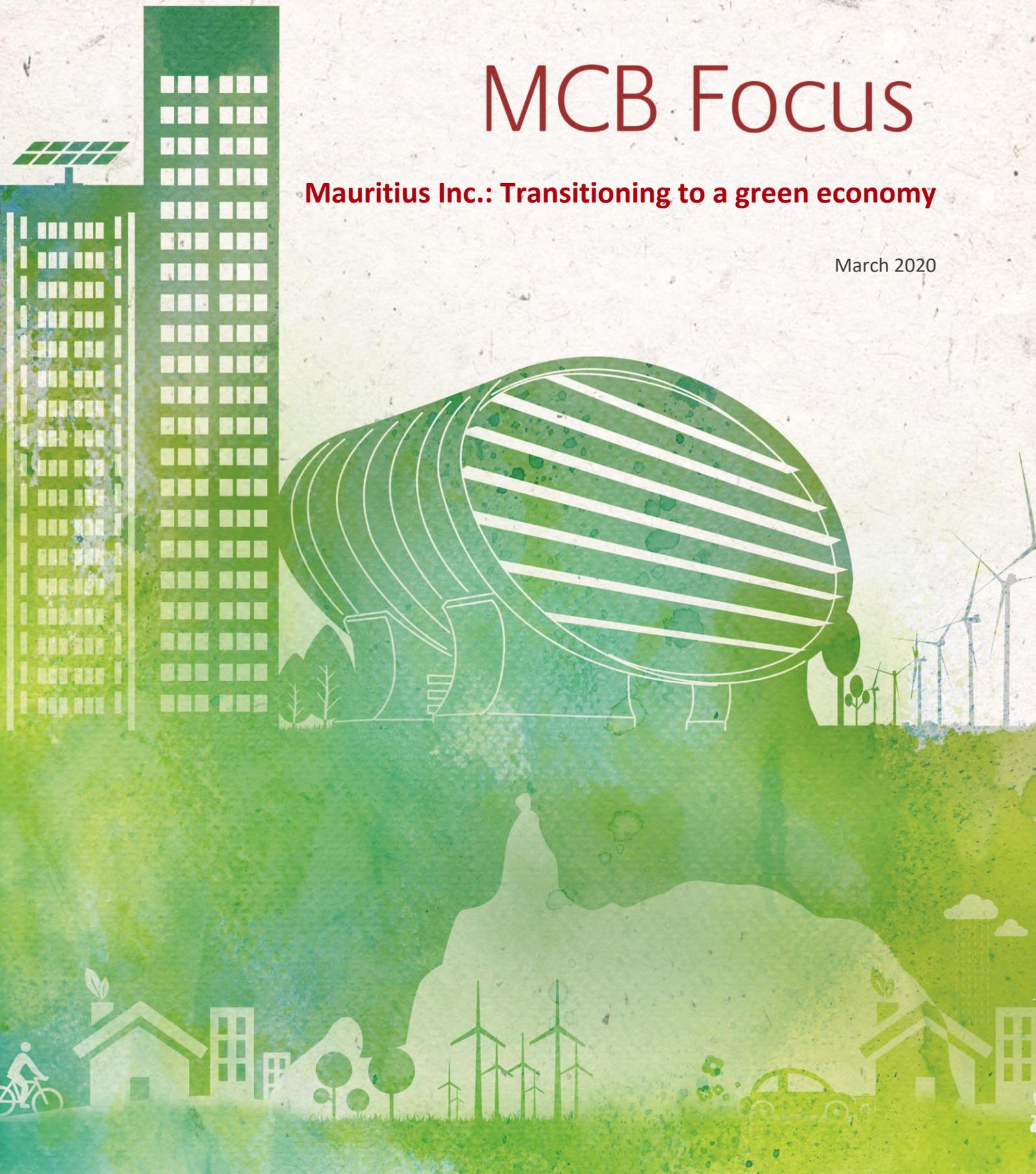


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MCB Focus

Mauritius Inc.: Transitioning to a green economy

March 2020



While being released in **June 2020**, the report is based on insights and observations that have been formulated back in **March 2020**. In fact, the report was finalised during the latter period, but its dissemination was subsequently deferred in the wake of the COVID-19 outbreak and the ensuing confinement period.

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BACKGROUND

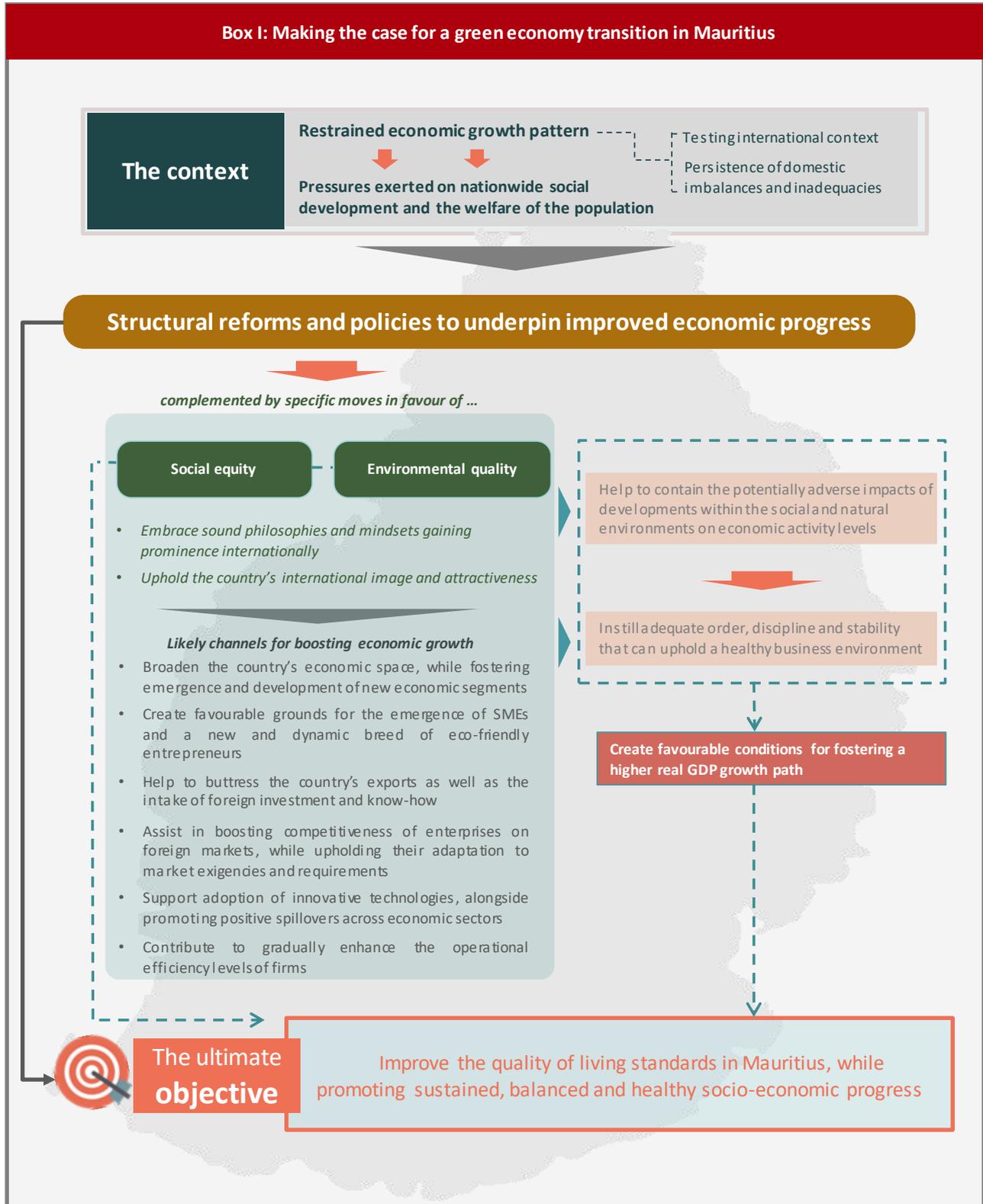
In spite of inherent disadvantages, including its small size, lack of natural resources and remoteness from global markets, Mauritius has, since its independence in 1968, achieved noteworthy socio-economic progress and a sustained rise in living standards. From a statistical standpoint, GDP per capita has magnified from USD 200 to hover above the USD 11,000 mark lately, with the country poised to graduate to the high income league in the near future. Nonetheless, the evolution of national output has somewhat decelerated in recent times, on the heels of the challenging global economic context, compounded by the persistence of domestic structural imbalances. Moving forward, while the quest for a higher growth path remains a *sine qua non condition* for uplifting socio-economic progress, it is increasingly apparent that the prosperity of a nation should be viewed from a wider perspective that integrates quality of life and environmental factors.

In this context, alongside being in tune with our international commitments and moral responsibility of not compromising the well-being of future generations, the pursuit of a greener growth path is deemed appropriate for Mauritius from a socio-economic perspective, especially given our dependence on imported fossil fuels and our vulnerability to climate change. Indeed, alongside helping to better manage our environmental resources, the adoption of well-designed policies to support the transition to a green economy would, in addition to structural reforms, assist in uplifting value added generation in the Mauritian economy by creating opportunities for: (i) further enhancing the competitiveness and appeal of the country on the global scale; (ii) broadening our economic space locally by notably giving a boost to the development and expansion of SMEs and eco-entrepreneurs; and (iii) nurturing the emergence of new green and cost-efficient economic sectors. Overall, the successful transition to a green economy would hinge upon: (i) the harnessing of a more holistic and integrated model of growth and prosperity; (ii) an ambitious approach to embrace new philosophies, while remaining pragmatic so as not to undermine economic competitiveness; and (iii) a shift in mindset, supported by a gradual reassessment of our attitudes and behaviours.

SCOPE AND METHODOLOGY OF THE REPORT

This report presses the case for Mauritius to entrench its transition to a green economy towards serving as a dependable foothold for uplifting the sustainable progress and prosperity of Mauritius. Specifically after underscoring the significance and benefits of a green growth path across key economic sectors, the report lays out the enabling conditions and specific policy priorities that can prove influential in shaping the

country's transition to a green economy. A list of measures and initiatives deployed in countries that are undergoing similar transitions is included in the Annex section. In the course of its analysis, the report leverages national and international statistical databases to appraise and benchmark the performance of Mauritius in respect of an inclusive green growth path, while resorting to empirical references and models.



STATE OF PLAY

The achievement of healthy economic growth rates has always featured highly on the agenda of policymakers across countries. In fact, over the past decades, sustained growth in output has enabled, with the support of increasing globalisation, more than 600 million people to rise out of the poverty trap and created noteworthy opportunities for job creation and better quality of life. That being said, while wealth creation remains key, the quality and distributional effects of growth also matter. Fundamentally, growth is not an end in itself but a means to enable broad-based advancement in living standard of the population. A noticeable observation is that gains from past growth policies have not been Pareto efficient, with some discontent with current economic systems being witnessed in several countries and mounting concerns about the perceived insufficient level of inclusiveness underlying recent social unrest across continents. In addition, economic development has contributed to the degradation of the world's environmental resources. This is popularly known as “grow now, clean up later” as captured by the environmental Kuznets curve, which depicts the worsening of the environment until a certain point where a country reaches a specific average income, beyond which money is invested back to restore the ecosystem. Illustratively, the past five years have been the warmest on record and unprecedented environmental challenges — encompassing tropical storms and hurricanes in the Atlantic, catastrophic floods in Indian states, heatwaves producing temperatures above 45°C in Europe and above 50°C in India and Pakistan, wildfires in Australia and crippling droughts in Chennai — have all imposed severe humanitarian costs and livelihood loss lately. Conspicuously, climate alarm bells have resounded loud and clear in the World Economic Forum's Global Risk Report 2020, with extreme weather, climate action failure, natural disaster, biodiversity loss and human environmental disasters identified as the top five risks in terms of likelihood, for the first time since the survey is conducted. As per the report: *“Climate change is striking more rapidly than many expected. It has already had significant consequences and its impact will grow in the coming decade.”*

Overall, given that high and inclusive economic growth is a fundamental prerequisite for poverty alleviation and that current economic processes are contributing to environmental damage to the planet, the terms ‘inclusive economic growth’ and ‘green measures’ cannot be conceptualised along dichotomous lines. Rather, they should be considered as part of the same development process, as mutually reinforcing means to achieve the same ends. In this context, the idioms ‘inclusive green growth’ or ‘green growth’ have gained support in the international policy discourse as a way to reconcile the need for higher economic growth with the imperative of avoiding irreversible and costly environmental damage as well as maintaining healthy ecosystems. To this end, following the first Conference of the Parties (COP 1) in 1995 and the signing of the

Box II: Key metrics on the international front

The world has registered continued growth over the past decades, with GDP increasing significantly in size



8x

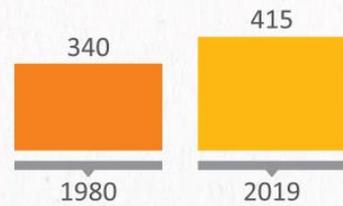
Number of times Global GDP has risen since 1980

Yet, past growth episodes have come with serious environmental consequences ...



CO₂ level

CO₂ level in the atmosphere has **increased by 22%** since the 1980's



Figures relate to millions per parts



The global mean temperature in 2018 is approximately **1 °C above the pre-industrial** baseline...

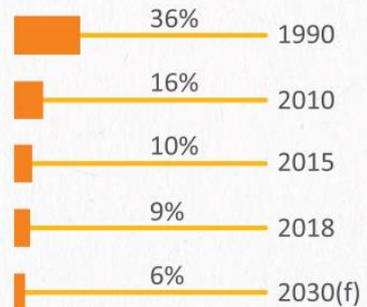
...while the past four years have been the **warmest on record**

while a significant portion of world population remains in poverty traps



In 92 countries with data, **the bottom 40%** receive less than **25%** of overall income

The world is **not on track to end poverty** by 2030



Figures relate to percentage of people living in poverty

BROAD DEFINITIONS OF A GREEN ECONOMY

The term 'green economy' was first coined in a 1989 report for the Government of the United Kingdom by a group of leading environmental economists, and was subsequently revived as part of discussions on the policy response to multiple global crises. A green economic growth path is typically about supporting economic development, while significantly reducing environmental risks and ecological scarcities, which encompass the various exosystemic limitations on growth and human activity. Green growth is about cleaning up the way our economies grow, both by better managing how we do things today and investing time, money and effort into harnessing new sources of smarter, cleaner economic activity. In recent times, the term green growth has been broadened to also encompass human well-being, social equity and shared economic opportunities. The following is an outline of standard definitions of a green growth path.

Figure 2 Definitions of green growth by international organisations	
OECD	<ul style="list-style-type: none">Green growth is about fostering economic growth and development, while ensuring that natural assets continue to provide the resources on which our well-being relies.
World Bank	<ul style="list-style-type: none">The World Bank's Inclusive Green Growth report defines the concept as growth that is efficient in its use of natural resources, clean in that it minimises pollution and environmental impacts, and resilient in that it accounts for natural hazards and the role of environmental management and natural capital in preventing physical disasters.
United Nations	<ul style="list-style-type: none">A green economy is defined as low carbon, resource efficient and socially inclusive. In a green economy, growth in employment and income are driven by public and private investment into such economic activities, infrastructure and assets that allow reduced carbon emissions and pollution, enhanced energy and resource efficiency, and prevention of the loss of biodiversity and ecosystem.
Global Green Growth Institute	<ul style="list-style-type: none">Green growth is the new revolutionary development paradigm that sustains economic growth while at the same time ensuring climatic and environmental sustainability. It focuses on addressing the root causes of these challenges alongside ensuring the creation of the necessary channels for resource distribution and access to basic commodities for the impoverished.

Sources: OECD, World Bank, United Nations Environment Programme, Global Green Growth Institute

ARGUMENTS FOR AND SIGNIFICANCE OF A GREEN ECONOMY TRANSFORMATION

As hinted before, green growth is about reconciling and reinforcing various aspects of economic, environmental and social policies. A green economic model could constitute a positive blueprint which encompasses more sustainable consumption and production patterns, alongside creating opportunities for the emergence of new green sectors, which could help in meeting domestic needs, enhancing the complexity of our exports and developing a new breed of eco-entrepreneurs. While the availability of sizeable financial capital remains an absolute prerequisite, this section outlines main benefits that could be reaped in the longer term by transitioning to a greener economic path.

Figure 3

Green growth outcomes

Economic benefits

Developing a Green Economy can contribute to sustainable GDP growth and employment through:

- Improvements in economic efficiency for example via: increased yields in agriculture, reduced need for energy imports, improved efficiency of land, water and natural resource
- Reduction in the economic costs of pollution and preserving the long term sustainability of natural assets
- Economic diversification, i.e. improved management of economic risks and widening of exports base
- Innovation, access and uptake of green technologies, development of new markets and eco-entrepreneurs
- Improved training and skills by enhancing the human capital within a country to help create a virtuous cycle of knowledge and growth

Social benefits

- Increased livelihood opportunities, income and/or quality of life, notably of the poor
- Reduced inequality and improved health outcomes
- Decent jobs benefitting poor people
- Enhanced social, human and knowledge capital and provision of better public services

Environmental benefits

- Sustainable management of natural assets and improved efficiency of natural resources
- Reduced GHG and other emissions
- Better adaptation to climate change and resilience to natural disasters
- Improved environmental quality
- Other types of capital increased through use of non-renewable natural capital

Sources: Green Growth and developing countries: A Summary for Policymakers; Benefits of a Green Economy Transformation in Sub-Saharan Africa

Box III: Green growth: Theoretical and empirical references

Green Keynesianism : Environmental stimulus in recession

The original case for green growth was made in the wake of the 2008 financial crisis. Economies which had experienced a huge recessionary shock could be stimulated back into growth – particularly employment growth – partly through measures aimed at improving the environment. Fields such as energy efficiency, renewable energy, water quality improvement, agricultural and landscape management, public transport and pollution control provided opportunities to get people into work and to increase demand for a wide range of goods and services. The core argument used was the simple Keynesian one that in a slump, Governments should sustain aggregate demand in the economy by replacing lost private sector demand with public expenditure. This in turn creates a multiplier effect which generates further income and employment growth. Estimates of the impact of the green stimulus measures taken show that around half a million net jobs have been created by the environmental elements of the US stimulus package (Barbier 2010a), with as many as 960,000 by similar measures taken in South Korea.

Growth theory: Environment as a factor of production

The second case in which environmental improvement can positively contribute to growth is based on the core framework of economic theory which explains why and how growth occurs. Economic output results from the bringing together of factors of production or capital: labour, physical capital, and technology and human capital. Green growth theory then starts from the simple observation that the natural environment is also a factor of production, but one which both classical growth theory, and historic patterns of economic growth in practice, have largely ignored (Nordhaus 1974, Solow 1974, Smulders 1999, Brock and Taylor 2005). The environment acts as a form of capital in three ways: it provides resources, it assimilates wastes, and it performs various 'environmental services' which sustain life, including climatic regulation and ecosystem health perseverance.

Comparative advantage and technological revolution: innovation and industrial policy

The third kind of argument for green growth relates to the commonly made claim that environmental policy creates significant numbers of new jobs in environmental industries. To meet higher environmental standards, firms and households require new products and services. So, two kinds of argument are used to justify the claim that environmental policy can be an engine of growth in this way. The first is that countries which introduce stringent environmental policies give the domestic environmental sector firms a head start over those in other countries. Such a 'first mover advantage' is notably held to account for the success of the Danish and Spanish wind turbine sectors, the German solar industry and a range of Japanese and American environmental technology firms. The second argument for regarding 'green jobs' as the harbinger of wider green growth involves a larger and more general claim. This is that low carbon energy systems and other environmental technologies are on the brink of creating a 'new industrial revolution' (Stern and Rydge 2012). Their pervasive impact, it is argued, will unleash a wave of innovation in production methods, products and lifestyles which will transform the economy in the same way as previous technologies such as the steam engine, the railways, the internal combustion engine and the microprocessor.

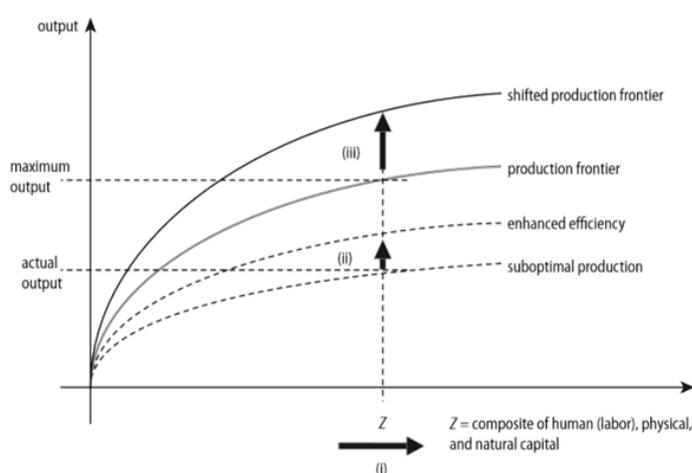
Sources: *Green Growth: Economic Policy and Political Discourse*, Grantham Research Institute on Climate Change and the Environment, London School of Economics and Political Science

Box III: Green growth : Theoretical and empirical references (Cont'd)

Green policies hold the potential to boost output

Environmental policies increase conventionally measured GDP through four channels linked to input, efficiency, stimulus, and innovation effects.

Actual economic output depends on the “production frontier” (the maximum production level possible with the available technology, physical capital, labour, and environment, assuming maximum efficiency) and on efficiency (how close the real-world production system actually is to the production frontier). Green growth policies can thus move the economy away from suboptimalities and increase efficiency, thus contributing to growth, while protecting the environment.



Input effect

The input channel works by increasing the quantity of natural, human, and physical capital (arrow i).

Efficiency effect

The efficiency channel works by increasing productivity, through correcting market failures and influencing behaviours, and by enhancing the efficiency of resource use (arrow ii). An example is environmental policies that aim at energy efficiency.

Stimulus effect

The stimulus channel can occur during an economic recession, when capacity utilisation and employment are low (also arrow ii). Large investments in green infrastructure could potentially increase employment over the short term.

Innovation effect

Environmental policies can shift the production frontier (increasing the potential output the economy can produce) by accelerating the development and dissemination of innovation and creating knowledge spillovers (arrow iii).

Structural reforms based on green policies and practices can contribute to growth through three channels.

- First, they can promote efficiency and help to increase the amount of natural, physical, and human capital available. Better-managed soil is more productive. Healthier environments result in more productive workers. Well-managed natural risks result in lower capital losses from natural disasters. In addition, imposing environmental taxes and removing inefficient subsidies create fiscal space for Governments to lower distortive taxes or subsidise green such as public transport or access to clean water and sanitation services. In London, congestion taxes, besides reducing traffic, helped to finance investments in the aging public transport system, thereby increasing effectiveness of the price signal by reducing the costs or —disutility associated with switching from single-car use to public transport.
- Second, green policies can stimulate innovation. Well-designed environmental policies stimulate innovation by firms, as measured by R&D spending or patents. Surveys of firms in the European Union identify existing or future environmental regulation as the main driver for the adoption of incremental innovations. Green growth can also increase trade in clean technologies.
- Third, green policies can increase resilience to environmental shocks (such as natural disasters) or economic shocks (such as spikes in commodity prices), thereby reducing natural resource price volatility and bottlenecks. In this context, dealing with the potential unintended effects of green growth policies on other priorities, such as food security and access to energy, is also essential.

Sources: World Bank, OECD & United Nations, various publications

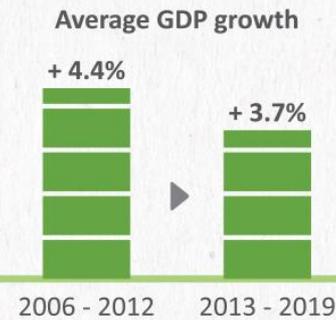
Context and challenges

Mauritius has a strong track record of consistent economic growth that have supported the diversification of the economic base and the creation of strong social safety net comparable to many advanced economies. This is encapsulated in the country's relatively good showing across indicators, including the Human Development Index of the UNDP which offers a complementary and broad understanding of where the society and its people are heading to, beyond what pure economic yardsticks usually do. Nevertheless, in recent years, the country has faced a restrained real GDP growth trajectory, with its average annual expansion rate undershooting potential output on the back of global uncertainties and domestic imbalances. Furthermore, economic development over the years has been accompanied with increased strain on the natural environment. Indeed, the amount of solid waste generated is pushing the country's landfill closer to full capacity at an alarming rate while the total primary energy requirement, mainly satisfied by imported fossil fuels, is also on an increasing trend. As a result, both the total and per capita carbon dioxide (CO₂) emissions are also steadily increasing, with the latter indicator having risen from 2.0 tons in 2000 to 3.3 tons of CO₂ emissions per capita in 2018. At the same time, official figures show that total fish catch is on a decline, while a general increase is being observed in respect of the number of threatened species. Additionally, being a small island developing country, Mauritius is increasingly exposed to the adverse effects of climate change. Specifically, accelerated sea level rise is contributing to coastal degradation and salinisation, while flash floods are becoming increasingly frequent and more intense cyclones are being observed in the region.

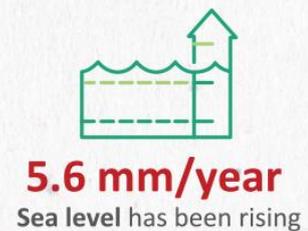
On the heels of such developments, the 2018 World Risk Report ranked Mauritius at the 16th spot among the highest disaster risk countries worldwide. Additionally, in a recent disaster profile on Mauritius made in the context of its Southern Indian Ocean Risk Assessment and Financing Initiative, the World Bank stressed that: *"Results suggest that a 100-year return period tropical cyclone could produce direct losses of USD 1.9 billion and require approximately USD 430 million in emergency costs"*. Importantly also, climate-related events are a key concern for the country since their impact tend to weigh more heavily on the lower-income segment of the population. In this respect, whereas notable progress has been made, it is worth highlighting that in 2017, as per Statistics Mauritius, 9.4% of households lived under half of the median household income per adult equivalent, though it should be noted that less than 1% of the population were living below the absolute poverty line of \$ 1.90 (PPP) a day. Beyond this element, other limitations exhibited by Mauritius can be underlined via insights gathered from our positioning across global performance indicators. For instance, judging by rankings displayed in the Global Competitiveness Report 2019-20 of the World Economic Forum, further efforts are required with regard *inter alia* to the reliability of water supply, the prominence of research institutions and the ratio of wage and salaried female workers to male workers.

Box IV: Challenges and issues to be tackled

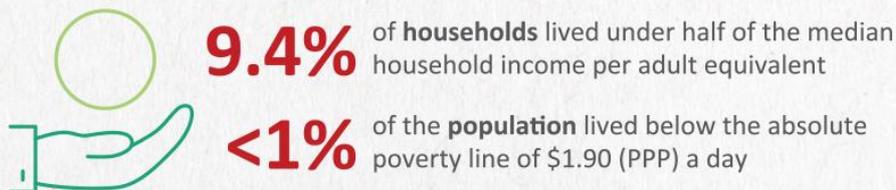
Given the slowdown in growth experienced by Mauritius, an inclusive green growth strategy has the potential to facilitate a transition towards higher and more resilient patterns of growth...



that take into account the environmental impact ...



... as well as social and equity challenges that still prevail.



Sources: Statistics Mauritius, Mauritius Meteorological Services & Ministry of Environment, Sustainable Development, and Disaster and Beach Management

With respect to the quality of the natural environment, Mauritius has posted relatively sub-par global rankings as per the World Economic Forum's Travel and Tourism Competitiveness Index 2019, notably in terms of the 'environment sustainability' pillar. Some of these inadequacies have also been underscored by the Environmental Performance Index 2018 by the Yale Center for Environmental Law & Policy which ranks Mauritius at the 90th spot out of 180 countries. Amidst such concerns, the pursuit of an inclusive green growth path is viewed positively as it creates opportunities for the emergence of new sectors while uplifting value added in existing sectors and allowing *inter alia* for energy and water savings, increased agricultural productivity and the creation of green jobs. Besides, as per a report published as part of the Partnership for Action on Green Economy – an initiative by the UN Environment Programme and commissioned by the authorities: "green economy investments are expected to generate better economic outcomes than a

business as-usual investment allocation, with GDP 6 per cent higher in the GE case relative to business-as-usual, by 2035. Therefore, the potential for higher income exists under a green economy transition.” In fact, while making allowance for local peculiarities, a ‘Green New Deal’ such as the one penned by T. Friedman in 2007 to call for a gradual shift to clean and renewable energy could make for insightful readings.

Refer to the ‘Klima Neutral 2050’ report which can be accessed on www.klima.mu for more information on the potential effects of climate change in Mauritius and insights on options to reduce our carbon footprint

Policies and actions taken/announced by the authorities

Mauritius is among the first countries to have ratified the United Nations Framework Convention on Climate Change (UNFCCC) in 1992 and to adhere to the Kyoto Protocol in 1997. The country was also among the first 15 countries to sign and ratify the Paris Agreement in 2016. To date, over 30 multilateral environmental agreements related to chemicals, biodiversity, marine and atmosphere have been signed by Mauritius. Additionally, a number of policies and measures have, during the past years, been taken to enhance the resilience of the country and progress towards a low emission pathway. Some of the key legislative and policy measures as underscored in the ‘Third National Communication’ produced by the Ministry of Environment, Sustainable Development, and Disaster and Beach Management are as follows:

- National Disaster Risk Reduction and Management Act
- Master Plan for Energy Efficiency/Demand Side Management and Action Plan (2016 - 2030)
- Marshall Plan Against Poverty
- Strategic Plan 2016-2020 for the Food Crop, Livestock and Forestry
- A Guideline for Climate Change Adaptation Strategy Coastal Setback
- Action Plan for the implementation of measures in the Intended Nationally Determined Contribution
- National Biodiversity Strategy and Action Plan (2016 – 2020)
- Climate Change Charter for Local Authorities
- National Climate Change Adaptation Policy Framework
- A Master Plan for Development of the Water Resources in the Republic of Mauritius
- Building Control Act
- Energy Efficiency Act
- Long term Energy Strategy 2009 – 2025

Furthermore, the authorities have, in the latest Government Programme 2020 – 2024, stressed their intent on furthering investment in clean energy, notably towards increasing the proportion of electricity generated

from renewable sources to 35% by 2025 and 40% in 2030. Amongst key pronouncements, it is interesting to note that:

- a biomass policy will be developed and small planters incentivised to produce energy with bagasse
- high consumers of electricity would be encouraged to set up their own solar farms;
- incentives would be provided to consumers to shift to LED technologies;
- a waste to energy project would be introduced to nurture a greener Mauritius;
- a National Youth Environmental Council will be set up under the aegis of the Prime Minister's Office to give them the opportunity to contribute in the decision making process;
- eco-friendly measures such as building norms and improve public infrastructure for better protection against natural disasters such as cyclones and floods would be enforced; and
- measures would be implemented to protect our oceans, marine resources and our beaches.

The authorities have also organised an 'Assises de l'Environnement', providing a forum for discussion for a concerted approach towards the elaboration of a new National Environmental Strategy 2020-2030. In addition, the authorities indicated their intent on introducing a new Climate Change Bill and an inter-ministerial council to mitigate climate change related risks and strengthen coordination among stakeholders.

Way forward

Overall, the recent policies and measures implemented in Mauritius as well as intentions proclaimed indicate the commitment of policymakers and stakeholders to steer the country onto a greener economic growth path. Success in engineering the meaningful change being aspired would, nonetheless, rest on a proper understanding of the significance of and conditions for transitioning to a green economy. This should be accompanied by a set of ambitious and holistic reforms that are gradually implemented towards fully capitalising on the green potential of economic sectors, alongside creating the proper enabling environment. Such issues are discussed in the later sections of the report after casting light on the construction of an inclusive green growth index for Mauritius, towards assessing the quality of the country's growth pattern.

OUTLINE

As stressed earlier, the underlying objective for Mauritius is to attain a more balanced pattern of growth that is strong, socially inclusive, and environmentally stable. To this end, it is important that the authorities remain committed to using GDP-related indicators as an indispensable channel for undertaking a realistic investigation of the country's economic advancement over time, while concomitantly complementing such assessment with other economic and non-economic metrics so as to move towards Pareto optimality in our assessment of the evolution of quality of life. Importantly, the idea is not to tamper with the concept of real GDP growth because it remains as significant as ever in measuring the health of an economy. Instead, the objective is to complement this measure with other indices to assess and monitor the country's performance from a wider and more insightful angle that encompasses, amongst others, the quality of life, well-being of the population and environmental considerations, in line with postures being adopted on the international front. This would assist in nurturing more reliable and accurate grounds for guiding the direction, magnitude, tone and prioritisation of socio-economic development reforms and policies to be pursued by the authorities

In that respect, several studies have added measures of inclusiveness and environmental sustainability with a view to capture the quality of growth. These set of measures include, amongst others, the IMF's Quality of Growth Index, the Green Growth Index, developed by the United Nations Economic and Social Commission for Asia and the Pacific and the Organisation for Economic Co-operation and Development, or the World Economic Forum's Inclusive Development Index. In this section, we leverage the methodology used by the Asian Development Bank in a study on Asian economies in 2018, to estimate an Inclusive Green Growth Index (IGGI) for a large sample of countries of different income groups on the international scene so as to gauge how Mauritius fares worldwide on a measure capturing its performance across the economic, social and environmental dimensions. The main motive for using the IGGI is that it is aligned with the central tenet of the Sustainable Development Goals, which is to 'leave no one behind.' Its indicators capture the key dimensions of economic growth, social equity, and environmental sustainability, including climate adaptation and mitigation. This IGGI is a benchmark for the quality of growth that combines the strengths of existing indices, frameworks, and dashboards into one composite index with a wider coverage of indicators.

DESIGN OF THE INCLUSIVE GREEN GROWTH INDEX

Basically, we have adapted the model of the Asian Development Bank and made some adjustments, notably in respect of the choice of variables to cater for relative data inadequacies, towards coming up with an

assessment of the quality of growth that complements what is captured solely by real GDP growth of the country. The following figure provides the list of the selected variables under each of the three pillar captured in the index: (i) Economic Growth; (ii) Social Equity and (iii) Environmental Sustainability. Of note, equal weights are assigned to each pillar in the model. Data is sourced mainly from the World Bank Development Indicators, with latest information available for year 2017. The IGGI is therefore estimated for year 2017, with the sample covering some 150 nations (see annex for full list of countries and definitions of variables) of different income groups. The performance of Mauritius on the IGGI in 2017 is subsequently compared with findings for year 2012. Moving forward, the index can be regularly updated to monitor the gains and gaps in respect of the progress being witnessed by the country, to help make informed decisions.

Figure 4

Pillars and indicators of the Inclusive Green Growth Index

Inclusive Green Growth Index		
Economic Growth	Social Equity	Environmental Sustainability
GDP per capita growth rate	Employment – population ratio	Natural resource rent
Inverse CV of GDP per capita growth	Life expectancy gender gap	Renewable freshwater sources
Trade openness	Primary enrollment gender gap	Water productivity
HH Market Concentration Index	Labor force participation gender gap	Population exposed to air pollution
Age dependency ratio	Life expectancy at birth	CO ₂ per GDP
Adjusted net savings	Infant mortality rate	Energy intensity of primary energy
Gross general government debt	Access to improved sanitation	Use of renewable energy
	Access to improved water	
	Access to electricity	
	Gini coefficient on inequality	
	Poverty gap	
	Mean years of schooling	
	Primary completion rate	
	Political participation gap	

CV = coefficient of variation, GDP = gross domestic product, HH = Hirschman-Herfindahl

Adjusted net savings = net savings plus education spending and minus energy depletion, mineral depletion, net forest depletion, CO₂ and particulate emissions damage, measured as a percentage of Gross National Income

Source: : Inclusive Green Growth Index, Asian Development Bank, 2018

Pillar 1: Economic growth

Under the first pillar, seven performance indicators aiming at capturing the strength, stability, diversity of sources and sustainability of economic growth are included. As such, while GDP per capita growth rate measures the economic performance of countries, the inverse coefficient of variation of GDP per capita was added as a measure of volatility of growth episodes; the lower the inverse, the more volatile the growth episodes are considered to be. Similarly, the Hirschman-Herfindahl Concentration Index (HHI), which measures the dispersion of trade value across exporter's trading partners, captures the stability of countries' growth which is considered to be positively correlated with market diversification. Furthermore, economic dependency on other countries, as measured by trade openness, is included to measure the extent to which countries are vulnerable to external economic shocks. Other indicators under this pillar include age dependency ratio, adjusted net savings and public debt as measures of economic sustainability.

Pillar 2: Social equity

The relationship between strong and stable growth and inclusive socio-economic development can, in some cases, be sub-optimal, as per the empirical literature. The fourteen indicators included under the IGGI's Social Equity pillar gauge the extent to which growth has been inclusive. Indicators such as life expectancy at birth and infant mortality rates assess the availability of and accessibility to quality health care services, while indicators such as mean schooling years and the completion rate for primary education evaluate the access to and coverage of the education system. Other indicators relating to employment, gender gaps and fulfilment of basic needs aim at giving an objective and comprehensive picture of countries' well-being.

Pillar 3: Environmental sustainability

Environmental Sustainability takes into account the environmental impact of growth, spanning from air quality, sustainable use of natural resources to impacts of climate change. Among the seven indicators under this pillar, natural resources rent, which measures the revenue generated from extracting oil, natural gas, coal, and mineral and forest resources, is an indicator of the rate of depletion. Freshwater resources and water productivity assess the sustainability of water resources and the potential impact of climate change is measured in terms of carbon dioxide emission, energy intensity and use of renewable energy.

Note:

The detailed methodology used by the Asian Development Bank to construct the Index is provided in the Annex. The sample of countries covered in the analysis is also provided, as well as data sources for our model.

Box V: Construction of the Inclusive Green Growth Index

The scores of the IGGI, its three pillars and their indicators range from 1 (worst) to 6 (best) for comparability over time and across countries. The IGGI is constructed using a three-step approach.

Step 1: Normalisation of each indicator

In brief, normalisation techniques are applied to all the indicators to transform them into the same scale of scores from 1 (worst) to 6 (best), using the following formula:

$$5 \times \frac{(\text{country score} - \text{sample minimum})}{(\text{sample maximum} - \text{sample minimum})} + 1$$

In cases where an indicator's impact direction on the IGGI's score is negative—that is, a higher value indicates a worse outcome, as with public debt and air pollution—a reverse transformation formula is applied to ensure that 1 and 6 still correspond to the worst and best possible outcomes:

$$-5 \times \frac{(\text{country score} - \text{sample minimum})}{(\text{sample maximum} - \text{sample minimum})} + 6$$

Step 2: Computation of each pillar score

Once normalised, the indicators for each pillar are assigned equal weights, after which they are aggregated to get the score of each pillar.

Step 3: Computation of IGGI score

From there, the equal weighted average of the pillar scores yields a single composite index for each country:

$$IGGI_i = \frac{\sum_{i=1}^n \text{score}_i \text{ in each pillar}}{3}$$

i being a specific country and n the total number of countries in the sample

In determining the IGGI, we used the equal weighting method because of its simplicity, transparency and broad acceptance.

Source: *Inclusive Green Growth Index*, Asian Development Bank, 2018

INTERPRETATIONS OF THE IGGI AND CAVEATS IN ITS CONSTRUCTION

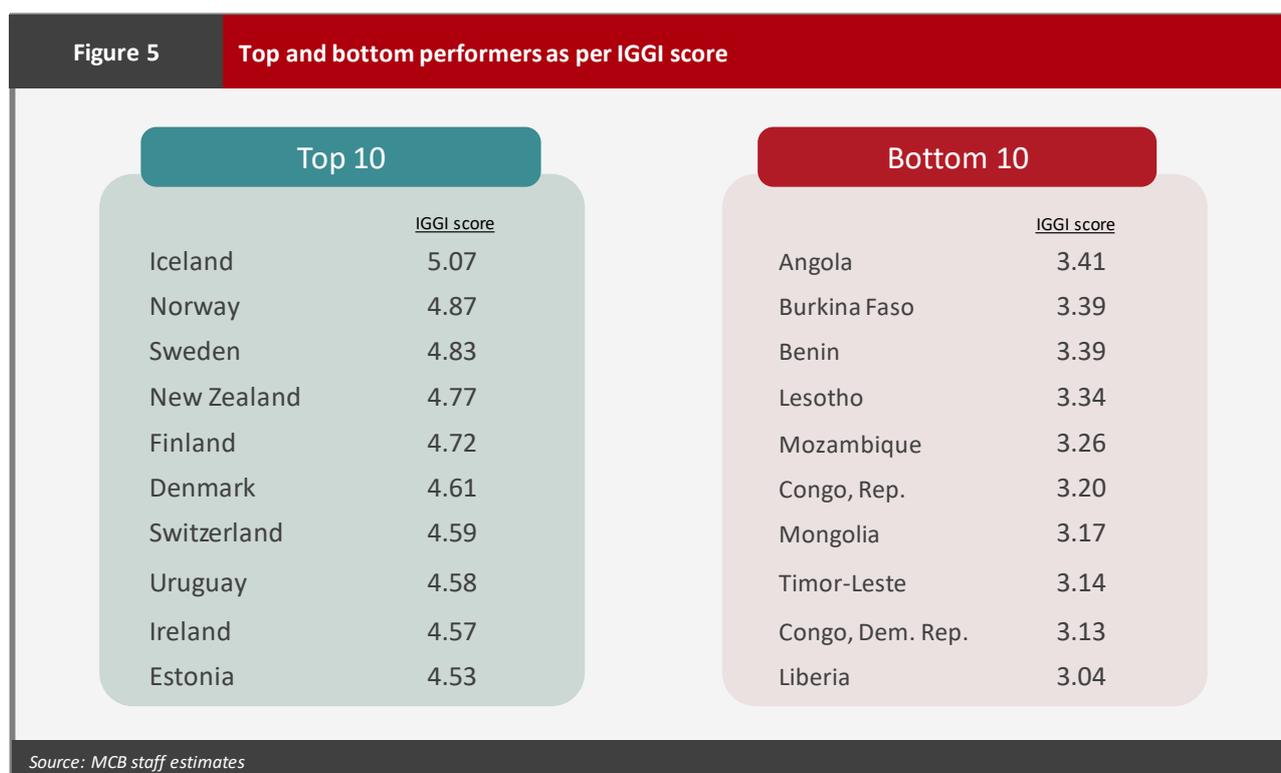
The scores and ranks on the IGGI of a given country, for example Mauritius, are to be interpreted in terms of the performance of the country in relation to that of the whole sample of 150 countries. As such, even if the individual performance of Mauritius on any particular indicator is improved, it can still end up being outweighed by better performances by other nations. Furthermore, it is important that the following caveats in the construction of the index be born in mind when using the findings for further policy making:

- Countries with over 25% missing values in any one of the pillars were excluded to ensure accuracy and reliability of estimations.

- In some cases, data for 2017 is not available and latest available figures have been taken, to the extent that they are not older than 2015 figures; Furthermore, we have checked for the number of observations across indicators, with the ‘water productivity’ metric being, as a result, excluded due to unavailability of data for half of the sample.
- The IGGI is meant to be only indicative as it is influenced by the number of countries in the sample and only relate to data up to 2017. As such, it does not make allowance for relevant developments across the various pillars that have occurred during the last two years.

GLOBAL PERFORMANCE

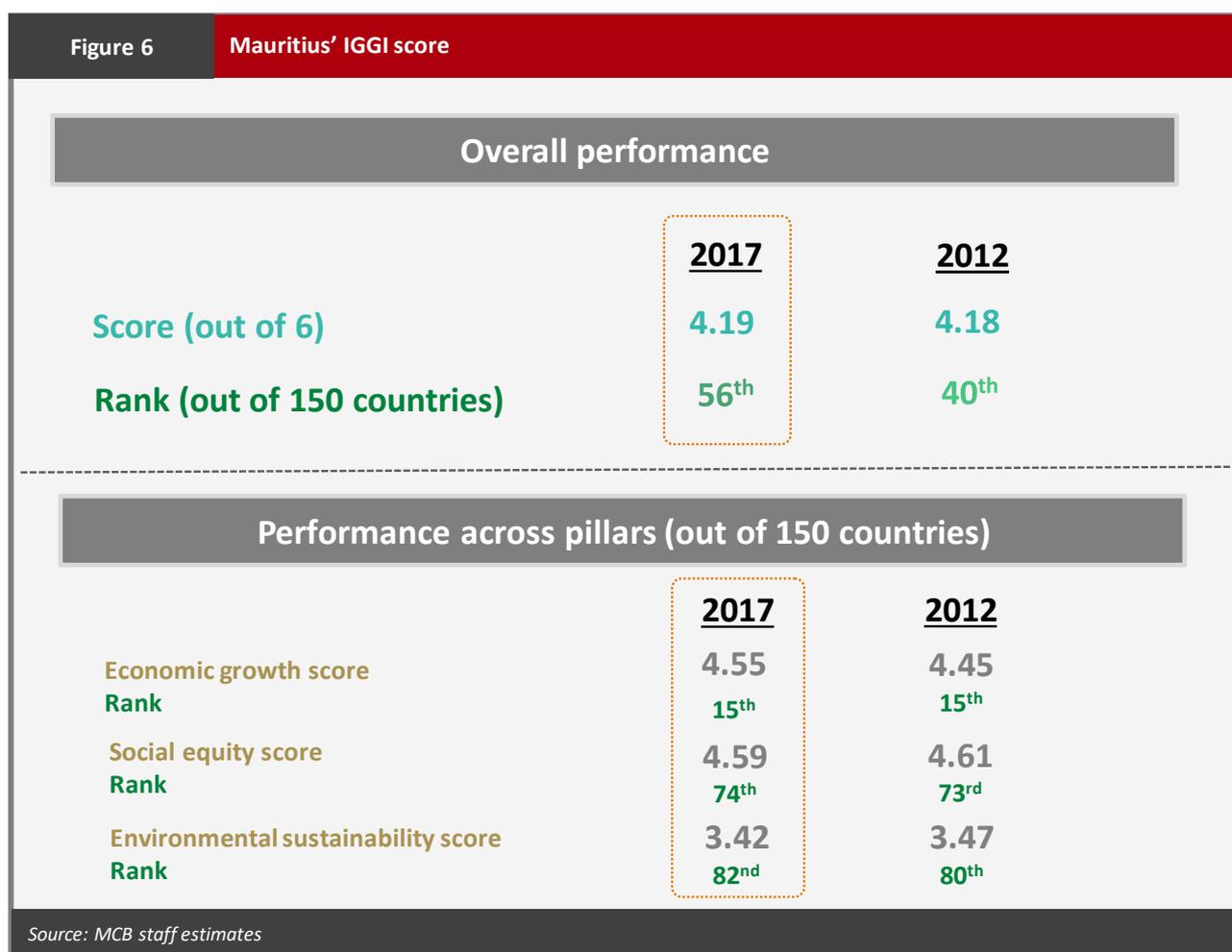
In general, many countries in the high-income league appear in a better position to secure inclusive green growth, given that they are endowed with better financial means and possess more sophisticated markets and economic frameworks. In fact, as per our computations for year 2017, which is based on a sample of 150 countries across different income groups, Iceland tops the ranking, followed by Norway and Sweden. This is broadly consistent with the performance achieved by these countries on similar indices. Of note, Timor Leste, Congo Democratic Republic and Liberia feature respectively in the last three spots worldwide.



PERFORMANCE OF MAURITIUS

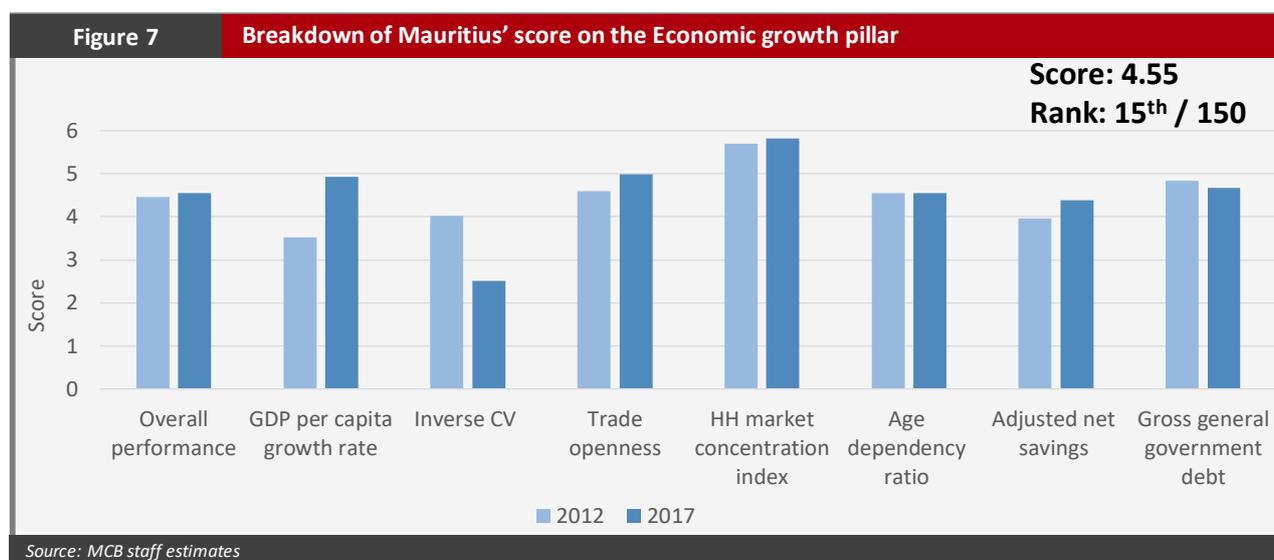
Overall assessment

As per the computations, Mauritius has improved its overall score on the IGGI to 4.19 (over 6) in 2017, compared to 4.18 in 2012. The country is ranked 56th out of 150 countries in 2017. It is also worth noting that the country is ranked first in the sub-Saharan African region, followed by Seychelles. Mauritius is well positioned in terms of the 'Economic Growth' pillar, with its score improving to 4.55 in 2017 while its rank was maintained at 15th in the world relative to 2012. With regard to the other two pillars, the country is ranked 74th out of 150 countries on 'Social Equity' and 82nd on 'Environmental Sustainability'. In the sections that follow, our performance on each pillar is dissected and appraised in relation to other nations.



Pillar 1: Economic growth

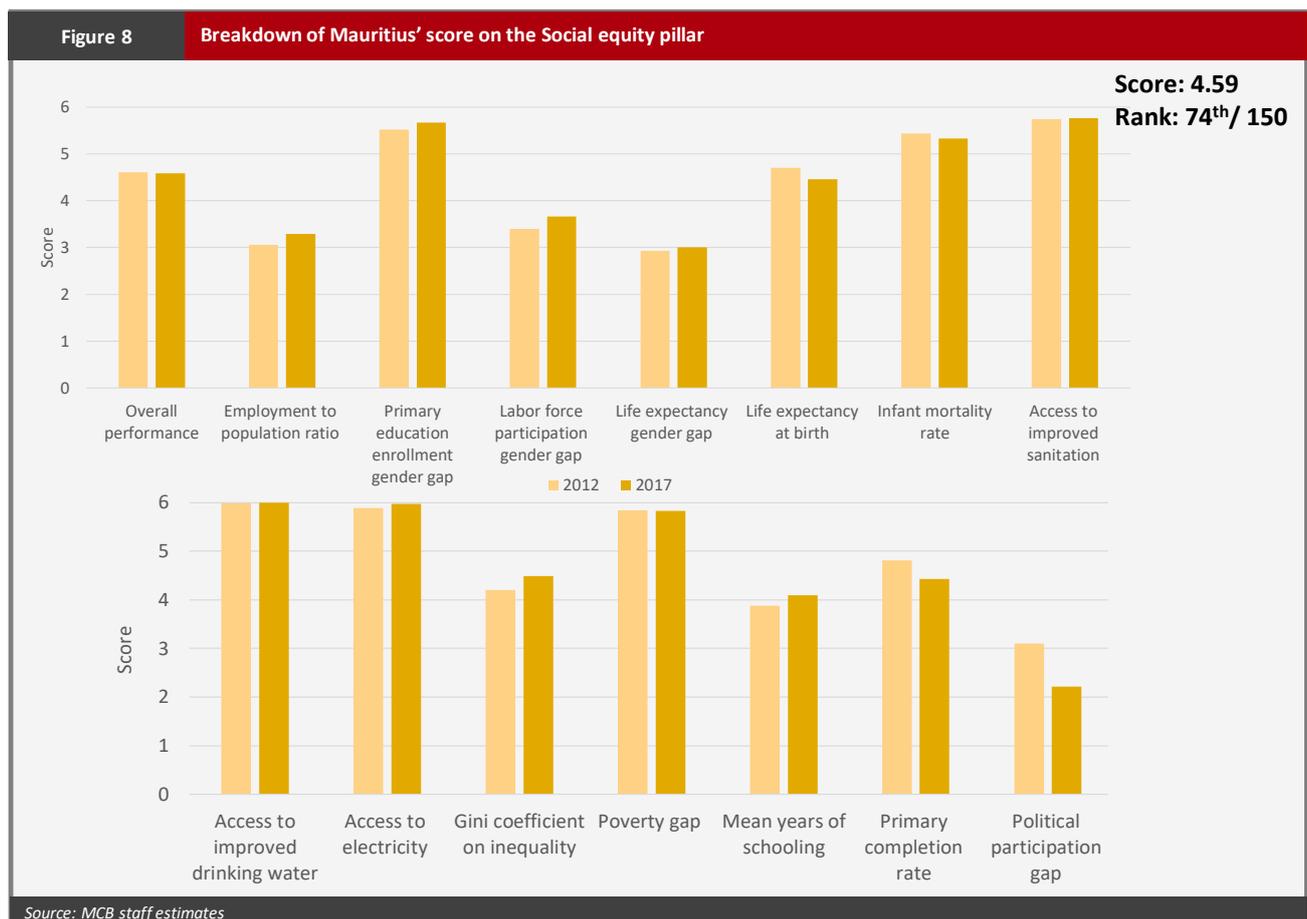
As stressed above, Mauritius performed very well in respect of the ‘economic growth’ pillar, standing at the 15th spot out of 150 countries worldwide in 2017 with a score of 4.55 over 6. The country is also ranked 1st in the sub-Saharan region in that particular category. Overall, this testifies to the general strength and diversity of sources of domestic growth. Specifically, alongside maintaining a steady growth in per capita GDP and positive economic growth rates, Mauritius registers a good performance in respect of trade related indicators. In terms of economic sustainability, our public debt ratio has somewhat weighed in the balance, with the country’s score on the latter indicator having fallen between 2012 and 2017. Additionally, while Mauritius has, in absolute terms, improved on the ‘inverse coefficient of variation’ metric which assesses stability in real GDP per capita, its score on the latter indicator has dropped when making allowance for relatively better showing from other nations forming part of the sample.



Pillar 2: Social Equity

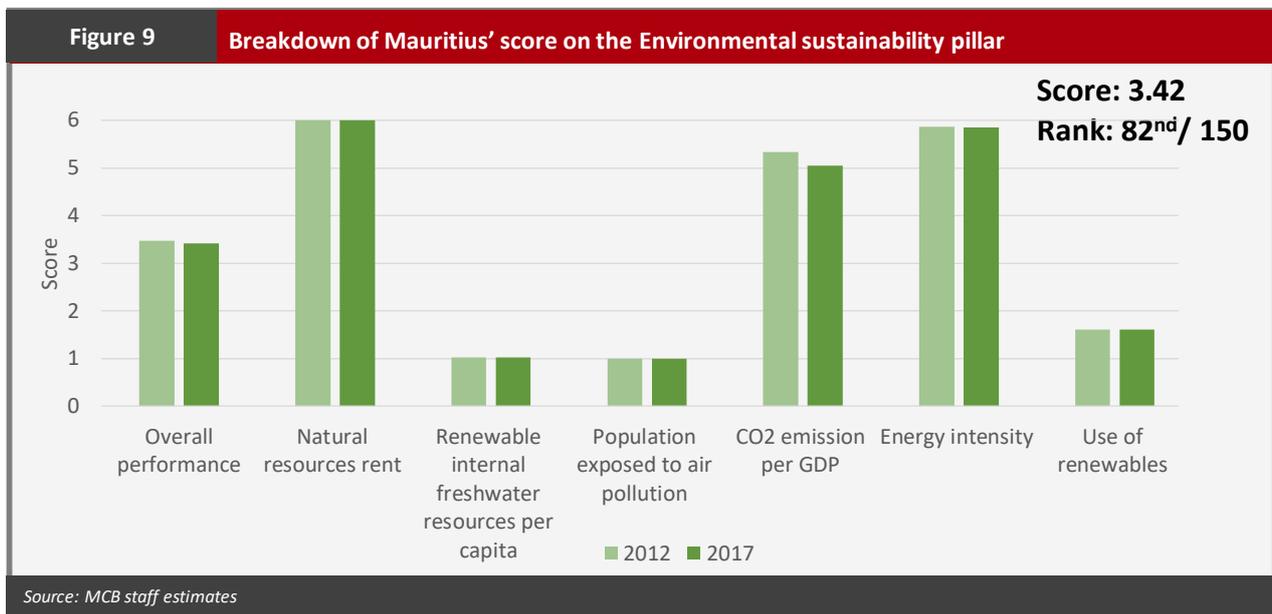
As per the model computations, Mauritius obtained a commendable score of 4.59 on the ‘social equity’ pillar in 2017, which is even higher than our score on the ‘economic growth’ pillar. However, our ranking on the ‘social equity’ pillar (74th out of 150 countries) appears to be an average performance and can be partly explained by the number of advanced economies that form part of the sample which scored highly on gender-related indicators, whereas Mauritius performed poorly on the latter aspects. In fact, the ‘social equity’ pillar assesses the social performance of a country from a relatively broader perspective than traditional indices, with 14 indicators covered, of which 13 are non-financial based. The country registered an excellent performance in respect of access to basic needs such as electricity and drinking water, and

posted an appreciable showing as regards the Gini coefficient. However, as mentioned before, it fared relatively weakly on gender-related matters (for example, in 2017, female labour participation rate was 45% compared to a corresponding rate of 73% for male, with the gap affecting the employment to population ratio which stood at only 55%, while the political participation gap was 76.8%). Actually, if the specific gender-related indicators were to be excluded, the country would have had a higher score and ranking in 2017, which would be broadly in line with its performance on the Human Development Index 2019 of the United Nations. With regard to the only financial indicator, i.e. the Gini coefficient, it is worth noting that the indicator bears some non-negligible drawbacks. In fact, besides not properly discerning the effects of structural changes in population, the Gini coefficient does not incorporate all Government free services, which in a country like Mauritius would be quite significant. Further, a caveat of this pillar is that, given the fact that calculations factor in data up to 2017, they do not make allowance for key measures by the authorities in recent times on the social front, such as the introduction of a negative income tax system and minimum wage as well as the increase in pension benefits. Actually, as per official pronouncements, the Gini coefficient for Mauritius, which fell from 0.386 in 2012 to 0.365 in 2017, is expected to decline further to 0.34 in 2020, which, *per se*, indicates a relatively improved performance of Mauritius on that front. If the latter updated figure were to be included, other things equal, our score on this front would rise by 30 basis points, while our international rank would have further improved.



Pillar 3: Environmental Sustainability

Mauritius is ranked 82nd out of 150 countries worldwide in 2017 on the ‘Environmental Sustainability’ pillar, representing a marginal deterioration relative to our 2012 positioning. Overall, improvements are deemed necessary on this front with a view to steering the country onto an inclusive green growth path. To begin with, while the country obtains an appreciable score in respect of energy intensity, natural resources rent and direct CO₂ emission per GDP, such showings should be treated with care given that they reflect the country’s positioning in relation to a large sample of countries, many of which performed poorly on such indicators. Furthermore, while we contribute a very low proportion of global CO₂ emissions, it is worth noting that the country’s emissions have been increasing of late. On another note, the country’s relatively weak performance on generating economic growth that is environment-friendly is notably testified by its poor showing in respect of the population exposed to air pollution metric, defined by the World Bank as the percentage of the population exposed to air pollution levels exceeding the World Health Organization’s 2.5 particulate air quality guideline. In another light, the use of renewable energy, defined as the percentage of renewable energy consumption to total final energy consumption, is also assessed as subpar relative to other countries in the sample.



Overall, the estimates of the performance of Mauritius on the Inclusive Green Growth Index (IGGI) are intuitive in that they can provide a useful basis to assist policymakers in fostering an economic growth trajectory that is environmentally sustainable and attuned to climate change risks. Specifically, the findings of the IGGI can provide pointers for assisting in the: (i) prioritisation of reform initiatives; (ii) composition and deployment of investment; and (iii) allocation of human and physical resources. In that respect, the remaining chapters of the document lay emphasis on the potential for greening key economic sectors in Mauritius and the enabling conditions for facilitating the transition to a green economy.

GENERAL OVERVIEW

This section explores the potential opportunities for greening the economic base in Mauritius, as a means to steer the domestic economy onto a sustained, more inclusive and greener growth path. For the purpose of the analysis, alongside factoring in cross-cutting areas such as energy, water and waste, the focus is laid on the benefits of greening four economic sectors, namely: agriculture, manufacturing, tourism, and transport, given their relevance to the environment and their significance in terms of contribution to GDP and employment. Worth noting, recourse is made to official statistics and targets set by the authorities in performing the relevant sector assessments.

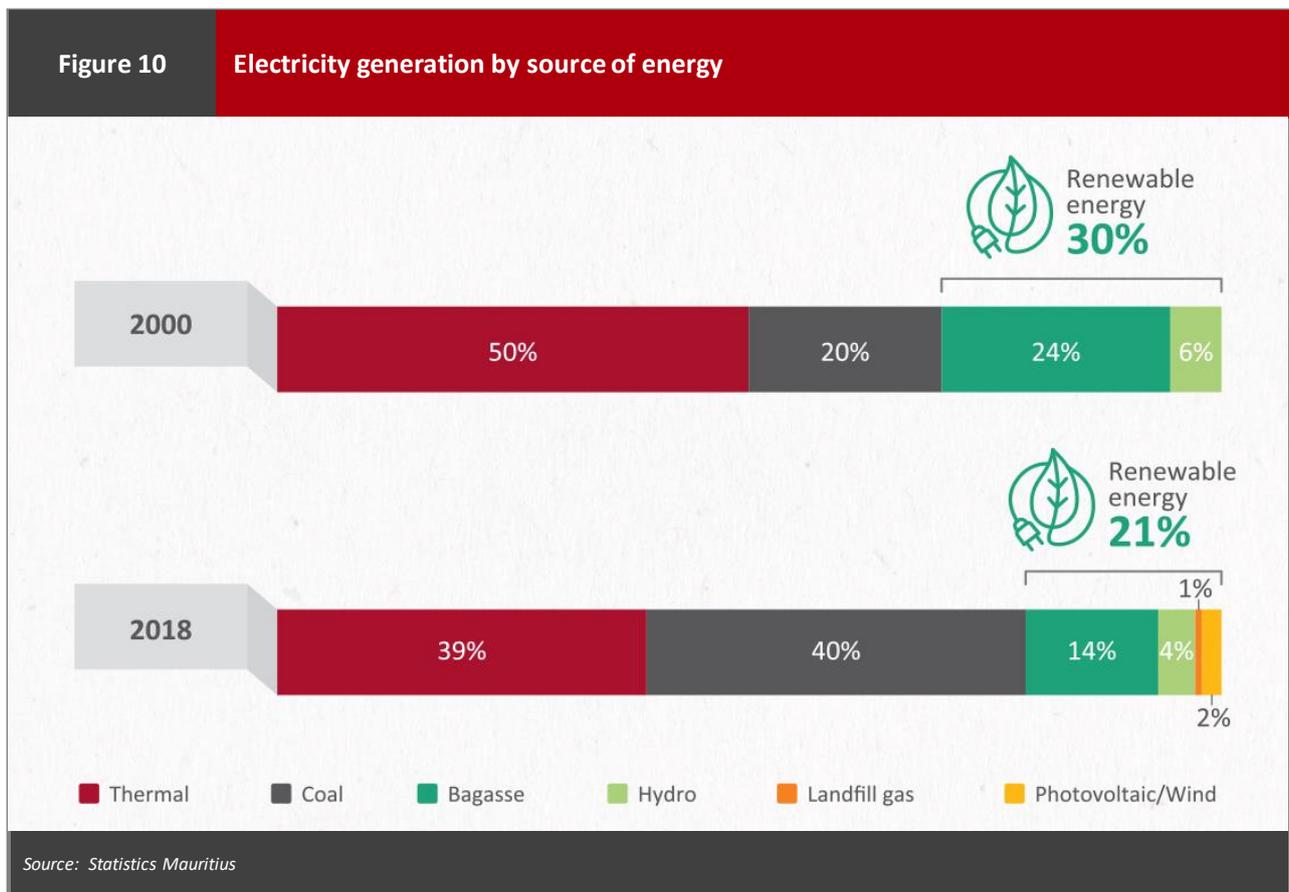
KEY ISSUES DISCUSSED

The section begins with an outline of the significance of each economic sector in the Mauritian context and lays down the main challenges being faced and gaps to be filled to achieve set official targets. Then, the potential socioeconomic benefits emanating from the adoption of greener practices are emphasised in selected sectors. Moving on, drawing on the experience of other nations which are further detailed in the Annex section of the report, specific policy orientations and courses of action that can serve as a reference to Mauritius with a view to complementing the already-initiated as well as intended green initiatives by the authorities are summarised. That being said, it would, evidently, be important to properly sift through these listed reforms and initiatives in order to identify and implement those yielding the highest payoffs for Mauritius, whilst concomitantly laying emphasis on those that are best adapted to our socio-economic imperatives and realities. Importantly also, the green economy policy package to be developed for Mauritius needs to strike a proper balance between higher economic growth imperatives and broader social and environmental objectives. From an overarching perspective, such outcomes could be achieved through the execution of a balanced mix of well-designed and sequenced strategies and policies. More fundamentally, the right goals and targets are warranted, while the adoption of smart, pragmatic and decisive solutions should assist in engineering the wholesome positive change that we seek to achieve in the Mauritian economy towards promoting an inclusive and greener society.

ENERGY

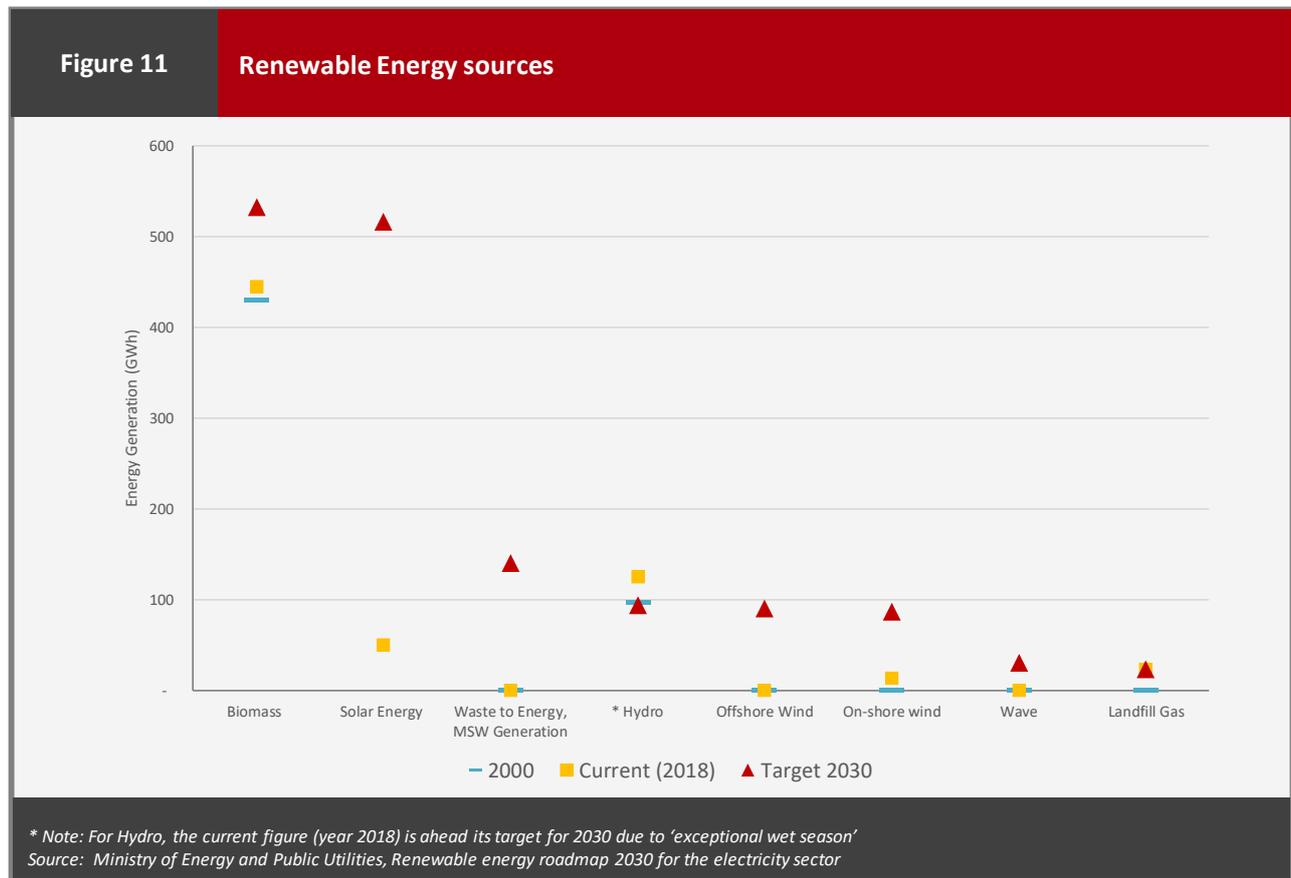
Context and challenges

While the energy sector in Mauritius has undergone a successful transition over the past few years with the setting up of a wind farm, new solar farms and systems, a waste to energy plant, amongst others, it still relies heavily on imported energy sources. Imported energy sources, which accounted for around 11% of total imports in 2000, has increased to 20% in 2018. As per the latest statistics, around 79% of electricity was generated from non-renewable sources, principally petroleum products and coal and 21% from renewable sources, mainly bagasse, hydro, wind, landfill gas and solar. Besides, while CEB currently produces 43% of the country's total power requirement from the thermal power stations and hydroelectric plants, the remaining 57% is purchased from independent power producers, particularly private generators from the sugarcane industry using bagasse and imported coal. As a cause for concern, the share of renewable energy in electricity generation mix has trended down lately, as illustrated below.



Looking ahead, it is interesting to note that the new Government Programme (2020-2024) envisions to encourage carbon-free energy generation by accelerating the development of renewable energy from the

current mix of 21% to reach 35% in 2025 and 40% in 2030. The aim is to achieve this through wind farms, solar energy, biomass, wave and waste-to-energy projects. However, it can be observed that Mauritius is still lagging behind in terms of its renewable energy generation benchmark, as illustrated below.



Additionally, Mauritius has a relatively high ratio of energy use to GDP, which bears non-negligible risks owing to its heavily reliance on imported fossil fuels to satisfy its energy requirements. Over time, the fossil fuel mix for electricity generation has been changing with a shift from oil to coal. Such energy dependence implies that Mauritius is highly vulnerable to fossil fuel market dynamics such as price volatility, quality and availability. The import of fossil fuels also represent a sizeable outflow in the country’s balance of payments. Besides, the country’s high dependence on fossil fuels has serious environmental impacts, such as air pollution, damage to ecosystems and greenhouse gas emissions. In fact, electricity generation remained the major source of carbon dioxide emissions, contributing nearly 60% of the country’s total emissions in 2018. Figure 12 illustrates the rising evolution of CO₂ emissions relating to energy lately, although it is worth noting the authorities have pledged to reduce its greenhouse gas emissions by up to 30% by the year 2030. Overall, there is a need for better energy services to fuel higher economic development and ensuring energy security, the more so when considering that energy plays an important role in fuelling activity in almost all sectors of the economy as part of its commitment to the Paris Agreement in 2016.

Figure 12

Evolution of carbon dioxide (CO₂) emissions from electricity generation



Source: Statistics Mauritius

Specific policies to boost green payoffs

The following policy approaches could be useful in ensuring and accelerating the effective green transition of the energy sector:

- Incentivise renewable or low-carbon energy generation. Specifically, feed-in-tariffs are widely used as incentivising policy to businesses and households to invest in renewables, energy efficiency and GHG emission mitigation. The two other key policy tools used worldwide for “getting prices right” are the reform of fossil fuel pricing mechanisms and the implementation of carbon taxes.
 - Carbon pricing could be a simple, transparent, and cost-effective solution to change investment and consumption behaviours if structured carefully to ensure: (i) fairness; (ii) alignment with broader policy goals; (iii) stability and predictability; (iv) efficiency and cost-effectiveness; and (v) reliability and environmental integrity

- Set up a comprehensive and effective framework to further incentivise the use of biomass, including cane trash, for electricity generation. As a pragmatic solution in the short to medium term, the authorities could also look into promoting cleaner fossil fuels such as Liquefied Natural Gas (LNG). When used for power generation, natural gas emits as much as 50% less CO₂ than coal and results in negligible emissions of sulphur dioxide and particulates compared with other fossil fuels according to the International Gas Union.
- Further promote the adoption of lower-energy infrastructure by (i) reviewing construction standards for new buildings, (ii) building retrofits for improved efficiency, (iii) incorporating lower-energy passive measures such as natural ventilation, night ventilation, evaporative cooling, insulation, and solar control or shading; (iv) active measures such as mechanical ventilation, and (v) designing new urban and industrial clusters to minimise energy waste.
- Encourage higher levels of public-private partnerships to enable knowledge and resource transfers by diverse stakeholders (utilities, government and private sector partners) and to create outcomes, which would be difficult to achieve in silos.
- Encourage carbon capture and storage (CCS) to enable the continued use of fossil fuels while reducing CO₂ emissions, thereby reducing the climate impact of fossil fuel use. As fossil fuels presently supply over 85% of all primary energy globally, stabilising global temperatures at or near the 2°C warming target will require CCS to reduce GHG emissions.

WATER

Context and challenges

Mauritius is faced with a steadily growing demand for water, driven mainly by rising living standards, industrial activity expansion and tourism development while inadequacies with respect to water capture, storage and distribution still prevail in the country. In fact, with more than 1,500 km (35%) of the water network in Mauritius being above 50 years old, recent observations by the Central Water Authority suggest that 50% of water produced is wasted, which, in addition to triggering water shortages at consumer level, entail a significant loss of revenue. Furthermore, deficient water storage capacity has remained a somewhat serious hindrance to proper retention of rainwater. Specifically, in 2018, Mauritius received nearly 5,300 million cubic metres of rainfall, with only 10% going as ground water recharge. At the same time, the effects of climate change have translated into uneven rainfall patterns affecting water resource availability, a phenomenon which is expected to aggravate in the future, on a no-change scenario. Concomitantly, according to Mauritius Meteorological Services, there has been a general downward trend in the amount of rainfall over Mauritius over the past century with an increase in the number of consecutive dry days. Moving forward and on current trends, if there is no material supply-side improvement, the country would find it increasingly difficult to address the rising water needs alongside ensuring water security.



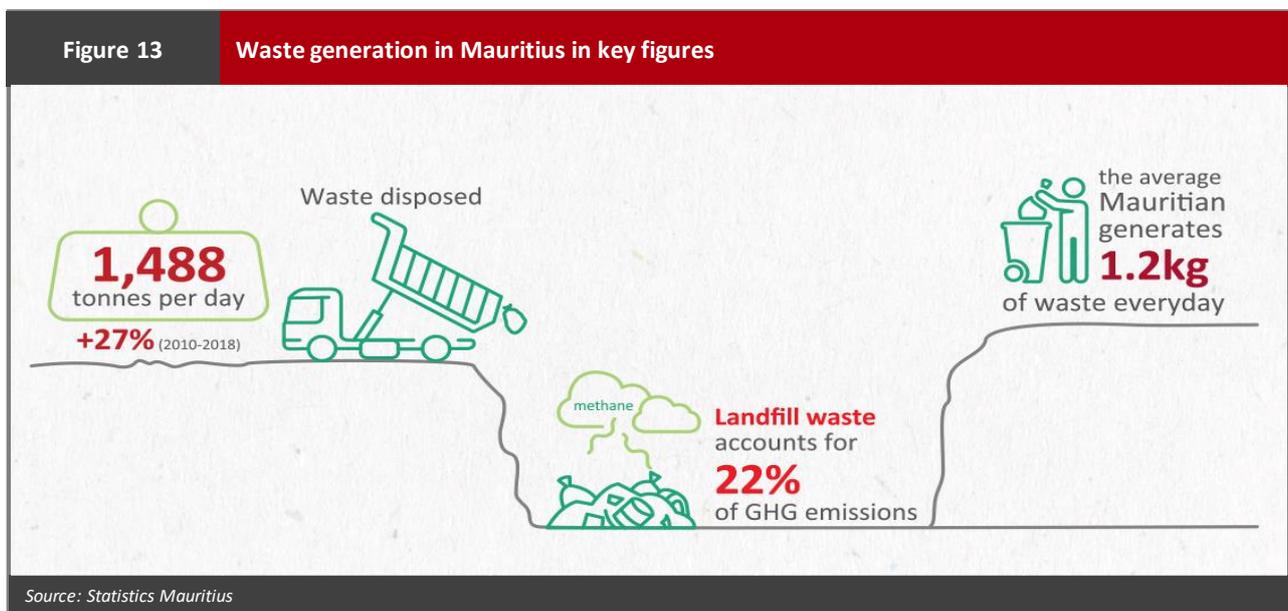
Specific policies to boost green payoffs

- Pricing policies and mechanisms should encourage water allocation to higher value uses in order to optimise its net economic and social benefits. Water tariffs could be reviewed to ensure that it does not encourage wastage and hinder the revenue mobilising capacity of the authorities for capital investments. Concurrently, incentives could be provided to encourage large water consumers to reach self-sufficiency.
- Further investment in efficient water storage and distribution infrastructure.
- Strengthen the country's disaster mitigation capacity to deal with extreme climate events
- Evaluate the shift to alternative water sources (rainwater harvesting, wastewater re-use, desalination, managed aquifer recharge) as these alternative resources remain largely untapped.
- Promote the adoption of water saving devices in businesses and households through awareness-raising, incentives and legislative measures such as higher import duties on high water use devices.

WASTE

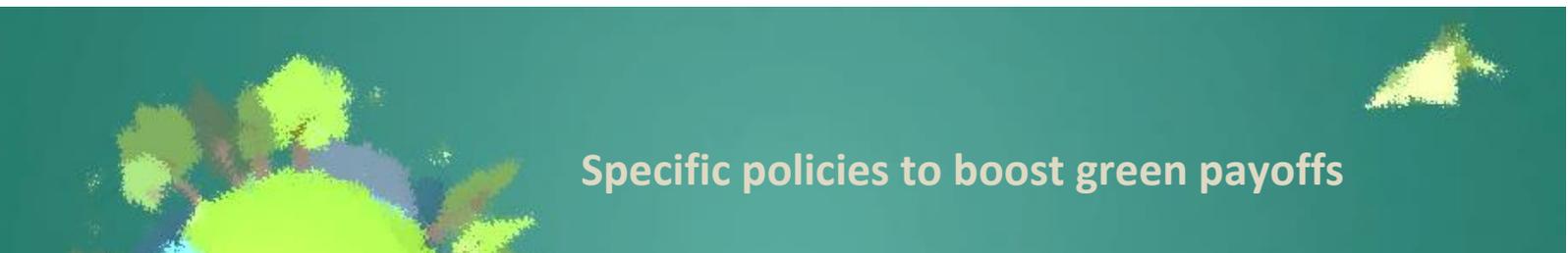
Context and challenges

Rising urbanisation and improved living standards coupled with changes in consumption patterns over the last few decades have generated mounting volumes of waste in the country. Whilst waste management is a major challenge faced worldwide, the issue is even more pressing in small island developing states like Mauritius. For a population of around 1.3 million, the country generates about 1,488 tonnes of waste daily, representing a per capita production of 1.22 kg of waste per day as per official figures. During the last five years, this figure has increased by 30%, bringing Mauritius closer to levels observed in high income economies. Strikingly, this has decreased the lifetime of Mare Chicose, the country's only landfill, which the authorities expect to saturate by May 2020 as per the current design. Under these circumstances, the proper management of solid waste has become a crucial environmental issue. Waste disposal is a particular challenge in Mauritius as low recycling rates and improper waste management endanger biodiversity, human and animal health, and groundwater and landscape resources. Methane, generated from decomposing organic waste, is the solid waste sector's largest contributor to GHG emissions and is viewed by the World Bank as being more potent than CO₂. Furthermore, poorly managed waste risks (i) contaminating the seawater, (ii) clogging drains and causing flooding, (iii) transmitting diseases via the breeding of vectors, (iv) increasing respiratory problems through airborne particles from burning of waste and (v) affecting the image of the island, thus impacting the attractiveness and competitiveness of Mauritius as an investment and tourism destination.



Greening the waste sector by primarily involving the 'reduce, reuse and recycle' principle to foster the establishment of a circular economy and eventually a zero-waste society entails several key benefits for small

insular islands like Mauritius. It will ensure that the use of materials and subsequent waste is limited, most unavoidable waste is recycled or remanufactured, and any remaining waste is treated so as to minimise environmental damage or even create additional value through recovering energy embedded in materials. This will maintain the continuous supply of non-contaminated resources to the recycling industry, reduce the quantity of wastes to be landfilled and consequently the emission of GHGs while simultaneously stimulating the economy with the creation of new green jobs.



Specific policies to boost green payoffs

A number of policy measures have been implemented by the authorities with the overall objective of reducing, reusing and recycling waste, such as the prohibition of non-biodegradable plastic bags and moves to enhance the domestic sewage system. That said, additional bolder measures and actions are warranted to decouple waste generation from the projected rise in consumption and living standards in Mauritius.

- Waste reduction and reuse can be encouraged in the short term through home composting, deposit on post-consumer products, amongst others, as well as awareness campaigns on the importance of separation of waste at source to efficiently recover resources that are otherwise being wasted
- Economic, administrative, informational and legal instruments can be leveraged in the longer term to reduce waste generation, incentivise separated collection and recycling of household waste, divert waste streams from landfill disposal as well as prohibit environmentally harmful products. For e.g. the use of non-biodegradable plastic products can be further discouraged by amending existing regulations. Furthermore, economic instruments can contribute to the “polluter-pays-principle” by providing revenue – either through user charges or through taxes on waste disposal that can be used to fund activities improving waste management and recycling activities.

AGRICULTURE

Context and challenges

The agricultural sector has, over time, played a pivotal role in the socio-economic development of Mauritius. While the direct share of agricultural production to GDP has been declining steadily from around 13% in 1990 to only 3% in 2019, the sector still plays a multi-functional role within the economy, ensuring food security and providing direct employment to 41,000 persons in Mauritius. Its forestry and biodiversity components play vital roles in the management of natural resources and are recognised as significant contributors to sustainable development and to the mitigation of climate change impacts. Agriculture is intrinsically linked to the health of ecosystems through soil formation, water regulation and carbon sequestration.

Yet, the sector is, today, faced with significant challenges that range from water shortages, decreasing soil fertility and harmful farming practices to unfavourable weather conditions and decreasing interest by younger generations. Within the sector, sugarcane has suffered a major downturn. Between 1990 and 2019, the area under sugar cane cultivation decreased from 76,000 ha to 48,000 ha, representing a drop of 38%, notably due to land abandonment and conversion for commercial and residential uses. This represents a potential challenge for the energy sector as bagasse derived from sugar manufacturing remains an important source of energy for Mauritius. Bagasse represents around 88% of the local renewable energy sources and nearly 15% of the total energy requirement of the country, thus avoiding the import of coal or sulphur-heavy fuel oil. Furthermore, sugarcane plants not only assist in the preservation of the local environment and natural sceneries but also are the most important carbon dioxide sequestrator of our local ecosystem and prevent of the erosion of top soil from the highlands from affecting beaches and lagoons. Moreover, being a net food importer, with imports close to 77% of its food requirements, Mauritius also faces the challenge of reaching a comfortable level of food security. Indeed, between 2010 and 2018, the import of food and live animals increased by 41% while domestic food crop production fell by 16%, indicating an increasing dependency on imported food and vulnerability to external food market dynamics. Further, agriculture in Mauritius is highly vulnerable to climate extremes and variability, such as flash floods and cyclones, which result in lower agricultural productivity, crop loss or crop failure. Under a no-change scenario, changes in temperature and rainfall associated with climate change are expected to shift crop production ranges, change the incidence and severity of pests and diseases, worsen the water stress and increase stress on livestock. Such developments will have a direct effect on production, prices, incomes and ultimately the livelihoods and lives of the farming community. The impact and economic cost of such events can be significant on national food production and food security.

Key benefits of greening agriculture

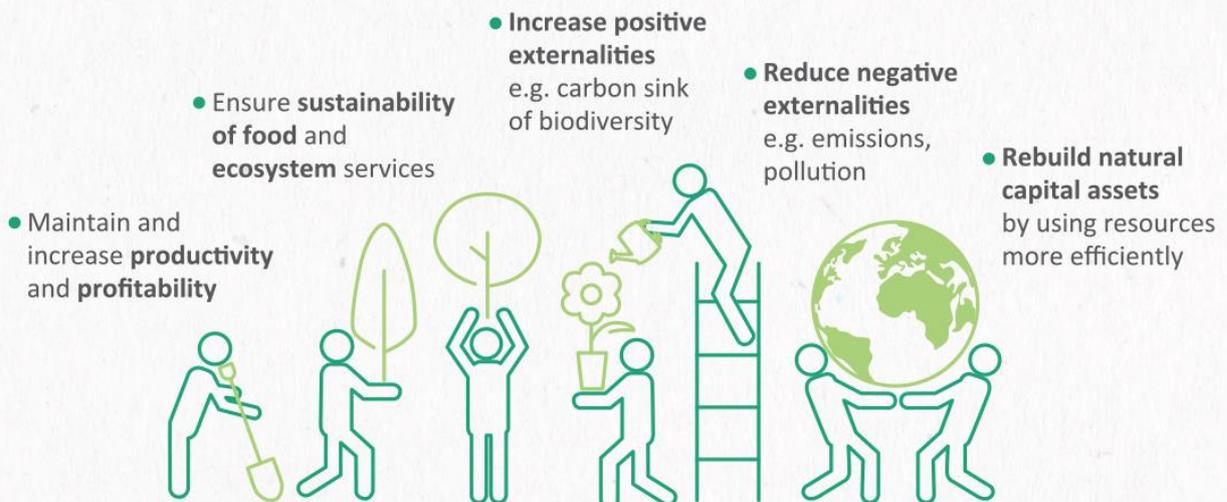
Empirical evidence suggests that greener forms of agricultural production present viable alternatives to conventional and unsustainable farming practices. Greening agricultural systems offer numerous opportunities and benefits, including competitive economic returns, the supply of essential and life-supporting ecosystem services, the creation of decent jobs and livelihoods, reduced ecological footprint, increased resilience to climate change, and enhanced food security. In addition, green agriculture has a local multiplier effect as it directs a greater share of total farming input expenditures towards the purchase of locally-sourced inputs such as labour and organic fertilizers. Greening agriculture can also relax foreign-exchange constraints by reducing the need for imported inputs and by increasing exports of sustainable food products. Furthermore, the environmental benefits from greening agriculture are critical and far-reaching. Conversion to organic agriculture can trap greenhouse gases within crops and soils more effectively and increase carbon sequestration substantially while greater farm biodiversity and improved soil organic matter also makes agriculture more resilient to climate change.

Figure 14

Greening the agricultural sector

Greening the agricultural sector involves **meeting the nutritional needs of the population** while also **minimising the environmental degradation** associated with certain agricultural practices.

Increasing use of farming practices and technologies that:



Source: PAGE, Green Economy Assessment Mauritius

Specific policies to boost green payoffs

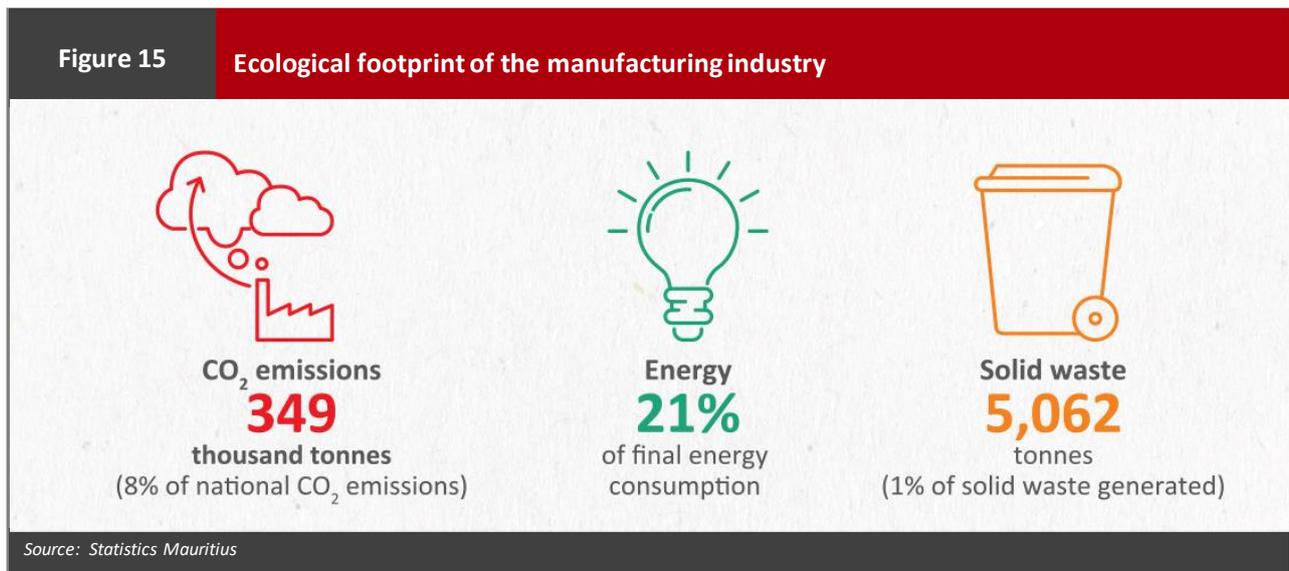
The following policy measures could be assessed and considered to complement the dedicated initiatives already put in place or announced by the authorities to promote the transition of the agriculture sector to a greener path.

- Improve the sector's long-term productivity and sustainability through investment in human and infrastructure capacity.
- Improve environmental performance by enhancing land management practices, minimising pollution discharges and damage to biodiversity.
- Increase recourse to process innovations to improve production techniques and strengthen the overall agricultural innovation systems to make them more collaborative and responsive to needs, such as improved agricultural productivity and environmental performance. E.g. improving seeds or irrigation systems.
- Equip the farming community to move towards sustainable agriculture through appropriate training. The green agriculture paradigm requires participatory learning in which farmers and professionals in agro-ecological sciences work together to determine how to best integrate traditional practices and new agro-ecological scientific discoveries. This could be supported by standardisation of curricula in educational institutions to include concepts and practices of green agriculture.
- Develop a framework, backed by incentives to farmers to promote sustainable agriculture practices; these could include, for instance, taxing the excess use of nitrogen fertilizers and rewarding farmers who comply with specified green practices through direct green payments.
- Promote the dialogue with regional groupings (such as SADC, COMESA members) to promote investments in eco-friendly agricultural Research & Development.
- Further encourage the use, notably by small planters and SMEs, of energy-saving technology such as next generation LED grow lights in farming activities.
- Make legal provisions for hydroponics and vertical farming operations in 'manufacturing districts' or urban areas.

MANUFACTURING

Context and challenges

The manufacturing sector has, over time, played a key role in the socio-economic development of Mauritius. It accounts for nearly 13% of GDP in 2019 – with notable shares for textile and food – and generates significant spillover effects in the economy in terms of employment, output, and export earnings. Concurrently, the manufacturing sector is the second highest energy consuming sector, accounting for around 21% of the final energy consumption in 2018. Additionally, the sector contributes significantly to the country's overall GHG emissions with important implications for the environment and climate, as illustrated in the figure below.



Lately, alongside being exposed to a challenging operating environment, value addition in the sector has been subject to mounting pressures emanating notably from low productivity, high product and market concentration, rising competitive pressures, obsolete technology/innovation base, inward-oriented manufacturing sector and relatively high labour and production costs, amongst others.

Key benefits of greening manufacturing

- A key benefit of greening the production base in the manufacturing sector would be in terms of reduction in overall costs over time. Specifically, the recourse to renewable energy, along with applicable energy-efficient equipment and machinery, can effectively reduce energy and utility bills. Additionally, increasing recycling and going paperless can also enable saving on supply costs.

- Sustainability has become an interest for consumers, and taking a business into that arena can be an important reputation boost. Rebranding a company can open a business to a new market of consumers, and increase sales overall.

Specific policies to boost green payoffs

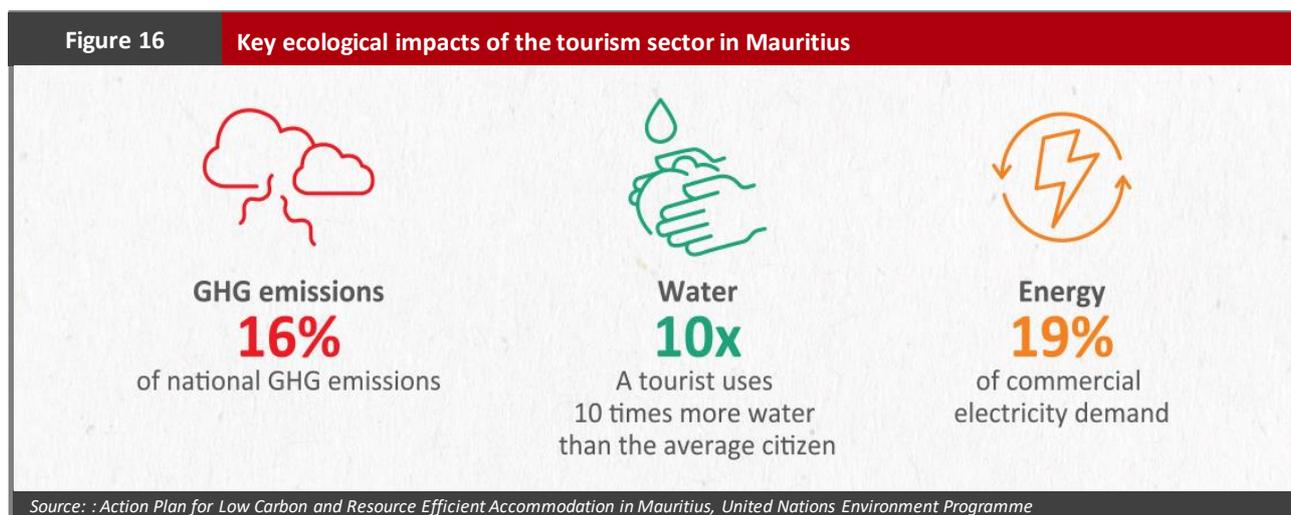
The authorities have announced their intention to revamp the manufacturing industry mainly by diversifying its industrial base and adopting a value-added strategy. Further developments in technology, evolving consumer preferences and digitalisation are likely to shape the future of the sector that is moving towards smart and green manufacturing. The following specific moves could be considered to fast-track the green transition of the industry

- Introduce green taxes on products that cause environmental damage in their manufacture or use. Effluent taxes can be imposed on polluters according to the amount of harmful material they discharge into the air or water. For example, a form of Pigouvian tax – i.e. a tax to tackle an inefficient market outcome triggered by negative externalities linked, for instance, to environmental pollution – has been introduced in Denmark and Finland, to encourage a shift in behaviours. Less directly, tax differentiation - that is, treating some enterprises differently from others under the tax code - can eliminate tax assistance to environmental offenders and reward environmentally beneficial behaviour. For instance, the U.S. government has developed a series of tax credits and incentives to help manufacturers offset the costs while switching to greener methods.
- Align price signals to green growth policy to provide incentives and direction to the market and investors. At individual- and firm-levels, the introduction of a price signal through a product tax can change consumer behaviour significantly.
- Further promote a national eco-labelling framework and incentives for green certifications and Bio labels. Eco-labelling of sustainably produced products and services provides a market-based instrument to enhance access to international markets for Mauritian businesses. In turn, this provides an additional incentive for these businesses to adopt green economy strategies.
- Promote the use of green technologies and technology transfer services which are essential to low-carbon industrial growth. Important opportunities exist for technology transfer, including power generation technology, energy and water efficient technology, waste recycling and soil management.

TOURISM

Context and challenges

Tourism is a key driver of socio-economic progress in Mauritius, as illustrated, notably, by its noteworthy contribution to GDP, employment, foreign exchange earnings and infrastructure development. In fact, during the 2014-2018 period, growth in value added in the tourism industry has outperformed nationwide real GDP growth, while tourist arrivals and gross receipts have, on average, grown by around 7% and 10% per year respectively during this period. While the traditional tourism model has served the industry over during the past decades, the sector is, today, being increasingly confronted by profound transformations being witnessed on the global scene. Indeed, the challenges posed by climate change, technology disruptions, geopolitical changes, changing profile of tourists and rising competitive pressures are already impacting value addition in the sector, as testified by the recent softening registered in arrivals and earnings. On the environmental front, tourism activity has brought negative impacts to the natural resources on which the island relies. In fact, the sector's growing consumption of energy and its dependence on fossil fuels have important implications for global GHG emissions and climate change as well as for future business growth. Indeed, the tourism sector is now a major contributor to the country's national GHG emissions and waste generation while being amongst the top consumers of water and energy, as illustrated in the following figure.



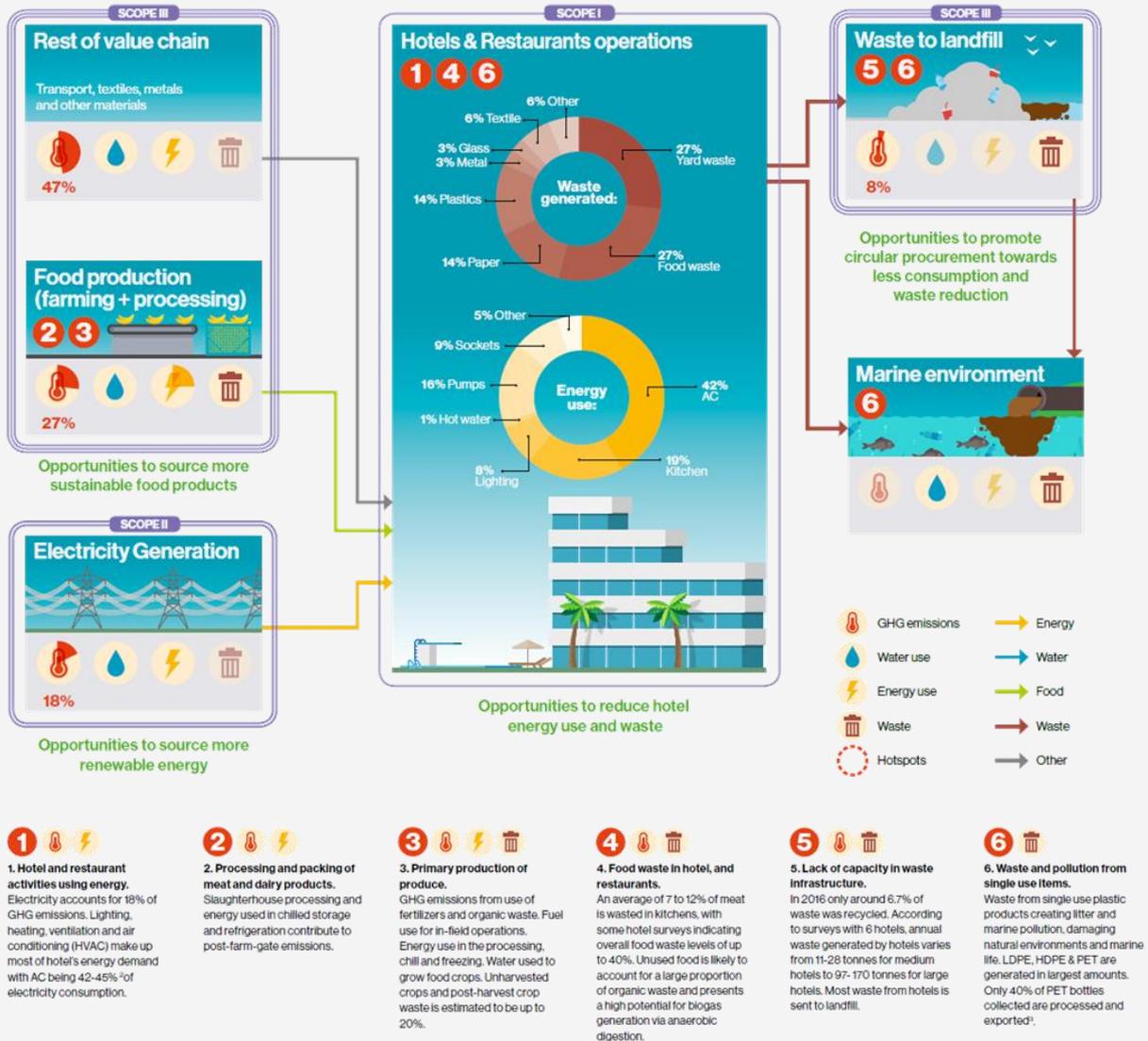
Moving forward, while 11% of our coasts are already eroded, approximately 23% of the island's beaches are considered at risk of disappearing as a result of the impact of climate change. Further, marine ecosystems have been affected as the stock of live coral cover decreased from 49% in 2002 to 18% in 2014. If unaddressed, the authorities estimate that these effects could reduce tourism revenue by up to USD 50 million a year by 2050.

Benefits of greening the tourism industry

- Greening the tourism sector allows tourism growth, environmental conservation and social well-being to be mutually reinforcing – with green tourism creating new, green jobs, supporting the local economy and reducing poverty. Future growth in the tourism sector need to be firmly based on the principles of inclusivity, social responsibility, environmental protection, local economic development and sustainable growth. It is encouraging to note that, so far, more than sixty hotels in Mauritius have already reported voluntary commitments to improve their environmental performance, and twenty-eight hotels are certified by international sustainable tourism standards. Going forward, tourism can, not only be a tool for economic development, but also for environmental conservation and resource efficiency. Tourist choices are increasingly influenced by sustainability considerations. In fact, a majority of international tourists – notably the millennials - are now interested in the social, cultural and environmental issues relevant to the destinations they visit and are interested in frequenting hotels that are committed to protecting the local environment. Research by the United Nations also indicates that consumers are concerned about the local environments of their travel destinations and are willing to spend more on their holidays if they are assured that workers in the sector are guaranteed ethical labour conditions in the places they are visiting.
- Moreover, sustainable tourism investment can help create additional job opportunities in energy, water, and waste services while expanded local hiring and sourcing are expected from the greening of mainstream tourism segments. This also is likely to significantly expand indirect employment growth opportunities in segments oriented towards local culture and the natural environment. Additionally, the shift to a more sustainable tourism model can also increase both the local contribution and multiplier effect as local communities are involved in the value chain, through the supply of products, labour and other services.

Box VI: Identifying priority issues in the tourism value chain

This graphic shows a summary of the priority environmental issues or “hotspots” identified throughout the value chain of hotels and restaurants in Mauritius. It indicates where action should be focused to have the largest effect on reducing GHG emissions and improving resource efficiency.



The three main areas with the highest GHG emissions are:

- **Food production.** Including farming and processing, food accounts for around 27% of the GHG emissions associated with hotels and restaurants.
- **Electricity generation.** Electricity that is purchased and used by hotels and restaurants represents 18% of GHG emissions.
- **Waste landfilled.** Waste generated through hotel and restaurant activities that ends up in landfill is associated with 8% of their GHG emissions.

Source: Action Plan for Low Carbon and Resource Efficient Accommodation in Mauritius, United Nations Environment Programme

Specific policies to boost green payoffs

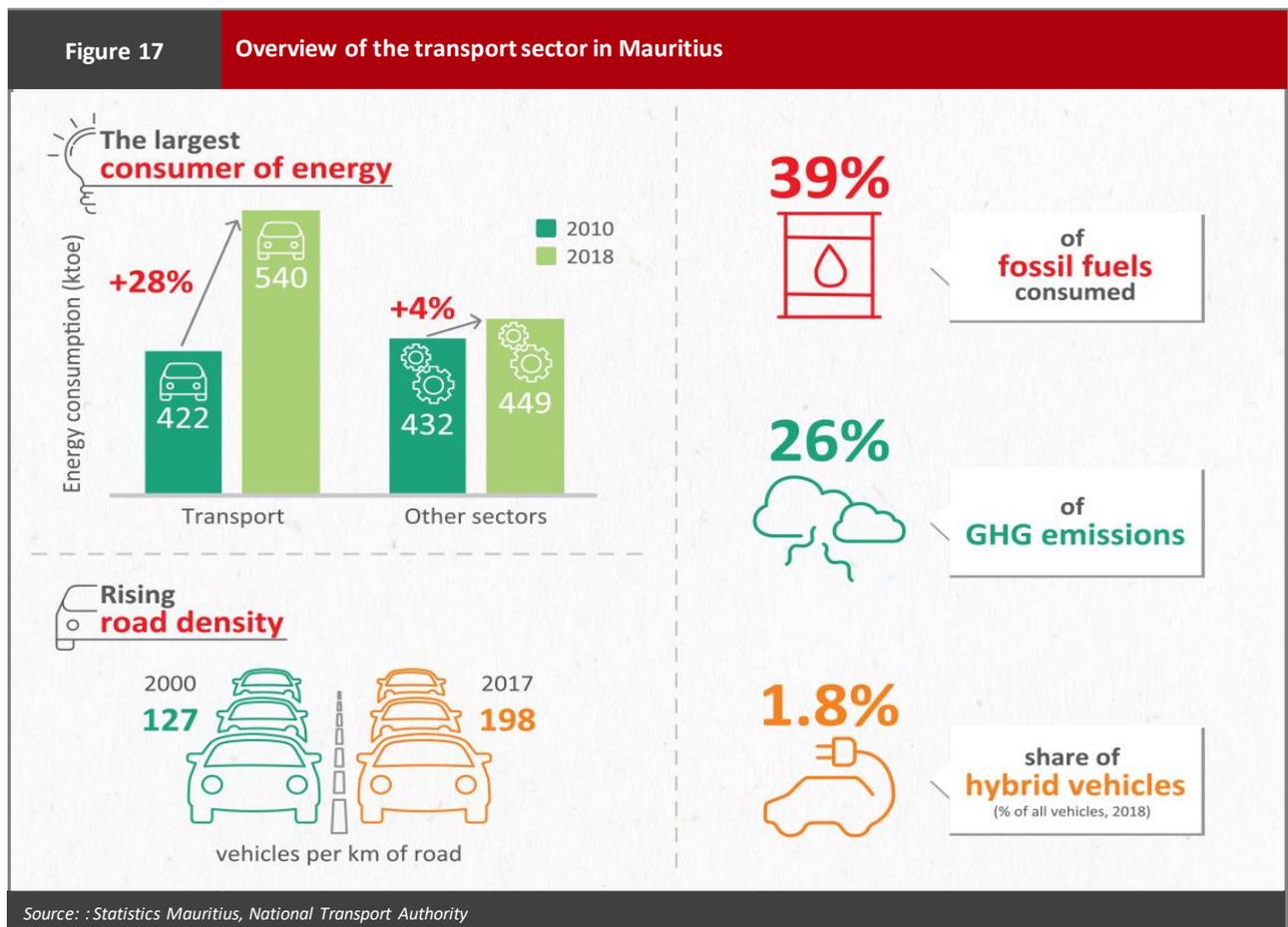
The Mauritius Tourism Strategic Plan 2018 – 2021 aims at turning Mauritius into a leading and sustainable island destination. The authorities in collaboration with the private sector also developed the SUS-Island project, with the aim of increasing the net positive impact of tourism, notably through the development of new products for the mass market by incorporating sustainability as a key ingredient. It is also encouraging to note that Mauritius has been selected by the United Nations Environment Programme as one of the four countries where it will implement its “Transforming Tourism Value Chains” project, which aims at reducing greenhouse gas emissions and improving resource efficiency. Looking ahead, the following policy options could be considered towards embracing a more sustainable and environment-friendly tourism industry.

- Promote the adoption, by tourism operators and relevant institutions of more innovative and appropriate technology to improve the efficiency of resource use (notably energy and water), minimise emissions of greenhouse gases (GHG) with the adoption, for instance, of solar schemes, and the production of waste, while protecting biodiversity. Hotels have the capacity to engage themselves, lead their suppliers, inspire guests and bring benefits to the local communities
- Create the enabling policy environment, backed by appropriate infrastructures, and technical assistance from international organisations, to incentivise and assist operators to adhere to dedicated programmes with a view to improving energy efficiency and reducing waste generation
- Involve local players and entrepreneurs to provide quality and certified products and services
- Engage communities and associations in key projects and undertakings
- Further efforts to preserve and restore coral reefs and the wider marine ecosystem
- Forge fruitful partnerships and alliances with NGOs, local and foreign environment specialists
- Set up dedicated forums for continuous and productive public-private partnerships

TRANSPORT

Context and challenges

Whilst the transport sector is instrumental to the country's development, the rising density of vehicles observed in recent times, has contributed to wider road congestion, greenhouse gas emissions, road deterioration and other forms of pollution. Rising private car ownership and the lack of adequate management of traffic have driven road congestion to the extent that it now inflicts serious economic costs to the country by disrupting workforce productivity. As depicted in figure 17, between 2010 and 2018, energy consumption by transport has grown significantly faster than other sectors, while also consuming the largest share of energy amongst all sectors in Mauritius. Transport not only uses 39% of petroleum products consumed, but also emits 26% of greenhouse gases in the country. Mauritius, like many small island developing states, lacks the capacity and expertise in various aspects of low-carbon mobility policy formulation, implementation, and deployment. While electric cars for personal transport are slowly making inroads in the local market, particularly amongst high income households, electric mobility options and associated charging infrastructure in the mass segment has known limited market growth.



Benefits of greening the transport sector

- A greener transport sector is central to a low carbon economy as it can reduce congestion and air pollution, create investment and employment opportunities while also lifting productivity levels.
- The adoption of greener public transport and more efficient vehicles along with cleaner fuels and stringent emission standards will significantly improve countries' ability to meet climate change mitigation targets. According to the Global Fuel Economy Initiative, it is estimated that even if kilometers driven double by 2050, fuel efficiency improvements and emission standards would cap CO₂ emissions from cars at current or lower levels.
- Furthermore, given the fact that land transport consumes 39% of total energy in the country, greener modes of transport are expected to reduce the energy demand and oil import bills, generating financial significant savings for the economy. Being a net fuel importer and therefore vulnerable to volatile oil prices in international markets, this also represents an opportunity for Mauritius to improve its energy security and reduce economic vulnerability to oil price shocks.

Specific policies to boost green payoffs

The authorities have recognised the need to incentivise the use of efficient vehicles and encourage the greater use of public transport. Despite positive trends in the area of fuel efficiency more large-scale measures to support the rapid decarbonisation of the transport sector are warranted.

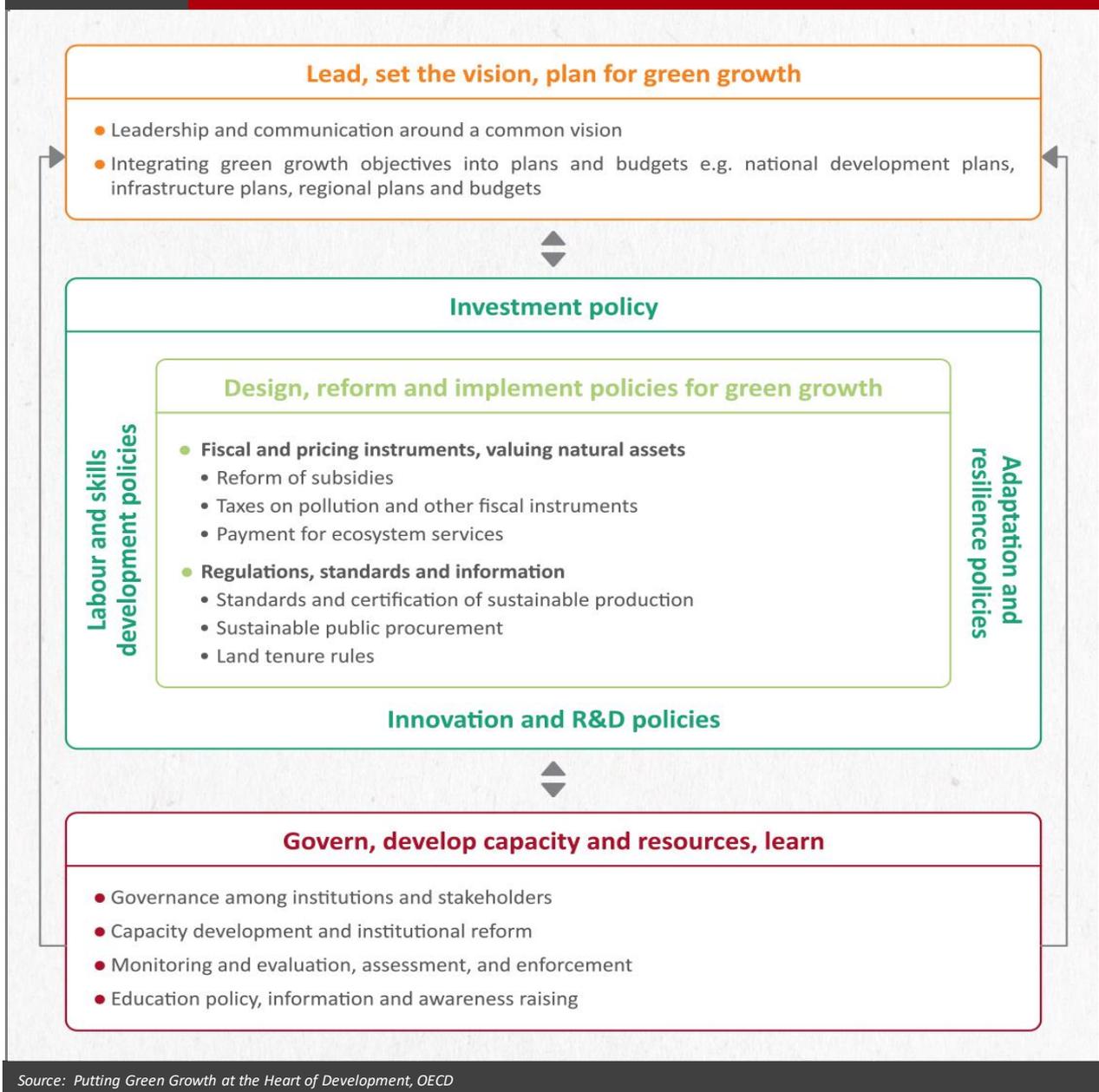
- Consider raising taxes on diesel vehicles to discourage use. Likewise, Government could increase investment in cleaner fuels. Studies revealed that using cleaner diesel immediately cuts soot emissions from diesel vehicles and equipment by 10%.
- Encourage the shift towards electric mobility by ensuring that electricity used is generated from low carbon, and that local energy systems are able to manage and respond to changes in demand. Success in the decarbonisation of the public transport sector would be met if measures such as the introduction of e-buses are coupled with incentives to shift to charging stations powered by renewable energy.
- Further efforts to reverse the trend towards more private vehicles by developing new mobility services such as carpooling and incentivise the use of public transport and non-motorised transport (NMT) such as bicycles. NMT is a key element to successfully encourage clean urban transport, especially in cities, as it provides an attractive mode of transport for relatively short distances, which make up the largest share of trips in cities. This can be done by a range of activities including construction of sidewalks and bicycle lanes, bicycle sharing programmes, urban planning and pedestrian-oriented development.

GENERAL OVERVIEW

The specific sector policies highlighted in the previous chapter should be guided by overall enabling conditions which are spelt out in this section. These relate notably to the importance of: (i) effective planning and coordination, backed by the reinforcement of capabilities; (ii) establishing a solid institutional background; (iii) promoting innovation and investment in green technology; (iv) forging meaningful public-private collaboration; and (v) stimulating public education and awareness. The figure below shows a general framework designed by the OECD for moving forward with a green approach.

Figure 18

The agenda for national action on green growth as per the OECD



EFFECTIVE PLANNING AND COORDINATION, BACKED BY THE REINFORCEMENT OF CAPABILITIES

Well-articulated planning processes driven by high-level experts, with a clear and strong mandate, specific objectives, backed by sound institutional governance and credible analysis are critical to the establishment of efficient green growth programmes. Furthermore, it is empirically observed that greater success is achieved when green growth objectives are defined in terms of a vision for a desired end-state, accompanied by more concrete short and medium term goals related to economic growth, social inclusion, employment, emission abatement, industrial growth, and natural resource protection.



While authorities across countries have employed a wide variety of approaches to green growth planning and no one size fits all model exists, the most successful ones are characterised by the following:

- Clear economic, environmental, and social objectives reflected in formal outcome-based mandates and supported by strong institutional governance.
- A holistic and properly coordinated approach to policy-making: (i) stating how the development of processes, norms and policies in one sector might affect others; (ii) carefully assessing decisions that

have long-term consequences; (iii) incorporating skills development policies; (iv) using an appropriate mix of policy tools to achieve a given objective

- Strong, high-level leadership, which links long-term national goals with environmental risks and opportunities while ensuring that the high level support is maintained during political transitions
- Active processes of stakeholder engagement with clear roles and procedures to manage and resolve conflicting interests and contestation.

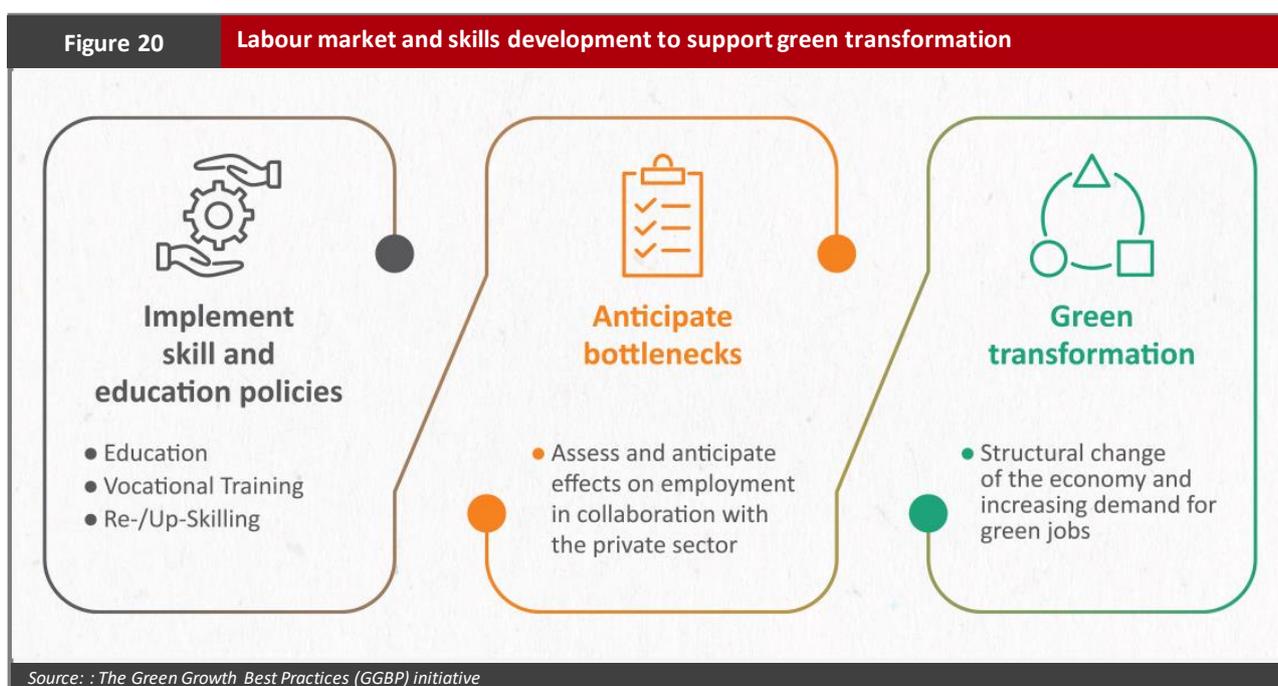
ESTABLISHING A SOLID INSTITUTIONAL BACKGROUND

A key tenet for the emergence of an inclusive green economy is the achievement of win-win-wins in terms of higher economic growth while simultaneously protecting the environment and improving human well-being. A strong institutional setting is key for the effective identification of constraints and the crafting of smart policy interventions that are adapted to local realities and flexible enough to deal with the evolving needs during the transition and associated trade-offs.

- It is important to align efforts of greening various sectors through a common institutional approach that brings together all relevant Ministries and departments. There is need for a coordinated approach the more so considering the several targets and commitments that have been made. For e.g. the Inter-Ministerial Committee on Sustainable Development (IMCSD) which was set up to formulate Singapore's national sustainable development strategy regrouped ministries and bodies overseeing different areas (environment, water resources, national development, finance, transport, trade and industry)
- Institutional arrangements should protect green growth plans from political changes and potential interference from interest groups.
- Sound governance practices provide long-term legislative certainty and as a result, important signals to attract investment into green projects and industries.
- From an execution perspective, it is also important to incorporate monitoring and evaluation mechanisms in institutional arrangements, backed by robust and regular data collection capacity, covering economic, environmental and social policy objectives. Developing key indicators allows for monitoring of the various underlying changes required to achieve green growth in key sectors.
- Furthermore, beyond legal frameworks, developing strong enforcement capacity is crucial for laws, regulations and standards to be effective. Successful legal instruments incorporate sanctions designed to punish violations, obtain redress, and deter future violations.

Likewise, capacity development plays a key role for enabling the adoption and practice of an inclusive green economy. Capacity development is necessary for (i) creating and enhancing green economy understanding; (ii) developing employable skills in a green jobs labour market; (iii) supporting inclusive green economy policy formulation, planning and implementation (iv) and improving mitigation capacity against extreme weather events. Capacity development is essential in strengthening overall legislative policy and the social norms environment within which individuals, institutions and organisations operate.

- Labour market and skills development policies play an important role in supporting the reallocation of workers from declining to growing sectors. Such policies are vital to ensure that workers and firms have adequate skills to perform in greener sectors, without which skill bottlenecks can arise and become a serious impediment for growth and investments.



- Labour market and skill development policies can be implemented across three main categories: (i) general education; (ii) vocational training; and (iii) reskilling and up-skilling policies. As stressed previously, close collaboration between the government and the private sector is of utmost importance to ensure effectiveness and efficiency of labour market and skills development policies.
- Furthermore, given projections for more intense and frequent extreme weather events, there is need for enhanced preparedness and response capacity, both technical and managerial, to be integrated with disaster and emergency management planning. In this respect, capacity development in emergency services is a critical component.

PROMOTING INNOVATION AND INVESTMENT IN GREEN TECHNOLOGY

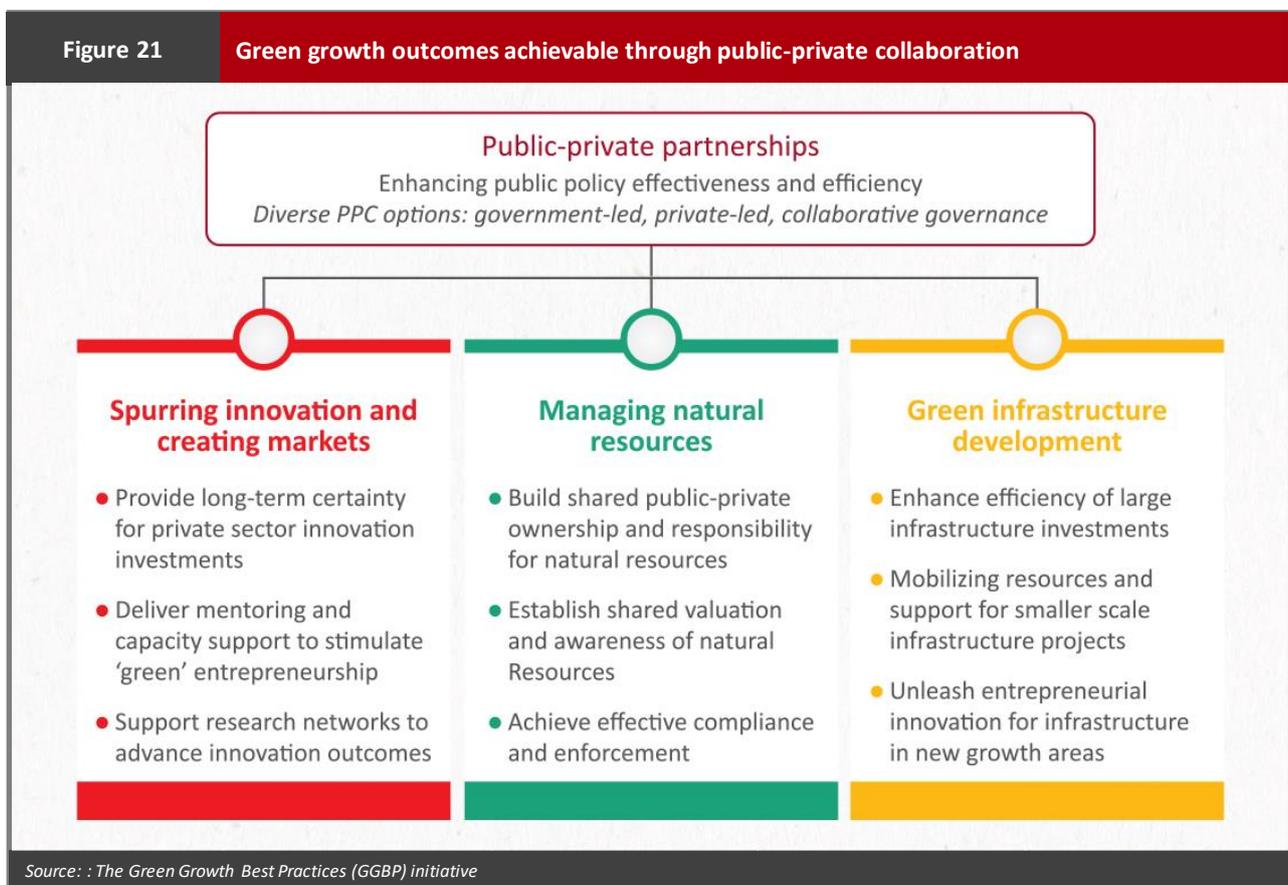
Unlocking sufficient investment capital is key to developing the economic and social infrastructure, strengthening institutions and facilitating the implementation of inclusive green economy projects.

- Green growth financing strategies will be most effective when they are supported by a stable regulatory environment and policy framework that provide effective price signals and ‘investment grade’ policies. Policies can be a source of risk in themselves if they change frequently and destabilise the investment environment. Hamilton (2009) introduced the concept of ‘investment grade policy’ for policies that create *‘the general environment which attracts private sector capital into a number of different solutions and if designed well will achieve the scale of investment required’*. A well-designed regulatory framework increases the confidence of investors and markets as it defines rights and creates incentives that drive green economic activity as well as remove barriers to green investments such as regulatory and business risks. Businesses prefer to work with clear and effectively enforced standards, and not have to deal with uncertainty or face unfair competition from non-compliance.
- Effective price signals should be in place to create incentives to investors in green projects or disincentives in unsustainable ones. To this end, it is important to align price signals to green growth goals, which may require redirecting existing incentives and subsidies towards green policy objectives. Harmful forms of unsustainable behaviour can be regulated also by creating minimum standards (requirements on products, processes and production methods).
- To create effective demand and price signals to entice new investors into green sectors, instruments such as financial de-risking instruments could be deployed in tandem with complementary policies to increase transparency of market information and data. Financial de-risking instruments can include concessional loans or equity, grants for investment and for technical assistance, guarantees and insurance mechanisms. Concessional loans and grant resources should be designed carefully to sufficiently adjust the risk profile to attract appropriate investors without crowding out private capital or creating an unsustainable market that will depend on long-term Government support.
- Sustainable public procurement can help create and strengthen markets in sustainable goods and services. Government procurement represents a large proportion of total public spending. By using sustainable public procurement practices, high-volume and long-term demand for green goods and services can be created. This can lead to the wider commercialisation of green goods and services, while promoting sustainable consumption.

- Existing production technology and consumer behaviour can only be expected to produce positive outcomes up to a point; a frontier, beyond which depleting natural capital has negative consequences for overall growth. By pushing the frontier outward, innovation can help to decouple growth from natural capital depletion.
- At the same time, measures that encourage the shift to greener technologies are needed. Green technologies include technologies for renewable energy, biotechnology, efficient vehicles, waste management, crop management, sustainable buildings, efficient water use, improved irrigation systems, and technologies that provide protection against sea level rise.

FORGING MEANINGFUL PUBLIC-PRIVATE COLLABORATION

Public-private collaboration acts as a powerful means to capitalise on innovation and technology transfer as it enables the knowledge and resources of diverse stakeholders to be harnessed to create outcomes which would be hard to achieve on their own. Close collaboration between the private and public sectors plays a key role in spurring green innovation, natural resource management and green infrastructure development.



STIMULATING PUBLIC EDUCATION AND AWARENESS

- In response to the call for a larger and appropriately skilled workforce that comes with a growing green economy, policies makers should work towards creating the required knowledge base from the grassroots level. Public awareness and communication is key for future generations to prepare for and adapt to a greener economy.
- Education has the potential to generate behavioural change at the level of the individual, the community and society as a whole. Indeed, according to results from the World Values Survey by the European University Institute, education is associated with increased environmental awareness, concern and action. It is also key towards maintaining consensus on policy implementation plans, especially in situations where green policies initially represent additional costs to consumers such as taxes or price increases. Public campaigns on the socio-economic implications of climate change or environmental degradation can also be a powerful way of raising public awareness and cultivating a sense of urgency for taking actions.
- In South Korea, the government has invested in greening education policies for university students as they have been identified as primary target group for skill development and education policy in the green economy transition. The government also provides support for vocational training with industry and youth education and public awareness raising initiatives.
- Similarly, Sciences Po, a leading French university, has announced that it will now review its courses on ecological transition to ensure that the nature and volume of the teachings are in line with the challenges faced whilst also instilling environmental awareness on a wider scale, notably through the introduction of compulsory courses on the subject.

CONCLUDING REMARKS

Nelson Mandela famously remarked: *“Everyone can rise above their circumstances and achieve success if they are dedicated to and passionate about what they do.”* Amidst the challenging operating environment and the natural aspirations of the population for higher quality of life, which factors in both income and environmental considerations, there is no doubt that, despite its low contribution to global CO₂ emissions, Mauritius needs to do its utmost to embrace a greener economic development path that could provide a boost to innovation, create new market opportunities and support wealth creation. Importantly, the choice should not be between boosting economic growth and protecting environment resources, but, instead, efforts should be deployed to achieve both objectives by integrating climate change mitigation and adaptation principles into macroeconomic policies after fostering an effective application of the Lagrangian method of constrained optimisation. To this end, it would be important to ensure that economic growth is elevated to higher echelons in the periods ahead to effectively cushion the elevated cost implications usually involved upfront in the transition to a green economy.

Overall, key success factors for the country can be delineated as follows: (i) adopting well-calibrated solutions and policies, including fiscal measures, to incentivise the efficient use of natural resources and make pollution more expensive; (ii) developing an integrated approach for effective national green economic planning backed by appropriate synergies and interactions among main public and private sector actors; (ii) scaling up capacity in terms of know-how and expertise, alongside significantly furthering our openness to foreign expertise and attracting top-calibre foreign professionals; (iii) ensuring pragmatism to preserve the key tenets of our competitive edge, with a prominent example relating to the promotion of a low, predictable and non-distortionary tax regime that has played a decisive role in stimulating investment over the past decades; (iv) communicating the benefits of a green growth path in a comprehensive way to raise awareness amongst the population and (viii) fostering recourse to international technical support that could prove beneficial in demystifying the complexities of an inclusive green economy transition and enable the proper framing of policy orientations for driving innovation and creating conducive conditions for the growth and development of SMEs, startups and eco-entrepreneurs to. Overall, the onus is, therefore, on Mauritius Inc. to rise up to the challenge and stimulate its transition to a high-performing inclusive green economy. In the end, amongst the various Pareto optimal allocations, the one that guarantees social welfare maximisation should be aimed at.

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Chief Strategy Officer

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ANNEX

Construction of the Inclusive Green Growth Index

The Inclusive Green Growth Index (IGGI) is constructed by the Asian Development Bank as follows:

- (i) To accommodate for the IGGI's 3 pillars (Economic Growth, Social Equity, Environmental Sustainability) and 28 indicators being expressed in different units, a min-max approach is used to normalize them. This technique involves dividing the difference between a country's performance indicator and the sample minimum by the difference between the sample's maximum and minimum value. These normalized scores are then converted on a scale of 1 to 6, corresponding to the worst and best possible outcomes respectively:

$$5 \times \frac{(\text{country score} - \text{sample minimum})}{(\text{sample maximum} - \text{sample minimum})} + 1$$

Consider the gross domestic product (GDP) per capita growth rate of Mauritius was 3.72% in 2017. In that same year, the lowest GDP per capita among the world sample was -10.91% (sample minimum) and the highest was 7.74%. Mauritius' normalized GDP per capita growth rate score is therefore calculated as follows:

$$5 \times \frac{(3.72 - (-10.91))}{(7.74 - (-10.91))} + 1 = 4.92$$

This normalization technique applies to all indicators with a positive impact on the IGGI. For indicators with a negative impact direction, meaning that a higher value reflects a worse outcome, such as air pollution or income inequality, the following transformation formula is used:

$$-5 \times \frac{(\text{country score} - \text{sample minimum})}{(\text{sample maximum} - \text{sample minimum})} + 6$$

Reversing the formula in this way ensures that the scores of 1 and 6 still reflect the worst and best possible outcomes respectively.

- (ii) The indicators for each pillar are assigned equal weights and aggregated to obtain the pillar scores. For instance, the economic growth pillar score is obtained as the simple average of the normalized scores of its seven component indicators. In the case of Mauritius in 2017, the indicator scores were: GDP per capita growth rate 4.92, inverse of the coefficient of variation of GDP per capita growth rate 2.51, trade openness 5.00, Hirschman-Herfindahl Market Concentration Index 5.82, age dependency ratio 4.56, adjusted net savings 4.38, and public debt 4.68. Therefore, the simple average of these seven indicators' normalized scores yields the economic growth pillar score of 4.55. This same process is used to obtain the social equity pillar score of 4.59 and the environmental sustainability score of 3.42.
- (iii) From there, the three pillar scores are assigned equal weights and aggregated to obtain the IGGI score, ranging from 1 to 6, reflecting the worst and best possible outcomes, as shown below:

$$IGGI = \frac{1}{3}(\text{average economic pillar}) + \frac{1}{3}(\text{average equity pillar}) + \frac{1}{3}(\text{average environmental pillar})$$

In the case of Mauritius, in 2017, the IGGI was estimated as follows:

$$IGGI = \frac{1}{3}(4.55) + \frac{1}{3}(4.59) + \frac{1}{3}(3.42) = 4.19$$

Description of Indicators and Data Sources as adapted in our model

Pillar	Indicator	Description	Data Source
Economic Growth	Inverse coefficient of variation	Ratio of average real GDP per capita growth and its standard deviation, using a 5-year rolling window to derive the time series; this variable measures economic stability	World Development Indicators
	Trade openness (% of GDP)	Sum of exports and imports in percentage of GDP	World Development Indicators
	Hirschman-Herfindahl Index (HHI)	Measures the dispersion of trade value across an exporter's partners	World Integrated Trade Solution
	Age dependency ratio (%)	Percentage of people younger than 15 or older than 64 to the working-age population	World Development Indicators
	Adjusted net savings (% of gross national income [GNI])	Net national savings plus education spending and minus energy depletion, mineral depletion, net forest depletion, CO ₂ , and particulate emissions damage, measured as a percentage of GNI	World Development Indicators
	Public debt (%GDP)	Gross general government debt	International Monetary Fund
Social Equity	Employment-to-population ratio (%)	Estimated percentage by the International Labour Organization (ILO) of employed to the population aged over 15	World Development Indicators
	Primary education enrollment gap (% points)	Percentage point difference of the proportion of male and of female enrolled in primary education	World Development Indicators
	Labor force participation gap (% points)	Percentage point difference of the ILO- estimated male and female labor force participation rates	World Development Indicators
	Life expectancy at birth	Number of years a newborn infant would live if prevailing patterns of mortality at the time of their birth were to stay the same throughout their life	World Development Indicators
	Life expectancy gender gap	Difference in number of years a male and female newborn infant would live	World Development Indicators

	Infant mortality rate (per 1,000 live births in a given year)	Number of infants dying before reaching 1 year per 1,000 live births in a given year	World Development Indicators
	Access to improved sanitation (%)	Percentage of population with access to improved sanitation	World Development Indicators
	Access to improved drinking water (%)	Percentage of population with access to improved drinking water	World Development Indicators
	Access to electricity (%)	Percentage of population with access to electricity and non-solid fuel	World Development Indicators
	Gini coefficient on inequality	Measures the extent to which the distribution of income (or, in some cases, consumption spending) among individuals or households within an economy deviates from a perfectly equal distribution	World Development Indicators
	Poverty gap (%)	Percentage of population living on less than \$3.20 a day	World Development Indicators
	Mean years of schooling	Average number of completed years of education of a country's population, excluding years spent repeating individual grades	UNDP Human Development Reports
	Primary completion rate (%)	Percentage of total enrollment, regardless of age, to the population of the age group that officially corresponds to primary school	World Development Indicators
	Political participation gap (% points)	Percentage point difference of the proportion of seats held by male and by female in national legislatures	World Development Indicators
Environmental Sustainability	Natural resources rent (% of GDP)	Ratio of the sum of oil, natural gas, coal (hard and soft), mineral, and forest rents to GDP	World Development Indicators
	Renewable internal freshwater resources per capita (cubic meters)	Annual availability of renewable water per capita	World Development Indicators
	Air pollution (% of population with exposure)	Percentage of population exposed to air pollution levels exceeding WHO's 2.5	World Development Indicators

		particulate air quality guideline	
	CO ₂ emission per GDP (constant 2010\$)	Annual kilogram of CO ₂ emissions relative to annual production in constant 2010 \$	Our World in Data
	Energy intensity (mega joule per constant 2011 purchasing power parity [PPP] GDP)	Energy intensity level of primary energy (mega joules per GDP measured in constant 2011 PPP dollars)	World Development Indicators
	Use of renewables (% of total energy consumption)	Percentage of renewable energy consumption to total final energy consumption	World Development Indicators

List of countries in the sample classified by Region

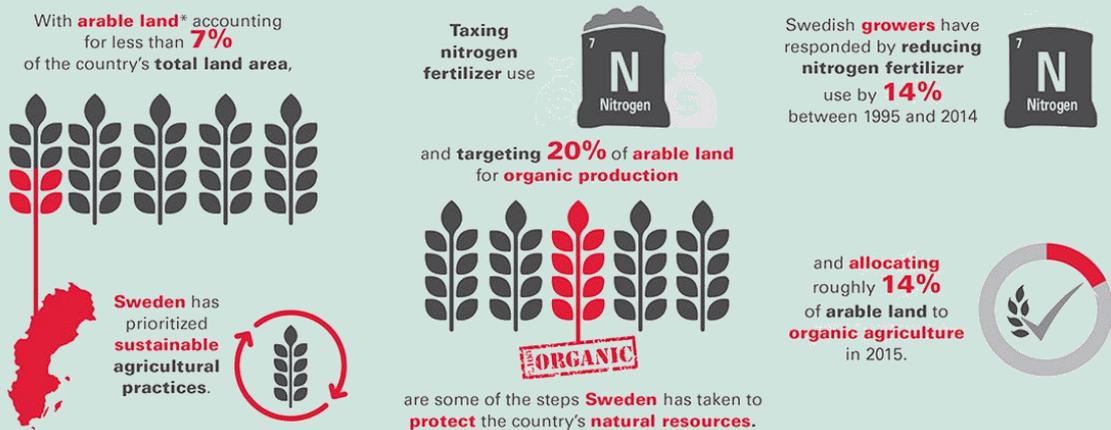
East Asia and the Pacific	Latin America and the Caribbean	Sub-Saharan Africa
Australia	Argentina	Angola
Brunei Darussalam	Bahamas, The	Benin
Cambodia	Barbados	Botswana
China	Belize	Burkina Faso
Indonesia	Bolivia	Burundi
Japan	Brazil	Cabo Verde
Korea, Rep.	Chile	Cameroon
Malaysia	Colombia	Congo, Democratic Rep.
Mongolia	Costa Rica	Congo, Rep.
Myanmar	Dominican Republic	Côte d'Ivoire
New Zealand	Ecuador	Eswatini
Philippines	El Salvador	Ethiopia
Singapore	Guatemala	Gambia, The
Thailand	Haiti	Ghana
Timor-Leste	Honduras	Guinea
Vietnam	Mexico	Kenya
Samoa	Nicaragua	Lesotho
	Panama	Liberia
	Paraguay	Madagascar
	Peru	Malawi
Eastern Europe and Central Asia	Uruguay	Mali
Albania	Jamaica	
Armenia	Guyana	Mauritania
Azerbaijan	St. Vincent and the Grenadines	Mauritius
Belarus	Middle East and North Africa	Mozambique
Bosnia and Herzegovina	Afghanistan	Namibia
Bulgaria	Algeria	Nigeria
Croatia	Bahrain	Rwanda
Czech Republic	Egypt, Arab Rep.	Senegal
	Iran, Islamic Rep.	Seychelles

Estonia	Israel	Sierra Leone
Georgia	Jordan	South Africa
Hungary	Kuwait	Tanzania
Kazakhstan	Lebanon	Togo
Kyrgyz Republic	Morocco	Uganda
Latvia	Oman	Zambia
Lithuania	Qatar	Zimbabwe
Moldova	Saudi Arabia	
Montenegro	Tunisia	
North Macedonia	Turkey	
Poland	United Arab Emirates	
Romania	Sudan	
Russian Federation		
Serbia		
Slovak Republic		
Slovenia	Western Europe	
Tajikistan	Austria	
Ukraine	Belgium	
Uzbekistan	Cyprus	
North America	Denmark	
Canada	Finland	
United States	France	
South Asia	Germany	
Bangladesh	Greece	
Bhutan	Iceland	
India	Ireland	
Maldives	Italy	
Nepal	Luxembourg	
Pakistan	Malta	
Sri Lanka	Netherlands	
	Norway	
	Portugal	
	Spain	
	Sweden	
	Switzerland	
	United Kingdom	

CASE STUDY 1: GREEN AGRICULTURE IN SWEDEN

After becoming a member of the EU, farmers were required to gradually adopt the framework of the EU's Common Agriculture Policy (CAP), including a push towards a more market-oriented and eco-friendly approach to agricultural production. Swedish agriculture has been able to maintain and increase its economic value-added despite a declining percentage of the country's population focusing on agriculture. Since Sweden's participation in the CAP has incentivized farmers to focus on their comparative advantages, productivity gains have mainly been achieved by merging small unprofitable farms into larger units.

Sweden's **Eco-Friendly Agriculture**



CASE STUDY 2: FULFILLING AGRICULTURAL POTENTIAL THROUGH R&D AND REGIONAL INTEGRATION IN SOUTHERN AFRICA

- Despite the confirmed returns to investments in agricultural R&D, agricultural research in Africa is particularly underfunded. Regional integration has proven to be an effective strategy that can allow groups of countries facing common research challenges to increase the efficiency of their investments in agricultural R&D.
- In southern Africa, technology spillover is already occurring within the sub-region, and a number of high-yielding crop varieties and improved crop and livestock management practices have been successfully disseminated across borders. The Agricultural Productivity Program for Southern Africa (APPSA) brings together participating countries in southern Africa to improve technology generation and dissemination through capacity building within national R&D systems and enhancing regional collaboration. Since the launch of APPSA, Malawi, Mozambique and Zambia have joined, 42 technologies have been made available to farmers and other end users, 48 collaborative research/extension sub-projects are under implementation, and 8,225 farmers have been reached.

CASE STUDY 3: GREENING IN THE EU

- The green direct payment (or greening) supports farmers who adopt or maintain farming practices that help meet environmental and climate goals. Through greening, the EU rewards farmers for preserving natural resources and providing public goods, which are benefits to the public that are not reflected in market prices. Farmers act as managers of the countryside, they shape landscapes and through their work, farmers provide public goods beneficial to all.
- Farmers receive the green direct payment if they comply with three mandatory practices that benefit the environment. The three actions farmers have to put in place are:
 - **crop diversification**: a greater variety of crops makes soil and ecosystems more resilient;
 - maintaining **permanent grassland**: grassland supports carbon sequestration and protects biodiversity (habitats);
 - dedicate 5% of arable land to **areas beneficial for biodiversity**: Ecological Focus Areas (EFA), for example trees, hedges or land left fallow that improves biodiversity and habitats.

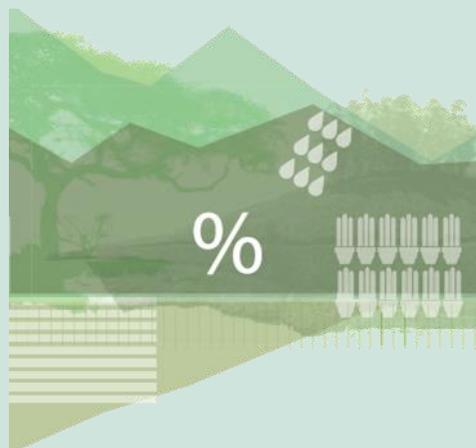
CASE STUDY 4: **VERTICAL FARMING IN CHICAGO, ILLINOIS**

- Using energy-saving technology such as next generation LED grow lights, commercial indoor vertical farming operations in Chicago are emerging. Facilities are able to harvest up to 26 times a year using 85% less energy, one tenth the water and eliminating pesticide and herbicide use entirely. Investment in hydroponic food production lowers production costs by reducing transportation needs and increases predictability in the food supply chain.
- Companies such as FarmedHere, a 90,000 square-foot facility—the largest in the world—have been successful in Chicago in part because of zoning amendments to urban agriculture passed by council in 2010. The new law allows provisions for hydroponics and vertical farming operations to run in all “Planned Manufacturing Districts” citywide. Amending city zoning and bylaws to allow hydroponics and vertical farming facilities to operate is the first step toward enabling these benefits to be realized.

ENERGY

CASE STUDY 5: **Germany’s Renewable Energy Policy**

The Government of the Federal Republic of Germany has implemented policies to promote the development and uptake of renewable energy, since the beginning of the 1990s. The approach combines feed-in tariffs, for renewable electricity; investment subsidies and low interest loans targeting renewable heat; and quota obligations and tax exemptions targeting biofuels. The keys to its success are the combination of instruments and the design of the feed-in tariff that offer long-term and predictable revenues to renewable energy investors. It has been effective in stimulating a rapid and large deployment of renewable energies in Germany - the share of renewables in final electricity consumption increased from 4% in 1990 to about 38% in 2018.



CASE STUDY 6: Sweden first introduced taxes for environmental purposes

Sweden was one of the first countries to introduce taxes for environmental purposes, including a tax on emissions of CO₂ in 1991 at a rate corresponding to 24 € per ton of carbon dioxide. The CO₂ tax rate has been substantially raised over time (as of 2019, it is SEK 1180 (115 € at exchange rate as of January 1, 2019) and it is now among the world's highest. Sweden is one of the few countries to successfully undertake a "green tax shift", reallocating the tax burden from labour to environmentally harmful activities, namely CO₂ emissions and the use of energy generated from burning fossil fuels.

In order to combat acidification, in 1992 Sweden introduced a charge on NO_x emissions from stationary combustion facilities (such as power plants and industrial installations) as an incentive to reduce emissions beyond the regulatory limits. To address competitiveness concerns, all proceeds from the charge are paid back to the plants, based on the amount of energy used. This means that plants with low emissions vis-à-vis energy production are net receivers of funds, while plants with high emissions in relation to energy production are net payers. The NO_x charge stimulated demand for NO_x abatement technology and thus increased innovation. It also helped halve NO_x emissions per unit of energy produced. However, the charge rate needs to be systematically adjusted to maintain its incentive function. The refund mechanism gives rise to an implicit subsidy to producers: they do not pay the full environmental cost of the pollution they generate.

Other examples relate to: Thailand used a tax on petroleum products to provide low-interest loans for renewable energy. Besides, Indonesia removed diesel subsidies for industries and used the budget savings for poverty alleviation programs.

CASE STUDY 7: Low-energy house in Denmark

In the area of Skibet near Vejle, Isover has built 10 low energy houses in close collaboration with actors from the building sector, Zetra invested and Middelfart Bank. The target for all 10 houses was that they should be certified after the German passive house standard and there should be a particular focus on indoor comfort. The house is heated with floor heating and ventilation air via a heat pump with energy from soil pipes and exhaust air. There is a mechanical ventilation with heat recovery with preheating of fresh air in 40 m soil channels.

Energy demand has been demonstrated by one year of measurements and shows that the house meets the requirement of passive house standard.



CASE STUDY 8: Biodiesel for energy security in West Africa

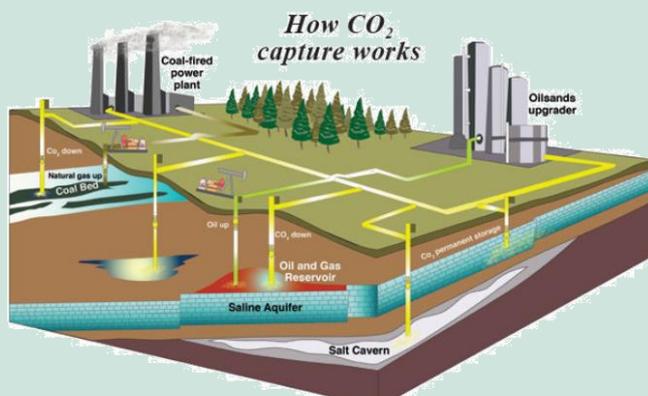
Farmers' cooperatives in Mali and Burkina Faso integrate the Jatropha plant, which can be used for the production of biofuel, into their production systems. Jatropha is grown on unproductive land, thus avoiding a conflict over food and fuel production and doing no harm to food security. Biodiesel is produced by a private company, MBSA, which has also set up local foundations in both countries aiming to strengthen farmer capacity.

The governments of Mali and Burkina Faso have created an enabling environment for foreign and national private investment, and support in the form of technical services. In this way, more than 10,000 smallholder farmers could benefit from the co-operation with MBSA. The collaboration between the private and public sectors has thus been vital for the success of the project (IFAD, 2013).



CASE STUDY 9: Carbon capture and storage project in Canada

Canada holds the world's third largest oil reserves (175 billion barrels), behind Saudi Arabia and Venezuela, with large reserves of crude oil (from western Canadian oil sands), natural gas and shale gas. It is also a major exporter of energy, with the majority of its crude oil exported to the U.S. Canada has great potential for CO₂ storage, and the country has demonstrated a commitment to CCS as part of its approach to reducing GHG emissions, with over \$2 billion Canadian dollars (USD \$1.8 billion) allocated for the development of CCS and one of the world's largest operating CCS projects. Canada is home to seven large-scale CCS projects: Two are in the planning phase, four are under construction, and the Weyburn/ Midale EOR project in Saskatchewan, the largest of its kind, is operational.



CASE STUDY 10: Rainwater harvesting in Singapore

The average annual rainfall of Singapore is 2400 millimeters. In spite of 50% of the land area being used as a water catchment, almost 40-50% of its water requirement are imported. Schemes have included the utilisation of the roofs of high-rise buildings, the use of run-off from airports for non-potable uses, and integrated systems using the combined run-off from industrial complexes, aquaculture farms and educational institutions.

Rooftop water collection systems:

- **Changi Airport:** Changi Airport system collects and treats rainwater, which accounts for 28 to 33% of its total water used, resulting in savings of approximately S\$ 390,000 per annum. The potential for using these rooftops as catchments are high. The system developed have been result of intensive research. A simple computer programme was developed and nomogram prepared relating the roof area, tank size and roofwater available.
- **High Rise Buildings:** In this system implemented in a 15 storey building, the collected roofwater was diverted to two rainwater tanks. An economic appraisal established that there was an effective saving of 13.7% of the water. The cost of the rainwater was s\$0.395 (us\$0.25) per cubic meter (cum) as against the cost of potable water which was s\$0.535 (us\$ 0.33).
- **Capturing Urban Runoff:** By 1986, the growing need for water led to the establishment of the lower Seletar-Bedok water scheme where almost 9% of the total land area was used. The most important feature of this scheme is that almost one-quarter of this catchment is in urban area having high rise buildings and industries and surface run-offs were subject to a wide varieties of contaminants. The reservoirs are interconnected and raw water from Bedok reservoir is treated to potable levels before distribution. The rest of the catchment of 2,625 ha was primarily urban and both the runoffs are directed to Bedok reservoir.

CASE STUDY 11: New York City, New York: Conservation as a Water Resource

Beginning in 1985, New York implemented a series of conservation initiatives, including education, metering, leak detection, and water use regulation. For instance, the city initiated computerized sonar leak detection of all city water mains, installed magnetic locking hydrant caps to discourage residents from opening hydrants in the summer and installed water meters at unmetered residences.

As a result, the leak-detection program saved 30 to 50 million gallons per day (mgd) in its early years and continued to help reduce losses. In 1996, leak detection and repair efforts saved approximately 11 mgd. Savings from metering total more than 200 mgd at a cost of \$150 million. New York City performed more than 200,000 homeowner inspections, resulting in the elimination of more than 4 mgd in leaks. The city also replaced 1.3 million inefficient toilets between March 1994 and April 1997, saving an estimated 70 to 80 mgd. Customers realized 20% to 40% savings in total water and wastewater bills. Overall, New York's conservation efforts resulted in a drop in per capita water use from 195 gallons per day in 1991 to 167 gallons per day in 1998.

CASE STUDY 12: A SUCCESSFUL PLASTIC RECYCLING SYSTEM IN TUNISIA

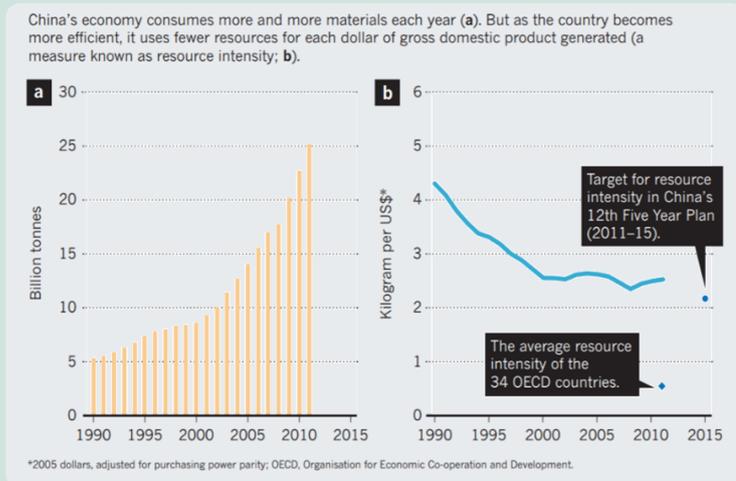
- Tunisia provides an example of successful integration of the informal recycling sector into waste management and of the application of the extended producer responsibility principle.
- The Eco-Lef program developed a national system for the recovery and recycling of post-consumer packaging primarily focused on plastic waste. The program is partly financed by the private sector through an eco-tax of 5% on the net added value of certain locally manufactured or imported plastic polymers.
- The system encourages individual and informal collectors to gather used plastic and metal packaging and deliver the materials to Eco-Lef collection centers. In return, waste collectors receive remuneration based on the type and quantity of packaging collected.

The success of the Eco-Lef program

- The Eco-Lef program has successfully improved postconsumer packaging collection and recycling rates. Depending on the type of plastic, 70–90% of collected waste is recycled through more than 70 active private recyclers who receive plastic collected through the Eco-Lef system. Eco-Lef has contributed to the creation of about 18,000 jobs and 2,000 micro-enterprises for collection

CASE STUDY 13: THE CIRCULAR ECONOMY IN CHINA

China has successfully promoted the recirculation of waste materials through setting targets and adopting policies, financial measures and legislation. The ultimate goal is a circular economy by closing industrial loops to turn outputs from one manufacturer into inputs for another. This approach reduces the consumption of virgin materials and the generation of waste.



Key measures

- A fund was allocated to support the conversion of industrial parks into eco-industrial agglomerations.
- Tax breaks were provided to enterprises in the reuse sector.
- A circular economy promotion law demanded that local and provincial governments consider such issues in their investment and development strategies. Objectives included reusing 72% of industrial solid waste by 2015 and raising resource productivity (economic output per unit resources used) by 15%.
- Targets were enacted for the coal, steel, electronics, chemical and petrochemical industries.
- The plan laid out a three-pronged '10–100–1,000' strategy:
 - **10** major programmes focusing on recycling industrial wastes, conversion of industrial parks, remanufacturing, urban mining, and the development of waste-collection and recycling systems;
 - **100** demonstration cities such as Suzhou and Guangzhou; and
 - **1,000** demonstration enterprises or industrial parks nationwide.

Results

By 2013, resource intensity and waste intensity had improved by 34.7% and 46.5%, respectively, indicating that resource consumption (of metal, water, energy and biomass) was decoupling from economic growth in relative terms. The treatment rate of pollution, including sewage, the decontamination of urban residential waste and the reduction of major pollutants also increased by 74.6%.

CASE STUDY 14: A PATH TO ZERO WASTE IN SAN FRANCISCO

In 2002, San Francisco announced a vision to send zero waste to landfills by 2020. Through initiatives to promote recycling and composting, San Francisco is now one of the greenest cities in America and a global leader in waste management. San Francisco's success has been achieved largely by robust public policy implemented by determined political leadership, strong public-private partnerships, resident education, and financial incentives for waste reduction.



- The city prohibited the use of styrofoam and polystyrene foam in food service, required mandatory recycling for construction debris, banned plastic bags in drugstores and supermarkets, and implemented mandatory recycling and composting for both residents and businesses. San Francisco most recently also banned the sale of plastic water bottles in 2014.
- State-of-the-art outreach programs covering residences, businesses, schools, and events are widespread, and financial incentives encourage waste reduction and recycling. To help residents more clearly understand their waste disposal practices and financial impact, each house or building receives a detailed bill for waste management fees. Payments are reduced if residents shift their waste from mixed waste bins to ones designated for recycling or composting.
- Furthermore, the size of the provided mixed waste bins was halved and the size of recycling containers was doubled. Waste bins are regularly inspected, and households that fail to comply with policies first receive warnings, followed by a financial penalty.
- San Francisco also introduced the first and largest urban food waste composting collection program in the United States, covering both the commercial and residential sectors. San Francisco has collected more than a million tons of food waste, yard trimmings, and other compostable materials and turned these materials into compost for local farmers and wineries.
- As a result of its efforts, San Francisco achieved nearly 80% waste diversion in 2012—the highest rate of any major city in the United States (EPA 2017).

CASE STUDY 15: WORLDWIDE PIONEERS IN GREEN MANUFACTURING

- **IKEA** - The furniture maker uses a lot of natural resources for its furniture, but it is committed to getting wood from sustainable forests and, in anticipation of the Paris Climate Agreement, in 2016 committed to becoming an energy producer and exporter by 2020 thanks to wind turbines and solar panels on stores and distribution centers.
- **Johnson & Johnson** - As part of Climate Week NYC in 2015, Johnson & Johnson joined other Fortune 500 companies in committing to 100% renewable energy. Today, the company gets more than half its energy from renewable resources and is the second biggest consumer of solar power in the US.
- **Schott** - Glass manufacturer Schott is committed to environmental responsibility by limiting its use of natural resources and potentially harmful heavy metals such as antimony and arsenic. The company develops its own technology for specialty glass that is safer for the environment and more sustainable.
- **Allergan** - The pharmaceutical company perhaps best known as the makers of Botox is a five-time EPA EnergySTAR Award winner thanks to energy conservation efforts. The company uses benchmarks and reporting to limit its water usage and has reduced its waste and emissions across the supply chain.

CASE STUDY 16: TAX EXEMPTION IN CALIFORNIA

California has used a number of taxes to align price signals to support green growth. In particular, California offers a sales tax exemption for clean technology manufacturing equipment. Such incentive for investing in clean technology development have helped establish California as a leading region for green energy research and investment (Iwulska, 2012).

CASE STUDY 17: GREEN INDUSTRIAL LAUNDRY IN THE DOMINICAN REPUBLIC

- To minimize the negative impacts of hotel laundries in the coastal zone of Punta Cana, Grupo Puntacana decided to re-think its laundry operations to reduce costs by lowering water and energy consumption and giving preference to the use of biodegradable chemicals.
- Grupo Puntacana created the first green industrial laundry site whose main energy source is steam generated by a biomass boiler.
- To mitigate risks related to the high investment costs on the site, the business model targeted not only providing laundry services to Grupo Puntacana hotels, but also to other businesses from the region including hotels and the Punta Cana airport.
- Pooling the needs from 12 hotels and centralizing the provision of laundry services in one sustainable industrial site enabled economies of scale. This meant lowering water, energy and detergent requirements, compared with traditional laundries that hotels used to operate in their respective premises. Risks related to wastewater from hotel laundries leaking into the marine environment have also been reduced.



CASE STUDY 18: THE BLUE FLAG ECOLOGY PROGRAM IN COSTA RICA

- The Blue Flag Ecology Program was founded with the purpose of improving education and information regarding the environment. Every year more and more beach communities of Costa Rica are competing for the Blue Flag and working for the purpose of the Blue Flag Ecology Program. The success of this program has inspired authorities to expand it to the non-coastal communities. The Blue Flag Ecology Program is divided into ten categories: beaches, communities, neutral weather, education centers, community health, micro drainage basin, sustainable homes, special events, protected natural spaces, and climate change.
- The programme was successful in inspiring people, businesses and communities to care about the environment and carry out environmentally-friendly practices. The idea of being awarded a prestigious blue flag has prompted many communities to work together in an effort to take care of their local environment. Costa Rica is now widely recognized for its ecotourism and sustainable tourism practices as testified by its strong international rankings in environmental sustainability

CASE STUDY 19: CYCLING TO SUSTAINABILITY IN AMSTERDAM

- Amsterdam provides an excellent example of how a city can become more livable and most sustainable by designing its transport system around the bike.
- Amsterdam has benefited greatly from the growing popularity of the bicycle. In Amsterdam between 1986 and 1991, the city already saw 470,000 trips by bike on an average day. Between 2004 and 2008, that number grew to 604,000 per day, and is still growing now.



- The Netherlands boasts 22,000 miles of cycle paths. In 2015, cycling accounted for 27% of all journeys in the Netherlands, roughly more than double the cycling modal share of Germany. This 27% share of journeys can be compared with 2% in the UK and this rises to 38% in Amsterdam and 59% in the university city of Groningen. In fact, the popularity of the bike is still growing, owing to partly to the development of electric bicycles.

CASE STUDY 20: THE RISE OF ELECTRIC VEHICLES IN NORWAY

- The Norwegian government is intent on reducing greenhouse gas emissions from road traffic. In its quest for cleaner air, especially in urban areas, it has turned its attention to electric vehicles (EVs). Through a combination of advanced research, financial incentives and public awareness campaigns, the breakthrough has been made: there are around 70,000 EVs on the road in Norway and 20% of new vehicles are fully electric.
- The government's broad environmental objective for 2020 is that the average emissions from new private vehicles will not exceed an average of 85 g of CO₂/km. This sets the context for its EV policy, on the assumption that more use of EVs is an obvious means of reducing air pollution.
- Norwegian resident Bjørn Engebretsen, who was an early convert to electric vehicles, believes the EV industry is poised for strong growth. "Just look how much has happened in the past five years," he said, pointing to the introduction of the new EV models and investments by the government in supporting infrastructure like charging points. "It's so beautiful to drive electric cars." Plus, he said, people were increasingly realising how enjoyable owning an EV can be.

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