types of investment are assumed to be perfect substitutes in production. The government is directly affected by NDs as non-resilient public capital is destroyed and is indirectly affected as tax revenues decrease with the decline in output and labor income.

- *Fiscal policy* is anchored by a debt rule and does not follow an optimization process. All government expenditures, including public investment, are set as a constant share of nominal GDP and marginal tax rates are assumed unchanged in response to a ND. Non-distortionary lump-sum taxes levied on households are used to raise revenue to allow to match the public debt target over the medium term.

## 25. The model shows that the return of investing in resilient structures outweighs the cost, through near-term and long-term returns.

- ***Near-term return of resilient investment.*** Resilient investment reduces output decline (flow return) and reconstruction cost (stock return). Countries benefit in the near term with reduced asset loss and output after NDs. Resilient investment contains output decline after NDs by reducing capital destruction and labor through migration. Also, replacement capital needs and maintenance costs are lower. Assuming 80 percent resiliency of public capital (i.e., the damage of ND with resiliency investment is reduced to 20 percent of the damage without resilient investment for the same ND intensity), these two sources imply gains equivalent to 0.7–2.7 percent of GDP on average per year in the ECCU (panel chart 1). In St. Kitts and Nevis, the output decline after NDs is reduced by about 2 percentage points of GDP, which proves long lasting. Therefore, it compounds to large output loss over time, affected by time to build under investment adjustment cost.
- ***Long-term return of resilient investment.*** The shift to resilient public investment reduces expected losses from NDs, increasing private investment and capital stock, employment, and output (panel chart 2). Resilient public capital reduces private investors' expected output losses in the event of a ND. As a result, expected returns to private investment are higher relative to non-resilience, resulting in a higher capital stock. An increase in resilience from 0 to 80 percent is assessed to increase output in the ECCU countries, in the range of 3–11 percent<sup>8</sup>. Higher private investment increases the stock of private capital and the returns to labor and wages, inducing inward labor migration with a reduction of the labor force working abroad and higher domestic employment. Investment and inward labor migration reinforce each other with positive feedback, increasing output. In St. Kitts and Nevis, the long-term output level increases by about 9 percent.

<sup>7</sup> Based on estimates in the Dominica Ex-Post Damage Assessment produced by the World Bank.

<sup>8</sup> Variations across countries are mainly explained by the size of public investment and capital stock; share of migrant labor; exposure to NDs (frequency and intensity); government size in the economy; share of public capital in total capital; and tax policy mix (i.e., direct vs. indirect taxation; investment returns vs. labor taxation).

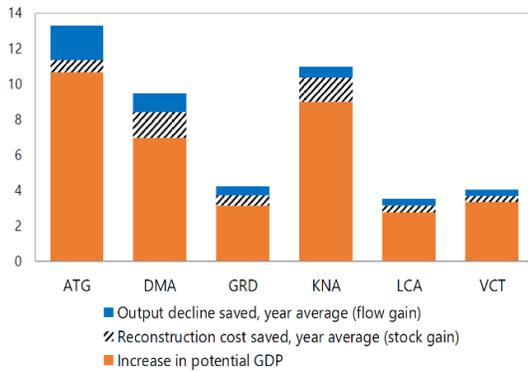
- **Climate change.** The long-term return of costly resilient investment increase significantly as climate change increases the intensity of NDs. GDP increases by an additional 4 percent relative to no climate change.
- **Fiscal performance.** There are several key effects.
  - *In the near term, the increase in public debt after a ND is reduced* (panel chart 3), with this gap remaining very protracted (i.e., 20 years after a ND). This implies that resilient investment reduces the dispersion of debt outcomes due to natural disasters, supporting fiscal resilience.
  - *Fiscal performance deteriorates in an initial phase while the share of resilient investment is growing to become dominant.* Costlier resilient investment worsens the fiscal balance initially, because higher tax revenues from resilience take time to materialize.<sup>9</sup> The additional cost of resilience would increase public debt by 4–20 percentage points of GDP in the ECCU by 2030 above the regional target (panel chart 4). The gap to be filled would be about 0.4–1.5 percent of GDP per year above historical levels to reach the regional debt target (panel chart 5). Benefits from a shift to resilient public investment may take a long time, possibly over 40 years before the share of resilient capital becomes dominant. This implies that the growth (about a 0.4 percent average annual gain) and tax benefit accrue at a slow pace.
  - *Fiscal performance improves in the long run as resilient investment returns more-than-compensate costs.* The long-term increase in tax revenues underpinned by higher output, labor, and consumption more-than-offsets the higher cost of resilient investments. Tax revenues increase in the range of 2–6 percent depending on the tax type. As a result, overall fiscal balances improve in the range of 0–3 percentage points of GDP (panel chart 6) with the increase in resilient investment to 80 percent. This is a critical result for long-term fiscal sustainability considering the additional cost of resilient investments.

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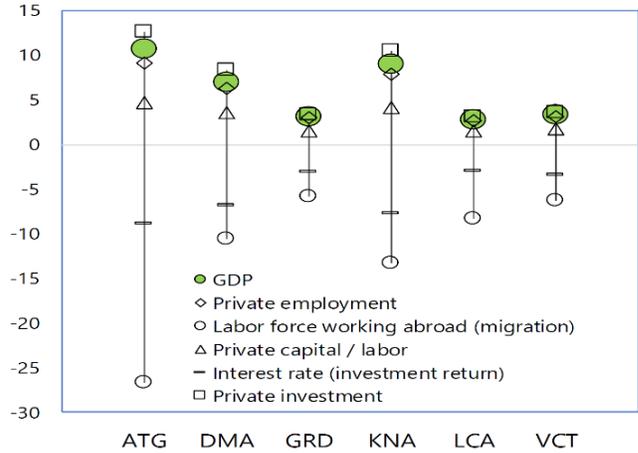
<sup>9</sup> For example, if a country has a public investment rate of 5 percent of GDP and increases resilient investment to 80 percent while keeping constant total physical investment, the fiscal balance deteriorates by 1 percent of GDP ( $5 \times 0.8 \times 1.25 + 5 \times 0.2 \times 1 = 6$ ).

**Figure 1. St. Kitts and Nevis: Economic Impact of Resilient Investment**

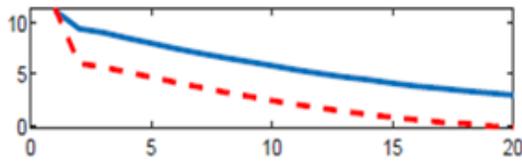
**Long-term GDP Return of Investment in Resilience**  
(Percent change with increase in resilience to 80 percent)



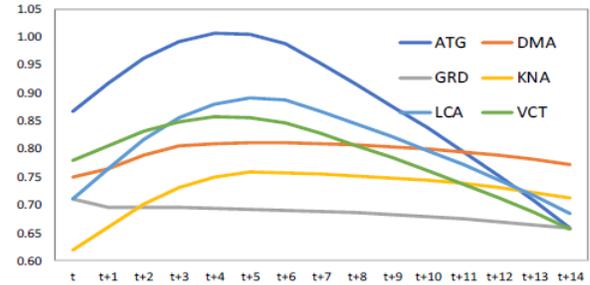
**Potential GDP with increase in resilience to 80 percent**  
(In percent change relative to no resilience)



**Public Debt to GDP With Resilience after a ND**  
(Example of Dominica; quarters after the event; in percentage points of GDP relative to steady state)

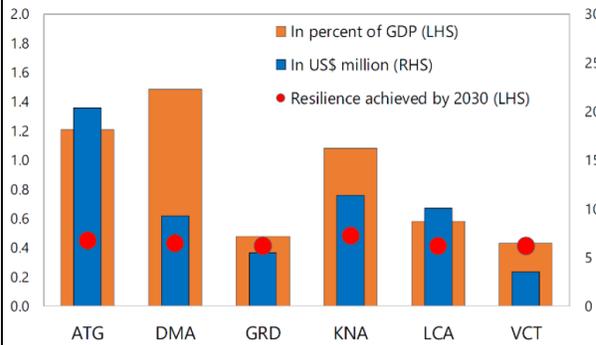


**Public Debt with Investment in Resilience<sup>1/</sup>**  
(Share of GDP)

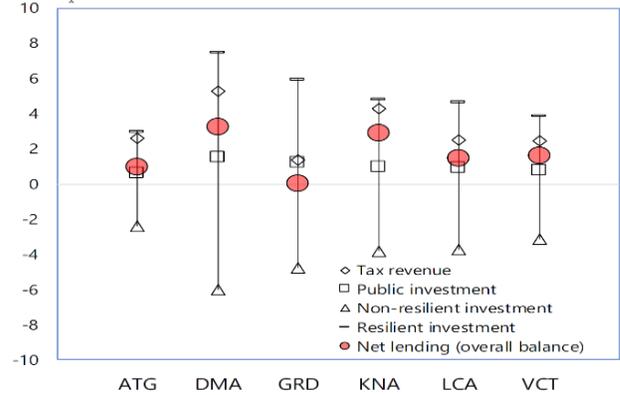


Source: staff simulations based on authorities' data.  
1/ The simulations are not country projections. Assumes fiscal consolidation on steady-state calibrations in each country sufficient to reduce the debt ratio to 60 percent of GDP in 12 years, and then increases resilient public investment to 80 percent.

**Financing Gap to Reach Debt Target of 60 percent of GDP by 2030**



**Fiscal Performance with increase in resilience to 80 percent**  
(Change relative to no resilience, in percentage points of GDP)



## E. Multi-Layered Insurance Framework

**26. Disaster insurance is key instrument to mitigate risks.** Time is of the essence when ND strike. Disaster insurance scheme provides the urgent financing for the immediate expenditure needs, supporting the affected population, rehabilitation, and reconstruction. Often, the government becomes the de-facto insurer of first resort as the private sector is generally uninsured or underinsured for ND. Hence the government is expected to cover both public and private losses (Guerson, 2020). Nevertheless, small states often have insufficient insurance coverage against NDs mainly due to high costs and St. Kitts and Nevis is no exception.

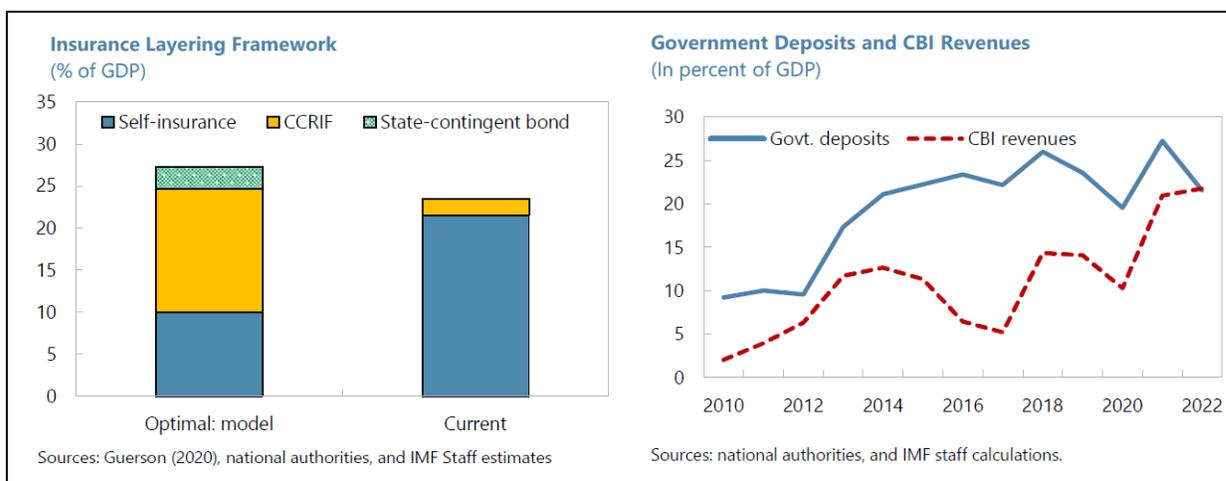
**27. Considering the large economic impact and high costs of insurance, Guerson (2020) outlined an optimal layering financing framework for a ND-prone country.<sup>10</sup>**

- **Model.** The paper uses Monte Carlo simulations to project output, fiscal revenue and spendings affected by ND shocks. ND shocks are identified as the tail of the distribution of fiscal deterioration after controlling for other major shocks in a country specific unrestricted Vector Auto-regression Model. Public debt dynamics are determined by simulations incorporating the below-the-line Saving Fund (SF) transactions that depend on the occurrence of NDs. For instance, the budget contributes to the SF in years with no ND (i.e., “inflows”) and use available SF in years with ND (i.e., “outflows”). The model incorporates the country specific annual probability of occurrence of ND, and the annual budgetary contribution is calibrated to achieve low probability of SF depletion given the initial level of the SF.
- **Layering Financing Options.** The analysis introduces three layers of financing options — Saving Funds (SF), CCRIF, and contingent bond issuance—to illustrate an optimal size of disaster insurance framework. The SFs provides the first line of financing option (Layer 1). The SFs size and annual budgetary contribution to the SFs are calibrated to cover fiscal costs in 95 percent of simulated NDs. Then, CCRIF (Layer 2) and the issuance of contingency bond (Layer 3) will cover fiscal costs reaching the 99 percent coverage target from simulated NDs. The idea is to have the most costly instruments providing financing needs for severe and extreme events, where SFs are insufficient to cover the costs (barring unrealistically large SFs).

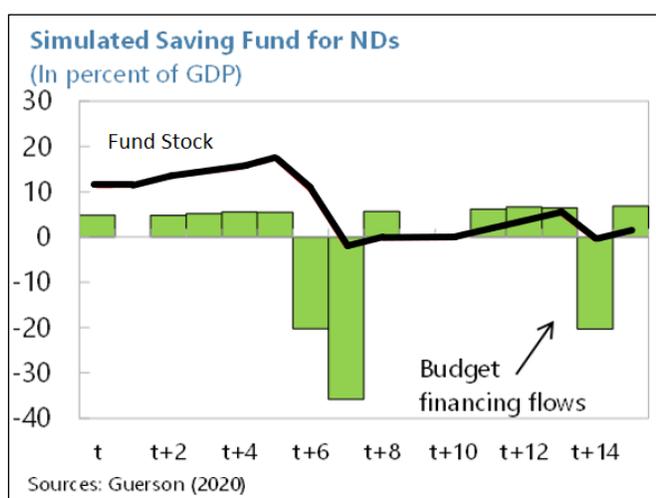
**28. In the case of St. Kitts and Nevis, model simulations suggest that a layered insurance of 27 percent of GDP would cover the fiscal costs in 99 percent of ND events.** The estimation is based on a low level of resilient investment most relevant in the current context.

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<sup>10</sup> See IMF working paper series No. 20/266 for a technical presentation of the methodology.



- Layer 1. Saving funds.** The simulation suggests 10 percent of GDP as an optimal level of SFs stock with an annual fiscal cost of 0.3 percent of GDP. Under this scenario, the country is calibrated to contribute 1.9 percent of GDP to SFs in a year without NDs and uses 4.8 percent of GDP in case of NDs to cover an estimated average fiscal cost of 19.3 percent of GDP. The model aims to achieve financial sustainability of SFs with a low probability of depletion (at 7



percent). In reality, the government deposits are much higher—at 22 percent of GDP in 2022—reflecting the windfall from CBI revenue and prudent government policy. However, the government deposits can be used for other policy and no specific amount has been earmarked for ND events. For instance, government used its deposit to finance emergency spending during the pandemic and a substantial land buyback in 2022.

- Layer 2. Caribbean Catastrophe Risk Insurance Facility (CCRIF).** The country has access to the regional insurance facility, incurring an annual fiscal cost of 0.05 percent of GDP. The main benefit of CCRIF is related to quick financing availability. Under the current policy, St. Kitts and Nevis has the maximum coverage of close to 2 percent of GDP from earthquakes, tropical cyclones, and rainfalls. However, thus far, the historical payout from ND has been small—only 0.1 percent of GDP per ND event. CCRIF payouts are driven by parametric triggers, such as wind and rain intensity, as opposed to estimated damage, that often resulted in insufficient payouts per ND to cover fiscal costs (IMF 2022a). The CCRIF is more likely to payout relatively more in extreme ND events because the payouts are not discounted for rare, severe events

and discounted for more frequent, less severe events.<sup>11</sup> Considering the country's large exposure to large ND in the past, the model suggests having a higher coverage from CCRIF, close to 15 percent of GDP, at an annual fiscal cost estimated at 1.1 percent of GDP. Achieving this level may require the government and CCRIF to recalibrate the triggers. The St. Kitts and Nevis authorities have requested technical assistance from the Fund in this area.

- **Layer 3. CAT bond issuance.** The amount of CAT bond issuance presents the remaining coverage to reach 99 percent of NDs, after topping SF and maximizing CCRIF coverage. The simulation assumes that the country issues between US\$10 and 100 million in CAT bonds as needed to reach the 99 percent target. For St. Kitts, to reach 99 percent of coverage of ND costs, the simulation illustrates CAT bond issuance of 2–5 percent of GDP that will incur annual fiscal cost of 0.3 percent of GDP. There is no discussion of CAT bond issuance in St. Kitts and Nevis yet but work is ongoing in the region. St. Vincent and Grenadines enrolled in a contingent credit line with the World Bank in 2020. The World Bank is working on issuing a regional CAT bond for the 2024 hurricane season following the successful issuance in Jamaica.

## F. Policy Implications

**29. The review of regional best practices suggests that further policy actions could be taken to strengthen and address gaps in the area of assessment, adaptation, mitigation, and the identification of funding sources.** Peer countries' climate change strategies discussed in Section B can serve as benchmarks. These could include:

- Designing a multi-layered national strategy that integrates growth and climate resilient strategies.
- Enhancing institutional capacity and building a complete and coherent legal framework supporting climate change mitigation, adaptation, and resilience.
- Developing and maintaining early warning systems and risk maps, including hydrometeorological information.
- Adopting zoning and coding regulations for safe and efficient land use, particularly in vulnerable coastal and high-density areas, involving private through building codes reform.
- Advancing sustainable agriculture practices and related land-use change consistent with efficient land and water use and reduced carbon emissions.

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<sup>11</sup> CCRIF payouts are discounted by a factor of 0.5 for 1/20-year losses and 1 for 1/100-year loss. In other words, for payouts to be ½ of losses, on average, for smaller NDs and to be proportional to the loss for a larger and less frequent NDs. Separately, CCRIF insurance multipliers, defined as the ratio of the cost of premia and expected payouts, are around 2, and higher for extreme events.

- Adopting nationwide vegetation management planning to support balanced economic development and sectoral plans.

**30. Regarding fiscal policy for resilience building and climate change adaption, priority should be set on building adequate fiscal buffers and optimizing their allocation.**

- **The country would benefit from the development of a comprehensive fiscal policy framework inclusive of climate mitigation and adaptation.** The framework would include key elements discussed above: (1) an enhanced multi-layered insurance framework and (2) substantial investment in resilience. The framework could be supplemented by a well-balanced policy strategy to increase public investment and enhance growth, to build up buffers, and lower gross debt.
- A **Disaster Layered Insurance Framework** would protect government finances from ND shocks and would accelerate economic recovery after each event.<sup>12</sup> The government should strengthen insurance coverage with a layered framework to secure immediate financing after NDs and minimize scarring. The insurance model's results show that the required insurance coverage (around 20.5 percent of GDP in total) is smaller than the current "self-insurance" coverage (up to 27 percent of GDP in total).
  - **The level of layered choice could be recalibrated to achieve an efficient cost-minimizing framework.** The coverage size and choice should first reflect the countries' preference towards risk aversion, fiscal space, capacity constraints, and other idiosyncratic considerations (IMF, 2019). The country could also review and recalibrate CCRIF's attachment point ("deductible") and coverage limit to ensure payouts are triggered with severe and less frequent ND events that are insufficient to cover with the SFs. The issuance of state-contingent debt instrument (e.g., CAT bond) would be beneficial only if the cost of issuing these bonds is significantly smaller than observed (Guerson 2020).<sup>13</sup>

**31. The models confirm that fiscal prudence and additional fiscal savings will be of the essence to fully implement these strategies.** Fiscal restraint, usually achieved with the adoption of fiscal rules, would be needed over the medium- and long-term. Specifically, one key source of revenue—CBI proceeds—could be partially earmarked for the climate strategies above.

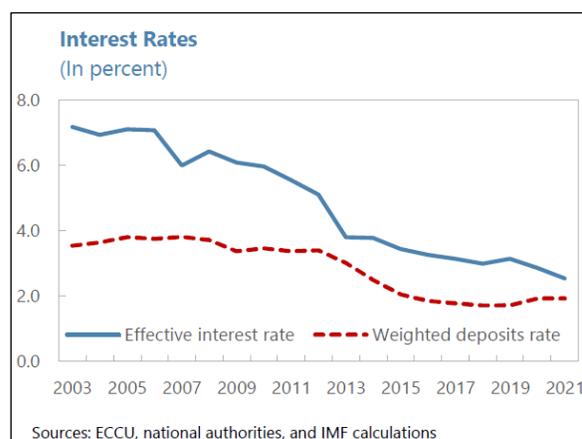
**32. Low debt levels would serve as a useful buffer.** If fiscal restraint is exercised, as in the past, over the short- and medium-term, St. Kitts and Nevis's gross debt ratio is projected to fall below the regional target of 60 percent of GDP while maintaining stable deposits. Hence, the wedge between the 60 percent of GDP and the projected debt ratio of 51 percent of GDP in

<sup>12</sup> See IMF Country report (St. Lucia 2022 Article IV—not yet published) and (St. Vincent and the Grenadines—not yet published).

<sup>13</sup> The WB is currently working towards to issue regional CAT bond for the 2024 hurricane season.

2028 could be viewed as part of the buffers available for the climate strategies, namely, the SF layer, together with deposits.

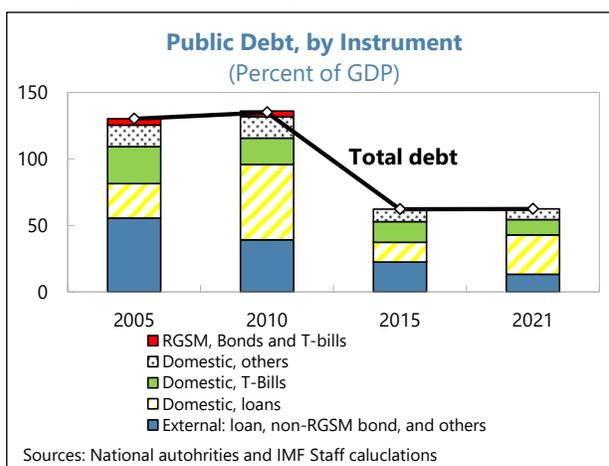
**33. The optimal combination of gross debt and deposits should take into consideration the net costs and the volatility of the economy.** The government choice to build buffers should strike an appropriate balance between accumulating deposits and paying down debt. Deposits provide immediate liquidity needs after NDs. Yet accumulating deposits rather than paying debt could be costly because the interest on debt is higher than that on deposits.<sup>14</sup> An IMF TA report (IMF, 2018) suggests that 40 percent of GDP is an appropriate safe debt anchor for St. Kitts and Nevis. Based on the inherent volatility of the country's economy, this debt anchor provides sufficient buffers to sustain adverse shocks over the years and would allow the country to remain below the ECCU debt ceiling of 60 percent of GDP with a 95 percent probability.



**34. A sovereign wealth fund (SWF) with three objectives—standard wealth accumulation, ND preparedness, and investment in resilience—would be desirable (IMF, 2018).** A SWF would benefit the country in several respects. First, it would help formalize and financially secure its ND and climate adaptation strategy by allocating government savings specifically for these purposes. Second, earmarking a portion of CBI revenue to the SWF would improve transparency on the channeling and use of CBI inflows and help redistribute CBI revenue across generations. Third, the transfer of government deposits from the National Bank to a SWF with proper risk management and external advisors would improve governance, reduce the investment risk, potentially raise income to the government in a sustainable manner, and diminish the bank-sovereign nexus. Allocating a large portion of CBI—especially in the early years—would be optimal. An increased CCRIF coverage against ND early on would help protect the economy and preserve fiscal resources. Front-loaded investment in resilience would gradually reduce the need for expanded insurance coverage, entailing savings from reduced insurance premiums. Going forward, the gains in the SWF's value and the upside potential of CBI (if realized) would be used for further investment in resilience and for protection against other shocks.

<sup>14</sup> One can consider the sustainability of net debt based on the net  $r-g$ , which simplifies to the net  $r$  or the net nominal interest rate =  $\text{Interest}_G \cdot G / (G+D) - \text{Interest}_D \cdot D / (G+D)$ , where  $\text{Interest}_G$  is the interest paid on gross debt,  $\text{Interest}_D$  is the interest earned on deposits,  $G$  is gross debt, and  $D$  is deposits. The larger the difference between  $\text{Interest}_G$  and  $\text{Interest}_D$ , the better off the government is by paying down gross debt instead of accumulating deposits. To boost  $\text{Interest}_D$ , the country could consider investing cash into non-cash liquid assets with proper risk assessment and portfolio management.

**35. More frequent recourse to the regional government securities market (RGSM) may be a worthwhile option.** The benefits of developing the local currency bond market (LCBM) are well recognized in the literature.<sup>15</sup> A well-functioning LCBM could be a reliable, and often scalable, source of medium- to long-term government financing with attractive cost and risk characteristics that reduce vulnerabilities.<sup>16</sup> In the context of ND preparedness, access to the RGSM is highly desirable, because a severe ND could deplete existing buffers and the government would need to raise debt quickly. In the absence of market access during “the good times,” it would be nearly impossible to gain market access in the aftermath of a ND. St. Kitts and Nevis has not tapped the RGSM for T-bills and T-bonds for about 10 and 20 years, respectively. Instead, the country has mainly relied on domestic loans. Tapping into the international market for concessional lending with long-term maturities (e.g., blue bonds) would open opportunities to finance required investment in resilience with lower costs.



<sup>15</sup> See, for example, IMF, World Bank (2021).

<sup>16</sup> With shorter tenors, such as bills, there are still benefits, as these instruments assist the government in managing within-year timing mismatches between cash inflows and cash outflows, even if the financing requirement for the entire year is low. There are benefits for the wider capital market too, as the LCBM provides an anchor for pricing and managing risk and stimulating issuance by private sector firms.

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## Annex I. Economic Impact of Large Natural Disasters

**Table 1. Estimated Tropical Cyclone Damages, 1950–2021**

Date	Hurricane/ Tropical Storm	Damage (percent of GDP) 1/	Date	Hurricane/ Tropical Storm	Damage (percent of GDP) 1/
Aug-1950	Hurricane Baker	156.9	Sep-1995	Hurricane Luis	67.8
Sep-1950	Hurricane Dog	256.5	Sep-1995	Hurricane Marilyn	19.4
Sep-1953			Jul-1996	Hurricane Bertha	18.5
Jan-1954			Sep-1998	Hurricane Georges	220.5
Jan-1955	Tropical Alice	94.2	Oct-1999	Hurricane Jose	20.3
Aug-1956	Hurricane Betsy	92.6	Nov-2000	Hurricane Lenny	10.7
Aug-1959			Aug-2000	Hurricane Debby	11.2
Sep-1960	Hurricane Donna	287.8	Sep-2004	Tropical Storm Jeanne	
Oct-1963			Dec-2007	Hurricane Olga	
Sep-1966	Hurricane Inez	121.7	Oct-2008	Hurricane Omar	
Jul-1979			Sep-2009	Hurricane Erika	
Sep-1979			Aug-2010	Hurricane Earl	
Sep-1981			Sep-2010	Hurricane Igor	
Nov-1984	Hurricane Klaus	10.3	Aug-2011	Tropical Storm Emily	
Sep-1989	Hurricane Hugo	25.4	Oct-2012	Hurricane Rafael	
Aug-1989	Hurricane Gustav	4.1	Oct-2014	Hurricane Gonzolo	

Source: Acevedo (2016). "Gone with the Wind: Estimating Hurricane and Climate Change Costs in the Caribbean", Table 7; UNFCCC (2015).

1/ Wherever available, damages were either from the actual costs from EM-DAT or estimated from the Acevedo (2016).