

Policy review

# Science Technology and Innovation Policy Review: Seychelles



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**United  
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# Abbreviations

<b>4IR</b>	Fourth Industrial Revolution
<b>AfCFTA</b>	African Continental Free Trade Area
<b>AfDB</b>	African Development Bank
<b>AI</b>	Artificial Intelligence
<b>AISEC</b>	International Association of Students in Economics and Business
<b>ARIPO</b>	African Regional Intellectual Property Organization
<b>AU</b>	African Union
<b>AUDA</b>	African Union Development Agency
<b>ASTII</b>	African Science, Technology and Innovation Indicators
<b>BERM</b>	Blue Economy Road Map
<b>BIT</b>	Bilateral investment treaty
<b>BTI</b>	Business and Technology Incubator
<b>CBS</b>	Central Bank of Seychelles
<b>COMESA</b>	Common Market for Eastern and Southern Africa
<b>CSR</b>	Corporate Social Responsibility
<b>DIAE</b>	Division on Investment and Enterprise
<b>DICT</b>	Department of Information Communications Technology
<b>DOIED</b>	Department of Industry and Entrepreneurship Development
<b>DSTI</b>	Division of Science, Technology and Innovation
<b>EPF</b>	Entrepreneurship Policy Framework
<b>ESA</b>	Enterprise Seychelles Agency
<b>EU</b>	European Union
<b>FCA</b>	Fair Competition Act
<b>FDI</b>	Foreign direct investment
<b>FSA</b>	Financial Services Authority
<b>GDP</b>	Gross Domestic Product
<b>GERD</b>	Gross Expenditure on Research and Development
<b>HDI</b>	Human Development Index

<b>IASTE</b>	International Association for the Exchange of Students for Technical Experience
<b>ILO</b>	International Labour Organization
<b>IMF</b>	International Monetary Fund
<b>IP</b>	Intellectual property
<b>IPA</b>	Investment Promotion Agency
<b>MIEI</b>	Ministry of Investment, Entrepreneurship and Industry
<b>NDS</b>	National Development Strategy 2019-2023
<b>NEPAD</b>	New Partnership for Africa's Development
<b>NIS</b>	National Innovation System
<b>NISTI</b>	National Institute for Science, Technology and Innovation
<b>PUC</b>	The Public Utilities Company
<b>R&amp;D</b>	Research and Development
<b>SADC</b>	Southern African Development Community
<b>SCS</b>	Seychelles Cable Systems
<b>SIDS</b>	Small Island Developing States
<b>S&amp;T</b>	Science and Technology
<b>SoEs</b>	State-owned enterprises
<b>STEM</b>	Science, technology, engineering and mathematics
<b>STI</b>	Science, Technology and Innovation
<b>STIPS</b>	2016-2025 Science, Technology and Innovation Policy and Strategy
<b>STISA</b>	2024 Science, Technology and Innovation Strategy for Africa
<b>TVET</b>	Technical and Vocational Education and Training
<b>UN</b>	United Nations
<b>UNCTAD</b>	United Nations Conference on Trade and Development
<b>UNESCO</b>	United Nations Educational, Scientific and Cultural Organization
<b>UNIDO</b>	United Nations Industrial Development Organization
<b>WIPO</b>	World Intellectual Property Organization

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## Key recommendations

- **Build a broad-based political and public compact for STI** to enhance the understanding of and engagement in STI policy among all political actors, especially the legislative assembly. This involves improving STI policy literacy among parliamentarians and politicians and developing mechanisms for the National Assembly's engagement in STI policy. Public awareness about STI programmes and activities should be increased through collaborative efforts involving the Government, media, non-governmental organizations, development partners, and educational institutions.
- **Review the institutional arrangements for STI** to establish an autonomous national organization for STI policy and NIS coordination. Proposals should be informed by an independent analysis and draw lessons from international best practices. This process should also address issues of trust-building and policy literacy, reflecting on the tendency towards institutional siloing.
- **Revise the current national STI Policy and Strategy 2016-2025 (STIPS)** to reflect recent scientific and technological developments, including aspects of the 4IR, open science, and the growing role of the private sector and civil society in STI governance. The revised policy should expand its scope to include recent developments, as well as the development of a strong evidence base and participation in the Global Innovation Index, and articulate clear research priorities and innovation areas in terms of sectors and industries. Develop an implementation plan for STIPS up to 2025.
- **Set research and innovation priorities using technology assessment and technology foresight.** Establish a defined process for setting R&D and innovation priorities, aligning STI investments with national, regional, and global sustainable development goals. Participatory and expert exercises should be used to generate and revise multi-year STI policy implementation plans.
- **Establish a National Innovation and Entrepreneurship Fund.** The fund would mobilize public and private financial resources to support firms and entrepreneurs in their innovation research and commercialization, and engage with funding alternatives like venture capital, angel investors, and public-private partnerships.
- **Establish a National R&D Fund.** The fund would serve to increase investment in R&D and align funding with national STI priorities, including by encouraging private sector investment in R&D through matched funding and fiscal incentives.
- **Strengthen participation in international and regional STI processes.** This would include active participation in the United Nations' Commission on Science and Technology for Development (CSTD) and the STI Forum as well as deeper engagement with the Southern African Development Community (SADC), the African Union (AU), and the South African Research & Innovation Management Association, and others. It may also include establishing science and innovation attaches in consulates or embassies to energize bilateral STI cooperation, as well as engaging with its own diaspora who are successful entrepreneurs, innovators and technologists.
- **Build a critical mass of skills for STI policymaking, entrepreneurship, innovation management, and R&D.** This involves developing technical and soft skills through education and training. It also requires a focus on digital skills, and the development and conduct of innovation and entrepreneurship courses for small- and medium-sized enterprise entrepreneurs. Improving linkages between skills development and demand in the labour market is essential. Supportive activities will need to be programmed in a subsequent STI plan and strategy and, eventually, in the revised STI Policy post 2025.
- **Improve financial services provision for small- and medium-sized enterprises, in particular those related to e-commerce.** Access to trade finance and financial instruments for international transactions, including secure online credit card payments, is necessary to foster small- and medium-sized enterprises' engagement in international activities and global value chains.

# Summary

**The Science, Technology and Innovation (STI) Policy Review of Seychelles** was conducted by the United Nations Conference on Trade and Development (UNCTAD) at the request of the Government of Seychelles. The request was made in the context of the UNCTAD project on Technology Assessment in the energy and agricultural sectors in Africa to accelerate progress on science, technology and innovation, and this Review is one of its products.

**The review of Seychelles' National Innovation System (NIS) and the implementation of its 2016-2025 national Science, Technology, and Innovation Policy and Strategy (STIPS) suggests a range of policy actions and institutional reforms.** These recommendations are essential for invigorating the NIS, thereby enabling Seychelles to harness STI and entrepreneurship effectively to achieve the goals set in Vision 2033 and the Sustainable Development Goals (SDGs).

**The STIPS, while adequately framed in many aspects, suffers from weak implementation due to various factors, including limited political support and engagement.** The repeal of the National Institute for Science, Technology and Innovation (NISTI) Act, further complicates the situation.

**Many of the provisions of the STIPS remain unimplemented, primarily due to the weakened institutional capacity characterized by a lack of personnel and dedicated funding.** Of these, the failure to establish the proposed National Research Fund, as envisioned in the Policy and Strategy, has hindered the country's ability to mobilize domestic and international resources for STI. The STIPS, while focused on innovation and entrepreneurship, lack adequate provisions for science-informed policy-making and governance of emerging technologies like AI and Fourth Industrial Revolution (4IR) technologies. This indicates a need for the policy to be updated or thoroughly revised.

**Despite these challenges, the National Institute for Science Technology and Innovation (NISTI) – which transformed in 2021 into the Division on Science, Technology and Innovation (DSTI) of the Ministry of Investment Entrepreneurship and Industry (MIEI) – has played a key role in initiating several initiatives.** These range from STEM programmes for schools, Research and Development (R&D) and innovation surveys, the development of the Business, Technology and Innovation (BTI) Incubator, and actively contributing to the design of the Blue Economy plan and various regional and international STI programmes.

**Driving the implementation of the STIPS and developing a strong understanding of the economic rationale for an active STI policy can benefit from a well-funded, competent and active agency.** The current situation highlights the need for developing communication competency in DSTI and came out very clearly during the capacity building workshop in September 2023. Building a strong public awareness campaign for STI is one of the main recommendations of this review.

**The proposed recommendations in this review aim to create a more dynamic and effective NIS** in Seychelles, thereby propelling the country toward realizing its Vision 2033 and fulfilling the SDGs through strengthened STI capabilities.

**In conclusion, while Seychelles has foundational elements for leveraging STI towards achieving the SDGs, the policy foundations are weak, while opportunities are significant.** Strengthening policy foundations for STI would require strategic interventions to enhance institutional capacities and policy implementation as well as update policy frameworks to reflect contemporary technological advancements and governance needs.



# I. Introduction

**This report reviews the implementation of the 2016-2025 STI Policy and Strategy (STIPS) and assess the country's national innovation system.** The review was conducted by the United Nations Conference on Trade and Development (UNCTAD) at the request of the Government of Seychelles, conducted between November 2022 and September 2023. The review involved a participatory process that included a fact-finding mission and a stakeholders' workshop in Seychelles in November 2022, a comprehensive desk review of national policy documents and reports, interviews with 39 persons from a number of organizations, a national workshop reviewing the draft text of this document held on 25 September 2023, and a capacity building workshop on 26 and 27 September 2023. Draft versions of the review were provided for comments and inputs to the MIEI and the DSTI.

**The report is structured as follows:**

**Chapter II introduces the development trajectory of the country and the challenges the country is facing in sustainable development.** Seychelles, a high-income Small Island Developing State, faces unique innovation challenges. Despite its high per capita income and political stability, the economy is heavily reliant on tourism and fisheries, making it vulnerable to environmental changes. The Government's Vision 2033 emphasizes science, technology, and innovation (STI) in development and sustainability, focusing on a sustainable Blue Economy and climate change.

The chapter reveals that while Seychelles is on track to attain several targets of certain SDGs (e.g., SDG1, SDG2, SDG3 and SDG5), it lags in SDGs relating to STI (e.g., SDG9 on industry, infrastructure and innovation). This undermines prospects of enduring the transition to sustainability and attaining the SDGs. Any prior progress made in attaining certain SDGs may be reversed if the economy is not diversified through industrial change which in part is dependent on the availability and use of skills in innovation, technology and entrepreneurship. Challenges include reliance on low-cost labour, high ICT costs, energy dependence on fossil fuels, and gender disparities in STEM. Efforts in e-Governance and education aim to address these issues, but significant hurdles remain in fully harnessing STI for sustainable development.

**Chapter III reviews the implementation and effectiveness of the STIPS 2016-2025 and other relevant policy frameworks.** STIPS 2016-2025 is well-aligned with Vision 2033 and the National Development Strategy (NDS) 2019-2023, which aim to transition the country to a knowledge-based and innovation-driven economy. Developed through participatory processes, STIPS focuses on mainstreaming STI across all sectors and includes explicit and implicit provisions in various national policies, covering areas like FDI, intellectual property, and the blue economy.

However, its implementation faces challenges due to weak institutional linkages, limited resources, and lack of political support. The restructuring of NISTI into the DSTI in MIEI has raised concerns about institutional capacity for STIPS implementation. Based on interviews, available data, and analysis of strengths, weaknesses, opportunities and threats, the section identifies and reviews the following: STI policy actions and policy frameworks addressing education and training, industrialization, foreign direct investment, entrepreneurship, intellectual property protection, tourism, agriculture, health, blue economy, and environmental and natural resources management.

**Chapter IV examines Seychelles' participation in international, continental and regional as well as bilateral STI cooperation programmes and policy processes.** It reviews the different partnerships or collaborations that the country is engaged in and how they contribute to the attainment of STI policy objectives. Key factors influencing Seychelles' participation in multilateral cooperation and public-private partnerships in STI are identified and analysed. One of

the issues highlighted in this chapter is that given Seychelles' small population, it needs to forge strategic international partnerships and strengthen public-private partnerships in STI. The country will need to develop and finance an implementation strategy for such STI partnerships.

**Chapter V looks at Seychelles' framework conditions for innovation.** It discusses 11 framework conditions that are relevant to Seychelles' development, ranging from policy frameworks to education system, entrepreneurship culture, research and innovation, infrastructure, intellectual property protection and regulations and standards. Framework conditions for innovation shape and influence the innovation ecosystem in a country. They do so by enabling individuals, businesses, and organizations to innovate.

Certain conditions and policy efforts can encourage and support innovation, fostering economic growth, competitiveness, and societal progress. Other key elements of framework conditions for innovation include regulations and standards, funding and infrastructure for research and development, digital and logistics infrastructures, an actively managed innovation ecosystem, a skilled and educated workforce, trade openness, a positive entrepreneurial culture and risk-taking attitudes, and active international collaborations in STI, among others.

**Chapter VI focuses on Seychelles' national innovation system.** Seychelles' NIS comprises various actors, including public research institutes, universities, state-owned enterprises, private companies, policy-making bodies, and non-governmental organizations. These actors engage in activities such as scientific knowledge production, education and training, funding STI, and formulating STI policies. However, Seychelles has a smaller NIS compared to larger countries, primarily due to its small population.

The main actors in Seychelles' NIS are entrepreneurs and firms, while public sector organizations such as MIEI and its DSTI play crucial roles. However, public-private partnerships in STI are weak, and there is a lack of trust and cooperation between public and private institutions. Seychelles faces challenges in implementing STI initiatives due to limited funding and human resources. The country's R&D productivity is modest, with limited data on R&D and innovation outputs. Efforts to support start-ups through initiatives like the Business, Technology, and Innovation Incubator are hindered by resource constraints. Seychelles has potential in developing intellectual property (IP) for plant varieties and geographical indications but needs to dedicate more policy attention in this area.

**Chapter VII discusses innovation in specific economic sectors for Seychelles' structural transformation.** Since 2005, Seychelles has experienced stalled structural transformation, with economic growth primarily driven by the services sector, particularly tourism. Opportunities for diversification during growth periods have been missed, while a structural shift from low to high productivity activities has been modest. Seychelles faces challenges in scaling industry and manufacturing primarily due to its small domestic market. Other factors are at play as well, such as geographic location, limitations in energy and primary resources, as well as a modest industrial heritage.

A focus on digital services and sectors as an innovation strategy is considered more feasible due to their ability to scale beyond physical limitations. Seychelles' economy heavily relies on tourism, which makes it vulnerable to external shocks like the COVID-19 pandemic. Efforts are underway to diversify the tourism sector itself, focusing on eco-, marine, and sports tourism, and integrating green and renewable technologies. In the financial services sector, opportunities lie in offshore banking and fintech, reliant on effective policies, regulations, and digital infrastructure. The fisheries industry faces important sustainability challenges. Innovation and diversification are necessary for its survival and a focus on sustainable aqua farming supported by green energy may be a path worth pursuing. In agriculture, innovation potential is limited by scale challenges. Transformation opportunities exist in the ICT sectors, sustainable energy, and water, and waste management.

**The last chapter presents a synthesis of findings and key recommendations that address challenges in implementing STI policy frameworks and fostering an effective NSI.** The overall message is that much remains to be done by the Government to implement the STIPS. Most of the policy objectives are unrealized, and the NIS remains relatively weak, thus undermining prospects of attaining Vision 2033's aspirations of becoming a knowledge-based, innovation-driven, sustainable and inclusive economy. However, there are many opportunities and Seychelles is well positioned to take advantage of its strong, albeit undiversified, economy, and stable governance. With the right STI policies and foresight, developmental threats, such as those arising from climate change and environmental degradation, and challenges to social inclusion, can be mitigated and used to pivot towards a more technological and innovative development path.



## II. Seychelles development trajectory and sustainable development challenge

**Seychelles is a high-income Small Island Developing State (SIDS) in the western Indian Ocean that has a small and culturally diverse population and ecologically diverse environment.** It is a high-income economy with a per capita income at \$14,340 GNI, according to the Atlas method (current US dollars).<sup>1</sup> Based on a purchasing power parity indicator (PPP) in current international dollars, however, the GNI per capita rises to \$33,480 in 2022.<sup>2</sup> With regards to its Human Development Index (HDI), in 2021 it was ranked 72<sup>nd</sup> out of 189 countries (UNDP, 2021/2022).

Since attaining independence in 1976, Seychelles has experienced rapid economic growth with per capita output expanding approximately seven times compared to pre-independence levels. This impressive economic growth can be attributed to factors such as political stability and macroeconomic stability.

**Since its independence, Seychelles has been a politically stable democracy with citizens actively participating in politics and policy processes.** Civil society organizations are involved in various agendas, including environmental justice and socio-economic development. The country has a functional legal system, the composition of which includes a mix of English common law, the Napoleonic Code, and customary law. Due to the scale and size of its economy, it does not have a specialized court for commercial cases.<sup>3</sup>

**The country has a wide range of programmes for social protection and support.** Life expectancy is 72 years for men and 82 years for women. The main sectors that have received government investment over the years are health and education. Health and education services are free in the country. In 2020, Seychelles spent almost 7 per cent of GDP on social welfare, a level higher than the averages observed across Sub-Saharan Africa (US Department of State, 2022).

Prudent fiscal and monetary policies have been implemented since 2008 with macroeconomic stabilization and structural reforms aimed at reducing the burden of external debt and enabling robust growth. An overview of key economic indicators is presented in annex 1.

**The key economic sectors in Seychelles are tourism, financial services and fisheries, and agriculture to a lesser extent.** The economy is driven by services, especially tourism, which represent about 75 per cent of GDP (US Department of State, 2022). Fisheries and agriculture sectors are heavily reliant on their natural resources, and as a result the economy is vulnerable to environmental change – particularly to climate change – and other human-induced effects. To reduce over-dependence on tourism and fisheries, as well as diversify the economy more generally, the Government is promoting investment in agriculture, small-scale manufacturing and information and communications technology.

Foreign direct investment (FDI) flows, however, continue to target the tourism sector and related investments in the services sector. Mauritius is the main source of FDI, accounting for at least 40 per cent of inward foreign investment projects in 2018. According to UNCTAD's 2022 World

<sup>1</sup> For Seychelles Atlas method calculations see: <https://data.worldbank.org/indicator/NY.GNP.PCAP.CD?locations=SC> (accessed 29 November 2023).

<sup>2</sup> For parity rises see: <https://data.worldbank.org/indicator/NY.GNP.PCAP.PP.CD?locations=SC> (accessed 29 November 2023).

<sup>3</sup> There are plans to establish a commercial court to deal with an increasing number of commercial crimes and disputes. The Government allocated funds for the establishment of the court in its 2022 budget. See: <https://www.state.gov/reports/2023-investment-climate-statements/seychelles/> (accessed 29 November 2023).

Investment Report, FDI inflows to Seychelles increased by 28.3 per cent year-on-year in 2021, reaching \$157 million compared to \$122 million one year earlier and above the three-year average recorded before the pandemic (\$152 million for 2017–19). FDI inward stock closed at \$3.33 billion in 2021, representing around 227.8 per cent of the country's GDP. The United Arab Emirates, South Africa and China are also major sources of FDI.

**A large services sector is bolstered by the availability of imported low-cost labour which disincentivizes investment in technology and innovation and presents the key challenge for developing an innovative economy.** At 3.9 per cent, overall unemployment is low, while youth unemployment is higher at 13.6 per cent. Unlike many other countries challenged by the need to create off-farm jobs for growing populations, Seychelles is importing labour. The number of jobseekers with post-secondary education has been steadily declining since 2019 (Ministry of Employment and Social Affairs, 2023).

A 2018 ILO study estimates that the private sector employs 67 per cent of the working population while government and parastatal sectors employ 33 per cent (ILO, 2018). About 19 per cent of all jobs are in the accommodation and food service sector, while some estimates advise that tourism employs up to 30 per cent of all labour and generates 70 per cent of foreign currency earnings (US Department of State, 2022). The largest single employer in Seychelles is currently the Indian Ocean Tuna Ltd., which employs around 2,500 personnel.

Foreigners represent 27 per cent of the workforce in tourism, while locals often perceive the working hours as inconvenient for working mothers and women who also have social and family obligations and cannot take up unsuitable shifts or weekend work (ILO, 2018). The construction industry employs 11 per cent of the workforce but relies heavily on imported labour. Foreigners are estimated to make up to 60 per cent of construction workers (ILO, 2018). Seychelles nationals, in particular its youth, do not see construction work as well-paid employment, while low-wage takers are readily available from seasonal and temporary labour from southern Asia. Fisheries account for 8 per cent of GDP but employ almost exclusively foreign labour. As a result, Seychelles increasingly relies on foreign or imported labour.

Labour competition from temporary and seasonal workers is a serious disincentive to improving the innovation performance of the national economy. Given the choice of growing a business by engaging low-cost labour rather than developing innovative and technology-based solutions, entrepreneurs will usually opt for the less risky labour-based variable-cost strategy rather than incur capital costs by investing in innovation. This is compounded if strong policy guidance and clear incentives are not put in place concerning development of a diverse economy and STI capabilities. Seychelles needs to diversify its economic activities, spur manufacturing and expand its industrial base. This will require building critical national capabilities for innovation, entrepreneurship and research.

**In respect of Seychelle's implementation of the 2030 Agenda on Sustainable Development, its progress on achieving the SDGs has been mixed.** However, there is a paucity of data on trends in the transition or attainment of the 17 UN SDGs in Seychelles. There is no official (at least in the public domain) annual or frequent up-to-date reports on how the country is performing on different SDGs. Different UN agencies and some international non-governmental organizations are producing different data on different SDGs.

For example, UNESCO Institute for Statistics has produced some data on trends in education for SDG4 (UNESCO undated), while the non-governmental, and leading environmental conservation organization, Nature Seychelles, has focused on tracking trends in SDGs related to climate change, biodiversity, energy and partnerships.

A recent report by Sachs provides a global assessment of progress towards the SDGs and includes trends in Seychelles (table 1 and figure 1).

**There are different public opinions (based on interviews with key stakeholders) about the country's progress on the SDGs, aligning generally with the findings of Sachs (2022).**

Most of the interviewees for this review held the opinion that the country is making progress on SDG3 (health and wellbeing) and SDG4 (education); there is a reversal of progress made on SDG2 (ending hunger) and SDG5 (gender equality); and there is progress on SDG9 (industry, infrastructure and innovation) mainly in terms of the digital transformation of the economy. Industrialization and innovation in many technological and organizational areas are progressing slowly.

Some interviewees held the opinion that the country was making significant progress in women's empowerment (SDG5), while the relevance of skills and the generally low quality of education and training in STEM courses or subjects was causing SDG4 to stagnate. There is a consensus that Seychelles is not on track to attain SDG13 (climate action) or SDG14 (life under water). Most of the interviewees were of the view that public awareness of the climate crisis is high, and that the country has relatively good policies. The challenge is that of inaction due to limited scientific and technological capabilities to engage in sustainability-oriented innovation in both public and private enterprises.

**Through its Blue Economy Strategy (2018) and the Seychelles Climate Change Policy (2020), the Government highlights the unavoidable reality that SIDS often face This is best described as an over-reliance on natural endowments as well as a heightened responsibility to work towards the SDGs using technology and innovation.** The Government of Seychelles has acknowledged the importance of STI in driving a sustainable blue economy and is designing policy frameworks and programmatic initiatives to modernize and increase the productivity of this sector. As a SIDS, Seychelles is particularly vulnerable to climate change, which poses specific challenges for its blue economy ambitions. Nevertheless, Seychelles plans to increase R&D investments in the blue economy.

Table 1: Progress in SDGs in Seychelles

Sustainable Development Goal	Overall Performance
SDG 1: No Poverty	Information unavailable
SDG 2: Zero Hunger	Stagnating
SDG 3: Good Health and Wellbeing	Moderately improving
SDG 4: Quality Education	On track to attainment
SDG 5: Gender Equality	Decreasing
SDG 6: Clean Water and Sanitation	On track to attainment
SDG 7: Affordable Clean Energy	On track to attainment
SDG 8: Decent Work and Economic Growth	Information unavailable
SDG 9: Industry, Innovation and Manufacturing	On track to attainment
SDG 10: Reduced Inequalities	Information unavailable
SDG 11: Sustainable Cities and Communities	Information unavailable
SDG 12: Responsible Consumption and Production	Moderately improving
SDG 13: Climate Action	Stagnating
SDG 14: Life Below Water	Moderately improving
SDG 15: Life on Land	Moderately improving
SDG 16: Peace, Justice and Strong Institutions	Moderately improving
SDG 17: Partnerships for the Goals	Stagnating

Source: Sachs JD, et al. (2022).

To build the necessary capacity to respond to climate change, the Government established the Department of Energy and Climate Change in 2015 and adopted the Seychelles Climate Change

Policy in 2020. The Seychelles Climate Change Policy puts emphasis on increasing investments in building capacity for research and monitoring of the long-term impacts of climate change. It provides for the creation of a National Climate Change Council.

**The Seychelles Blue Economy Strategic Policy Framework and Roadmap (2018) puts emphasis on the creation of enterprises and high value jobs in the blue economy while ensuring the integrity of the country's ecosystems.** It focuses on strengthening the circular economy, by transforming fish and other waste into products like fertilizer. The Government has established the Blue Grants Fund and Blue Investment Fund to provide grants and loans to start-ups and entrepreneurs in the circular blue economy.

Figure 1: Progress in SDGs in Seychelles



Source: Sachs JD, et al. (2022).

**As a SIDS, solid waste management poses a significant challenge to Seychelles. Seychelles generates about 80,000 tons of waste per year and this number is expected to increase by 50 percent by 2030.** Waste is disposed in a landfill on the main island of Mahe. This landfill is expected to reach full capacity by 2025. The landfill is in visible proximity of the international airport and is prone to self-combustion, releasing toxic fumes and leaking toxins into the nearby seashore. Much of the waste originates from the tourism industry and sustainable solutions would require joint action and partnerships between public and private sector actors in the tourism economy as well as key stakeholders in the NIS.<sup>4</sup>

**Solid waste management intersects with several United Nations Sustainable Development Goals (SDGs), reflecting its importance across environmental, economic, and social dimensions.** The most relevant SDGs that address the issue of solid waste management include: SDG 6: Clean Water and Sanitation, SDG 11: Sustainable Cities and Communities, SDG 12: Responsible Consumption and Production, SDG 13: Climate Action, SDG 14: Life Below Water, and SDG 15: Life on Land. These goals require a critical focus on integrated solid waste management in achieving environmental sustainability, promoting public health, and ensuring the well-being of Seychelle's citizens.

**Already in 2017, Seychelles banned the importation, sale and commercial use of plastic bags, cups, plates and cutlery.** The Ministry of Agriculture, Climate Change and Environment is collaborating with the Standards Bureau to validate and approve biodegradable alternatives.<sup>5</sup>

<sup>4</sup> See: <http://tinyurl.com/seylandfill>.

<sup>5</sup> See: <http://tinyurl.com/seylasticups>

Addressing the challenge of reducing both land and marine pollution, the Government of Seychelles has developed a Seychelles National Waste Policy 2018-2023 and a Solid Waste Management Plan 2020-2035. UNEP, UNDP, UNFPA and UNECA are working together under the Joint SDG Fund to support the Plan and have been working with the Government to develop a circular economy roadmap and action plan, a financing strategy, while strengthening partnerships between the public and private sector.

As well, in 2023, the UNDP launched the SDG Investor Map as a market intelligence tool aimed at mobilizing private sector investment in critical waste management infrastructures. The ultimate result of these initiatives would be a reduction in the amount of solid waste being directed to the landfill.

The international experience in waste management processes and technologies is vast and there are many positive examples coming from the developing world. Box 1 describes several innovative initiatives with different technological intensities.

**Funding SDG activities remains a key challenge.** In 2018, Seychelles issued a sovereign Blue Bond for \$15 million and a ten-year maturity with a 6.5 per cent coupon (World Bank, 2018).<sup>6</sup> This was supported by the World Bank and the Global Environment Facility, as well as with a partial guarantee of \$5 million from the International Bank for Reconstruction and Development (IBRD). Funds raised by the bond are supposed to be used to expand marine protected areas, improve the regulation of sustainable fisheries, develop the Seychelles' blue economy, and support the ocean economy. It also aims to help the Seychelles' Government save over \$8 million in interest charges over the next ten years.

Overall, Seychelles needs to fast-track its transition to the SDGs, particularly those on climate action, life under water and conservation of biological diversity, ending hunger and improving health and wellbeing. The economy is vulnerable to environmental change and is dependent on a healthy population to be productive. There is a growing recognition, at least as expressions in various development documents, that STI is critical in addressing many of the challenges facing Seychelles and its attainment of the SDGs.

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<sup>6</sup> Also referenced here: <https://www.cabri-sbo.org/uploads/files/Documents/Session-3-Presentation-of-Dick-Labonte-Seychelles.pdf> (accessed 29 November 2023).

## Box 1: Innovative and scalable systems for solid waste management

Several developing countries are not just addressing the challenges of solid waste management but are also leveraging these challenges as opportunities to innovate, improve public health, protect the environment, and contribute to socio-economic development. Seychelles may study these and other approaches and technologies and innovate itself out of its current problem of solid waste management.

### 1. Waste-to-Energy Technologies in Ethiopia

Ethiopia has implemented a notable waste-to-energy initiative with the Reppie Waste-to-Energy Facility in Addis Ababa. This facility, which opened for production in 2018, is considered the first of its kind in Africa, converting municipal waste into electricity. The Reppie facility processes about 1,400 tons of solid waste per day, roughly 80% of the city's waste production, and generates enough electricity to power up to 30% of the households in Addis Ababa. This project not only helps in managing the city's solid waste but also contributes to reducing reliance on fossil fuels for energy production, showcasing a sustainable model for waste management and energy generation in developing countries.

Source: <http://tinyurl.com/ethiosolidwastee>

### 2. Integrated Solid Waste Management in Brazil

Brazil has been a pioneer in integrating advanced technologies and community participation in solid waste management, particularly with its approach to recycling and composting. The country's model includes the use of innovative sorting and recycling facilities that are often part of cooperative efforts involving local communities. For instance, the city of Curitiba is renowned for its integrated urban waste management system, which includes a strong emphasis on recycling and has one of the highest recycling rates in the country. The program, which has been implemented since the early 1990s, not only facilitates efficient waste processing but also generates employment and income for waste pickers, integrating social benefits with environmental sustainability.

Source: <http://tinyurl.com/brazilwastecuritiba>

### 3. Biogas Production from Organic Waste in India

India has made significant strides in utilizing organic waste for biogas production, particularly through decentralized biogas plants. Programs for promoting biogas technologies have been running since the 1970s. With a simple design, more around five million family biogas plants have been installed until 2020, with significant potential for more.

One innovative approach is the development of small-scale biogas units that convert organic waste from households or communities into biogas that can be used for cooking or electricity generation. This solution not only addresses the challenge of organic waste management in densely populated areas but also provides a renewable source of energy, thereby reducing reliance on conventional fuels. The government supports these initiatives through various schemes and subsidies, promoting sustainable waste management and energy production in rural and urban settings alike.

Source: <http://tinyurl.com/indiabiogase>

### III. Implementation and effectiveness of the current STI policy frameworks

Seychelles Vision 2033 and the NDS 2019-2023 contain explicit provisions for promoting STI. The 2016-2025 Science, Technology and Innovation Policy and Strategy (STIPS) is well aligned with the Vision 2033 and the NDS. Mainstreaming STI across all sectors of the economy is key to realizing Vision 2033. In addition, the Seychelles has an array of national policies which, while not strictly in the mandate of the MIEI and DSTI, can positively contribute to STI outcomes. These include policies for FDI, intellectual property protection, trade, industrialization, environmental conservation and climate change, education and training, public procurement, ICT, technology, biosafety and the blue economy. Illustrative cases or examples are given to demonstrate that for successful implementation of STIPS 2016-2025 there is a need for policy coherence and alignment across policy sectors, and the use of policy mixes. STIPS should not be treated as a stand-alone policy regime, but as a framework for mainstreaming STI across all sectors of the economy.

#### 1. Effectiveness of STIPS 2016-2025

STIPS 2016-2025 was developed through consultative processes involving workshops organized by the former NISTI under the Office of the Vice-President. The overall objective of the STIPS was to support the country to transition from a natural resource-base to "... a knowledge-based and innovation-driven economy that will attain its national aspirations as well as the United Nations SDGs."

Previous STI policy and related programmatic initiatives tended to focus on R&D, while the colonial administrations emphasized guidelines or regulatory approaches to the administration of research as opposed to STI policy. With the support of UNESCO, Seychelles adopted a science and technology (S&T) policy in 2011 that was largely framed around a linear approach with emphasis on research-driven technological development. This 2011 S&T Policy did not have much impact because there was no institutional or governance mechanism to lead its implementation.<sup>7</sup>

**Regarding the genesis of STIPS, several points are worth noting.**

**First, there was a legal requirement and cabinet decision for the STI policy to be formulated.** In April 2014, the National Assembly passed the National Institute for Science, Technology and Innovation Act, followed by the creation of NISTI. It was approved by the Cabinet of the Government of Seychelles and domiciled in the Office of the President, though hosted in the Office of the Vice President.

**Second, political leadership enabled the process of formulating the current STI Policy and Strategy, and participatory mechanisms were launched to ensure that stakeholders were directly involved.** In April 2016, the Vice-President led a group of ministers at a workshop on STI to discuss various issues, including ways and means of mainstreaming STI into all sectors of the economy. International experts from Malaysia, Germany and South Africa were invited to advise on various facets of STI policy. The process was largely participatory and inclusive, aiming to build broad-based constituencies for the STI Policy.

<sup>7</sup> It was not possible to get a copy of the 2011 S&T policy document at the time of drafting this report. Some officials from various government departments referred to this policy but could not avail a copy of it.

**Third, the international, continental and SADC contexts for STI and development were steadily evolving since 2015.** In 2014, the African Union (AU) adopted the Science, Technology and Innovation Strategy for Africa (STISA 2014-2024), requiring AU member states to adopt national STI policy frameworks that are aligned with STISA 2012-2014 and AU Agenda 2063. At the SADC level, there was an STI Protocol that required Seychelles to modernize its STI policy. In September 2015, the United Nations adopted the global Sustainable Development Goals (SDGs) that have specific requirements for STI policy. Overall, the rationale for the 2016-2025 national Science, Technology and Innovation Policy and Strategy was influenced by these and other global imperatives.

**NISTI was responsible for coordinating and overseeing the attainment of STI policy objectives. NISTI was also charged with overseeing the formulation of a STIPS and an implementation plan.** STIPS was conceptualized around an NIS approach and contains strategic policy actions aimed at attaining its objectives. It provides for its periodic review – preferably after every three years – based on and informed by a Monitoring and Evaluation (M&E) framework. STIPS became Seychelles’ first post-independence policy for STI.

STIPS has 11 specific objectives:

1. Building political leadership for STI;
2. Increasing Gross Expenditure on Research and Development (GERD) to at least 2 per cent of GDP by 2025;
3. Building capacity in STEM and entrepreneurship;
4. Promoting technology-based companies to create jobs;
5. Building strong public-private sector linkages in STI;
6. Building a world-class R&D infrastructure;
7. Promoting the procurement and use of science in policy-making;
8. Governance of STI for SDGs and economic competitiveness;
9. Improving or establishing ICT infrastructure;
10. Developing systems for efficient management of data; and
11. Improving the country’s participation in international STI programmes/cooperation.

**NISTI developed the 2018-2022 Strategic Plan as a follow-up to guide its organizational or institutional approaches to the implementation of the above objectives.** It is a comprehensive plan developed using a strengths, weaknesses, opportunities and threats – or “SWOT” – analysis approach and the PESTLE methodology focusing on political, economic, social, technological, legal and environmental conditions and contexts.

**NISTI was able to make progress on three strategic areas:**

- **The development of the Blue Technology Incubator** with a focus on the Blue Economy Cluster, a partnership between the Blue Economy Department and NISTI (DSTI);
- **The launch for STEM related activities in schools** such as the robotics and Artificial Intelligence (AI) competition scheme; and
- **Integration of STI into the NDS** as well as some efforts at mainstreaming STI in sectoral strategies and plans such as agriculture and energy.

**NISTI was also instrumental in developing and launching R&D and innovation surveys under the AUDA-NEPAD African Science, Technology and Innovation Indicators (ASTII) Initiative.** This survey reported country data on GERD and innovation outputs for 2017/2018. Capacity building was conducted for staff from NISTI and the National Bureau of Statistics, in the

collection and analysis of STI statistics and data. NISTI also played a key role in helping some SADC countries participating in ASTII to digitalize their STI data systems.

**However, despite some progress, the status of NISTI changed with the revocation of NISTI Act in 2021.** NISTI was subsequently re-established as a division of STI (DSTI) in MIEI. The proposed rationale was that such a restructuring was needed to enable NISTI to better support Seychelles' industry in its transition towards a more innovative economy based on NISTI knowledge in science, technology and innovation.<sup>8</sup>

This review of STIPS also covers its scope, relevance and implementation. In terms of policy scope, though the concept of innovation is used in STIPS, it is not clearly defined. In addition, some of the outlined specific policy actions to promote innovation activities in the economy require serious consideration and revision.

**With the expiry of the Strategic Plan 2018-2022, there is no comprehensive plan for the implementation of STIPS, nor a set of well-articulated R&D and innovation priorities.** The main challenge for NISTI's Strategic Plan 2018-2022 was that it was seen as one agency's plan, rather than a national plan for the implementation of the STI Policy and Strategy.

## 2. Implementation challenges for STI Policy 2016-2025

**The implementation of STIPS had several conceptual, institutional and practical challenges.** To gather perspectives on what strategic actions of the STIPS have been implemented so far, interviewees were asked several interrelated questions. Among these were inquiries into awareness of policy objectives, whether objectives were implemented, what was the level of implementation, and were the possible reasons for the levels of implementation experienced. These questions were aligned with the generic framework used for the analysis of strengths, weaknesses, opportunities and threats conducted at the November 2022 workshop. The feedback is presented within the context of specific issues and challenges as laid out below. Some of the factors influencing the implementation of the Strategic Plan are outlined in annex 2 and include institutional uncertainty and lack of capacities.

### 2.1 Institutional issues

**Most interviewees held the opinion that less than half of the policy objectives and less than one-third of the 2018-2022 Strategic Plan have been achieved.** It is likely that the redevelopment of NISTI into MIEI/DSTI may continue to erode any accumulated institutional capacity to implement the STIPS unless there is a major policy effort. The transition from NISTI to DSTI also created uncertainty for STI stakeholders and may have eroded the confidence of development partners to support the implementation of both STIPS and the Strategic Plan.

### 2.2 Limited resources

**Most interviewees and discussants at the November 2022 workshop proposed that NISTI did not have the necessary human, financial and infrastructural resources to effectively oversee the implementation of the STIPS 2016-25.** While the DSTI inherited the Strategic Plan 2018-2022 from NISTI, it too has not been adequately resourced with financial, human and infrastructural resources, to effectively implement it. Seychelles has not established appropriate mechanisms and instruments for financing STI.

There are several reasons why funding was a challenge. Many interviewees held the view that STI and STI policy do not have the backing of the current political leadership, while civil society

<sup>8</sup> See: <https://www.nation.sc/articles/11097/minister-devika-vidot-enlightens-assembly-members-on-nisti-restructuring-> (accessed 29 November 2023).

groups that could advocate for greater political and financial support for STI are small and weak. A representative of a civil society organization remarked that STI policy work has a small budget and therefore does not bring enough money to attract politicians' attention, nor for that matter the attention of the broader population.

NISTI made efforts to attract international funding for STI projects. However, these efforts were ad hoc and with limited support from the Government. This was particularly so during and after the transition from the NISTI to the DSTI. Without predictable and sustainable funding, the DSTI will not be able to spearhead the implementation of STIPS. This issue needs the full attention of the leadership of the country.

**Despite NISTI's efforts at raising awareness, there is still a lack of appreciation of social and economic values of STI, which indirectly hinders funding and financing decisions at the national level.** This clearly indicates a need to develop more effective awareness-building campaigns and enhanced collaboration with the education sector, civil society and the media. Along with encouraging STEM subjects, the value of science as well as the advantages of technology-led entrepreneurship and innovation need to be espoused among the youth and in particular among girls and young women.

## 2.3 Funding R&D

**In implementing the current STIP, resource limitations have particularly affected R&D funding.** There are at least two reasons why Seychelles should invest or finance R&D and STI in general.

The first reason is to improve the quality of life of citizens and build preparedness for future pandemics. New medicines and treatments, efficient transport and communications systems, nutritious food and food supplements, better hygiene and sanitation, and clean water and clean energy are some of the benefits of investing in STI. As COVID-19 has shown, Seychelles, like all countries, requires capabilities to develop and deploy vaccines and other health innovations.

The second reason is that Seychelles should fund R&D to build human capabilities, particularly postgraduates that can engage in R&D activities. In fields such as medicine and engineering most of the training of new experts takes place through R&D in research programmes and laboratories at universities.

**An institutional mechanism for funding R&D, as mandated in the STIPS, has not been established.** STIPS required that a National Research Foundation be established "to develop criteria for research prioritization and plans and provide grants to researchers" (STIPS, 2017). The purpose of the proposed National Research Foundation was to "... plan GERD and orient research for the betterment of the quality of lives of the people of Seychelles" (STIPS, 2017). According to stakeholders interviewed during UNCTAD missions, the National Research Foundation was not established because there was no clear political support for it.

**Some interviewees, however, held the view that NISTI and later the DSTI did not have adequate capacity and strategic vision to establish and manage a National Research Foundation.** However, the questions of a need for a National Research Foundation and the competence to run a National Research Foundation must be held distinct. The primary question is, does Seychelles need a National Research Foundation and for what? What is the current research funding demand that addresses issues relevant for Seychelles' sustainable development or for its firms, sectors and industries? Once these questions are answered, competencies for National Research Foundation management can be developed and deployed.

**Seychelles has not attained the 2 per cent GERD of GDP, which was recently revised to 1 per cent, as committed in the STI Policy and Strategy.** The National Research Foundation and instruments such as tax rebates or waivers for R&D have not been created or implemented.

## 2.4 Accelerating technological development

**Accelerating technological developments are outpacing the capacity of Seychelles policymakers to design and deploy relevant STI policy.** The relevance of STIPS in relation to current developments and accelerating global technological processes is challenging policymakers. Since the Policy and Strategy was conceived and adopted in 2017, megatrends such as COVID-19, climate change, 4IR and geopolitical shifts in trade and FDI have occurred. For example, when the Policy and Strategy document was adopted, Artificial Intelligence (AI) was not a mature technology seeing deployment worldwide, and its development and application were not raising STI and geopolitical policy and governance issues such as those on ethics, inclusiveness and sharing the cost and burden of environmental damage.

**Today, there is an array of ethical and technical issues that are emerging with AI and other 4IR technologies that require a competent policy response.** In this regard, STI Policy will need to be revised to comprehensively cover new and emerging technologies, in particular actions and mechanisms to govern AI. For example, the STIPS may consider the UNESCO Recommendation on Ethics of AI and the UNESCO Recommendation on Open Science. The pending policy revision should also enable a policy learning process, whereby an openness to revisions can ensure that STI policy will remain current.

## 2.5 Mainstreaming evidence-based and science-informed policy

**Evidence based policymaking, including design, implementation and evaluation that feedback into a policy learning cycle, is largely absent in the STI domain as efforts at developing STI data have stalled.** Seychelles' NIS has a limited group of private and public sector actors and therefore data on STI inputs and outcomes in terms of GERD and research personnel, which can be used for political and policy support, are scarce.

**Though Seychelles participates in AUDA-NEPAD ASTII, it has not been able to consistently generate data on STI.** The last R&D and innovation surveys were conducted in 2016-2017 and the data are now out of date. In the 2016-2025 STI Policy and Strategy, the Government committed to establishing a Research Data Centre and STI Knowledge Hub within NISTI. However, the data centre has not been established, and Seychelles is not conducting R&D and innovation surveys.

Until 2021, NISTI was working on establishing a data or information management system for STI, but budget cuts and lack of human resources had undermined planned activities. With support of organizations such as AUDA-NEPAD, WIPO, UNESCO and UNCTAD, the DSTI should work out modalities of operationalizing the establishment of data or information management system for STI and institutionalize the collection R&D and innovation statistics. Seychelles needs to generate data that will enable it to establish a Global Innovation Index ranking and develop a useful benchmarking for its innovation performance.

**A future policy revision needs to include and highlight the role of science and scientific data.** The scope, as well as the objectives, of STIPS 2016-25 were focused mainly on policies for science and technology. However, an explicit indication of the importance of science-informed and evidence-based policy for and beyond STI is largely missing.

Due to the institutional changes and high mobility of personnel from both DSTI and the National Bureau for Statistics, the capacity for STI data collection and management has not been consolidated. This represents a missed opportunity to conduct R&D, STI and firm-level innovation surveys on a frequent basis. According to some interviewees, the capacity for STI data management that was created within NISTI has been eroded. This has implications for monitoring and evaluation of the implementation and effectiveness of the STIPS and the Strategic Plan.

**Science is critically needed to inform policy interventions aimed at solving or addressing current and complex challenges such as climate change and health pandemics.** With the

growing complexity of STI and other policy domains, governments are increasingly under pressure to procure and use factual and scientific evidence to make policy choices. Governments can place scientific advisory councils in the executive branch of government. National and regional as well as global academies of sciences can be mandated or requested to provide support. Examples of these are the African Academy of Sciences, Academy for Developing Countries, and the World Academy of Art and Sciences.

**International bodies such as UNESCO and the International Science Council (ISC) are established to generate and provide science advice to governments.** To effectively use such bodies, countries need to embrace a science-for-policy approach in their national policy frameworks. Increasing science-for-policy and focus on technology prospecting and technology transfer in STI policy work can be achieved through a more active participation in these and other science programmes. Technology assessment and technology foresight exercises are policy tools for making sure that STI is steered towards the SDGs, and the country anticipates technological change. In this regard, there is a need to build TA and STI foresight capacity in Seychelles.

## 2.6 Limited substantive understanding and policy knowledge

**In general, there is a very low level of policy literacy or very limited substantive understanding of the STIPS 2016-2025.** A majority of interviewees indicated that they had received copies of the policy document and may have participated in workshops to develop it but had not read it. They had very scant knowledge of the policy objectives and strategic actions. Most of them acknowledged that NISTI had disseminated the policy document in official languages, but they had not read it. There has also been feedback that the STIPS document is too technical and not friendly to a lay public. Possible workarounds include developing a popular version of STIPS as well as other key policy documents.

## 3. Other policy frameworks supporting STI

**Seychelles has several related policy frameworks that can be invoked to promote and support STI.** The main ones are those pertaining to FDI, intellectual property protection, entrepreneurship, education and training, industrial policy (currently in drafting), and trade. In the area of intellectual property, the key legislations include the Industrial Property Act of 2014, Industrial Property (Geographical Indication) Regulations 2014, and the Industrial Property (Industrial Design) Regulations, 2014. These are briefly discussed below.

**The Industrial Property Act of 2014 has explicit provisions for promoting investment in invention and innovation.** Its overall aim is to:

*“... provide for the adequate protection and enforcement of industrial property rights in order to encourage local inventive and innovative activities, stimulate transfer of foreign technology, promote foreign direct investment, create competitive business environment, discourage unfair practices, enhance free and fair practice and thereby foster socio economic development and for matters connected therewith or incidental thereto” (Republic of Seychelles, 2014).*

The Industrial Property Act’s provisions are aligned with the STIPS and should be enforced to help strengthen the country’s technological capabilities. Its provisions on disclosure of information about the invention to be patented require applicants to put that information into the public domain. The information then becomes exploitable by local scientists and/or researchers towards their own research endeavours, enabling the creation of new inventions that avoid impinging on the rights of the holders of granted patents or intellectual property.

**Another important framework with provisions that promote STI is the Blue Economy Strategic Policy and Roadmap: Charting the Future (2018-2030).** It is well aligned with Vision 2033 and the NDS as well as the STIPS. It identifies specific STI priorities that the country should

focus on to sustainably develop the blue economy. One of the six core principles of the Blue Economy Strategic Policy and Roadmap is innovation.

This principle is articulated as follows.

*“Innovation facilitates creative solutions and opportunities to achieve transformative outcomes, and generates discovery and new knowledge, practices or approaches that open opportunities. Innovation is at the core of Seychelles’ Blue Economy and Blue Brand and is essential to moving from a commodity-based to a service and knowledge-based economy”* (Republic of Seychelles, 2018).

Technological innovations in digital connectivity are cited as key factors for blue economy development. Applications such as remote global monitoring, control and surveillance tools and environmental monitoring will be critical for marine resource management. Blue economy technology and innovation has the potential to reduce costs of doing business and to develop economic opportunities. Research and innovation priority areas include marine biotechnology, marine renewable energy, sustainable aquaculture, and ecosystem management.

**The 2007 National Information and Communication Technologies Policy has provisions for promoting digital transformation—the introduction and use of digital technologies in the economy.** The Policy is premised on the following rationale:

*“[T]he future success of Seychelles in enhancing its competitiveness in the regional and global economy and improving the quality of life of its people is crucially dependent upon its capacity to develop as a leading ICT hub through international best practices in the use of ICT in all aspects and sectors of its economy”* (National Information and Communication Technologies Policy, 2007).

Specific priorities of the National Information and Communication Technologies Policy 2007 include: promoting the diffusion and use of ICTs to improve government’s abilities to deliver public services; strengthening physical infrastructure and improving regulatory frameworks for e-commerce; improving the development and use of ICT literacy and use of digital technologies in education and training; and encouraging the development of electronic content for safeguarding the nation’s environmental, historical, traditional and cultural heritage and in order to support ecotourism.

**Other policies supporting STI in various frameworks include those for FDI and entrepreneurship.** The National Investment Policy of 2018 and the Investment (Economic Activities) Regulations (Statutory Instrument (SI) 71 of 2014) focus on creating an enabling policy and legal environment for domestic and foreign investment (WTO, 2014). Policy frameworks for promoting entrepreneurship include the Seychelles Small- and Medium-Sized Enterprise Development Policy and Strategy (2016) and the National Entrepreneurship Strategy of 2023. These also contain STI provisions that are aimed at stimulating innovation in the private sector. Both policy frameworks outline strategic measures to simplify processes of creating and operating new enterprises or businesses, supporting start-ups through incubation and technology upgrading, and building enterprises’ capacities to access foreign technologies and markets.

There are several other policy frameworks that contain provisions that can be invoked to promote and govern STI. While it is not possible to review all of them in this report, annex 5 provides an overview of STI-related provisions of various key policy frameworks.

**In addition to the policy frameworks described above, there are various processes to develop new policies and strategies in the country. One of these is the development of a new Industrial Policy Framework, which is led by MIEI and supported by UNIDO.**<sup>9</sup> One of the goals of the Industrial Policy Framework is to promote the production of green goods that can support environmental preservation and reduce the environmental impact of other sectors, such as Tourism and Construction. Under the existing industrial policy, Seychelles established the

<sup>9</sup> See: <https://www.icr-facility.eu/intervention/developing-a-new-industrial-policy-for-the-seychelles/> (accessed 29 November 2023).

Industrial Land Allocation Point system, which allocates industrial land to industries. The National Seychelles Made Brand was introduced in 2021 to promote locally produced products. In addition, the Government created several fiscal or tax incentives to generate environmentally friendly energy technologies and conserve water resources or re-use or recycle wastewater.

**A High-Level Steering Committee for a Knowledge-Based Economy, chaired by the Vice-President, was established by the STIPS, to provide all leadership for the coordination of the implementation of the STI policies—both in the NISTI Policy and Strategy and in the complementary policy frameworks outlined above.** The effectiveness of the Committee in ensuring synergies and coordination of various STI initiatives across the whole of government is a subject of a more detailed assessment. Most of the interviewees who participated in this review however, held the view that there was some achievement in getting STI considerations mainstreamed in the Vision 2033, NDS and the blue economy policy frameworks. Coordination by the Office of the Vice-President was instrumental in getting various sectoral ministries and state-owned enterprises to engage in dialogues to strengthen the STI policy content of various sectors. However, these efforts were ad hoc and seem to have dissipated with the demise of NISTI and change of government administration.

**Overall, the weak implementation of STI policy provisions of the various frameworks had many challenges. Some are listed below as follows.**

- **Low levels of awareness or knowledge of the STI policy content:** most of the interviewees were unaware of the STI policy provisions of the various frameworks for FDI, blue economy, entrepreneurship and education.
- **No established mechanisms to raise awareness of the STI policy instruments and how these are to be implemented.** Most interviewees suggested that MIEI should develop a compendium of STI policies that Seychelles should invest in their implementation (including international ones such as the UNESCO Recommendation on Ethics of Artificial Intelligence).
- **Weak institutional coordination:** most of the ministries and state-owned enterprises operate in silos with a tendency to focus their operations within narrowly defined mandates without taking systemic or holistic approaches to development. STI are often seen as belonging to a particular sector, or even a sector in themselves, and thus tend to be excluded from programming and budgeting by various sectoral ministries and/or state-owned enterprises.
- **Weak institutional and cross-sectoral leadership:** the High-Level Committee on the Knowledge-based Economy is largely dormant, while the Cabinet and the National Assembly lack engagement in STI policy issues and in the implementation of existing policy measures.
- **Weak monitoring and evaluation:** most national policy frameworks do have implementation plans with clear monitoring and evaluation (M&E) targets, and thus it is difficult to ensure policy accountability.

## IV. Forging international STI partnerships for sustainable development

**To realize its aspirations espoused in Vision 2033 and NDS 2019 -2023, Seychelles will need to strategically invest in building STI partnerships at all levels.** Partnerships in STI can take different forms, including public-private, bilateral, regional multilateral, continental, as well as with international organizations and development partners.

Partnerships are critical for strengthening the NIS and leveraging international scientific and technological capabilities to address social, economic and environmental challenges facing the country. They can enable Seychelles to exploit regional and international networks of research and build collaborations as well as endogenous scientific and technical capabilities. Enhancing or improving the country's participation in STI cooperation is also one of the 11 specific objectives of STIPS.

**STI partnerships are critical for Seychelles because its need to develop STI capabilities outpaces its size and capacities.** Due to its small population and relatively small NIS, Seychelles cannot develop all the critical scientific and technological capabilities required for economic transformation and sustainable development. It cannot afford all the research infrastructures and human resources for absorbing 4IR technologies and other emerging and cutting-edge innovations.

In this regard, Seychelles needs to partner with other countries, as well as networks of excellence in research and innovation, and join multilateral STI programmes that would enable it to access available scientific and technological resources, including research infrastructures and current scientific research. Collaboration can also enable policy learning beyond purely technological considerations, while building capacity for STI policy design and implementation. For example, by collaborating with global partners, such as the Global Innovation Index WIPO programme, or regional initiatives such as ASTII, Seychelles can harness and use international expertise in STI data collection and management to build its own local capabilities.

**Seychelles has engaged several international commitments and partnerships, primarily with SADC, and has ratified the African Continental Free Trade Area and several IP treaties under WIPO auspice.** Seychelles has several strong international commitments, having subscribed to all the SDGs including SDG17 (partnerships), and committing to SADC and AU's STI policy frameworks that require countries to collaborate or engage in regional and continental partnerships.

Within SADC, Seychelles has ratified the SADC Protocol on Science, Technology, and Innovation, and adopted the 2015 SADC Industrialization Strategy and Roadmap (2015-2065). Article 21(d) of the SADC Treaty makes explicit reference to SADC member countries cooperating in science and technology for regional development and integration. The objective of the Protocol on Science, Technology and Innovation is "to foster co-operation and promote the development, transfer and mastery of science, technology and innovation" among Member States. Seychelles has also signed the SADC Protocol on Industry (in May 2020) and the SADC Industrialization Strategy and Roadmap (SISR), which sets out areas of cooperation at regional level to build diversified and globally competitive industrial bases and economies.

**However, the SADC Protocol on Science, Technology and Innovation is not adequately domesticated or implemented by Seychelles because of a range of challenges.** These include a lack of awareness of provisions of the Protocol, a lack of dedicated resources (both human

and financial) and no demonstrated political and executive leadership for regional cooperation in STI. A review of proceedings of SADC ministerial meetings shows that over the past five years or more, Seychelles was not represented at ministerial level in SADC high-level STI meetings on the Protocol. NISTI was represented in some of the technical meetings and had several staff attend SADC organized training courses and activities on STI policy. NISTI's participation in SADC meetings was largely financed by the SADC Secretariat, AUDA-NEPAD, and international partners such as UNESCO, but not the Government of Seychelles.

Seychelles has also signed to and/or ratified continental policy frameworks such as the AU Science, Technology and Innovation Strategy for Africa (STISA-2024), and agreements such as the African Continental Free Trade Area Agreement that require it to collaborate or engage in pan-African STI programmes or forge partnerships that enable it to contribute to and benefit from continental STI and trade. It is also a party to the African Regional Intellectual Property Organization (ARIPO) and acceded to the Harare Protocol on Patents and Industrial Designs. At the international level, Seychelles is a party to the Paris Convention for the Protection of Industrial Property and the Patent Cooperation Treaty (PCT) since 2002 and ratified the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (ABS) to the Convention on Biological Diversity (CBD).

In October 2022, Seychelles signed a bilateral cooperation agreement with South Africa. However, during the preparation of the agreement, due to capacity constraints and lack of financial resources, the DSTI was not able to effectively engage with its counterpart organization, the Department of Science and Technology (DST) of South Africa.

**Collaboration with the UN and other multilateral organizations can help Seychelles improve policymaking and implementation capacity.** In terms of international partnerships, Seychelles participates in several UN and international STI programmes, and receives support from some of the UN programmes and agencies to implement STI projects. For the past five years or so, particularly during the existence of NISTI, the Seychelles participated in the UNCTAD-hosted UN Commission on Science and Technology for Development sessions, as well as the UN STI Forum. The country has also had delegations to the UN conferences on climate change, biological diversity and other related sustainable development issues.

According to discussions with officials at the DSTI, most of the costs of participation in the UN STI related events and/or processes have been supported by the UN. The Government of Seychelles does not have a dedicated budget or allocation for the country's engagement in UN STI programmes, despite its status as a high-income country. As a member of the United Nations, Seychelles is expected to take part in UN programmes and commissions with a view to becoming a member of the Commission on Science and Technology for Development, moving up from its current status of observer.

**Over the past decade or so, several UN bodies, particularly UNCTAD, UNIDO, UNESCO and WIPO, have supported Seychelles with technical and financial assistance to undertake various studies and review on various aspects of STI issues.** For example, UNCTAD is supporting Seychelles to conduct a technology assessment in energy and agriculture sectors. It is also supporting this STI policy review. The UN Seychelles-based group has prioritized support for data and STI as one part of its technical cooperation work with Seychelles and as part of the UN Strategic Partnership Framework 2019-2023. Some of the specific areas of support include activities to strengthen the National Bureau of Statistics. Currently, the Joint Research Centre and the Directorate General for International Partnerships of the European Commission are conducting a project that aims to develop a policy roadmap for the Seychelles focusing on enhancing energy efficiency and the use of renewable energy. Box 2 provides more details on this project.

## Box 2: STI policy roadmap for Seychelles

A current initiative that is broadening Seychelle's engagement with international STI and development partners is the project on STI for SDGs Roadmaps in Africa. This project, established in 2022, is supported by the Joint Research Centre and the Directorate General for International Partnerships of the European Commission. The objective of the project is to improve directionality and effectiveness of STI policies to contribute to the SDGs.

The project's methodological approach builds on the experience of smart specialisation strategies in the European Union and beyond and through the adaptation of the smart specialisation approach to the rationale of STI for SDGs roadmaps as defined by United Nation's Inter-Agency Task Team in cooperation with the Joint Research Centre. This is taking place under the umbrella of the UN Technology Facilitation Mechanism. The Joint Research Centre is currently member of the working group on STI for SDGs Roadmaps and of the working group on capacity building on STI for SDGs.

In 2019, the IATT launched the Global Pilot Programme on Science, Technology and Innovation for SDGs Roadmaps with an initial group of five pilot countries (Ethiopia, Ghana, India, Kenya and Serbia), to test and adjust the newly developed Guidebook for the Preparation of STI for SDGs Roadmaps.<sup>10</sup> In February 2021, Ukraine joined the programme. JRC supported the pilot activities in Serbia and Ukraine<sup>11</sup> as well as in the Czech Republic where the approach was used to embed mission-oriented approach in the national smart specialisation strategy.

To support the design of STI for SDGs roadmaps, the Joint Research Centre provides tailored support to countries depending on the context and their needs. In 2022, the Division of Science, Technology and Innovation under the Ministry of Investment, Entrepreneurship and Industry of Seychelles expressed interest to join the project to develop the STI for SDGs roadmap for Seychelles<sup>12</sup>. Discussions with DSTI led to focus the work on the role of STI in the enhancement of Energy Efficiency and application of Renewable Energy in Seychelles<sup>13</sup>.

There is a planned (funds yet to be secured) UN project on strengthening the NIS, with emphasis on:

- improving evidence-based policymaking, (providing monitoring instruments for science and technology in the economy),
- identifying the weaknesses in the national system, and
- developing an action plan for capacity building and evidence-based solutions.

Seychelles faces various challenges in building enduring STI partnerships and engaging in international STI cooperation. DSTI needs to build in-house capacity for science diplomacy and strategic STI partnerships. Its engagement in international, continental and regional STI processes and programmes has been on an ad hoc basis and largely externally resourced. Seychelles will need to build the necessary institutional mechanisms to engage and absorb the externalities generated through international STI policy collaboration and leverage global and international partnerships to strengthen its NIS.

<sup>10</sup> See: <https://op.europa.eu/s/za9J>

<sup>11</sup> See Progress Report of the Global Pilot Programme on STI for SDGs Roadmaps updated to 2021, co-published by JRC and IATT and Pilot methodology for mapping Sustainable Development Goals in the context of Smart Specialisation Strategies

<sup>12</sup> Seychelles is one of six countries supported by the JRC. Other countries are Malawi, the Gambia, Namibia, Rwanda, and Mauritius.

<sup>13</sup> There may be other relevant challenge areas on which STI for SDGs roadmaps could focus, for example health or environmental issues. The selection of energy efficiency does not imply that it is seen as the most important sustainability issue in Seychelles. The roadmap aims to demonstrate how the approach can be applied to prepare the ground for future challenge-oriented roadmaps addressing different sustainability issues.



## V. Seychelles' framework conditions for innovation

**Framework conditions for innovation shape and influence the innovation ecosystem in a country.** They do so by enabling individuals, businesses, and organizations to innovate. Certain conditions and policy efforts can encourage and support innovation, fostering economic growth, competitiveness, and societal progress. Other key elements of framework conditions for innovation include regulations and standards, funding and infrastructure for research and development, digital and logistics infrastructures, an actively managed innovation ecosystem, a skilled and educated workforce, trade openness, a positive entrepreneurial culture and risk-taking attitudes, and active international collaborations in STI, among others. Finally, policymakers must embrace a science-based approach to sustainable development challenges as an unavoidable framework condition for innovation.

Effective framework conditions for innovation require a balance between freedom of creativity and entrepreneurship, and policies and regulations that guide towards development goals and aspirations, including the SDGs. Governments, industries, academia and civil society organizations must work together to create an environment that encourages innovation and supports its successful implementation. The following subsections discuss 11 framework conditions that are relevant to Seychelles' development and are proximate or part of the mandate of STIPS and collaborating stakeholders.

### 1. Policy frameworks

Recognizing the country's economic and environmental vulnerability, which implies eventual social vulnerability, the Government of Seychelles has adopted several policy frameworks and launched initiatives directly focused on or related to building capabilities to harness STI and the power of entrepreneurship to address societal challenges, transform the economy and integrate into the global trading system.

Seychelles has a long-term development vision – Seychelles Vision 2033 – and a five-year NDS (2019-2023) to implement the vision. Seychelles Vision 2033: Towards a Sustainable and Inclusive Future articulates a long-term sustainable development vision for Seychelles, as “A resilient, responsible and prosperous nation of healthy, educated and empowered Seychellois living together in harmony with nature and engaged with the wider world” (Vision 2033). It outlines the country's aspirations in various areas including education and training (human resource development), industrialization, the blue economy, women's empowerment, employment, health, and conservation and sustainable use of natural resources. Vision 2033 explicitly recognizes the need to, “invest in the necessary infrastructure and training to benefit from and keep up with technological advancements” (Republic of Seychelles, 2022).

**While taking note of the country's accomplishments in STI so far, Vision 2033 states that STI, “... will have to be further harnessed and adopted to meet national development needs, as Seychelles endeavours to become more engaged with the wider world” (Vision 2033).** Both Vision 2033 and the NDS are well aligned with the AU's Agenda 2063 and the SDGs. Vision 2033 explicitly recognizes that STI are critical to the attainment of the country's aspirations and the SDGs. Some of the STI policy goals outlined in Vision 2033 include:

- Building a highly and appropriately skilled, healthy and productive population to support the realization of Vision 2033;

- Creating a strong enabling environment for free enterprise and entrepreneurship, foreign direct investment and global partnerships;
- Establishing Seychelles as a global knowledge hub for research and implementation of the blue economy in partnership with global institutions; and
- Seeking and applying innovative and sustainable science and technology solutions to Seychelles' unique opportunities and challenges, including energy and food security.

**Science, technology and innovation (STI) are considered in Vision 2033 as values and principles that will underpin sustainable development.**

These values and principles are outlined as, "Private sector led economic growth"; "Solutions underpinned by innovative technologies"; and "Science and technology enhanced through global partnerships" (Republic of Seychelles, 2022). The Seychelles Vision 2033 and the NDS are overarching policy frameworks to be leveraged for the implementation of the 2016-2025 national Science, Technology, and Innovation Policy and Strategy (STIPS). Vision 2033 aspirations cannot be realized if the country's National Innovation System (NIS) is fragmented and weak. Strengthening the NIS is key to harnessing STI to attain the SDGs and the country's aspirations, such as building a blue economy and increasing manufacturing.

The 2019-2023 NDS has explicit provisions on STI. It states:

*"Science, technology and innovation (STI) are important drivers of economic development. The ability to create, distribute and exploit knowledge has become a major source of competitive advantage, wealth creation and improvements in the quality of life"* (NDS, 2019).

It goes on to highlight several issues:

- The growing impact of information and communications technologies;
- The role of STI in improving economic performance and social well-being; and
- The role of STI in meeting the national development needs of Seychelles, including through establishing and maintaining global partnerships.

The NDS also recognizes the importance of technology governance and implicitly technology assessment. It states:

*"A plethora of applications demonstrating new capabilities from robotics, materials science, 3D printing, sensors, artificial intelligence, biotechnology, and a variety of sources are enabling new business processes that are transforming business and economic opportunities and the way we live. In the same way that technology has transformed our lives and the sort of businesses that thrive over the past 15 years, so we should anticipate that the world of 2033 will be very different to the world of today, with technology being a major driver of change ..."* (NDS, 2019).

**On the role of the private sector in development, the Government envisions "an innovative, globally competitive and technologically advanced private sector driving the Seychelles' economy" (Republic of Seychelles, 2019).**

Vision 2033 makes a general statement about unlocking the full potential of the private sector to contribute to sustainable development but does not outline or provide specific policy actions on how companies or firms can contribute to the sustainable development agenda. The Seychelles private sector is relatively small and concentrated in sectors for which the Government has elaborate policies. Policy frameworks for promoting private sector participation in the economy include those for entrepreneurship, intellectual property protection and FDI.

Other key policy frameworks include the Information Communications Technology (ICT) in Education and Training Policy 2022-2027; various industry property regulations (e.g., geographic indications, copyright and trademarks); the 2014 National Employment Policy (NEP) for Seychelles; the 2020

Seychelles Teacher Management and Development Policy; and the 2018 National Investment Policy and the 2010 Investment Act.

**In addition to the national policies, Seychelles has adopted or endorsed various continental and regional policy frameworks** such as the AU Science, Technology and Innovation Strategy for Africa (STISA-2024); the Southern Africa Development Community (SADC) Protocol on Science, Technology and Innovation; the Southern African Development Community (SADC) Protocol on Finance and Investment (2016); and the Investment Agreement for the COMESA Common Investment Area (2007), among others. The country has also subscribed to international treaties, such as those of the World Trade Organization (WTO) and the World Intellectual Property Organization (WIPO).

## 2. Entrepreneurship and ease of doing business

**According to the 2020 World Bank Ease of Doing Business report, Seychelles ranked 100<sup>th</sup> among 190 economies and 8<sup>th</sup> in sub-Saharan Africa.** Within Africa, Seychelles ranks 22<sup>nd</sup> in contract enforcement and 28<sup>th</sup> in enabling access to credit and business start-ups.<sup>14</sup> In Seychelles, entrepreneurs encounter various challenges, including understanding business registration policies, operating standards, obtaining licenses, securing land for business activities, and accessing credit and financing options. Banks are often reluctant to support risky and innovative startups. Figure 2 provides more details.

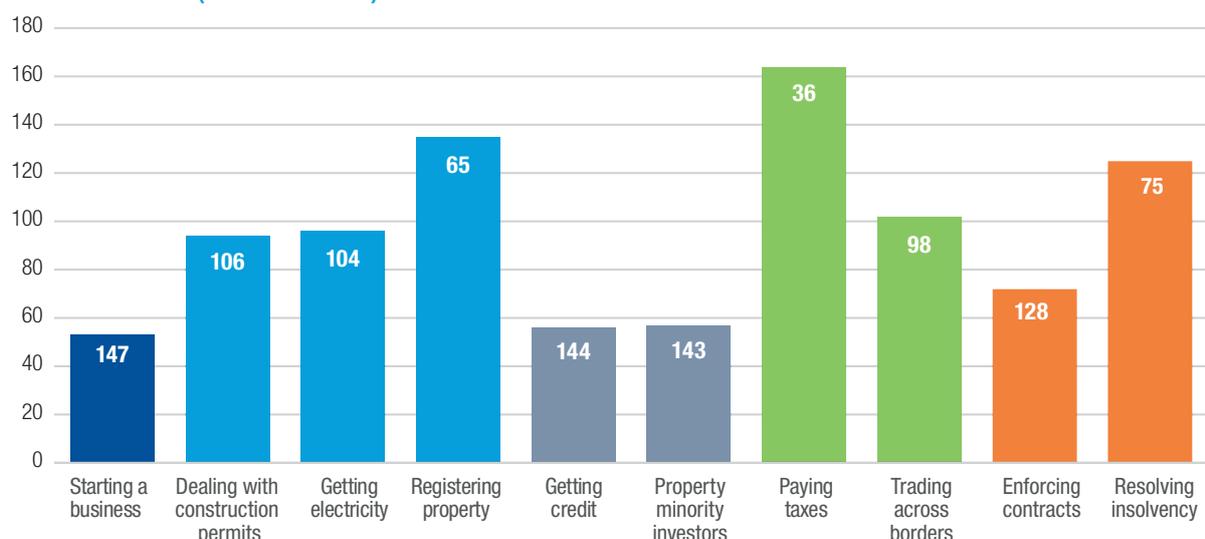
**A centralized platform where information, document submissions, and permits could be processed efficiently is urgently needed.** Regulatory agencies should consider modernizing legislative frameworks, such as the Companies Act and Seychelles Licensing Act (SLA) and updating the state land policy and inventory to optimize land use. Private sector stakeholders have requested a national commitment from government agencies to improve the ease of doing business, including regular ecosystem reviews with private sector participation (UNCTAD, 2023).

**In the STI domain, entrepreneurial challenges include limited technology education in schools, resistance to innovation in banking and financial services, high internet costs, and inadequate hardware/software.** Entrepreneurs may also not have sufficient understanding of intellectual property. Possible support actions could include establishing incubators, sandboxes, and technological support for strategic or emerging sectors like agro-tourism, the blue economy and circular economy.

A recent review by UNCTAD concluded that the Seychelles Small- and Medium-sized Enterprises Policy and Strategy also specifically mentions the role of Seychelles Investment Board as the promoter of linkages between local entrepreneurs and foreign investors (UNCTAD, 2020). However, very few of these strategic measures have been implemented to date and the Strategy is silent on how entrepreneurship and small- and medium-sized enterprises are supposed to contribute to transforming Seychelles into a knowledge-based economy. This is principally due to the lack of guidance on the kind of entrepreneurship and entrepreneurs the Government wants to encourage

<sup>14</sup> See: [https://www.undp.org/mauritius-seychelles/blog/ease-doing-business-entry-point-economic-diversification-seychelles#:~:text=The%20Ease%20of%20Doing%20Business%20report%20\(2020\)%20ranked%20Seychelles%20in,Lucia%20in%20the%2093rd%20position.](https://www.undp.org/mauritius-seychelles/blog/ease-doing-business-entry-point-economic-diversification-seychelles#:~:text=The%20Ease%20of%20Doing%20Business%20report%20(2020)%20ranked%20Seychelles%20in,Lucia%20in%20the%2093rd%20position.)

Figure 2: Ease of doing business in Seychelles – global ranking and components (190 countries)



Source: World Bank (2020).

### 3. Education

**In Seychelles, education is free through secondary school and compulsory up to the age of 16. Enrolment rates are high at 112 per cent and completion rates are equally high at about 126 per cent.** The Southern and Eastern Africa Consortium for Monitoring Educational Quality (SACMEQ) estimates that literacy rates are between 93 and 98 per cent, while more than 80 per cent of those tested in learning assessments for reading and mathematics score above the lowest SACMEQ benchmarks (Education Policy and Data Center, 2018). According to SACMEQ, about 97 per cent of primary school pupils transition to lower secondary (SACMEQ, 2018). Table 2 provides an overview of the statistics on the number of education and training institutions published by the Ministry of Education.

Table 2: Overview of the distribution and enrolment in education and training

Level of education	State/Public	Private	Pupil/Student Enrolment
Day Care, Early Childhood (Crèche)	29	9	3,354
Primary	24	6	9,441
Secondary	11	4	7,282
Tertiary Non-University	9		3,107
Tertiary University Education	1 (UniSey)		270

Source: Ministry of Education, Republic of Seychelles (2022).

**Seychelles' gross expenditure on education as a percentage of GDP is one of the highest in Southern Africa.** According to UNESCO, government expenditure on education as a share of GDP over 2015–2018 was 0.34 per cent above South Africa's 0.2 per cent (UNESCO 2021). The Government of Seychelles has also made considerable investments and progress in improving access to education.

**In 2022, the Ministry of Education adopted a new Strategic Plan 2021-2024 that aims at modernizing the education and training system to make it relevant, high quality**

**and accessible to learners from all backgrounds** (Ministry of Education 2024). According to many interviewed stakeholders, the education and training system is perceived as not well aligned to labour market needs. In general, performance in science, technology, mathematics and engineering (STEM) has been poor, and many graduates of the system also lack the necessary soft skills that are critical for the services-based economy. Table 3 gives an overview of the post-secondary system. Only a few provide training in technical or technology-related skills. Seychelles' small education and technical and vocational training system is relative to its small population size.

**Table 3: University and vocational education institutions in Seychelles**

	<b>Name of institution</b>	<b>Year established</b>	<b>Number of students attending in 2022/23</b>	<b>STEM courses available</b>
1	National Institute of Health and Social Studies	2002	240	Yes
2	Seychelles Tourism Academy			
3	The Guy Morel Institute <ul style="list-style-type: none"> <li>• Numeracy — Core</li> <li>• Introductory Statistics</li> <li>• Economic Principles</li> <li>• ICT Skills</li> <li>• ICT for Management</li> <li>• HR Information Systems</li> <li>• Information Management Systems</li> </ul>	2018	511	Yes
4	Seychelles Institute of Distance and Open Learning			n/a
5	Seychelles Institute of Teacher Education			n/a
6	Seychelles Maritime Academy			n/a
7	Seychelles Institute of Agriculture and Horticulture	1983	53	Yes
8	Seychelles Institute of Technology <ul style="list-style-type: none"> <li>• Technology</li> <li>• Science</li> <li>• Mathematics</li> </ul>	2005	537	Yes
9	Seychelles Institute of Art and Design	1983	93	Yes
10	Seychelles Business Studies Academy <ul style="list-style-type: none"> <li>• technology and mathematics</li> </ul>	2015	374	Yes
11	University of Seychelles <ul style="list-style-type: none"> <li>• Environmental Science</li> <li>• Computer Science</li> <li>• Maths</li> </ul>	2009	455	Yes

Source: Information provided by MIEI/DSTI.

**The Technical and Vocational Education and Training (TVET) system has been under reforms since about 2010.** The African Development Bank (AfDB) is supporting the Ministry of Education to develop a TVET policy and strategic plan. The AfDB has supported an assessment of TVET to inform the proposed policy and strategic plan. Two of the issues emerging from the assessment relate to misalignment between current TVET curriculum and skills required in the economy, and organizational weaknesses of the Seychelles Institute of Technology and its location in the Ministry of Education. Some interviewees were of the view that, since its establishment in 2006, the Seychelles Institute of Technology has not expanded enough to adequately meet

growing demands for technical training in the country, or address the deficits and constraints to its human resource capacity and infrastructure. In 2019, Seychelles Institute of Technology had a total staff of 38, most of whom needed to be retrained or have their skills upgraded. Its infrastructure needs expanding and modernizing for a student population of about 300, an increase from the current capacity of around 150 trainees.

**The University of Seychelles (UniSey) is the only university in the country. Established in 2009, UniSey's student intake or enrolment increased from 53 (2009) to 142 in 2021. By 2021 it had produced 1,859 graduates of whom 1,395 (or 75 per cent) were female.** Its teaching programmes are mainly undergraduate and focus on business administration, ICT, law, media, social care and hospitality. UniSey recently established three laboratories for environmental sciences, blue economy and ICT. It has no engineering courses or facilities. The university has a total of 45 lecturers, around 30 of which are active researchers. UniSey has less than 500 students enrolled at any time. It provides bachelors- and masters-level courses in Environmental Science, Computer Science and Maths.

**To strengthen UniSey's role in the NIS, several challenges should be addressed. One major challenge is that UniSey does not receive any research grants from the Government and therefore it is not able to effectively contribute to the NIS's research performance.** UniSey's research portfolio is largely funded from external sources, and most of the foreign researchers who bring grants to UniSey are focused on their own research agendas. Some of the University's researchers secure grants by bidding or writing proposals to international organizations and regional bodies. The University also participates in projects funded through the Southern African Research Universities Association (SARUA) and the African Research Universities Association (ARUA). The mechanisms may, in the long-term, distort the University's research alignment with national priorities.

**While unemployment rates are not high at 4 per cent, youth unemployment is more than double at 11 per cent and there are concerns that the education and training system may not be structured to meet labour market needs.** Other factors influencing youth unemployment include limited job opportunities beyond the tourism sector, challenges related to its size, its remote geography, challenges of being a SIDS, and its economic fragility and susceptibility to global economic fluctuations. Seychelles' gross expenditure on education is relatively high compared to most Sub-Saharan African countries. Nevertheless technical and vocational education and training as well as adult education account for ten institutions (see table 3).

**A key issue is the alignment of education policy and STI policy.** Education systems do not always recognise that their output – their pupils and students – are effectively inputs for the diverse social and economic activities of the nation. Alignment in policy does not only happen on paper, through a revision of the texts that define STI and education policies, or in their alignment with higher level national development policy. Alignment will manifest in practice, through operationalization, where strong working relationships and linkages between ministries and agencies enable collaboration.

**There are wider, cultural issues and challenges about the perception of STEM education specifically, in addition to systemic issues.** The cultural issues are fundamentally detrimental and must not be ignored. MIEI/DSTI and the Ministry of Education may need to conduct a joint survey of perceptions of STEM studies perceptions in Seychelles. Discovering exactly how attractive such studies are in Seychelles, and why this is the case, will require developing a stronger partnership with the Ministry of Education, as well as funding and organizing.

It is important to note that negative perceptions of STEM studies may not be “fixed” by targeted policy. They are usually “fixed” by cultural leaders exemplifying purposeful activity leading to success. For STEM, this would be giving media space (print, TV, social media...) to showcase successful people coming out of a STEM background and exemplifying how STEM studies worked

for them in their lives and careers. Of particular concern is the gender perspective of STEM studies – are STEM studies seen as predominantly suitable for young men?

**The systemic issue is that STEM education, though necessary, is insufficient on its own.** STEM educated individuals need counterparts who have backgrounds in arts, design, management, marketing, logistics, finance and economics, among other disciplines. Unless there is complementarity of diverse competencies in firms and all the way up to the national economy, STEM graduates will often fail to impact and improve innovation outcomes, eventually leaving to go abroad (known as ‘brain drain’). In this way, Seychelles would be effectively subsidizing the development of STEM human resources for other countries.

The tertiary system may be promoting an imbalance among the various graduates targeting diverse professions. There may be too many tertiary/university studies offering enrolment in Bachelor of business admin (BA) degrees. To address this, the correct policy would be to simply reduce the number of places on offer through capping enrolment or even decertifying the institutions. Schools will argue that they are meeting demand, but they should then be challenged to interact with firms and industries and collaborate to develop jobs for their BA graduates.

From a national innovation systems perspective, the key issue is developing alignment between outputs of the education sector and the needs of innovative firms and industries, as well as public sector organizations and parastatals.

**Given its size and that of its labour market, Seychelles may benefit from closer stakeholder coordination.** A permanent committee between MIEI, the Ministry of Education, the Ministry of Employment and Social Affairs, etc., and all tertiary education organizations and TVETs, as well as representatives of key economic sectors (tourism, fisheries, bank, telecoms, small- and medium-sized enterprises, etc.), would hold yearly consultations on future job development and human resource needs. These would include:

- **Developing foresight on the future needs of particular types of STEM graduates,** as well as go beyond STEM, as many types of non-STEM professional profiles are also needed, even in the most innovative and tech-enabled businesses.
- **Holding open discussion between all the above-mentioned stakeholders on the quality of education outcomes.** The key question is how much time STEM and other graduates need to become professionally active and productive in a new or first job – not how well they perform on academic tests. Should schools and universities claim that this is not their problem, firms and industries could respond that if the education sector cannot provide capable staff, they then need to import alternative employees from abroad. Some mutual compromise is necessary, as well as the establishment of internship programmes. Here, supporting international participation in programmes such as AIESEC or IASTE, as well as developing extensive domestic internship programmes for STEM graduates, may have an important impact.
- **Organizing open discussion about the development and profile of curricula.** This is particularly important for TVET schools who aim to provide employable skills. All TVET schools need to have an active curriculum board that presents specific vocational and technical skill needs, and mandates the appropriate curriculum development. STEM requires TVET in many supporting roles, such as lab technicians, infrastructure and IT support, maintenance, logistics, etc.
- **Assessing how many STEM graduates are needed to conduct research.** This can then be linked to the science component of STI policy and to the identification and designation of national research priorities. A multi-stakeholder group, including firms/industries, academia and civil society, can be assigned decision-making or consultative status on the question of national research priorities.
- **Finally, deciding whether Seychelles has the size and scope to conduct research as regular programme activity (with regular research staff and allocated budgets),**

**or whether project-based research is more realistic.** In most cases, financing is a mix of ad hoc extra-budgetary finance from ad hoc grants, and from domestic sources (such as government agencies, but also philanthropists), as well as international donors and development partners. Often the opportunities available will dictate the composition of this mix and, similarly, the outcomes, in terms of demand and prospects for STEM staff, will vary accordingly.

#### 4. Research and innovation outputs

**There is very scant data on Seychelles' R&D and innovation inputs and outputs. The Seychelles' Government does not participate in the Global Innovation Index and many other R&D and innovation surveys.** Instead, it has been involved in the African Union Development Agency-The New Partnership for Africa's Development – "AUDA-NEPAD" – African Science, Technology and Innovation Indicators (ASTII) Initiative, according to the African Innovation Outlook III (AUDA-NEPAD 2019). Seychelles' public expenditure on R&D was about 0.19 per cent of GDP, and higher education expenditure on R&D was 0.02 per cent of GDP. The data is based on a survey conducted in 2015. The same report indicates that the total number of researchers (not necessarily all R&D personnel) in the country was 149. Of the firms that participated in the 2015 ASTII-supported survey and reported in the African Innovation Outlook III, about 55 per cent had in-house R&D activities.

Table 4: Seychelles' scientific publications 2017-2019

Field of research	Number of publications
Agriculture, fisheries and forestry	12
Animal and plant science	21
Chemistry	1
Health sciences	42
Environmental sciences (excl. geosciences)	23
Cross-cutting issues	1
Geosciences	1
<b>Total</b>	<b>101</b>

Source: UNESCO (2021).

**The country's R&D productivity, measured in terms of research publications, is relatively small, which is understandable given its size as well as scope of research topics that are relevant for its socio-economic development.** UNESCO provides more recent statistics on Seychelles' publications by field of science (UNESCO 2021). The volume of publications increased from 35 in 2017 to 52 in 2019. This increase of publications can be associated with the growth of research at the University of Seychelles and increasingly international cooperation between local and foreign researchers, in particular in agricultural, health and environmental sciences. Table 4 below provides indicative total figures of publications covering the period 2017-2019.

**During the period 2017-2019, Seychelles' top country five partners for scientific co-authorship, were the United Kingdom (68), the United States of America (64), France (40), Australia (35), and South Africa (35).** This may be an indication that there is limited research collaboration between Seychelles and most African countries. According to one interviewee, most of the research conducted in Seychelles is initiated by foreign scientists who have funding from abroad. They engage local researchers as assistants who eventually co-publish with them. This may have the advantage of building domestic research culture of publishing by local researchers in the country.

When considering innovation outputs measured as intellectual property – granted patents and trademarks – there is modest evidence of activity. A further discussion of IP follows in section 4.6.

## 5. Firm incubation and innovation parks

**In response to the National Policy and Strategy 2016-2025 provisions for the establishment of a Business, Technology and Innovation (BTI) Incubator is being established as a core initiative of DSTI to support start-ups.** In December 2019, Cabinet approved the establishment of a BTI. DSTI is working on modalities of establishing the BTI and had held consultative meetings and workshops with potential key players from private sector and government agencies.

Despite these efforts, the Government has not allocated resources for BTI and DSTI does not have adequate in-house staff for the project. Only one staff member is allocated for the BTI project.

**The Africa Development Bank (AfDB) has provided a grant to the Blue Economy Department. The DSTI is one of the agencies charged with setting up a Blue Economy Incubator and developing a knowledge hub for marine data.** The Blue Economy Incubator is planned as a first tenant of the BTI. If well developed and adequately funded, the BTI could play a major role in the NIS helping to build and strengthen public-private partnerships and nurturing start-ups in sectors such as manufacturing and the blue economy. The MIEI and the whole of Government should mobilize resources, including political, financial and technical support for the BTI.

## 6. Intellectual property

**Considering the size of the country, intellectual property activity in Seychelles, while modest, is not insignificant. An increased focus on plant varieties or geographical indication IP should be explored.** There are two central economic objectives of any system of IP protection. The first is to promote investment by establishing exclusive rights to own, use and sell innovative and creative technologies, goods, and services. Without IP rights such as patents, copyrights, geographical indications and trademarks, competitors can appropriate innovations and creations without compensation, and this can be a disincentive to investment in innovation. The second goal is to promote the dissemination, transfer and diffusion of creations and innovations by encouraging rights holders – usually entrepreneurs, technologists and creators in the first instance – to go public and commercialize their creations through public registrars, such as a patent office, and ultimately as products and services on the market (Maskus, 2000).

**In Seychelles, the Trade Division of the Department of Trade, Ministry of Finance, National Planning and Trade is the main policy body for IP.** The Trade Division is also the Secretariat to the National IP Committee which was established in July 2017. It serves as a forum for coordinating and guiding national stakeholders in relation to IP developments. Since 2018, the Registration Division of the Department of Legal Affairs of the President's Office is the sole institution responsible for the registration of IP in Seychelles.

IP is governed by the Industrial Property Act 2014 and the Copyright Act 2014. The Industrial Property Act 2014 governs the protection and use of patents, trademarks, geographical indications, utility models, layout designs and integrated circuits. The Copyright Act 2014 provides for the administrative enforcement of copyrights to protect eligible works by an exclusive right conferred to the author or another person for the lifetime of the author plus 50 years.

Seychelles ascended to the WIPO convention in 2000, as well as the Paris Convention for the Protection of Industrial Property (2002), Patent Cooperation Treaty (2002) and the Beijing Treaty on Audiovisual Performances (signed in 2012, but yet to be enforced).<sup>15</sup>

<sup>15</sup> See: <https://www.wipo.int/wipolex/en/treaties/ShowResults?code=SC> (accessed 29 November 2023).

### Box 3: Business, Technology and Innovation (BTI) Incubator

#### Background:

The BTI was officially established 14 November 2022, its core purpose to nurture technology and innovation start-ups in Seychelles. Its anticipated contributions encompass job creation, skills development, and fostering an innovation and entrepreneurial culture. Programme activities include aiding start-ups in developing business and innovation plans, technology prospecting, strengthening public-private partnerships, mobilizing resources, and assisting with intellectual property protection.

#### Expected Outcomes:

The establishment, growth, revenue increase, customer base expansion, enhanced market presence, and overall success of BTI start-ups is the key outcome. Flourishing start-ups are anticipated to significantly contribute to job creation, providing valuable employment opportunities. Central to this ecosystem is innovation, focusing on products, services, or technologies that can bring about industry-wide change. The BTI initiative plays a key role in this, drawing investments and aiding economic growth and diversification.

Efforts are underway to attract investors, with frameworks in place to facilitate venture capital and angel investments, thus bolstering start-up and entrepreneurial opportunities. This initiative also aims to foster a strong entrepreneurial community, with government-employed individuals contributing to a diverse revenue stream. Successful alumni mentor and inspire new entrepreneurs, adding to the community's vibrancy. Global expansion of these start-ups is also targeted, enhancing the region's recognition as an entrepreneurial hub. To track and ensure progress, a system measuring key performance indicators like profitability, job creation, investment, and revenue is employed, ensuring the achievement of growth, innovation, and economic development goals.

#### Achievements:

Although the BTI has not yet admitted a tenant due to space constraints, several notable achievements include developing an implementation framework with a consultant hired by AfDB, providing start-ups with training, workshops, and mentorship funded by AfDB, acquiring essential ICT equipment and furniture, and engaging in discussions with the Seychelles Climate Change Adaptation Trust for additional funding.

#### Challenges and Solutions:

1. Funding: The BTI lacks dedicated government funding and is not financially independent. Legislation is needed for venture capital and angel funding and non-bank instruments.
2. Space: Limited office space has hindered the programme's operation, requiring government intervention.
3. Government Commitment: Clarity is needed regarding which organization should oversee the BTI programme, its insertion in the STI policy document a potential solution.
4. Equipment: Lack of necessary equipment poses a challenge, and funding has been allocated to address this.
5. Startup Success: Most start-ups are stuck at the concept stage due to limited funding and institutional constraints.
6. Resource Constraints: Limited resources and facilities hinder BTI's ability to support start-ups.
7. Start-up Selection: A robust screening and selection process are required.
8. Mentorship Quality: Proper training for mentors is crucial.
9. Diversity and Inclusion: Efforts are needed to promote diversity and inclusion within the programme.
10. Sustainability: The BTI needs to brainstorm sustainability strategies.
11. Market Alignment: Ensuring start-ups address market needs is vital.
12. Exit Strategies: Identifying suitable exit strategies for start-ups is challenging.
13. Post-Incubation Support: Ensuring long-term success after graduation is crucial.

To overcome these challenges, the BTI should focus on effective management, networking, partnerships, adaptability, and continuous improvement, while remaining attentive to the needs of start-ups.

Source: inputs from MIEI/DSTI

Innovation is often measured by the number of patents granted to nationals and/or local companies. Table 5 and figure 3 give recent data on IP filings, resident and abroad, for the categorization of industrial design, patents and trademarks from 2013 to 2022. During this period there were no applications for plant varieties or geographical indications. In 2020 there were only three patent applications registered with WIPO, of which two patents had been granted to nationals of Seychelles. In 2022, The Seychelles Registration Division received application for registration of 25 patents and 611 trademarks; there were no applications for industrial design. Looking at world-wide filing, in 2022, only one patent and 54 trademark applications came from Seychelle residents, while there were no applications for industrial design.

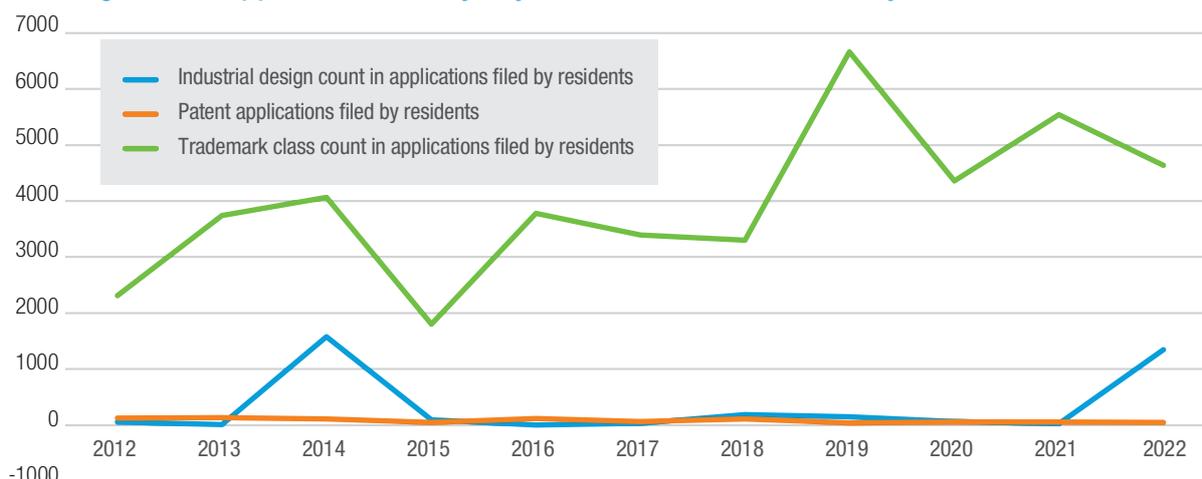
Table 5: IP filed by Seychelles residents domestically and abroad

Year	Industrial design	Patents	Trademarks
2012	55	121	2,311
2013	9	133	3,740
2014	1,575	109	4,067
2015	93	48	1,804
2016	1	113	3,779
2017	30	64	3,396
2018	188	106	3,300
2019	145	36	6,662
2020	64	53	4,360
2021	27	51	5,540
2022	1,344	46	4,641

Source: WIPO. Available at <https://www.wipo.int/edocs/statistics-country-profile/en/sc.pdf>.

This does not necessarily mean that local firms and individuals are not innovative. According to AUDA-NEPAD African Innovation Outlook III (2019), about 75 per cent of firms that were involved in the survey conducted by Seychelles in 2015 were innovating. Their main forms of innovation were organizational and marketing-related. Many of the firms operate in the services sector.

Figure 3: IP applications filed by Seychelles residents domestically and abroad



Source: WIPO. Available at <https://www.wipo.int/edocs/statistics-country-profile/en/sc.pdf>.

According to WIPO, “Trademarks are the most used form of industrial property rights in the country. The beneficiaries or users of the IP system are foreigners... All the applicants of patents and the

*patent holders are foreigners... The bulk of trademark users are foreigners and the majority of trademark applications (over 90%) are by foreigners” (WIPO, 2010).*

**Intellectual property activity shows a bias towards growing trademark registrations and relatively few filings for industrial design and patents. This is indicative of an economy that is heavily reliant on its services sector and retail.** It can also be understood as a sign of an economy with potential for improving innovation outcomes. In this respect, given Seychelles natural endowments, building awareness and consideration of IP for plant varieties and geographic indications merits greater policy attention.

Indeed, while in absolute terms, Seychelles has a modest IP output comparable to Mauritius, Oman, Kenya or Bahamas, when IP output is compared against population size, the picture changes considerably (see table 6).

**Table 6: Patent applications filed domestically and abroad by resident applicants**

Year	Seychelles	Mauritius	Oman	Bahamas	Kenya
2012	121	55	24	132	143
2013	133	129	4	149	181
2014	109	67	12	141	160
2015	48	118	38	146	180
2016	113	109	17	105	201
2017	64	49	71	56	195
2018	106	194	35	46	293
2019	36	70	54	37	372
2020	53	116	41	26	424
2021	51	165	583	55	199
<b>Total 2012-2021</b>	<b>834</b>	<b>1,072</b>	<b>879</b>	<b>893</b>	<b>2,348</b>
<b>Population in 2020</b>	<b>98,462</b>	<b>1,266,014</b>	<b>4,543,399</b>	<b>406,471</b>	<b>51,985,780</b>
<b>Patents per 1,000 population, per year</b>	<b>8.47</b>	<b>0.85</b>	<b>0.19</b>	<b>2.20</b>	<b>0.05</b>

Source: WIPO.

Still, there are relevant policies and experiences that Seychelles may explore in refining its STI policy in terms of its approach to IP as a development tool. Box 4 outlines a few examples that may be explored by national policy experts and policymakers. These examples illustrate how less populous countries and SIDS are leveraging IP policies to protect their indigenous knowledge, cultural heritage, and innovations, contributing to economic growth and sustainable development.

## 7. ICT

**Physical infrastructure (specifically ICT connectivity) is generally well developed in Seychelles. The country is rated one of best in information and communication technology (ICT) development in Africa.** As part of the efforts to develop the ICT sector, the Government of Seychelles has published a National ICT Policy to promote the use of ICT in all sectors of the economy (Republic of Seychelles 2022). The Government engages with private partners to invest in fibreoptic cables to connect the country and enhance its connectivity to the rest of the world.

In Seychelles, local and international telecommunications lines are operated by two companies: Cable & Wireless and Airtel. With an internet penetration rate of 78 per cent and a mobile penetration rate of 187 per cent, Seychelles has fundamental digital infrastructure.

**However, with two main mobile telecom operators servicing a small market, costs are relatively high and economies of scale difficult to achieve.** Figure 4 presents costs of data

## Box 4: Intellectual property in SIDS and less populated countries

Developing countries with small populations face unique challenges due to their geographical, economic, and environmental circumstances. However, many have made significant strides in developing intellectual property (IP) and related policies that support innovation, cultural preservation, and economic development. Here are some positive examples:

### 1. Copyright and Related Rights in Barbados

Barbados has made strides in copyright law to protect artists, authors, and other creators, ensuring they receive fair compensation for the use of their work. This includes modernizing copyright legislation and engaging in international copyright systems, which helps to foster a vibrant creative economy. Following on the 2005 UNESCO Convention on the Protection and Promotion of the Diversity of Cultural Expression, in 2015 Barbados proclaimed the Cultural Industries Development Act which supports the sector and provides possibilities for engagement and employment opportunities for cultural practitioners.

Source: <https://en.unesco.org/creativity/governance/periodic-reports/2018/barbados>

### 2. Regional IP Strategy in the Pacific Islands

Several Pacific Islands, under the Pacific Islands Forum, have collaborated on a regional IP strategy that addresses the unique needs of SIDS in the region. This strategy focuses on the protection of traditional knowledge and genetic resources, supporting local innovation, and ensuring that IP contributes to sustainable development. Greater emphasis is placed on grassroots projects, especially those involving and led by women and youth, while aiming to increase intellectual property activities by more countries in the region.

Source: [https://www.wipo.int/cooperation/en/funds\\_in\\_trust/japan\\_fitip\\_global/news/2023/news\\_0034.html](https://www.wipo.int/cooperation/en/funds_in_trust/japan_fitip_global/news/2023/news_0034.html)

### 3. Protection of Traditional Knowledge and Biodiversity in Bhutan

Bhutan has made significant efforts to protect its traditional knowledge and biodiversity through IP policies, recognizing the importance of these assets to its economy and cultural heritage. Historically known as the valley of medicinal herbs, Bhutan boasts a rich diversity of medicinal plants. This has fostered a deep-rooted tradition of traditional knowledge regarding the use of biological resources. The policy framework is defined in the 2014 National Biodiversity Strategies and Action Plan. The government has integrated traditional medicine in the national health system by establishing indigenous hospitals, a college, and a pharmaceutical unit that produces and distributes medicine derived from this knowledge. The country's approach includes the development of a legal framework to protect traditional knowledge related to biodiversity, ensuring that the benefits of its use are justly distributed. This is particularly relevant for Bhutan's rich medicinal plant knowledge.

Source: <https://www.cbd.int/doc/world/bt/bt-nbsap-v4-en.pdf>

### 4. Biodiversity and IP in Costa Rica

Costa Rica has been a pioneer in protecting biodiversity through biodiversity and IP policies. The 1998 Biodiversity Law aligns Costa Rica with the principles and themes outlined in the Convention on Biological Diversity (CBD). It advocates respect for all forms of life, includes traditional knowledge in its conceptualization of biodiversity, and introduces a participatory governance system for sustainable use of natural resources. A key aspect is the Law's consistent implementation to the present. Costa Rica's approach ensures that the exploitation of its rich biodiversity is conducted sustainably and that benefits are shared with local communities and contribute to conservation efforts.

Source: <https://www.futurepolicy.org/healthy-ecosystems/biodiversity-and-soil/costa-ricas-biodiversity-law/>

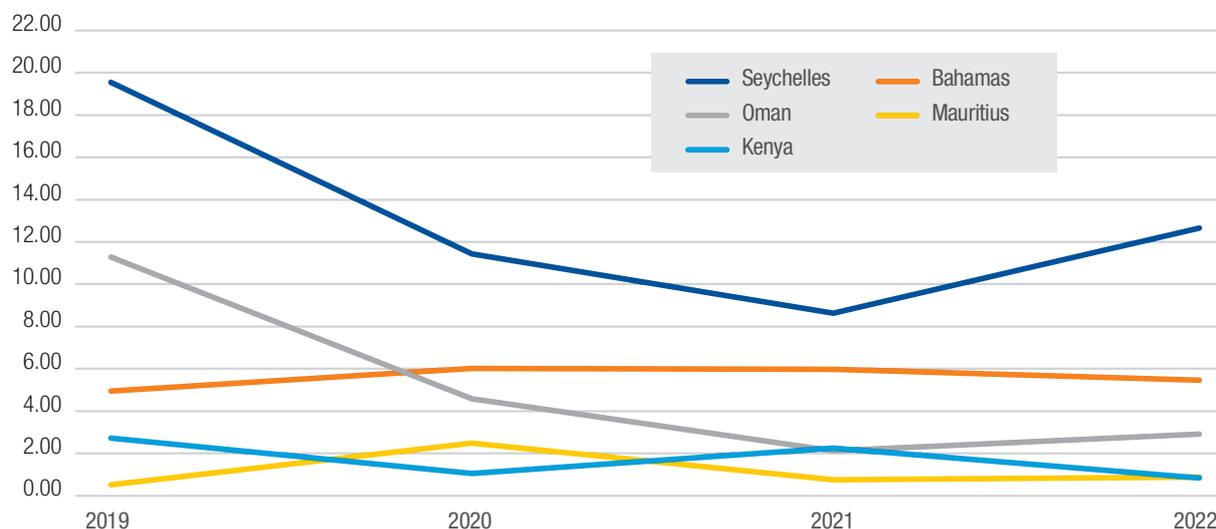
### 5. Copyright industries, and art and crafts in Botswana

Using the WIPO Guide on Surveying the Economic Contribution of the Copyright Industries, revised in 2015, Botswana determined that copyright industries make a significant contribution to the national economy of Botswana. In 2016, these industries contributed 5.46 per cent to value added and 2.66 per cent to the total labour force. It was revised in 2015. In terms of their relative contribution to the economy, copyright industries compare well with other economic sectors. For instance, they rank eighth out of 11 sub-sectors in terms of contribution to GDP, surpassing other important sectors such as water and electricity, agriculture and manufacturing. Botswana has also taken steps to protect the IP rights of its craft and cultural industries, recognizing these as vital to its economic diversification and cultural identity. By implementing policies that safeguard traditional designs, crafts, and cultural expressions, Botswana aims to enhance the value of these products and open new markets, both domestically and internationally. Policy support is provided through the Botswana Intellectual Property Policy promulgated in 2022.

Source: [https://www.wipo.int/export/sites/www/copyright/en/performance/pdf/econ\\_contribution\\_cr\\_bw.pdf](https://www.wipo.int/export/sites/www/copyright/en/performance/pdf/econ_contribution_cr_bw.pdf)

and comparators and indicates large differences in pricing. While the Seychelles ICT market may be able to support such excessive pricing due to its overall high level of income per capita, expensive digital services are a hindrance to innovation and this is well understood even by the most developed countries with high income levels.

Figure 4: Average cost of one GB of data



Source: Worldwide mobile data pricing 2022. Available at <https://www.cable.co.uk/mobiles/worldwide-data-pricing/>.

The situation may change in the immediate period as two cable operators – Seychelles Cable Systems (SCS) and Intelvision – have landed cable in Seychelles, supplementing existing capacity of the Cable & Wireless managed legacy cable – the Seychelles East Africa System. The SCS cable will connect to the Pakistan and East Africa Connecting Europe cable. The SCS itself is owned by the Seychelles Government, Cable & Wireless and Airtel. Intelvision is privately owned and was developed in collaboration with Vodafone. It will connect with the 2Africa cable system, which itself has multiple international investors.<sup>16</sup>

## 8. Energy

**Innovation in the Seychelles’ energy sector is moving towards increased use of locally available renewable resources – solar and wind – and away from imported fossil fuels. Robust energy supply is fundamental for innovation.**

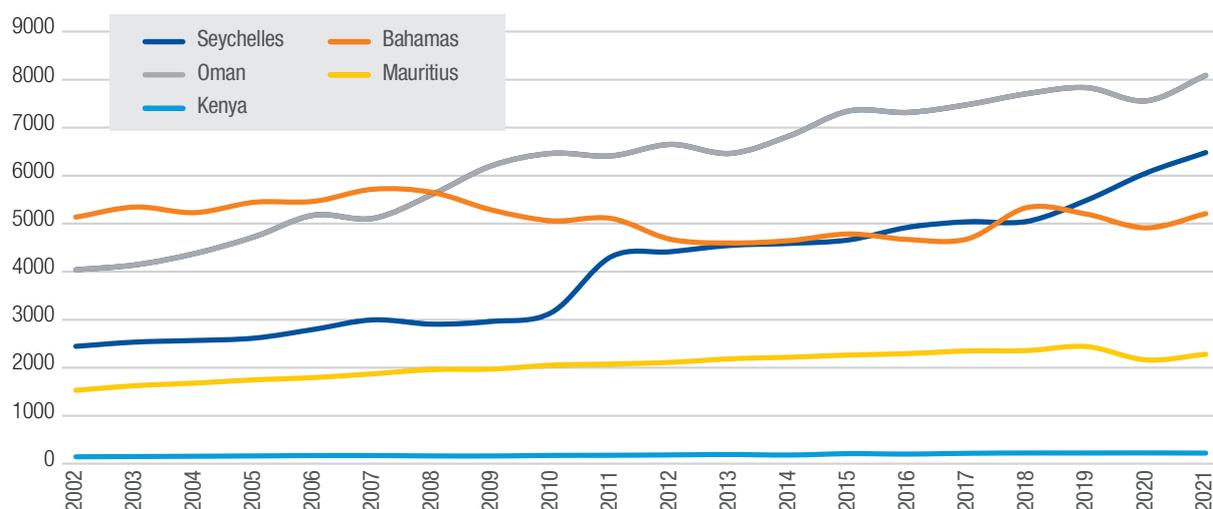
The use of imported fossil fuels introduces energy security concerns in terms of price volatilities and supply chain disruptions. However, a robust energy supply is fundamental for any innovation within the realm of the digital economy, or where ICTs interact with established sectors and industries, dramatically enhancing productivity and enabling more sustainable and less resource-intensive development.

The energy sector in Seychelles is largely state-owned, thereby enabling it to target public policy that addresses both development and sustainability needs and concerns.<sup>17</sup> To support existing growth rates and realize its development aspirations, Seychelles will need to secure its energy base.

<sup>16</sup> See: <https://tinyurl.com/seydigict1> and <https://tinyurl.com/digseyict2> (both accessed 29 November 2023).

<sup>17</sup> The Ministry of Home Affairs, Environment, Transport and Energy is in charge of the energy sector. The energy regulator is the Seychelles Energy Commission. The Public Utilities Company (PUC) is the sole generator, transmitter and distributor of electric energy.

Figure 5: Per capita energy generation in Seychelles and comparators (kWh per capita)



Source: U.S. Energy Information Administration. Available at <https://www.eia.gov/>.

In parallel with its strong economic growth, Seychelles has experienced similar growth in its energy generation capacity in the last two decades. Energy use has grown rapidly in the last three decades at an annual rate of 4.5 per cent, with CO<sub>2</sub> per capita output tripling from two to more than six metric tonnes (data.worldbank.org). While generation was equal to the world average in 2002, by 2021 it doubled to about 6,500 kWh per capita and will approach developed country levels by the end of this decade (see figure 5). Current electricity generation capacity is 76.4 MW.

Currently, over 95 per cent of electricity generation is from oil-based power plants. Oil fuel is completely imported. The ISS Africa Futures forecasted that Seychelles' share of gas would increase in total energy production from 27.3 per cent in 2019 to 42.9 per cent in 2043, while coal production falls from 45.5 per cent in 2019 to 23.8 per cent in 2043 (ISS African Futures 2023).

**As a matter of policy, Seychelles has commitment to moving to 100 per cent renewable energy by 2050, with a near-term target of 15 per cent by 2030** (Climate Policy Database, 2011). **Energy security, both in terms of price volatility as well as supply chain disruptions, is a legitimate concern, and renewable sources will unavoidably play an important role in the near future.** Renewable generation consists of a 6.0MW Port Victoria wind farm, a 5.0MW solar photovoltaic plant on Ile de Romainville Solar Park and around 5.75MW of distributed rooftop PV systems.<sup>18</sup> More recently, plans for developing a floating 6 MW PV plant in collaboration with QAIR are moving forward.<sup>19</sup> At the same time, Seychelles seeks to reduce greenhouse gas emissions by 26.4 per cent by 2030 (Republic of Seychelles, 2021).

## 9. Health and wellbeing

**An important sustainable development priority emphasized in Vision 2033 is health and wellbeing.** The Government of Seychelles recognizes the critical importance of investing in health innovation. Emphasis is placed on using existing and new partnerships to promote medical innovation and technological advancement in the health sector. Specific areas that the country plans to invest in and/or strengthen include telemedicine as well as developing and deploying digital technologies to improve healthcare. A well-performing and funded health system is a

<sup>18</sup> See: <https://tinyurl.com/seychrenewenerg> and <https://masdar.ae/en/renewables/our-projects/ile-de-romainville-solar-park> (both accessed 29 November 2023).

<sup>19</sup> See: <https://www.qair.energy/en/indian-ocean-qair-signs-first-seychellois-floating-solar-power-purchase-agreement-onboard-renewable-energy-and-hydrogen-powered-vessel-energy-observer/> (accessed 29 November 2023).

fundamental economic pillar and an important contributor to business continuity and overall economic performance of the country.

**Seychelles has a relatively robust national health system. All citizens are constitutionally entitled to healthcare or health services from the state.** Article 29 of the Constitution of the Republic of Seychelles requires the state to provide free primary health care in state institutions for all its citizens; and to take appropriate measures to prevent, treat and control epidemic, endemic and other diseases (Republic of Seychelles, 1996). The health infrastructure is good and most of the facilities are public. However, the national capacity for health research and innovation is weak (Republic of Seychelles, 2022). Consequently, Seychelles is highly dependent on foreign institutions for epidemiological studies and imports more than 90 per cent of health products into the economy.

In contrast with steady growth and overall standing as a high-income country, according to the Government of Seychelles and the United Nations Strategic Partnership Framework 2019-2023, there is a “deterioration in the quality of health and education services with increasing number of Seychellois preferring to seek treatment outside the country and higher demand for private education compared to public” (United Nations, 2018).

## 10. Gender

**Another key social development issue for Seychelles is women’s empowerment.** In 2022, around 45 per cent of the country’s population consisted of women. The Government, local non-governmental organizations and other international organizations are implementing various initiatives aimed at empowering women and promoting gender equality. According to UNDP (2022), only 8 per cent of women graduated in science, technology, engineering and mathematics (STEM) from tertiary education in 2020 (UNDP, 2022).

**A large percentage of women and girls lack professional skills in areas such as information and communications technology (ICT).** This is despite the country’s National Gender Policy of 2016 and the National Gender Plan of Action of 2019 that have provisions for the promotion of women in STEM. While the private sector is male dominated, women occupy around 60 per cent of jobs in the public sector (UNDP, 2022). There are other gender challenges, such as domestic violence against women and low participation of women in politics and legislative processes.<sup>20</sup> Women in Seychelles are also likely to be more vulnerable to megatrends such as climate change and health pandemics.

## 11. e-Governance

**According to the United Nations (2022), Seychelles has a high e-Government Development Index** (United Nations, 2022). Only four African countries (Mauritius, Seychelles, South Africa and Tunisia) are among the top 100 countries in terms of overall e-Government Development Index ranking, with values above the global average of 0.6102. South Africa has become the regional front-runner in e-government development, with an e-Government Development Index value of 0.7357 and a place in the highest (HV) rating class; Mauritius, also in the HV rating class, is next, followed by Seychelles and Tunisia.

**The Department of ICT (DICT) of Seychelles has established digital government platforms as an obligation or fulfilment of the Open Government Partnership.** The Open Government Partnership is a multilateral initiative bringing together public sector and civil society leaders to promote more inclusive, responsive and accountable governments. The digital government platforms are essential in the promotion of open government and provision of public services. They are a critical part of public sector innovation or innovation in public services (World Bank, 2018).

<sup>20</sup> See: <https://www.nation.sc/archive/252037/key-findings-of-the-gender-based-violence-national-baseline-study-in-seychelles-peace-begins-at-home>

## VI. National innovation system

### 1. Actors and institutional linkages

**A national innovation system (NIS) comprises actors within public and private sectors whose interactions, activities and collective learning produce new knowledge (R&D) and develop, transfer, diffuse and deploy new technologies (products, processes and practices) to generate new value in the economy.** The actors in the NIS include public research institutes, universities, state-owned enterprises, or parastatals, private companies, policy-making and legislative bodies, technical and vocational training institutes, funding agencies (science and innovation granting councils), and civil society-based or non-governmental organizations. These actors are involved in a variety of activities, including the production of scientific knowledge, building of human resources (or skills) through education and training, funding or financing of STI in general (research and innovation activities in particular), procurement and acquisition of new technologies, the formulation and implementation of policies, laws and regulations for promoting and governing STI, and the creation and/or promotion of new enterprises. They interact among themselves and engage in learning activities in various ways using a variety of mechanisms.

**In terms of the number and diversity of actors, Seychelles has a relatively small NIS compared to countries such as South Africa, Kenya or Nigeria. This is mainly due to the small size of its population.** The main actors in any NIS are entrepreneurs, firms and industries. In addition to private sector firms, Seychelles has 32 state-owned enterprises, either established using public financial resources, or in which the Government has a significant shareholding. These state-owned enterprises play important roles in the NIS, and some have STI related activities. Some are engaged in technology development and/or procurement or acquisition in sectors such as energy, water, roads, seaports, transport, civil aviation, housing, and tourism. According to the Public Enterprises Monitoring Commission (PEMC), in 2020, state-owned enterprises' total assets amounted to \$2.2 billion, with total net income of \$33.3 million, which is around 3 per cent of the country's GDP.<sup>21</sup>

Many public sector organizations are also STI stakeholders and actors in the NIS. In Seychelles, these include the Government ministries and departments, in particular MIEI and its DSTI.

Other public NIS actors include line ministries governing the domains of fisheries and agriculture, tourism, ICT, finance and health. State-owned or publicly funded organizations involved in STI related activities in the NIS include the National Development Commission, the National Energy Commission, the Department of Information Communication Technology, Seychelles Investment Board (SIB), Seychelles Institute of Technology, the University of Seychelles, and the Department of Tourism. Annex 3 provides an overview of some of the activities and/or functions of the key actors in the NIS.

**The MIEI and its DSTI are the locus of Seychelles' NIS as the institutional leaders in promoting STI and are responsible for policy coordination in the country.** The former NISTI had launched a series of activities to promote the implementation of the 2016-2025 national Science, Technology and Innovation Policy and Strategy. The DSTI is expected to implement these initiatives. They include:

- R&D and innovation surveys (to build statistics or data on Seychelles' scientific and technological investments and outputs);
- Promotion of the establishment of the BTI with stakeholders' collaboration;

<sup>21</sup> See: <https://www.pemc.sc/resource-centre> (accessed 29 November 2023).

- Promotion of public awareness or understanding of STI and increasing youth engagement in STI through school science clubs; and
- Enhancing the country's participation in STI programmes of SADC, AU, UN and increasing collaboration with international actors in areas such as climate change and intellectual property protection.

**The DSTI's activities are organized into three programmatic themes or thrusts: Research and Development, Knowledge Management and Education, and Technology and Innovation.** Implementing the above initiatives has been a major challenge. The Division has a small team of fulltime professional staff and no dedicated budget since it was reformed from being an autonomous agency – NISTI – to a division in MIEI. Many stakeholders at the November 2022 workshop and most of the interviewees expressed concern or raised issues related to the waning influence and effectiveness of the DSTI in the NIS.

Before the institutional change reforming NISTI as MIEI/DSTI, NISTI had developed and adopted the 2018-2022 Strategic Plan which focused on the implementation of the 2016-2025 national STI Policy and Strategy. It is important to stress here that many of the targets of the Strategic Plan were not attained for several reasons, including limited funding and human resources. Before it was reformed, NISTI had not established new active links or common projects with other actors in the NIS, while the weak links that existed were gradually being eroded due to DSTI's capacity challenges, including its lack of an explicit mandate and organizational capacities for NIS coordination.

**Public-private partnerships in STI are very weak in Seychelles. Overall, the policy objective of building strong linkages between public agencies and private companies to engage in STI remains unrealized.** As emphasized in several sections of this report (particularly in the analysis of strengths, weaknesses, opportunities and threats), one of the major weaknesses of the NIS is a lack of interinstitutional trust, which disincentivizes cooperation. The result is weak institutional articulation of potential common action agendas and linkages. Indeed, the linkages or articulation between public and private sector agencies are relatively weak. According to most interviewees, there are generally low levels of trust between public and private institutions, due possibly to a lack of platforms for public-private engagement on STI matters. This is despite NISTI's many concerted efforts to organize workshops to build both public and private constituencies for STI. In many cases, private sector's participation in STI workshops has been low, particularly after the institutional change from NISTI to DSTI.

**Seychelles has a relatively small private sector comprising of mainly small- and medium-sized enterprises in the hospitality (services) industry and many small- and medium-sized enterprises are not engaged in R&D or innovation** in their product, service or underlying technologies and business models. Many of the institutional arrangements for energizing public-private sector linkages due to be established under the 2016-2025 STIPS are not in place, such as the proposed Technology Acquisition Fund, Technology Transfer Centre, and the Committee on STEM, Innovation and Entrepreneurship.

**Inter-agency (public sector) collaborations in STI are few and unstructured in Seychelles. Judging from the interviews and discussions at the workshop, the consensus narrative is that ministries and departments largely operate in silos.** However, DSTI has established good working relationships with the Blue Economy Department and UniSey, but linkages need to be extended and strengthened with private sector firms operating in the blue economy. The extent to which such public-private partnerships in the blue economy will grow and endure largely depends on the successful establishment and operation of the BTI Incubator with both financial and human resources.

## 2. Analysis of strengths, weaknesses, opportunities and threats of Seychelles' NIS

**To address the challenge of a paucity of data, the UNCTAD team conducted a strengths, weaknesses, opportunities and threats (SWOT) analysis. The SWOT analysis indicated that the Seychelles NIS is neither dynamic nor strong enough to spur the realization of Vision 2033.** To develop a consensus perspective of the NIS, interviews with key stakeholders in Seychelles were held in November 2022 and their inputs provide the backbone of this review. Reports and evaluations of the TVET and education systems, assessment of the industrialization landscape and UN country programme reviews were also considered.

To develop structured inputs and assess the dynamism or performance of the country's NIS, a strengths, weaknesses, opportunities and threats analysis was conducted through focus group discussions. The outcome indicates that the NIS has weak institutional linkages, fragmentation of activities, policy inertia, weak policy coherence and limited funding for STI in general. There was strong consensus that the key problem for STI policy implementation was a fundamental lack of trust among various public agencies and an entrenched silo culture leading to insufficient collaboration.

**Weak links among all NIS actors, including among the departments within MIEI, required urgent attention.** Participants in an exercise analysing strengths, weaknesses, opportunities and threats noted that there is a need to build societal capabilities, focusing on enlarging social capital particularly among the youth. A compilation of the analysis conducted at the workshop on 23 November 2022 is provided in annex 4.

MIEI/DSTI may consider developing a more detailed and fact-based NIS strengths, weaknesses, opportunities and threats analysis, and conducting it regularly to gauge the impact of STIPS and future policies. Key factors or indicators for a detailed analysis of strengths, weaknesses, opportunities and threats may include the following:

- **The number and diversity of actors** (institutions) in both public and private sectors involved in technology-led entrepreneurship, R&D, technology transfer and/or acquisition, technology-support functions (e.g., technical standards), financing STI (including venture capital), policymaking and regulation, education and training and other activities that promote and/or govern STI.
- **Institutional linkages** with emphasis on the extent to which public agencies collaborate among themselves and have synergies in STI activities, and collaboration between public and private sector organizations as well as with non-governmental organizations.
- **Inputs into the NIS**, in particular Gross Expenditure on R&D as a percentage of GDP (GERD), fulltime personnel in R&D, technical (including engineers) personnel in private sector, number of innovation incubation hubs or centres, percentage of GDP allocated to human resource development (with focus on STEM and entrepreneurship courses).
- **Outputs from the NIS**, in particular the number of patents (and other intellectual property e.g., trademarks, geographic indications, copyright and industrial designs), the number of scientific articles in peer-reviewed journals, the number of new graduates (in STEM and entrepreneurship courses), and the number of new technology-based start-ups created in the economy.
- **An open approach by the NIS**, the extent to which the economy/country is liberalized to attract FDI, foreign companies, skills and technologies as well as support outward movement of persons (e.g., researchers and technicians) to do business and attend conferences outside the country.
- **A coherent vision of the policy landscape for STI** that would include the central STI policy – the STIPS – as well as supportive policies and regulatory measures from other domains, all working harmoniously through well-designed and complementary policy instruments.

### 3. Challenges for establishing a functional NIS

**While an NIS approach was adopted as a conceptual framework for STIPS, in practice its implementation was structured along a science and technology approach.** Therefore, insufficient attention was given to measures that were aimed at addressing problems in the NIS, particularly those relating to skills, financing, and policy conditions for enterprise development. In addition, there were organizational measures outlined in STIPS 2016-25 to address systemic problems of weak institutional linkages or articulation.

**In practice however, emphasis was placed on strengthening NISTI to enable better coordination of actors in the NIS.** However, these measures were shown to be inadequate because the problems of weak institutional linkages were due to weak social capital – including low trust – among institutions and their experts. Nevertheless, interviewees did not encourage command-and-control and legal-normative approaches to building institutional synergies in the NIS. A possible way forward involved the creation of platforms that enabled various institutional actors to engage in trust-building activities.

Anecdotal evidence suggests that many agencies and stakeholders in the NIS are not directly involved in or aware of the 2018-2022 Strategic Plan. Beyond the relatively unknown sector plan, the absence of a comprehensive national implementation plan has reduced the effectiveness of the operation of STIPS and impacted the mobilization of stakeholders to become actively involved in policy implementation.

**There are many consequences for such a reduced level of activity. One is that Seychelles has not developed a clear set of R&D and innovation priorities.** Establishing national priorities would allow the funding of a limited set of high-priority research areas. To address this challenge, the following can be recommended:

- **Conduct a technology assessment exercise.** Currently a technology assessment in agriculture and renewable energy is being conducted under the leadership of the DSTI with support of UNCTAD and exercises for other sectors may follow, such as ICT and digital tech for fisheries, or sustainable water and waste management for the tourism sector.
- **Develop a foresight exercise for STI based on specific technology assessment outcomes.** A foresight exercise would inform the process of developing a short-term (one to two year) action plan for the current STI Policy and Strategy.
- **Finally, Cabinet and the National Assembly should consider launching a multi-stakeholder participatory process of developing a new revised STI policy** and long-term implementation plan by 2024, at least a year before the expiration of the current STIPS in 2025; launching this process should not be left to the DSTI as it requires the highest level of national political leadership.

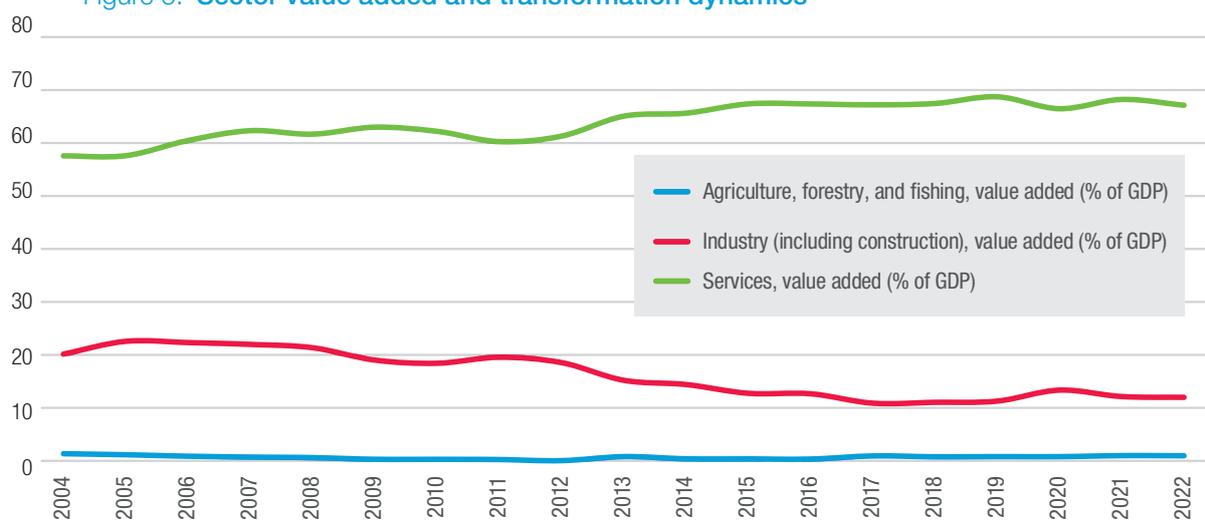
## VII. Innovation in economic sectors for structural transformation

**Seychelle's growth has been fuelled largely by developments in services, particularly tourism and related sectors. While Seychelles can benefit from economic diversification, opportunities during periods of growth are lost.** Structural transformation processes, usually characteristic of innovation-led growth, have stalled in Seychelles since 2005. A key indicator of dynamic and active development is the presence of structural transformation processes. In Seychelles, these have been modest since 2004. Structural transformation can be defined as the movement of labour and other productive resources from economic activities of low-productivity to high-productivity (UNCTAD, 2016). Alternatively, structural transformation may be seen as the reallocation of economic activity, expressed as their share in GDP, across three broad sectors: agriculture, industry and services (Herrendorf et al., 2013).

**The shedding of industry's share in favour of services is usually seen as an indicator of deindustrialization. However, this can be a positive development if services growth is driven by the growth of knowledge- and technology-led services firms, creative industries and public services.** The problem of scale economies arises when looking to industry as a generator of innovation. It will be difficult for Seychelles to mount a competitive export effort in manufacturing beyond specialized niches, as its domestic market does not provide significant support to manage international market and supply chain volumes or volatilities. Therefore, a focus on digital services and sectors may be a reasonable innovation and development strategy as these can scale beyond the physical limitations involved in industry and manufacturing.

**Figure 6 shows that, post 2005, structural transformation has been slow, even if growth has continued. This can be an indicator of modest innovative capacities while growth is based on extensive development – in other words, doing more of the same, mostly in tourism.** In countries where structural transformation is weak, policymakers may choose to review and redefine their STI policies, and their capacities for implementation. Innovation can be also seen in the growth of productivity levels, measured as GDP output per employed. However, data on formal employment in Seychelles has only been available since 2019 and does not provide a sufficient time period to draw conclusions, with the added complication of the COVID-19 pandemic introducing swings in the economy not normally expected. This is a strong argument for promoting the development of evidence-based policymaking and data collection as a recommendation of primary concern.

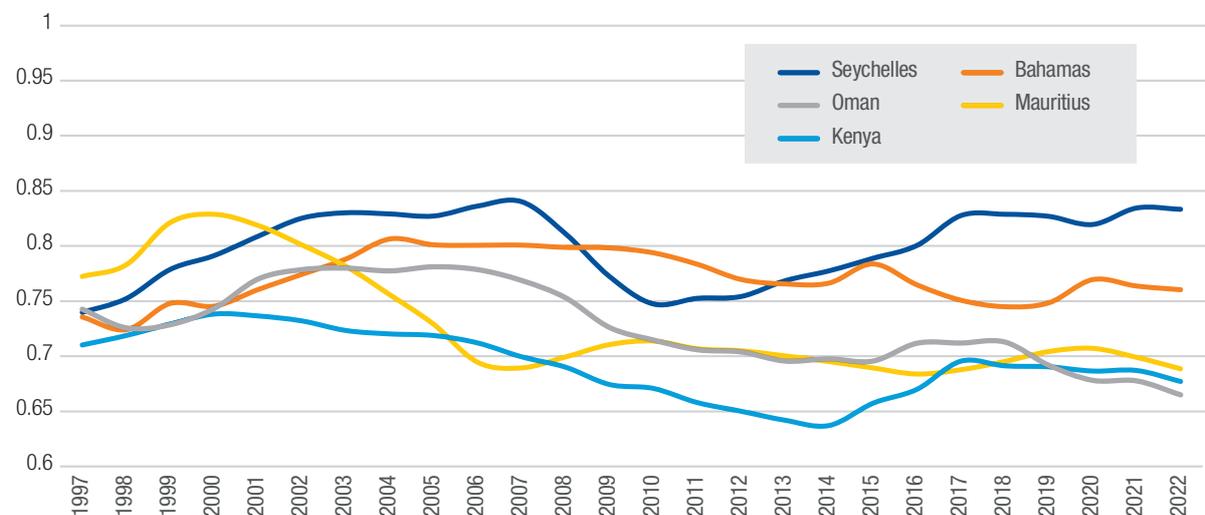
Figure 6: Sector value added and transformation dynamics



Source: World Bank.

Nevertheless, the small- and medium-sized enterprises sector may still find it feasible to attempt innovation targeting import substitution. Import volumes in Seychelles for many manufacturers may be low and so supplied through a chain of costly intermediaries rather than from direct suppliers-manufacturers which require minimum order volumes that exceed Seychelles' purchasing capacity. Innovations would include various additive manufacturing technologies, including 3D printing, laser technologies and computer-aided design/computer-aided manufacturing (CAD/CAM) technologies that have been physical scaling down at the same time as increasing in affordability.

Figure 7: Diversification in Seychelles and comparators (export, less is more diversified)



Source: UNCTAD. Available at <https://unctadstat.unctad.org/>.

**With a dominant tourism industry, Seychelle's economy is not diverse in terms of its export sector when compared to the world or selected comparator countries such as Mauritius.** Considering its small size, it is reasonable to exclude domestic production-consumption from consideration, as its impact on the overall economy, and by consequence on its export diversification, is fairly small. More concerning is that during times of economic growth and outside global crises such as the 2008-2009 financial crisis and the 2020 COVID-19 pandemic, Seychelle's exports tended to become less diverse, indicating missed opportunities for innovation. Figure 7 clearly denotes this problem.

## 1. Tourism

**Tourism remains the primary economic sector but diversification through innovation is an important challenge within the sector itself. Increasing the use of green and renewable technologies and practices can be an important innovation component in the sector.**

Seychelles' economy is largely dependent on tourism. Between 2015 and 2019, the contribution of tourism to GDP increased at an average yearly rate of more than 16 per cent. However, tourism earnings dropped severely during the COVID-19 pandemic, and exposed Seychelles' vulnerability to pandemic crises. In the first three quarters of 2020, only 93,200 tourists visited Seychelles, a drop of 64 per cent from the same period of 2019.

With a rebound in tourism in 2021, real GDP growth reached 7.9 per cent, compared to the contraction of 7.7 per cent in 2020 (WTO, 2022). To sustain and energize the post-COVID-19 recovery, in January 2022, a National Tourism Service Excellence Programme – *Lospitalite Lafyerte Sesel* – was launched to support the service excellence culture to improve on the standards in the tourism sector and to boost the overall competitiveness of the local tourism industry.<sup>22</sup>

The key innovation challenge is diversifying the Seychelles tourism product to other potential niche markets such as eco-, marine or sports tourism. Such innovation, even if it does not have a high-tech component, is a valid proposition. It will require policymakers and stakeholders to rethink innovation for Seychelles with a focus on entrepreneurship, business models and design of new services, rather than focusing on specific technologies. Innovation in tourism would necessarily include making progress towards greater use of clean and green technologies in energy and waste and water management, including renewables and circular economy approaches. Finally, it would entail public sector innovation, including in service delivery, public administration and governance.

In this sense the National Tourism Department highlights innovation as one of its core principals and defines its innovation agenda, "...as leveraging resources and partnerships to optimise delivery to our stakeholders and be responsive to change."<sup>23</sup> This indicates a systemic perspective of the sector among policymakers, which will serve well in supporting the national innovation drive in the tourism sector and the national economy.

## 2. Financial services

**Offshore banking and the development of fintech operations are potential areas for innovation and the diversification of the Seychelles economy. Both are reliant on well-designed policies and regulations, as well as digital infrastructure. The key innovation challenges are in fintech, as well as providing payment support for online merchants from Seychelles.**

The Central Bank of Seychelles is responsible for managing monetary policy and supervising commercial banks. As well as promoting a sound financial system, its mission is to contribute towards the inclusive growth and development of Seychelles by advising the Government on banking, monetary and financial matters. This includes the monetary implications of proposed fiscal, credit policies or operations of the Government. Among its promoted values are innovation and result-oriented operations that "... strive to redefine the standards of excellence".<sup>24</sup> There are currently 11 banking organizations operating in Seychelles, of which six provide offshore banking services.

The Seychelles Financial Services Authority (FSA) is an autonomous regulatory body responsible for non-bank financial services. Under the Financial Services Authority Act (2013), it is charged to license, regulate, enforce regulatory and compliance requirements, as well as monitor and supervise non-bank financial services, including fiduciary services, capital market and collective investment, gambling and insurance. In addition, the FSA is also responsible for regulating international trade

<sup>22</sup> See: <https://www.nation.sc/articles/12249/-launch-of-hospitality-campaign-lospitalite-lafyerte-sesel-> (accessed 29 November 2023).

<sup>23</sup> See: [https://tourism.gov.sc/?page\\_id=730](https://tourism.gov.sc/?page_id=730) (accessed 29 November 2023).

<sup>24</sup> See: <https://www.cbs.sc/Aboutus/AboutUs.html>

zones, hire purchase and credit sales activities, and the registration of international business companies, foundations, limited partnerships and trusts.<sup>25</sup>

Following the enactment of the Anti-Money Laundering and Countering the Financing of Terrorism Act 2020, the FSA is responsible for the supervision and enforcement of compliance by all entities licensed under the above acts. It launched its Strategic Plan in early 2021. The strategic plan has four pillars:

- Promoting user friendly supervision,
- Innovation through products, technologies, infrastructure and legal frameworks,
- Development of professional services and competent talents, and
- Stakeholder and industry support through collaboration and consultation.

Here again we find elements of systemic approaches and the idea that collaborative engagement is at the core of efforts supporting innovation.

**Mobile money services are provided by the telecom operator Airtel since 2015, while a second operator will be entering the mobile money market soon.** In February 2023, the Central Bank of Seychelles gave approval to Nebula FinTech to begin operations in collaboration with local bank, Nouvobanq, and telecom Cable & Wireless Seychelles. More generally, fintech is a development area that may not experience the challenges of physically scaling up common in industry and manufacturing.

**However, the most critical challenge is providing card-not-present (CNP) credit card accounts to online merchants in Seychelles.** These accounts are needed to conduct and expand e-commerce operations. At time of writing, merchants who wish to do business online must open card-not-present accounts with banks outside of Seychelles as none of the established local banks provide this service. This is a particular challenge for small- and medium-sized enterprises as the costs of developing documentation, managing the process and procedures, and eventual travel, may be overwhelming.

### 3. Fisheries

**With catches decreasing and stocks dwindling, the fisheries industry needs to quickly move and innovate its way into sustainable aqua farming, including seaweed, supported by green energy and sustainable resource management.** The fisheries sector contributes 6 per cent of GDP and employs 10-15 per cent of the workforce, mostly imported foreign labour. Fishery exports make up over 90 per cent of Seychelles' annual export earnings, outside of the tourism sector. The fisheries sector encompasses artisanal, semi-industrial, and industrial fishing, alongside the nascent aquaculture subsector.

During the COVID-19 pandemic, the economy was kept partially afloat by canned tuna production, which reached record highs, with 26,186 tonnes in the first half of 2020, a 10.2 per cent increase compared to the same period in 2019 (United Nations, 2020).

Despite strong growth over three decades, concerns about fish stock sustainability have emerged, threatening livelihoods, food security, and economic roles. Seychelles keeps detailed statistic of activities in its fisheries sector with yearly publication of its Fisheries Statistical Report produced by the Seychelles Fishing Authority. Most recent data indicates peak in total catch in 2018, levelling off with small variations up to 2022.<sup>26</sup>

Policy efforts to enhance innovation in the sector and diversify the economy led to the development of the Seychelles Blue Economy Strategy, including the Aquaculture Regulations 2020, which supplements the Fisheries Act 2014. Seychelles is currently implementing an innovative Marine

<sup>25</sup> See: <https://fsaseychelles.sc/about/who-we-are> (accessed 29 November 2023).

<sup>26</sup> See: <https://www.sfa.sc/e-library/fisheries-report?task=download.send&id=224&catid=6&m=0>

Spatial Planning project, financed through the Global Environment Facility<sup>27</sup> to conserve biodiversity and protect marine and coastal ecosystems, while exploring ways to expand the blue economy and enable sustainable development. The project aims to “... *put in place a comprehensive approach to the management of coastal and marine ecosystems in the Seychelles ... while increasing local communities’ involvement in nature-based livelihoods.*” However, the institutional and financing mechanisms and the monitoring and enforcement capabilities are largely limited only to the management of the expanded marine protected areas.

The future of Seychelles’ fisheries hinges on innovation and diversification. As catch sizes will likely decrease due to climate change, sectoral development will need to innovate, diversify and enhance value addition. Box 5 gives several examples of technology and policy being used in the fisheries sector worldwide and which may service as a point of research for the Seychelles sector.

## Box 5: Innovation and policy support for fisheries in developing countries

### 1. Thailand

In Thailand, sustainable fishing practices and innovations are being embraced to ensure the long-term viability of its fisheries sector. One major seafood processor, Thai Union, has for some years been enhancing production methods to minimize environmental impact. It has been engaging with the Marine Stewardship Council to improve sustainability of their operations and achieve certification. Specific actions included ensuring that plastics used in products are recyclable, reusable, or compostable. Reducing food waste in production, recycling by-products like fish meal from tuna and shrimp processing and exploring technologies to increase the value of waste-based products, such as oil from tuna heads and collagen from fish skins, have also been considered.

At an international level, collaboration between the Food and Agriculture Organization and the Southeast Asian Fisheries Development Center has resulted in an assessment of the sustainability of fishing technologies and operations in Thailand. The research is a part of a broader effort to promote innovation in fishing vessels, gears, and operations not only in Thailand but across Asia, while aiming to foster a more sustainable and environmentally friendly fishing industry.

Source: <https://wgfffb.org/2023/11/17/fao-seafdec-publication/>  
<https://www.nationthailand.com/special-edition/sustainability/40024861>

### 2. Indonesia

Small-scale fisheries are often characterized by unassessed stocks and unreported catch. Their management need better information on the size of the catch to take decisions to increase climate resilience and sustainability. In one case, in Lampung Province, a camera system has been installed at the most active ports to monitor the catch coming from the highly valued blue swimming crab fishery. Due to the large number of small vessels involved, it was previously challenging to accurately estimate the fishing catch. These camera systems allow for more precise monitoring, contributing to the sustainable management of the fishery and helping to ensure the equitable distribution of resources among communities reliant on fishing for food and livelihood.

<sup>27</sup> See: <https://www.thegef.org/who-we-are> .

Video footage from the cameras is wirelessly transmitted and subject to an analytical algorithm which detects boat traffic and counts vessels leaving and returning to port. This information is combined with estimates of the catch rate by inspectors who conduct interviews with boat operators offloading their catch and measure key biological parameters. Together, these two data sources combine to inform stock status.

Source: <http://tinyurl.com/indosmartcamfish/>

### 3. Viet Nam

Viet Nam is actively embracing digital technology in its aquaculture sector to enhance sustainability while improving productivity. Advanced technological solutions, including super-intensive farming and biofloc technology – recycling waste nutrients as fish food – have significantly increased traditional productivity, reduced production time and increased profits. A notable innovation in this space is the introduction of AI and sensor-enabled digital technology for shrimp farmers. By providing data to support daily farming decisions, the technology serves to assist shrimp farmers to take decisions to improve stock health and yields. Moving away from the digital domain, new materials such as wood and bamboo are being used to replace 100% of cage structures, which has led to a substantial increase in productivity.

Source: <http://tinyurl.com/vietfishtech>

## 4. Agriculture

**Faced with the challenge of scaling up more traditional agricultural technologies and mechanization, innovation in agriculture can focus on supportive technologies such as ICTs and sustainable energy, water and waste management.** The Seychelles agricultural sector is characterized by subsistence production with low pesticide and fertilizer inputs (FAO 2019). The main cash crops are coconuts, cinnamon, vanilla and some vegetable and root crops.

Most recently, production has doubled from total crop production of 828 tonnes in 2019 to 1,941 tonnes in 2021 (WTO 2022). This increase may be ascribed to some extent to the COVID-19 crisis and the related shipping and transportation challenges. The pandemic heightened the importance of enhancing food and nutrition security in Seychelles and self-sufficiency increased across most categories of food production.

Seychelles is a net food importer, with 80 per cent of its food imported, including main staples such as wheat, rice and vegetable oils (FAO, 2019). Its large tourist industry sees Seychelles import all manner of foods, including meat and poultry, fruits and vegetables, and processed foods.

The innovation potential is limited by challenges of scale in agricultural technologies such as mechanization. However, possible paths include supportive innovation through digital technologies and ICTs, green energy, sustainable water and waste management, and engaging with blue economy innovation such as the use of seaweed products in agriculture. One innovation pathway being developed is expanding the use of photovoltaic energy generation in agriculture under the auspice of the UNCTAD Technology Assessment project. Box 6 provides more detail about this project.

As its export market is its own tourism sector, with heavy reliance on food imports to service visitors, Seychelles has an important opportunity: a potential market of high-income adult consumers equivalent to 15 per cent of the Seychelles population.

## Box 6: Technology assessment - Agrivoltaics in Seychelles

In 2022, Seychelles' Division of Science, Technology and Innovation joined a pilot project on a technology assessment (TA) in the energy and agricultural sectors, alongside South Africa's Department of Science and Technology and Zambia's Ministry of Technology and Science. The project's aim was to accelerate the country's progress on science, technology and innovation.

A technology assessment is a participatory, interdisciplinary methodology for assessing the opportunities and risks of new technologies. To address the limited experience in implementing TA within the context of sub-Saharan Africa and developing countries, the UNCTAD Technology Assessment Methodology was specifically devised as part of this project.

Guided by a steering committee and an expert group which govern the TA project implementation in Seychelles, the DSTI has currently been employing this Methodology to evaluate agrivoltaics for controlled environment crop production. Agrivoltaics is a technology that enables the simultaneous use of land for both agriculture and photovoltaic power generation. The strategic selection of agrivoltaics stems from its potential to address Seychelles' dual challenges of food and energy insecurity. Moreover, the technology aligns seamlessly with national policies and strategies in both the agriculture and energy sectors.

As the assessment moves towards completion, insights gathered from survey data collection and discussions with major stakeholders in the agrivoltaics domain contribute to a comprehensive evaluation. In particular, the assessment highlights the economic, social, cultural, and environmental impacts of Agrivoltaic for Controlled-environment Crop Production.

The analysis shows that, economically, the technology offers simultaneous land use for agriculture and photovoltaic power generation, contributing to food and energy security. It has the potential to boost the economy through increased crop yields, continuous agricultural supply, and job creation. However, there are environmental concerns such as run-offs and waste generation that need addressing. Socially, the technology introduces a division between traditional and modern farming communities, potentially marginalizing women and low-income businesses due to high capital demands. Limited access to training and displacement issues among traditional farmers may also arise. Culturally, public misconceptions and resistance from conservative farming communities pose challenges, impacting market acceptance.

The report concludes with policy recommendations to address regulatory gaps, review energy policies, and implement measures to mitigate environmental impacts. It emphasizes the need for funding mechanisms, incentives, and addressing barriers to entry. Additionally, recommendations include enhancing institutional capacity, reassessing land allocation systems, ensuring an effective supply chain, and promoting inclusivity to benefit all, particularly women and traditional farmers. Lastly, educating the public on the technology is crucial to dispel myths and misconceptions.

*Source:* UNCTAD



## VIII. Summary of findings and key recommendations

### 1. Review of findings

Seychelles is a relatively high-income country with a small population, and an economy that is performing well. Its per capita GDP is one of the highest in the region and the country has a relatively high HDI. Political stability and natural resource endowment as well as geographical location are some of the factors that account for the Seychelles' current good economic performance. The country attracts increasing FDI inflows from Mauritius, the United Arab Emirates, the United Kingdom and China among others. It is making remarkable progress in the transition to the SDGs, in particular SDG1, 3, 4, 5, 7 and 14.

Most of its economy is dependent on tourism, fisheries and small-scale agriculture. There is some potential for economic diversification and industrial production through investment in manufacturing. However, the digital economy may be more promising as it is less sensitive to the challenges of scaling up that physical production, such as manufacturing or construction, can encounter.

The following structural, social and environmental challenges face Seychelles:

- As a SIDS, overdependent on natural resource-based activities, the country's economy and ecological integrity are vulnerable to climate change and other natural disasters;
- The private sector is quite small and concentrated in the services sector and agro-processing, with insignificant industrial manufacturing;
- Exports are predominantly low technology and fish products; and
- There is rising unemployment, particularly among unskilled youth who make up at least 30 per cent of the country's population.

To address the above and other sustainable development challenges, the Government of Seychelles has adopted a long-term development vision—Seychelles' Vision 2033, and the NDS 2019-2023, as well as a wide range of policy frameworks. These frameworks recognize that STI is critical for sustainable development, and the attainment of aspirations in Vision 2033. The STIPS is the main STI policy framework. It contains policy actions for building the NIS and steering STI for the economic transformation and sustainable development of the country.

Though lacking data and STI statistics, this review has explored the performance of the NIS and the effectiveness and progress in implementation of the STIPS. Using a participatory analysis of strengths, weaknesses, opportunities and threats and based on interviews with stakeholders, as well as a comprehensive review of various policy documents, this Review's key findings are as follows.

- a. Seychelles' NIS is small, fragmented and under-prepared for Vision 2033 and the SDGs. It is dominated by public sector organizations that are not entrepreneurial and innovative enough to spur techno-economic transformation.
- b. The country has increasing skills deficits in STEM, entrepreneurship and even in hospitality industry (services). Though gross expenditure on education is one of the highest in Sub-Saharan Africa, the quality of education and training is low or not suitable for the economy.
- c. The TVET system requires upgrading and expansion, as articulated in various policy documents, but progress is slow. The main public TVET organization, the Seychelles Institute of Technology, does not have the capacity to meet growing qualitative and quantitative demands.

- d. The country has several policy frameworks that contain provisions for promoting STI and entrepreneurship. However, there is weak implementation of STI policies.
- e. The overarching STI policy framework—the 2016-2025 national STI Policy and Strategy (STIPS) —is adequate in many respects with provisions to spur STI and strengthen the NIS. However, it is not adequately implemented for a variety of reasons, including those outlined in this list of key findings.
- f. There is weak political and public support for and engagement in STI policy in the country. At the political level, the National Assembly was responsible for repealing the Act that established NISTI.
- g. The 2021 repeal of the NISTI Act and downgrading of NISTI to the DSTI, from a fully-fledged agency in the Presidency under the Vice President’s office to a small division in MIEI, eroded institutional capacity and public confidence for STI policy implementation.
- h. More than 70 per cent of the provisions of the STIPS have not been implemented because of weak institutional capacity of NISTI and DSTI, characterized by limited personnel and a lack of dedicated funding for STI. Though it was envisaged in the STIPS, The National Research Fund has never been established. This has denied the country mechanisms for mobilizing domestic and international resources for STI.
- i. Despite the institutional challenges, NISTI (now DSTI) was instrumental in launching several initiatives to implement the STIPS. These include STEM programmes for schools, R&D and innovation survey, mainstreaming of STI in the NDS and active engagement in the design of the Blue Economy plan, and engagement in various SADC and UN STI programmes.
- j. The STIPS does not adequately provide for science-for-policy and governance of new technologies such as AI or 4IR technology. In this regard, it requires updating, if not a full revision.

Overall, the foundations for harnessing STI for the SDGs exist in the form of various policies, agencies and international support. Strengthening these foundations requires strategic interventions, some of which are proposed in the recommendations below.

## 2. Key recommendations

There are several policy actions and institutional reforms that Seychelles should undertake to strengthen its NIS, making it dynamic enough to harness STI and entrepreneurship to attain aspirations in Vision 2033 and the SDGs. The interventions are clustered into nine categories:

- a. Building broad-based political and public compact for STI;
- b. Reconfiguring and revitalizing institutional arrangements for STI;
- c. Revising the current 2016-2025 national STI Policy and Strategy (STIPS) to consider recent, emerging and frontier scientific and technological developments, and developing an implementation plan for the period up to 2025;
- d. Setting clearly fundable and implementable research and innovation priorities using tools such as technology assessment and technology foresight;
- e. Establishing a National Innovation and Entrepreneurship Fund;
- f. Establishing a National R&D Fund
- g. Strengthening the country’s participation in SADC, AU and international STI partnerships and/or programmes;

- h. Building a critical mass of skills for entrepreneurship, innovation management and R&D, at all levels, from TVET to postgraduate
- i. Improving financial services provision for small- and medium-sized enterprises, in particular those related to e-commerce and secure online payments.

Each of these categories is explained below.

1. **Building broad-based political and public compact for STI.** Engagement in and appreciation of STI policy by political actors, particularly the National Assembly, in Seychelles requires greater attention and strengthening. Given that the High-Level Committee on the Knowledge-based Economy is inactive, the National Assembly should develop a permanent mechanism for engaging in STI policy, including strengthening NIS linkages and ensuring that annual budgets contain allocations for research and innovation activities. To achieve this, several supporting decisions and activities are needed and are listed below.
  - 1.1. Improving parliamentarians' and politicians' understanding of what constitutes STI and the critical importance of STI for the country's economic, political and social security should be a priority activity for MIEI/DSTI. There is also low public understanding of STI, and often STI is reduced to or mis-defined as purely research or science.
  - 1.2. MIEI/DSTI should develop and deliver tailor-made workshops on STI policy for members of Seychelles National Assembly. Such workshops would aim at building STI policy literacy and enhancing understanding of the different roles that legislatures play in the promotion and governance of STI for sustainable development.
  - 1.3. As an immediate step, an interagency committee for STI should be established with clear terms of reference to provide expert, policy, and legislative guidance to the National Assembly. The National Assembly may seek to engage with and draw lessons from countries where such committees are established and operational. The committee would include private sectors and civil society representatives and would be charged with developing operational modalities and legislative instruments for establishing national and inter-agency vehicles to deliver on STIPS 2016-2025.
  - 1.4. Public awareness-building of STI programmes and activities must be promoted by the DSTI in collaboration with media, non-governmental organizations and schools to enhance the understanding of STI and their role in socio-economic development. Such activities would also serve in organizing and conducting participatory technology assessments and STI policy processes.
2. **Reconfiguration and revitalization of institutional arrangements for STI.** The Government of Seychelles, through the cabinet and the National Assembly, should review the need to re-establish an autonomous national organization for STI policy and NIS coordination.
  - 2.1. The review should be informed by an independent analysis and within the context of Seychelles' development objectives as well as ambitions in attaining the SDGs.
  - 2.2. MIEI should draw lessons from international best institutional practices of organizing and administering NIS and STI policy around the world.
  - 2.3. MIEI should also consider developing and proposing reforms aimed at institutional trust-building and improvements in policy literacy, while taking into account strong tendencies towards institutional siloing.
  - 2.4. Specific considerations should be given to re-establishing a national agency or interagency commission on STI, located in the presidency, with the remit to coordinate STI policy formulation, M&E, and implementation across the NIS.

**3. Revision of the current national STI Policy and Strategy 2016-2025.**

- 3.1. The current STIPS needs to be revised to consider recent scientific and technological developments associated with 4IR, open science and open innovation, and the increasing role of private sector and civil society in STI governance.
- 3.2. The policy scope should be expanded to cover ‘science-for-policy’ and clear research and innovation priorities should be articulated in the policy or in its implementation plan that should contain M&E with measurable targets and budgetary considerations.
- 3.3. The revised policy should contain explicit policy instruments for the attainment of its objectives. To ensure that the country has a new policy in place when the current one expires in 2025, the process of revising STIPS should start as soon as possible and should be linked to the review of the institutional set-up.
- 3.4. A STIPS implementation plan should be developed to succeed the 2018-2022 Strategic Plan. For its preparation and implementation, a specific methodology will need to be chosen, such as a theory of change or a logical framework approach. Both management and staff experts will need to receive training and a high level of commitment will be needed in implementation.

**4. Set research and innovation priorities using technology assessment and technology foresight,** while building on the current or ongoing TA being conducted in agriculture and energy sectors with support from UNCTAD.

- 4.1. Seychelles should establish a well-defined process of R&D and innovation priority-setting to align its investments in STI with national, regional and global sustainable development goals.
- 4.2. Given the size of its NIS it should consider participatory TA and STI foresight exercises that should enable it to generate and revise five-year research and innovation plans for the implementation of the STIPS.
- 4.3. A decision on an appropriate institutional arrangement that will place the STI mandate at the highest political level is needed. Regardless of formal arrangements, the STI mandate carrier should be endowed financially and staffed with personnel able to conduct technology assessments and STI foresight.

**5. Establish a National Innovation and Entrepreneurship Fund.** A strategic orientation towards innovation-led development is well recognized in Vision 2033 and the current STIPS. To perform on this mandate, Seychelles will need to establish appropriate mechanisms and instruments for mobilizing public and private financial resources for entrepreneurial innovation.

- 5.1. To develop its NIS, specific funding vehicles need to be developed for entrepreneurs, firms and industries. These must go beyond R&D and provide comprehensive support that will assist innovative firms to succeed as commercial entities.
- 5.2. Alternatives such as venture capital, angel investors, development bank financing for innovation, and an innovation levy on tourism, may be explored.

**6. Establish a National R&D Fund.** Seychelles aspires to achieve higher levels of scientific, technological and industrial output and build a dynamic or productive research system. It also aims to meet its commitment to annually realize GERD of at least 2 per cent of GDP, above that required by the AU and SADC commitments. Seychelles should devise innovative ways of financing for R&D and innovation and reduce overreliance on external sources.

- 6.1. Establish a National R&D fund to increase GERD as well as align funding to national STI priorities.

- 6.2. Encourage the private sector to invest in R&D, through vehicles such as matched funding in collaboration between the R&D fund and private sector investors, as well as other vehicles such as R&D tax credits or R&D vouchers for small- and medium-sized enterprises.
7. **Strengthen the country's participation in SADC, AU and international STI partnerships and/or programmes.** There is need for the Government to develop a strategy for international STI partnerships to ensure that the country leverages different forms of public and private partnerships to build its own NIS and exploit economies of scale from SADC, AU and other multilateral and STI programmes. It needs to consider establishing science and innovation attaches in some of its strategic consulates or foreign missions to help leverage different countries towards bilateral STI cooperation.
8. **Build a critical mass of skills for entrepreneurship, innovation management and R&D, at all levels, from TVET to postgraduate.** Though the country's expenditure on education is relatively high, there is a need to improve the quality of education and training as well as expand the R&D system.
  - 8.1. Technical skills and soft skills must be developed through the education and training system with the objective of human and social capital formation.
  - 8.2. Developing capacities for teamwork, critical thinking, creativity and problem solving are fundamental. Among the most critically needed training are digital skills, as well as innovation and entrepreneurship courses for small- and medium-sized enterprise entrepreneurs.
  - 8.3. At a technical level, practical courses are needed on green and circular economy technologies, including a move towards increasingly sustainable practices in all sectors of agriculture, services and industry.
  - 8.4. Achieving this requires improving the linkages between skills development and market or labour needs. The private sector and its associations need to be actively involved in curricula design and evaluation, together with all secondary and post-secondary institutions.
  - 8.5. Secondary, post-secondary and TVET institutions should be required to develop data on employment outcomes of their pupils and students. To achieve this, a close collaboration with the Ministry of Employment and Social Affairs is required.
9. **Improve financial services provision for small- and medium-sized enterprises,** in particular those related to e-commerce. This would include decisions and actions listed below.
  - 9.1. Access to trade finance and financial instruments and means of payments for international transactions, at reasonable cost, including those for receiving secure online credit card payments, can enable small- and medium-sized enterprises' engagement in international activities through global direct sales and participation in global value chains, and ultimately foster inclusive economic growth and innovation.
  - 9.2. Multistakeholder engagement including the National Assembly, Ministry of Finance, National Planning and Trade, MIEI/DSTI, regulatory authorities, commercial banks and representatives of small- and medium-sized enterprise firms, is needed to modernize the state of finance in the small- and medium-sized enterprise sector.

# Annex 1: Key economic indicators

## General information for 2021



## Economic indicators

(current \$)	2010	2015	2021
GDP millions	9,700	1,377	1,244
GDP per capita	10,496	13,880	11,684
Merchandise trade balance	-584	-577	-670

## GDP by expenditure in 2021



## International merchandise trade

(millions of \$)	2010	2015	2021
Merchandise exports	400	415	464
Merchandise imports	984	991	1,133
Merchandise trade balance	-584	-577	-670

## International trade in services

(millions of \$)	2010	2015	2021
Service exports	441	848	892 <sup>e</sup>
Service imports	266	498	476 <sup>e</sup>
Service trade balance	174	349	416 <sup>e</sup>

<sup>e</sup> Estimate

## Export structure by product group in 2019

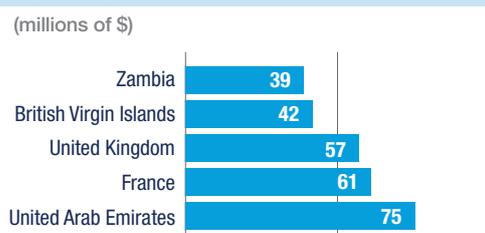


## Services exports by main category

(% of total services)	2010	2015	2021
Transport	29.7	24.5	14.3 <sup>e</sup>
Travel	62.3	46.3	34.7 <sup>e</sup>
Other services	8.0	29.2	51.0 <sup>e</sup>

<sup>e</sup> Estimate

## Top five partners, exports in 2019



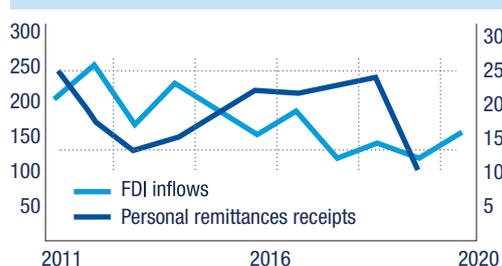
## Trade indices



## Financial flows

(millions of \$)	2010	2015	2021
FDI inflows	211	195	157
FDI outflows	6	10	-3
Personal remittances, % of GDP	1.79	1.34	-

## Financial inflows trends



Source: <http://tinyurl.com/unseychellesstat>

## Annex 2: Strengths, weaknesses, opportunities and threats analysis framework

This generic framework for a strengths, weaknesses, opportunities and threats – or “SWOT” – analysis of a National Innovation system is provided as a guideline should the MIEI and other STI stakeholders wish to repeat the exercise and compare outcomes and gauge progress.

### Background

In recent years, a growing number of countries are adopting a “national system of innovation” approach as a framework for developing their science, technology and innovation (STI) policies and strategies. The NSI emphasizes interactive learning, linkages and collaborations among actors from public and private sectors in knowledge production and innovation. Innovation and technology development are conceptualized as non-linear processes resulting from a complex set of relationships among actors (including enterprises, universities and government research institutes) in the NSI.

This approach also puts emphasis on the role of different actors in research and innovation but is largely influenced by or based on a linear conceptualization of innovation (as transition from research to innovation). It tends to focus more on the role of public research institutes and universities, and less on the role of private enterprises.

### Indicators for strengths, weaknesses, opportunities and threats

#### Stakeholders

To assess the dynamism (strengths, weaknesses, threats and opportunities) of NSI, seven clusters of stakeholders are proposed as follows:

1. Knowledge producers (R&D institutions);
2. Higher education institutions;
3. Basic education and TEVT;
4. Private sector enterprises (small- and medium-sized enterprises and large/big companies);
5. Non-governmental organizations (civil society);
6. Policy and regulatory agencies, and
7. Legislative bodies.

Issues to be considered for **strengths and weaknesses** for each cluster may include:

- Adequacy of mandate, relevance, staffing, infrastructure, funding, etc.;
- Productivity or performance in terms of research outputs;
- Relevance of academic and training programmes to the needs of the NSI/country;
- Productivity or performance in terms of research outputs;
- Relevance of training curricula to the needs of the NSI/country;
- Existence of private companies (large-, small- and medium-sized enterprises, as well as) with R&D and innovation activities (departments and/or programmes);

- Participation of private companies in public R&I programmes;
- Existence and dynamism of a ministry and/or department dedicated to STI policy;
- Existence and dynamism of technology/innovation support agencies (e.g., bureau of technical standards); and
- Existence and dynamism of legislative bodies that influence/determine STI policy priorities, budgets, etc.

Issues to be considered as **threats and opportunities** for each cluster may include:

- National economic performance and macroeconomic stability;
- Leadership and governance with organizational capacities including budgets for engagement in/ with STI;
- Potential institutional and legislative reforms;
- Stability (and/or discontinuity) in policy and legislative environment; and
- Engagement in policy and budgeting for STI.

#### **Policy and regulatory frameworks**

To develop an understanding of institutional and policy context in terms of strengths, weaknesses, opportunities and threats, five policy areas are considered:

- Explicit STI policy frameworks;
- Human resource development policy;
- Intellectual property protection policy;
- Trade and investment policy frameworks; and
- Public procurement policy frameworks.

Issues to be considered for **strengths and weaknesses** for each cluster may include:

- Existence, relevance (alignment with national and global SDGs) and effectiveness of national STI policy, implementation plan and policy instruments;
- Extent to which human resource development policy (for education, TVET and skills) contributes to attainment of STI/NSI goals;
- Extent to which IPP policy contributes to innovation, knowledge and technology transfer;
- Extent to which trade and investment policy frameworks support R&D, innovation and technology transfer; and
- Extent to which public procurement is used as an innovation policy instrument.

Issues for consideration as **threats and opportunities** for existing policy and regulatory frameworks may include:

- Rapid technological changes whereby the pace of technological innovation can outstrip the ability of policy and regulatory frameworks to keep up, leading to gaps in regulation and potential misuse of technology;
- With globalization economies become more interconnected and national governments may struggle to enforce regulations that are bypassed or undermined by global processes;
- Climate change and environmental degradation present complex challenges that require coordinated policy responses that account for winners and losers in the process;

- Advancements in technology that can be harnessed to improve policy formulation, implementation, and monitoring;
- Online platforms for engaging the public in policymaking for more inclusive and representative policies; and
- Evidence-Based Policymaking becomes a reality with improved access to data and analytical tools.

### **Interactive learning and exchange of knowledge and technology**

What are the strengths and weaknesses of the NSI in terms of the quality of linkages, exchange of information and technology, and learning?

- Industry-university linkages (exchange programmes);
- Institutional linkages in/among R&D institutes;
- R&D institutes-private sector linkages;
- R&D institutes/universities linkages to policy bodies;
- R&D institutes linkages to consumer associations;
- Country's participation in regional, continental and international programmes; and
- International mobility of researchers, technicians and engineers.

### **Financing mechanisms and instruments**

To develop an understanding of Financing mechanisms and instruments in terms of strengths, weaknesses, opportunities and threats, six policy areas are considered:

- Public R&D funding mechanisms and instruments;
- Public innovation funding mechanisms and instruments;
- Corporate/business R&D financing mechanisms and instruments;
- Corporate/business innovation funding mechanisms and instruments;
- Multilateral and bilateral international funding mechanisms and instruments; and
- Private philanthropic funding mechanisms and instruments.

## Annex 3: Key institutional actors in Seychelles' NIS

Institutions	Functions and activities
Ministry of Investment, Entrepreneurship and Industry (MIEI) and the Division of Science, Technology and Innovation (DSTI)	MIEI is responsible for policy frameworks for STI, industrialization, entrepreneurship and investment. DSTI (formerly National Institute for Science, Technology, and Innovation – NISTI), is the main body coordinating STI policy and programmatic initiatives in the country, including the implementation of the STI Policy and Strategy 2016-2025.
Ministry of Community Development, Social Affairs and Sports	The Ministry's mission is to empower the communities and enable them to be directly involved in determining their needs which will promote social and economic well-being. Develops, promotes and implements community-based programmes in liaison with district authorities. Liaises with other ministries and agencies to facilitate the implementation of their programmes at district level.
Ministry of Fisheries and Agriculture	The Ministry is responsible for fisheries and agricultural policy in general. Promotes R&D and innovation activities in agriculture and fisheries. Support training of local communities in the use of new agricultural technologies through field trials and extension services.
Ministry of Education	Sets overall national policy for education and training to build human resources for STI. Ensures equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university. Promotes the increase of the number of youth and adults who have relevant skills, including technical and vocational skills, for employment and entrepreneurship. Promote the building of digital skills in the economy.
Seychelles Investment Board (SIB)	To promote both local and foreign investments in Seychelles. To offer first class services to attract and retain investments. To work in close collaboration with key stakeholders to stimulate, identify and facilitate investments. To contribute towards the development of an investor-friendly business environment.
Enterprise Seychelles Agency (ESA)	ESA provides Business Development Services to improve the performance of the Micro, Small & Medium Enterprises, enabling their access to markets and competitive edge.
University of Seychelles	Training and research in various aspects of STI. Has institutes and/or programmes dedicated to climate change, blue economy, ICT/computing, chemistry and physics. Plans to establish a centre for innovation and entrepreneurship in 2023.
Seychelles Institute of Technology	Technical and vocational education and training (TVET) focused on engineering, built environment and information and communication technology fields.

## Annex 4: Strengths, weaknesses, opportunities and threats analysis of Seychelles' NIS

Strengths	Weaknesses
Existence a comprehensive national STI Policy and Strategy.	<p>There are no dedicated resources for the implementation of the Policy and Strategy.</p> <p>Public awareness of STI Policy and Strategy is low.</p> <p>Policy literacy is low.</p> <p>Institutional capacity of DSTI to administer the implementation of the policy is low.</p> <p>STI is narrowly defined or perceived as mainly research.</p>
The DSTI exists and is dedicated to promoting STI for development.	<p>The DSTI is under-resourced and has no legal authority to coordinate the NIS.</p> <p>The act establishing the NISTI was repealed.</p> <p>The DSTI is domiciled in the MIEI as a relatively 'low-level' entity with limited autonomy and legal authority to effectively provide leadership across the STI landscape.</p> <p>Weak links exist between the DSTI and other departments in various government ministries.</p> <p>The DSTI does not enjoy or receive adequate support from its parent ministry, the MIEI, and the public in general.</p>
The University of Seychelles and TVET are growing and becoming key actors in the NIS.	<p>Institutional linkages, synergies and trust are weak throughout the NIS.</p> <p>There is a mismatch between activities of the University, TVET and the R&amp;D priorities by the DSTI.</p> <p>The Seychelles Institute of Technology is relatively small and lacks the capacity to scale up technical training in the country.</p> <p>The University of Seychelles is not adequately funded by the Government, and most of its R&amp;D initiatives are financed and externally driven.</p>
There is a growing number of small- and medium-sized enterprises with potential to contribute to the NIS.	<p>Limited access to finance mechanisms e.g., venture capital constrains the technological potential of enterprises.</p> <p>Regulatory barriers in financial systems/markets may be impeding entry of tech enterprises into the economy.</p> <p>Small- and medium-sized enterprises have weak digital literacy and limited access to good digital infrastructure.</p>
There exists a wide range of implicit STI policy frameworks (and new ones being developed to cover) for industrialization, FDI, entrepreneurship, public procurement, and skills development.	<p>Weak institutional linkages deny the country the opportunities of using implicit policy frameworks for STI.</p> <p>The STI content of implicit policy frameworks is not well understood by key policy actors, including the DSTI.</p>

Opportunities	Threats
<p>There is a growing number of international partners willing to engage or that are already engaged in supporting Seychelles' NIS and STI efforts.</p>	<p>There is generally no well-articulated executive and political leaderships for STI.                      The DSTI lacks adequate capacity to harness emerging international STI partnerships.                      Youth seem to lack soft and basic technical skills for innovation.                      Lack of dedicated National Assembly committee for STI.                      Weak civil society engagement in STI and STI policy issues.</p>
<p>Youthful population with eagerness to engage in innovation.</p>	<p>There are few technical training opportunities and resources for the youth.</p>

## Annex 5: Overview of STI provisions in various key frameworks

Policy Framework	STI Policy provisions and/or objectives
Industrial Property Act 2014.	An Act of the National Assembly to provide for the adequate protection and enforcement of industrial property rights to encourage local inventive and innovative activities, stimulate transfer of foreign technology, promote foreign direct investment, create a competitive business environment, discourage unfair practices, enhance free and fair practice and thereby foster socio economic development and for matters connected therewith or incidental thereto.
Fair Trading Act 2022.	Promotes the improvement of standards and quality of goods and services supplied by service providers and business enterprises. Promotes technology transfer and dissemination.
National Employment Policy and Strategies, 2014.	Promote an information technology literate and competent labour force. Equip Seychellois with knowledge, competencies and entrepreneurial mindset to compete successfully in a global knowledge-based economy.
ICT in Education and Training Policy, 2022-2027.	Establishment of ICT in Education Public-Private Partnerships. Increase effective use ICTs for teaching and learning. Improve access to quality digital resources.
201 Seychelles Investment Act and 2014 Seychelles Investment (Economic Activities) Regulations; and Investment (Economic Activities) Regulations (Statutory Instrument (SI) 76 of 2022).	Promote FDI as a mechanism for technology transfer.
Blue Economy Strategic Policy and Roadmap: Charting the Future (2018-2030).	Prioritizes the development of a marine biotechnology sector as the driving factor to achieve sustainable, ocean-based economy, economic development.
2004 Cultural Policy.	“Protect, safeguard, and develop the moral, ethical, and spiritual values of Seychellois culture and dignity, including the protection of intellectual property, and the cultural, as well as the natural heritage of Seychelles”.
National Entrepreneurship Strategy, 2023.	To create a resilient and conducive knowledge-based entrepreneurship ecosystem that supports Seychelles’ socio-economic development agenda sustainably and inclusively. Facilitate technology exchange and innovation.

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