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A photograph of a young Black man with short dreadlocks, wearing a white long-sleeved shirt and blue jeans, kneeling on a brick-paved surface. He is plugging a black charging cable into the front of a white electric car. The car's charging port is open, and the cable is being inserted. In the background, another white car is parked, and a person in a red shirt is partially visible. A large purple diagonal banner covers the bottom right portion of the image, containing the title text.

A green economic growth model for Jamaica: Scenarios for fostering green growth

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Quality control supervisor on construction site © Siyavuya Pato/peopleimages.com, Adobe Stock Images

► List of abbreviations and acronyms

CE	Cambridge Econometrics
E3	energy-environment-economy
FRAMES	Framework for Modelling Economies and Sustainability
GDP	Gross domestic product
GVA	Gross value added
JM\$	Jamaica dollar
IEA	International Energy Agency
ILO	International Labour Organization
IMF	International Monetary Fund
ISCO	International Standard Classification of Occupations
IRP	Integrated Resource Plan
LFS	Labour Force Survey
LNG	Liquified Natural Gas
MEM	Ministry of Energy and Mining
NDC	Nationally Determined Contribution
PVC	Photovoltaic cells
US\$	United States dollars

Working on a wind turbine farm for fostering green growth



► Acknowledgements

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ILO is spearheading a global Just Transition agenda through the Climate Action for Jobs Initiative. The Paris Agreement on Climate Change, adopted in 2015, acknowledges the imperatives of a just transition and the creation of decent jobs in a response to climate change. In the same year, ILO constituents adopted Guidelines for a just transition towards environmentally sustainable economies and societies for all.

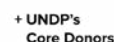
Pledge to Impact

This product was developed under UNDP's Climate Promise by the Pledge to Impact Programme. Delivered in collaboration with a wide variety of partners, the initiative has supported over 120 countries to enhance and implement Nationally Determined Contributions (NDCs) under the Paris Agreement. From Pledge to Impact is generously supported by the governments of Germany, Japan, United Kingdom, Sweden, Belgium, Spain, Iceland, the Netherlands, Portugal and other UNDP core contributors. This programme underpins UNDP's contribution to the NDC Partnership.

Authors and Contributors

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CLIMATE
PROMISE





Hydroponics farmers doing quality control inspection © DC Studio, Adobe Stock Images

► Glossary

Nationally determined contributions embody efforts by each country to reduce national emissions and adapt to the impacts of climate change as required under the [Paris Agreement](#) (Article 4, paragraph 2).

Primary sector represents the economic sectors involved in agriculture, forestry, fisheries and extracting natural resources.

Secondary sector represents the economic sectors involved in manufacturing, construction and utilities.

Tertiary sector represents the economic sectors involved in the provision of public and private services such as retail, transportation and distribution, accommodation, and health care and education etc.



► Executive summary

Jamaica's vision is to achieve developed country status by 2030. The key question is how to achieve this objective. While there is broad agreement that this requires the expansion and diversification of the economy, there are divergent views whether to pursue a business-as-usual development model based on oil and gas, or to accelerate the restructuring of the economy towards green growth and climate resilience.

The argument for a push to a green growth model is because Jamaica's economy is critically dependent on fossil fuel energy imports and highly vulnerable to climatic shocks in agriculture and tourism. These sectors are key to economic growth and job creation while highly impacted by climate change. Agriculture and tourism are most important for household income and jobs. They account for more than half of the jobs and are particularly vulnerable to climate extremes. The energy sector is key to economic growth but is a huge burden for the Government's budget and the trade balance as 100 per cent of fossil fuels are imported. Notably, imported oil and gas are needed to meet the national demand in transport and electricity generation which is a drain on Government and private resources.

It is in this context that this study sets out to assess the social, employment and economic impacts of a business-as-usual growth scenario and compare it with a green growth scenario.

Results from the model scenarios show that an accelerated transition towards a green and climate resilient economy is highly positive for job creation, social development and economic growth.

Net GDP impacts of the Green Growth scenario are close to 1 per cent above the business-as-usual scenario. The results are driven by three major strategies to foster green growth, namely:

1. An increase in investments into skills for green jobs training (3 billion JM\$);
2. An increase in green-tech capital expenditures (12 billion JM\$); and
3. A decrease of transport fuel cost by electrifying vehicles (14 billion JM\$).

In turn, job creation is highly positive, while macro-economic indicators improve significantly in terms of the trade balance, growth of the domestic economy, green technology adoption, knowledge acquisition and human capital development.

Some 7,500 net new jobs can be created, which is some 0.6 per cent greater than in the baseline scenario. Increased disposable income and consumption among households further drive the growth in service sectors, consequently increasing the demand for employment. This is reflected by additional jobs compared to the baseline in hotels and restaurants, wholesale and retail trade, real estate, renting and business activities and other services sector.

The structural change induced by the Green Growth scenario shifts in the occupational structure of the economy. Most of the jobs will be needed in the service sector and services-related occupations. Service and sales workers and clerical support workers would have added 3,500 employees to their ranks, accounting for almost half of the total employment increase when compared to the baseline.

The restructuring of the economy also leads to shifts in female employment. Traditionally, jobs held by males dominate sectors like construction, mining and quarrying and agriculture. Conversely, jobs held by women can be found in services sectors. Therefore, in the Green Growth scenario, more jobs

held by women are created than in the baseline scenario, notably in sectors like wholesale and retail trade, hotels and restaurants, real estate, renting and business activities and producers of Government services, which account for some 90 per cent of the total employment increase. The same is true for youth who also have a higher propensity to seek employment in service sector related jobs. It follows that the benefits of employment expansion in the green growth scenario accrue more to the young and female workers.

It is also important to note is that the social impact of the Green Growth scenario is positive. Increased disposable income among households accrues due to the switching of consumption from sectors reliant on expensive imported transport fuel. Household's savings are spent on cheaper national goods and services which has a positive induced effect on the economy. For example, households would substitute away from fossil fuel powered modes of transport towards electric vehicles in the Green Growth scenario. As a result, by 2037, the total household final consumption is 4.8 billion JM\$ (0.2 per cent) higher than the baseline level.

1. Introduction

The Government of Jamaica has made considerable efforts to improve the fiscal stability and socio-economic status of the country over the last decade. Climate shocks pose a considerable challenge to some of its key sectors such as tourism and agriculture, threatening to undermine progress made on improving food security and poverty reduction. Yet transport and industry in Jamaica remain heavily reliant on non-renewable resources like oil, to meet their energy requirements. As per the International Energy Agency (IEA), oil products account for close to 69 per cent of the total energy supply as of 2022¹.

Along with the ongoing work on debt reduction and fiscal consolidation, the Government of Jamaica has put several strategies in place to enhance its resilience to climate change by focusing on Green Growth. In accordance with the 2015 Paris Agreement, Jamaica released its first Nationally Determined Contribution (NDC)² report in 2017³, and an updated version in 2020⁴. The NDC details several strategies to reach the stated emission targets by 2030, including but not limited to transport electrification and emissions reduction in the forestry sector.

The report assesses the economic and employment implications of two policy scenarios aimed at promoting green and sustainable economy, in line with the medium-term goals set by Jamaican authorities. The FRAMES model⁵, developed by Cambridge Econometrics (CE), has been used to carry out the analysis. The model assesses the probable future economic pathways in the Jamaican economy, focusing on the sectoral economic structure, and the occupational distribution of the labour market. Further details of the model can be seen in Appendix A.

The analysis involves two scenarios. Firstly, the 'Baseline' scenario serves as the reference or business-as-usual, against which scenarios will be compared. The 'Baseline' reflects policies currently implemented and forecasted economic growth rates. Secondly, the 'Green Growth' scenario includes additional policies, specifically in the implementation of the 2020 NDC and the 2020 Integrated Resource Plan⁶. The results from the Green Growth scenario are compared to the baseline results. The employment by occupation draws on the Jamaican Labour Force Survey (LFS) data.

The structure of the report is as follows: Chapter 2 describes the data used and presents an overview of the baseline and scenario assumptions. Chapter 3 presents the socio-economic impacts of the Green Growth scenario; and Chapter 4 provides conclusions on the results.

1 <https://www.iea.org/countries/jamaica/oil>

2 <https://unfccc.int/process-and-meetings/the-paris-agreement/nationally-determined-contributions-ndcs>

3 https://cdn.climatepolicyradar.org/navigator/JAM/1900/jamaica-first-ndc-archived_83590e2551035c3b10ca1fc-d62a63932.pdf

4 <https://unfccc.int/sites/default/files/NDC/2022-06/Updated%20NDC%20Jamaica%20-%20ICTU%20Guidance.pdf>

5 <https://www.camecon.com/how/frames/>

6 <https://www.mset.gov.jm/wp-content/uploads/2020/03/2018-Jamaica-Integrated-Resource-Feb-21-2020.pdf>



2. Scenario assumptions

2.1 Introduction

This chapter outlines the methodology used to produce the scenario analysis. Description of the economic and employment data is provided, and assumptions for baseline and scenarios are explained. The section on baseline includes tables on business-as-usual economic and employment indicators, including the gender and age distributions, up to the year 2037.

The time horizon for the modelling is 2037. Whilst the time horizon of the NDC is 2030, there is additional insight to modelling a Green Growth scenario over a longer period. The year 2037 is chosen because the 2022 Integrated Resource Plan provides assumptions for the power generation sector up to 2037.

2.2 Data sources

2.2.1 Economic data

Table 1 represents a summary of the main economic data used throughout the modelling exercise. Historical and forecasted economic data used in the model use data from official Jamaican sources where possible.

► Table 1: Summary of the economic data sources

Variable / Subject	Source	Time
Input-output table	Statistical Institute of Jamaica	2007
GDP & expenditure components	Statistical Institute of Jamaica	1993 – 2019
GDP & expenditure components	World Bank	2000 – 2022
Gross value added by sector, annual	Statistical Institute of Jamaica	1993 – 2019
Gross value added by sector, quarterly	Statistical Institute of Jamaica	2007 – 2023
Gross value added by aggregate sector	World Bank	2000 – 2022
Employed labour force by industry group & sex	Statistical Institute of Jamaica	2019 – 2022
Wages by sector	Statistical Institute of Jamaica	1993 – 2019
Employment (by industry, age, & gender)	ILO microdata on the LFS of Jamaica	2022
GDP forecast	IMF, CE extrapolation	- 2028, - 2037
Population historical and forecast	United Nations World Population Prospects 2022	- 2050

2.2.2 Employment data

The sectoral employment data was based on the data from the Statistical Institute of Jamaica using data which was collected prior to the 2024 revisions to the LFS.

The 2022 LFS microdata is the basis for the following employment series used in the scenario analysis:

- By major groups of the International Standard Classification of Occupations (ISCO-08)⁷.
- By age groups: 15-24, 25-34, 35-44, 45-54, 55-64 and 65+.
- By gender: male and female.

The analysis assumes that the occupation, age and gender distributions within sectors will remain at their 2022 levels over time.

For further details of the sectoral and occupational disaggregation please refer to the Appendix B - Employment classifications.

2.3 Baseline assumptions

The baseline projections for the Jamaican economy are summarized in Table 2. The baseline GDP is assumed to increase by 28 per cent between 2022 and 2037. A part of the expenditure on investment leaks abroad is mirrored in greater imports of capital equipment necessary for the green transition such as wind turbines, solar PVs, other transport infrastructure and so on. As a result, over the 15-year period beginning from 2022, import growth is 3 percentage points higher than GDP growth. The remaining components of GDP are assumed to grow in line with the GDP growth over the period.

► **Table 2: Baseline - Economic indicators (millions 2023 JM\$)**

GDP and its components, m JM\$ (2023)	2022	2027	2032	2037	Total growth, 2022-37
GDP	2,901,995	3,169,594	3,431,406	3,714,845	28%
Total household final consumption	2,049,978	2,239,011	2,423,956	2,624,178	28%
Total Government final consumption	398,572	435,326	471,284	510,213	28%
Total investment	659,817	720,660	780,188	844,632	28%
Total exports	1,137,454	1,242,341	1,344,960	1,456,056	28%
Total imports	1,496,818	1,667,332	1,805,055	1,954,155	31%

Source(s): Cambridge Econometrics based on official sources.

Total employment is expected to increase by 5 per cent from 2022-2035. The wholesale and retail trade sector accounts for approximately one fifth of total employment. This sector, along with agriculture, Government services and real estate, renting and business activities represent 58 per cent of the total employment in the country. As can be seen in Table 3, the distribution of employment by sector is assumed to remain unchanged over the forecast years in the baseline.

► **Table 3: Baseline - Employment by broad sector (thousands)**

Sector name	2022	2027	2032	2037
Total	1,257.1	1,333	1,337.3	1,324.1
Agriculture, forestry & fishing	189.9	185.3	185.9	184.1
Mining & quarrying	3	4.3	4.3	4.2
Manufacture	80.4	82.4	82.6	81.8
Electricity & water supply	9.2	8.6	8.7	8.6
Construction	125.8	135.7	136.1	134.8
Wholesale & retail trade; repairs	245.4	253.7	254.5	252
Hotels & restaurants	98.2	113.1	113.5	112.4
Transport, storage & communication	71.1	72.6	72.8	72.1
Finance & insurance services	28.7	31.4	31.5	31.2
Real estate, renting & business activities	126.6	143.8	144.3	142.8
Producers of Government services	165	184	184.6	182.8
Other services	113.8	118.1	118.5	117.3

Source(s): Cambridge Econometrics.

Table 4 shows the employment distribution by broad occupations (major groups in ISCO-08). The distribution of occupations in sectors is assumed to remain the same up to 2037. Over a fifth of the people employed in Jamaica are service and sales workers. Skilled agricultural, forestry and fishery workers comprise 15 per cent of total employment, followed by craft and related trades workers at 13 per cent. This is consistent with the high share of employment in the sectors of wholesale and retail trade, and agriculture in the year 2022.

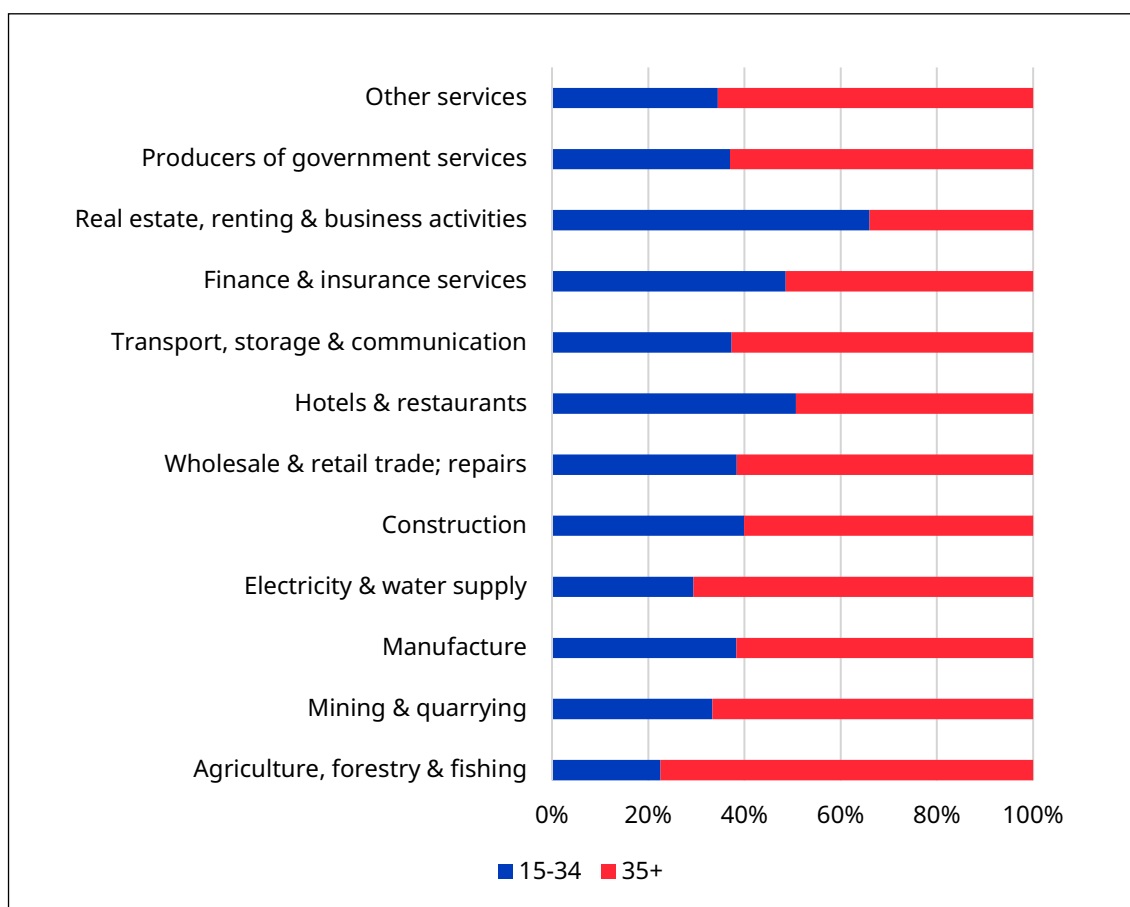
► **Table 4: Baseline employment by broad occupations (thousands)**

Occupations	2022	2027	2032	2037	% of total, 2022
1. Managers	100.6	107.7	108.1	107	8%
2. Professionals	107.6	118.2	118.5	117.4	9%
3. Technicians and associate professionals	73.1	80.1	80.4	79.6	6%
4. Clerical support workers	121.2	133.7	134.1	132.8	10%
5. Service and sales workers	283.9	305	306.1	303	23%
6. Skilled agricultural, forestry and fishery workers	186.1	182.7	183.3	181.4	15%
7. Craft and related trades workers	158.2	166.9	167.5	165.8	13%
8. Plant and machine operators, and assemblers	66.3	68.7	69	68.3	5%
9. Elementary occupations	154.7	163.8	164.3	162.7	12%

Source(s): Cambridge Econometrics

Figure 1 represents distribution of employment by sector and age in 2022. In Jamaica, close to 40 per cent of total employment is held by workers aged 15 and 34 years. In 2023, all sectors are characterized by a higher share of workers aged 35 and over, with one exception. In real estate, renting and business activities sector, close to 65 per cent of total employees were aged between 15 and 34 years. The hotels and restaurants sector employed an equal number of individuals from both age cohorts. As no assumptions were made on the change in the distribution of age by sector over the forecast period, these patterns are mirrored in 2037 as well.

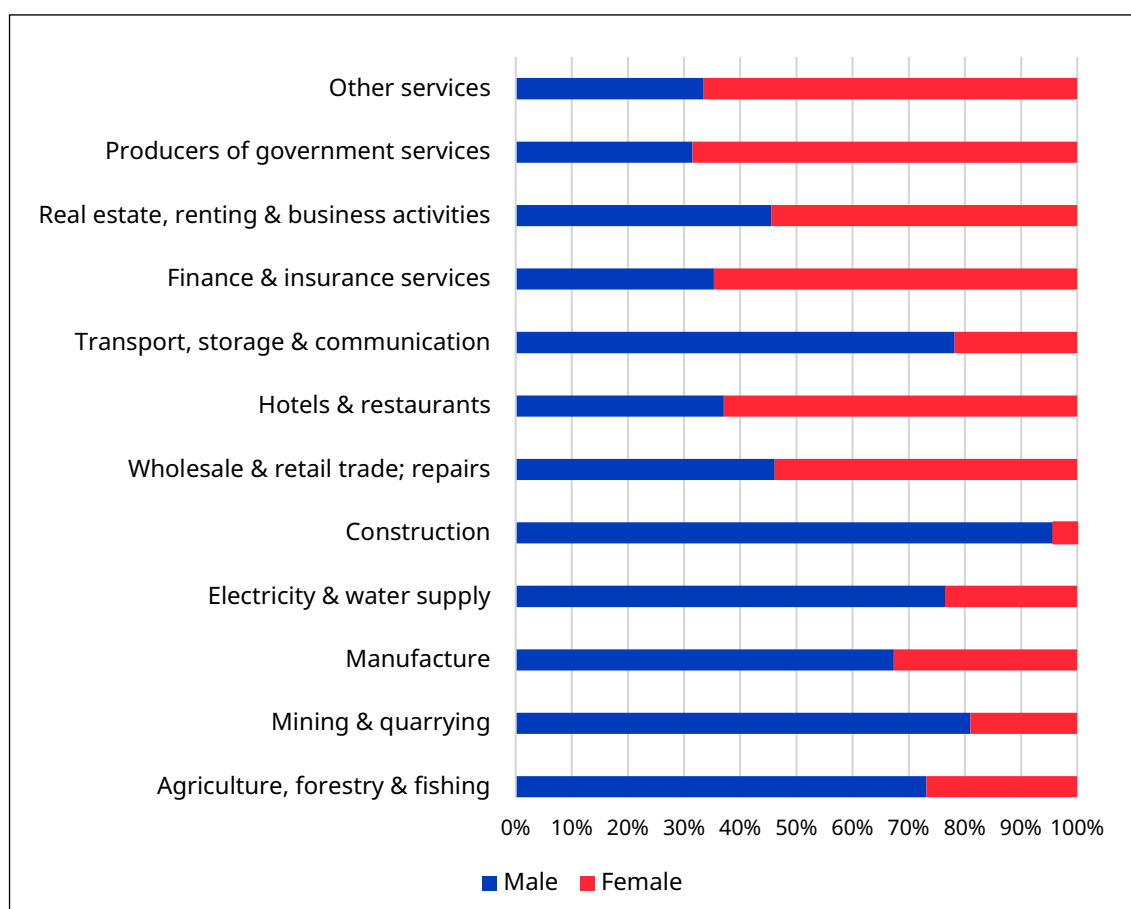
► **Figure 1: Baseline – Employment distribution by age and sector in 2022**



Source: Cambridge Econometrics.

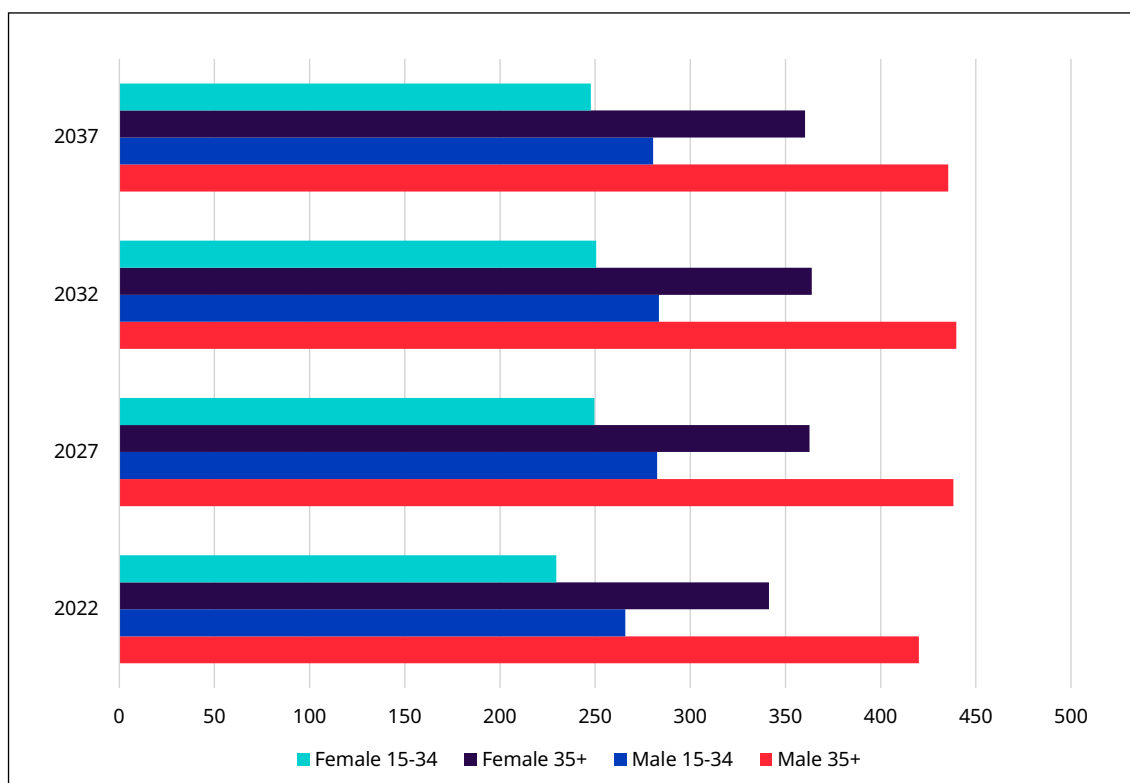
Figure 2 represents distribution of employment by gender and sector in 2022. As with age, it is assumed that the gender distribution in each sector remains the same over the years up to 2037. In Jamaica, primary sectors like construction, mining and quarrying, agriculture, etc., are heavily dominated by males. On the other hand, female employment rates are high in the service sectors like finance and insurance activities and in real estate, renting and business activities. Females are expected to account for 46 per cent of employment in 2037.

► Figure 2: Baseline - Employment distribution by gender and sector in 2022



Source: Cambridge Econometrics.

Using the assumptions on the distribution by age and gender in economic sectors from Figures 1 and 2, Figure 3 shows the employment by age and gender under the baseline scenario until 2037. Following the past trends, female participation in employment is at lower rates in the labour market when compared to their male counterparts.

► **Figure 3: Baseline - Employment distribution by age and gender (thousands) by 2037**

Source: Cambridge Econometrics.

2.4 Scenario assumptions – Green Growth

The Green Growth scenarios assumes that Jamaica will reach the targets under the Paris Agreement by 2037, based on the implementation of the policies mentioned in the following key technical and policy documents:

- Ministry of Energy and Mining (MEM) (2009), Jamaica's National Energy Policy 2009-2030.
- Government of Jamaica (2015), Intended Nationally Determined Contribution.
- Government of Jamaica (2017), Nationally Determined Contribution.
- Government of Jamaica (2020), Updated Nationally Determined Contribution.
- Ministry of Science, Energy, and Technology (2020), Integrated Resource Plan.
- World Bank, Vivid Economics (2020), Assessment of Jamaica's Climate Change Mitigation Potential and Implications for its Updated NDC - Sectoral Review.
- Inter-American Development Bank (2020), Strategic Framework for Electric Mobility.
- World Bank, Vivid Economics (2021), Jamaica's NDC Implementation Plan.
- World Bank, Vivid Economics (2021), Jamaica's Long-Term Climate Change Strategy.
- Government of Jamaica (2022), Jamaica's Adaptation Communication.
- Ministry of Science, Energy, Telecommunications and Transport (2023), Electric Vehicle Policy.

The assumptions included in the Green Growth scenario are summarized in Table 5.

► **Table 5: Summary of the assumptions in the Green Growth scenario**

Policies	Assumptions
Electric vehicle policy	Reduction in the imports of manufactured fuel, substitution of consumption to other sectors. Assumption of saved fuel expenditure in Inter-American Development Bank (2020). Private investment, household and private sector, in electric vehicle charging infrastructure – assumed to be imported value. Assumption expenditure in Inter-American Development Bank (2020).
Integrated Resource Plan	Investment in power generation capital equipment. Value of investment from Ministry of Science, Energy, and Technology (2020), Integrated Resource Plan. Estimate that capital goods are imported, and a share of construction/installation is met by the Jamaican economy. Across investment, approximately 98% is imported value.
National Forest Management and Conservation Plan (2016 – 2026)	Assumed increase in environmental protection expenditure, reaching 50% higher than 2020 values by 2037. No adjustment in taxation policy – therefore either international grant funded or increase in public deficit.
Investment in labour in the green transition	Training programmes for 10% of the workforce annually. Cost of US\$1650 per worker for manufacturing industries and US\$550 per worker in other sectors. No adjustment in taxation policy – therefore either international grant funded or increase in public deficit.



3. Socio-economic impacts of policy scenario

3.1 Introduction

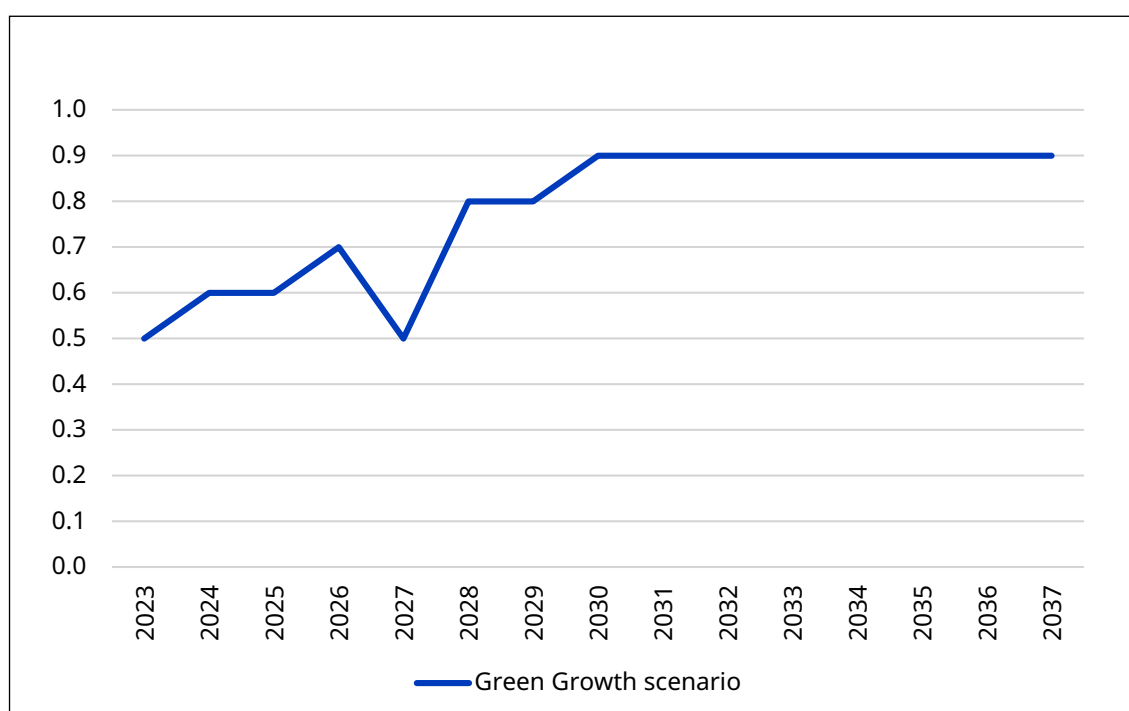
This chapter presents the results of the Green Growth scenario which assumes the implementation of some additional policies such as those stipulated in the Updated 2020 NDC and the Integrated Resource Plan (henceforth, IRP). The results from the Green Growth scenario are compared to the baseline results. Results of economic variables and employment by sector, occupation, gender and age are presented throughout this chapter.

3.2 Green Growth scenario

3.2.1 Economic impacts

The total GDP impacts of the Green Growth scenario are positive throughout the period leading up to 2037. Figure 4 shows the percentage difference to baseline. Jamaican GDP is expected to be 33.7 billion JM\$ (0.9 per cent) higher than in the baseline scenario by 2037.

►Figure 4: Evolution of GDP, % difference from baseline



Source: Cambridge Econometrics.

Whilst net GDP impacts are below 1 per cent, there is substantial variation at the GDP component level. Table 6 details the percentage difference to baseline by component. As the various policies under the IRP and NDC are implemented, the level of investment expenditure increases. By 2037, total investment expenditure is up by 11.7 billion JM\$ (1.4 per cent) compared to the baseline. With the electrification of road transport, the demand for liquid transport fuels decreases, resulting in the decline in total imports by approximately 14.3 billion JM\$ in 2037.

The increase in expenditure on monitoring and implementation of policies, as well as investments in training and skills development is reflected in the gradual increase in Government expenditure over the forecast period. In 2037, the total Government final consumption is 2.8 billion JM\$ (0.6 per cent) higher than the baseline. The impact on household consumption is moderate at the beginning for the projection period, increasing slightly in the years after 2030. This reflects households switching from sectors reliant on liquid fuels to goods produced by sectors with lower propensity to import and the subsequent positive induced effects on the economy. For example, households would substitute away from fossil fuel powered modes of transport towards electric vehicles in the Green Growth scenario. As a result, by 2037, the total household final consumption is 4.8 billion JM\$ (0.2 per cent) higher than the baseline level.

► **Table 6: Impact on GDP and components, % difference from baseline**

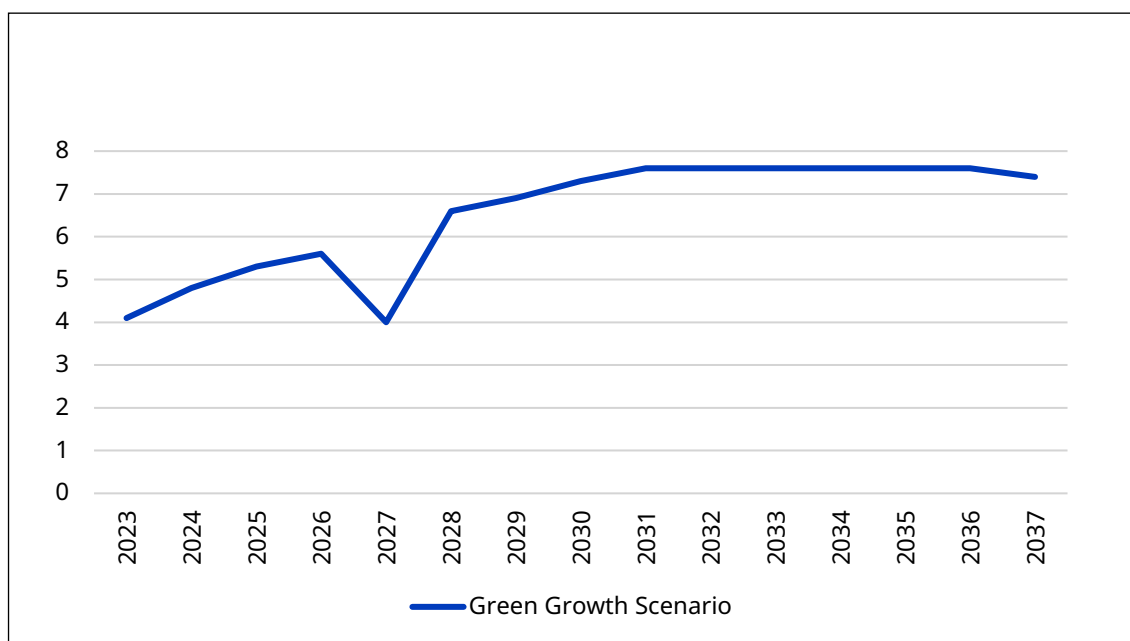
GDP and its components, m JM\$ (2023)	2023	2027	2032	2037
GDP	0.5	0.5	0.9	0.9
Total household final consumption	0.0	0.0	0.2	0.2
Total Government final consumption	0.0	0.2	0.4	0.6
Total investment	0.4	1.6	1.5	1.4
Total exports	0.0	0.0	0.0	0.0
Total imports	-0.7	-0.1	-0.7	-0.7

Source: Cambridge Econometrics.

3.2.2 Employment impacts

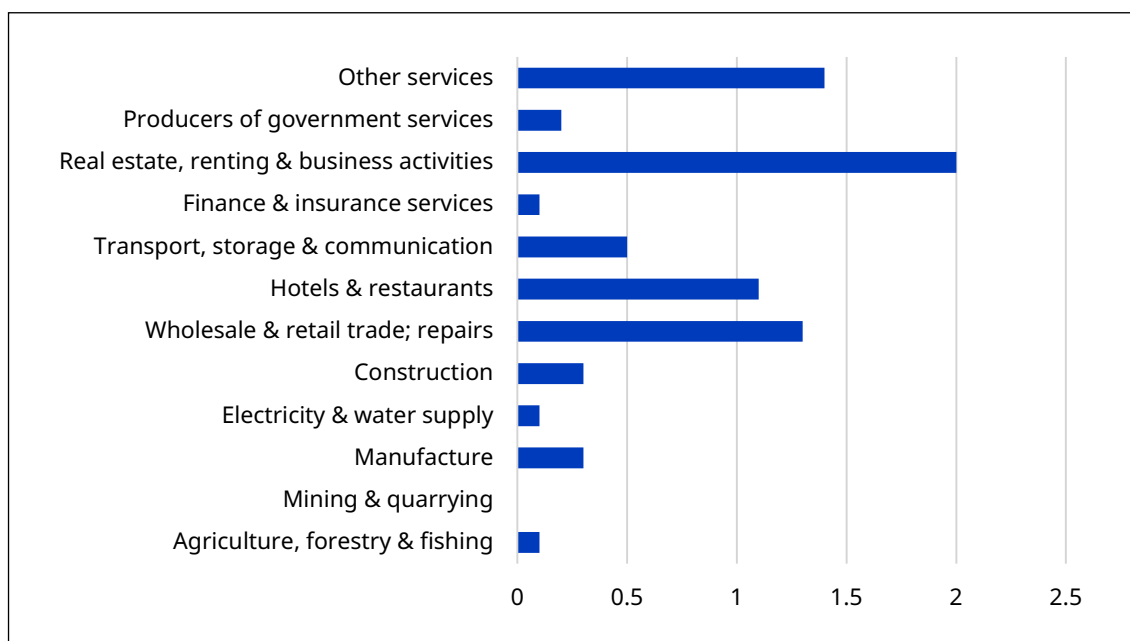
The aggregate employment impacts of the Green Growth scenario are positive. The highest difference to baseline is 7.8 thousand jobs in 2033. As can be observed from Figure 5, by 2037, employment is expected to be 7.5 thousand jobs (0.6 per cent) greater than in the baseline. Figure 6 shows the difference from baseline by sector in 2037, giving insight to the drivers behind scenario employment results. Household consumption increase drives the growth in services sectors, consequently increasing the demand for employment. This is reflected by additional jobs compared to the baseline in hotels and restaurants, wholesale and retail trade, real estate, renting and business activities and other services sector.

► Figure 5: Employment, absolute difference from baseline (thousands)



Source: Cambridge Econometrics.

► Figure 6: Employment by sector, absolute difference from baseline in 2037 (thousands)



Source: Cambridge Econometrics.

The structure of the economy changes in line with the policies that are assumed to be implemented in the Green Growth scenario. The structural change creates, in turn, shifts in the occupational structure of the economy. Table 7 shows the increase in employment by broad occupation categories from 2023-2037.

In the Green Growth scenario, there is moderate employment increase for those working in the primary or secondary sectors of the economy. Most of the expansion in demand comes from the tertiary or service sector driven by increases in consumption and investment in the economy. As a result, while employment grows across the board, services-related occupations experience greater increase in headcount. By 2037, service and sales workers and clerical support workers would have added 3,500 employees to their ranks, accounting for almost half of the total employment increase in the year when compared to the baseline.

► **Table 7: Employment by broad occupation, growth over 2023-2037**

Occupations	Baseline	Green Growth scenario
1. Managers	0.8%	1.1%
2. Professionals	0.9%	1.1%
3. Technicians and associate professionals	0.9%	1.1%
4. Clerical support workers	0.8%	1.2%
5. Service and sales workers	0.9%	1.2%
6. Skilled agricultural, forestry and fishery workers	0.8%	0.9%
7. Craft and related trades workers	0.9%	1.0%
8. Plant and machine operators, and assemblers	0.9%	1.2%
9. Elementary occupations	0.9%	1.1%

Source: Cambridge Econometrics.

The employment demand shifts, between sectors and occupations, lead to different impacts on female employment in the scenarios. As discussed earlier, in Jamaica, jobs held by males dominate sectors like construction, mining and quarrying, agriculture etc. Conversely, jobs held by women can be found in services sectors. Therefore, in the Green Growth Scenario, when the demand moves from construction to services sectors, more jobs held by women are created than in the baseline scenario.

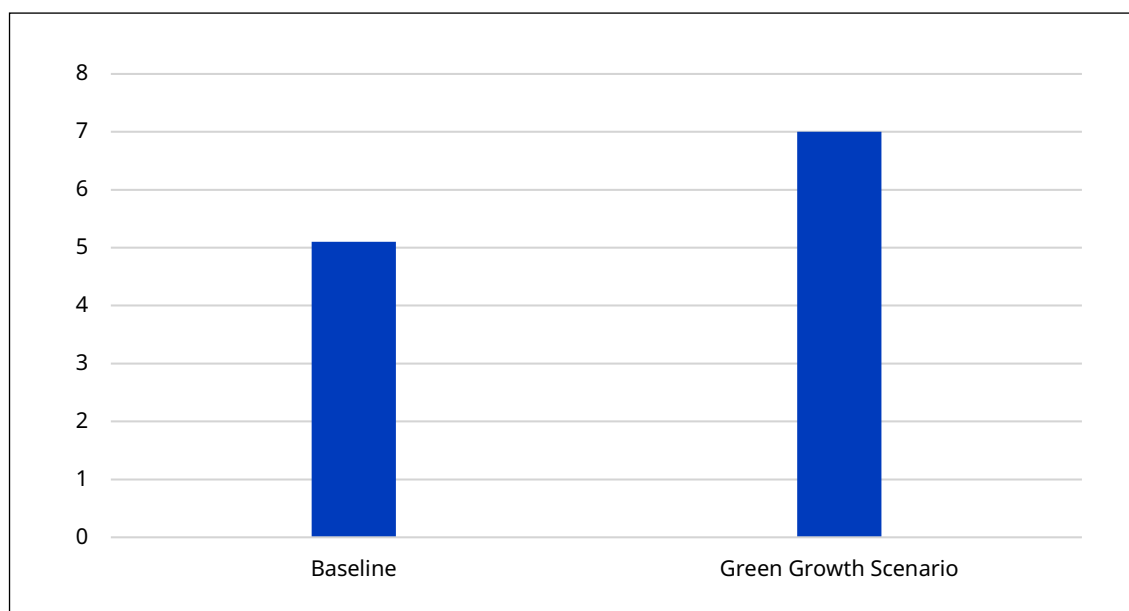
Table 8 shows increase in female jobs during the period 2023-37 by sector while Figure 7 depicts the total employment expansion for female held jobs over the same period.

Increased female employment in sectors like wholesale and retail trade, hotels and restaurants, real estate, renting and business activities and producers of Government services account for almost 88 per cent of the total employment increase in 2037. The expansion of female employment demand represented 48 per cent of the total employment increase in Jamaica in this scenario over 2023-2037.

► **Table 8: Female employment expansion, 2023 - 2037 (thousands)**

Sectors	Baseline	Green Growth scenario
Agriculture, forestry & fishing	0.4	0.5
Mining & quarrying	0	0
Manufacture	0.2	0.3
Electricity & water supply	0	0
Construction	0	0
Wholesale & retail trade; repairs	1.1	1.4
Hotels & restaurants	0.6	0.9
Transport, storage & communication	0.2	0.2
Finance & insurance services	0.1	0.2
Real estate, renting & business activities	0.7	1.2
Producers of Government services	1.1	1.2
Other services	0.7	1.1

Source: Cambridge Econometrics.

► **Figure 7: Total female employment expansion, 2023 - 2037 (thousands)**

Source: Cambridge Econometrics.

Table 9 shows the increase in youth employment demand by sector and scenario. An increase in consumer spending in the Green Growth Scenario results in higher employment demand in the accommodation, retail and Government service sectors like education, etc. The former, along with the real estate, renting and business activities sector has a higher propensity to employ youths in Jamaica. The benefits of

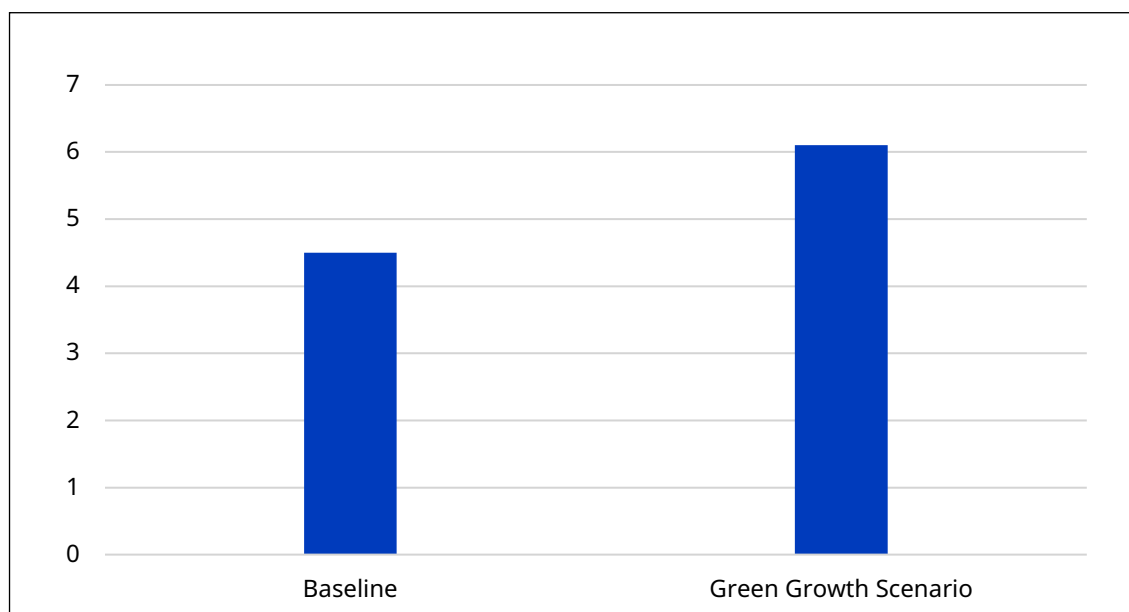
employment expansion accrue more to the younger members of the workforce. Youth employment increases by 6.1 thousand workers in the scenario over 2023-2037, which represents 20 per cent of the total employment increase over the same period.

► **Table 9: Youth employment expansion, 2023 - 2037 (thousands)**

Sectors	Baseline	Green Growth scenario
Agriculture, forestry & fishing	0.3	0.4
Mining & quarrying	0	0
Manufacture	0.3	0.4
Electricity & water supply	0	0
Construction	0.5	0.5
Wholesale & retail trade; repairs	0.8	1
Hotels & restaurants	0.5	0.7
Transport, storage & communication	0.2	0.3
Finance & insurance services	0.1	0.2
Real estate, renting & business activities	0.8	1.4
Producers of government services	0.6	0.6
Other services	0.4	0.6

Source: Cambridge Econometrics.

► **Figure 8: Total youth employment expansion, 2023 - 2037 (thousands)**



Source: Cambridge Econometrics.

4. Conclusions

Cambridge Econometrics modelled two different scenarios to check the socio-economic outcomes of the climate change mitigation policies which are a part of Jamaica's larger commitment to reducing national emissions. The 'Baseline' scenario considers policy which is currently implemented and uses forecasted economic growth rates for Jamaica. Under baseline scenario, the total GDP grows by 28 per cent over the period 2022-37. Employment also increases by over 1,300 new jobs over the same period.

The Green Growth scenario results show that the implementation of additional policy, especially the ones stipulated in the NDC and the IRP, would be beneficial to the Jamaican economy and will promote positive labour market outcomes. Due to overall economic growth, employment is higher by 7,500 than in the baseline by 2037. Moreover, the youth is assumed to benefit the most out of the additional jobs, while female employment grows by 36,300 jobs over the modelled period, as compared to 32,900 in the baseline.

The macroeconomic impact of the Green Growth pathway modelled in this scenario depends on the extent to which domestic industries meet demand. The composition of the domestic economy, and particularly manufacturing, means there is a reliance on imported capital goods, causing investment leakage abroad and limiting domestic economic benefits like job creation and growth. This dependence on imports can strain trade balances and weaken local industry development. International financial support is crucial for a sustainable transition, especially for developing economies such as Jamaica, by easing fiscal burdens, attracting private investment, and fostering local capacity-building. Such support ensures transitions are economically viable, socially inclusive, and environmentally sustainable.

Some of the policies considered in the scenario design have the potential to bring economic growth while reducing import dependency. For example, the electrification of road transport leads to positive macroeconomic impacts given the onshoring of value in the energy supply chain. That is, reduced imports of crude oil and manufactured fuels, substituted to domestically generated electricity. Moreover, onshoring of energy supply also yields positive outcomes in terms of energy security, and insulation from price shocks from the global system. That is, with domestically produced electricity, the effect of oil price fluctuations are less impactful. In the power generation sector, the implementation of the IRP will onshore energy value through reduced imports of Liquefied Natural Gas (LNG). Also, the positive macroeconomic outcomes can be observed regardless of the electrification in personal transport or in the residential, commercial, or industrial sectors.

In developing green policies for Jamaica, the policymakers would decide between mitigation vs adaptation to climate change. The policies explored in this report are focused on mitigation and the benefits of climate mitigation are seen at global level. Adaptation of policy measures provides benefits locally, however financial support for adaptation measures is the scarcest source of development finance (Global Development Policy Center, 2024).

Other ways to improve the economic growth in Jamaica is by reducing the strong induced demand for imported capital goods. There is substantial demand in the baseline (internal combustion vehicles and gas turbine plants) for imported capital goods, but additional demand in the Green Growth scenario (electric vehicles, solar and wind capital equipment and installation) leaks the investment amounts to imports. This is an important difference to the dynamic for many fossil-fuel importing countries, that would benefit more strongly from a transition, because domestic manufacturing receives a boost from the investment, as opposed to imports.

Green Growth also requires specific skills. That is why the scenario assumes that training in green jobs will be performed. This results in a stimulus to the service sector. Given the labour intensity of the tertiary sector, this has a positive impact on job creation in the scenario.

Crucial to the net macroeconomic impact of the scenario is the source of funding for the transition and the extent to which this is provided internationally through loans or through grants / concessionary finance. In the scenario, it is assumed that funds would be provided on a grant basis from international sources, thereby resulting in more positive outcomes. That is, there is an injection of financial resources into Jamaica. Moreover, the repayment of international finance is assumed to be made beyond the time horizon of the modelling scenario, assumption is driving the positive macroeconomic outcomes. More simply, the positive GDP effects in the years to 2037 are debt financed, and the long-term impacts of the debt repayment must be considered by policymakers.

Policy recommendations

The key policy question is how to achieve Jamaica's vision of a developed country status by 2030. Can it be achieved by pursuing a business-as-usual growth model based on fossil fuels? Or are other growth models, such as a Green Growth and climate resilience strategy, better suited to achieve the target?

Based on the findings from this study, it is recommended that policy makers in Jamaica consider a growth model which accelerates the shift towards green industries and green-tech, climate resilience and climate smart and sustainable agriculture, tourism and renewable energy. Such a green growth model is projected to increase household income, thereby alleviate poverty, create jobs and put the economy on a higher and diversified growth path. At the same time, it is making Jamaica more resilient to climate change and external shocks, including climatic extremes and price hikes of fossil fuels.

Key policy areas require particular attention to enable and accelerate the restructuring of the economy and ensure that the transition to a green and climate resilient economy is just.

Social dialogue, informed by evidence from economic, employment and social assessments – such as undertaken by this assessment – are key for social acceptance, cohesion and broad public support of any policy changes. Social protection is central for workers who face job restructuring and for households negatively impacted by the energy transition. Only then will there be broad based support for low-income households and the transition just.

Skills training must be a central part of any transition, starting from primary education to tertiary and university degrees. Technical and vocational training institutions and institutions to train farmers must adopt to green technology and climate smart agriculture practices and the increasing demand for Science Technology and Mathematics (STEM) and green service sector jobs. Curricula must be redesigned. Teachers must be trained to include all aspects of theoretical and practical teaching and learning in climate change, sustainable resource and business management, green-tech, eco-tourism, climate smart and sustainable agriculture, renewable energies and electro mobility. Green enterprise development and green entrepreneurship should be promoted to diversify the economy while workers' rights must be ensured.

Fiscal policy reform is the main driver of the restructuring of the economy. A fiscal neutral and progressive fossil fuel or carbon tax is proposed. The argument behind the proposed progressive scheme is that higher income households are causing most carbon emissions, while low-income households, notably in agriculture and tourism are impacted most severely by climate change. By recycling and redirecting the revenues from richer households to the less well off, inequality will be reduced and poverty alleviated. The progressive tax could be coupled with reduced labour taxes and a just transition fund where revenues from the energy and carbon taxes are collected. The just transition fund would finance skills training, green-tech investment and social protection for workers and households that are negatively impacted. A win-win situation and virtuous cycle will then be created for increased job creation, economic growth and reduced inequality.



► Appendix A: FRAMES description

Cambridge Econometrics (CE) specializes in the development and application of modelling tools, focusing on the energy-environment-economy (E3) domain. CE's main model is E3ME⁸, a global macro econometric model which is widely used for policy assessment, forecasting and research purposes.

CE has developed an E3 modelling tool, the Framework for Modelling Economies and Sustainability (FRAMES). FRAMES is a single-country framework designed to support modelling work for countries where data are limited. The data requirements are substantially less than more complex macroeconomic models, like E3ME. Notably, the framework can be used to provide a model for emerging economies, where data tends to be less detailed and available for shorter periods.

FRAMES is an advanced input-output tool designed to examine the socioeconomic and environmental effects of E3 policies. FRAMES was developed as a simplified, single-economy version of CE's E3ME model, a global macro-econometric simulation model.

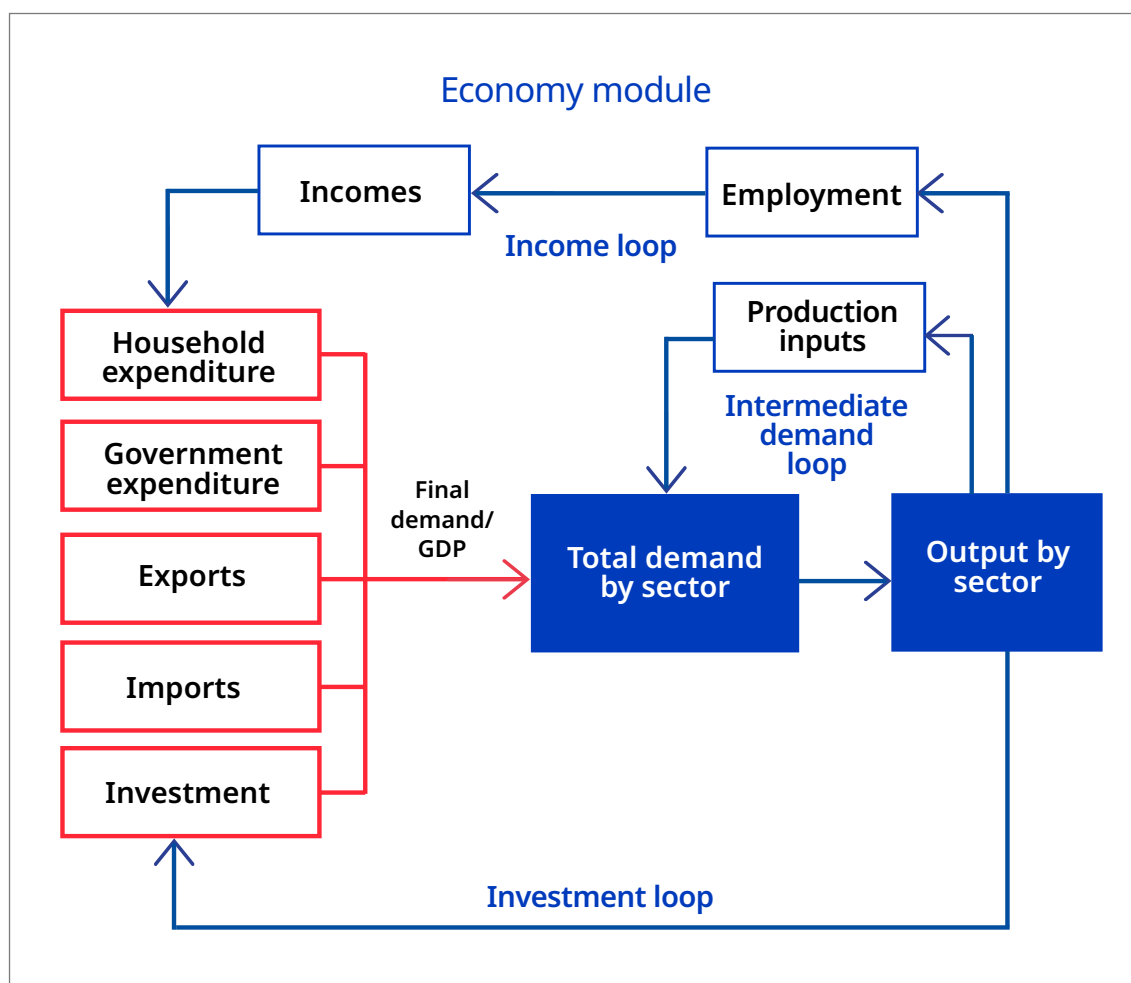
The key features of FRAMES are:

- an economic accounting framework based on the system of national accounts;
- detailed sectoral disaggregation, and a national level input-output table, reflecting the specific structure of the economy; and
- year-by-year annual projections.

Applications of FRAMES are typically as a simulation tool: a 'baseline' projection is assumed and then the results for a scenario are compared against that baseline to estimate the impact of changed assumptions in the scenario. Consequently, many of the equations are expressed directly as 'change from baseline', and only consider the impact of a change in certain explanatory variables, rather than representing a complete explanation of the determination of the endogenous variable.

Figure A.1 details the basic economic structure in the model. At the core of the economic modelling in FRAMES is a national input-output table. Relationships for investment, prices, employment, and trade are modelled using parameters which can be drawn from literature, or a proxy region in E3ME.

► Figure A.1: Economic structure of FRAMES



The results of modelling in FRAMES include:

- GDP and its final expenditure components: household consumption, investment, government consumption, exports, and imports.
- economic variables by sector/product: output, GVA, investment, exports, imports, and employment.

In 2019, FRAMES was used to assess the socioeconomic impacts of environmental tax reform in Bangladesh⁹. The work, completed with Ex'tax, provides evidence of potential co-benefits of environmental policy, namely, positive macroeconomic impacts alongside reduced emissions. In 2020, FRAMES was used in a study for the European Commission (DG Environment), assessing the potential impacts of circular economy policies in Africa.¹⁰ In 2021, FRAMES was used in a study for the World Bank to assess the economic impacts of the adoption of Government eProcurement in Bangladesh.

9 <https://www.camecon.com/news/low-income-countries-benefit-from-carbon-pricing-study-shows/>

10 See final report for the Ghanaian case study: <https://cdn.website-editor.net/1d19b3c8e4ec4cea997a5b973b37c28c/files/uploaded/CE%2520EC%2520Country%2520Report%2520Ghana%2520Published.pdf>.

► Appendix B: Employment classifications

Mapping ILO sectors to 1 digit sector categories as in ISIC Rev 4.

ILO sectors	ISIC Rev 4 (1-digit sector categories)
Agriculture, forestry & fishing	A - Agriculture, forestry and fishing
Mining & quarrying	B - Mining and quarrying
Manufacture	C - Manufacturing
Electricity & water supply	D - Electricity, gas, steam and air conditioning supply
Electricity & water supply	E - Water supply; sewerage, waste management and remediation activities
Construction	F - Construction
Wholesale & retail trade; repairs	G - Wholesale and retail trade; repair of motor vehicles and motorcycles
Hotels & restaurants	I - Accommodation and food service activities
Transport, storage & communication	H - Transportation and storage
Transport, storage & communication	J - Information and communication
Finance & insurance services	K - Financial and insurance activities
Real estate, renting & business activities	L - Real estate activities
Real estate, renting & business activities	M - Professional, scientific and technical activities
Real estate, renting & business activities	N - Administrative and support service activities
Producers of government services	O - Public administration and defence; compulsory social security
Producers of government services	P - Education
Producers of government services	Q - Human health and social work activities
Producers of government services	U - Activities of extraterritorial organizations and bodies
Other services	R - Arts, entertainment and recreation
Other services	S - Other service activities
Other services	T - Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use
Other services	X - Not elsewhere classified

By ISCO, major groups for occupations.

Occupation categories
0 - Armed forces occupations
1 - Managers
2 - Professionals
3 - Technicians and associate professionals
4 - Clerical support workers
5 - Service and sales workers
6 - Skilled agricultural, forestry and fishery workers
7 - Craft and related trades workers
8 - Plant and machine operators, and assemblers
9 - Elementary occupations
X - Not elsewhere classified

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