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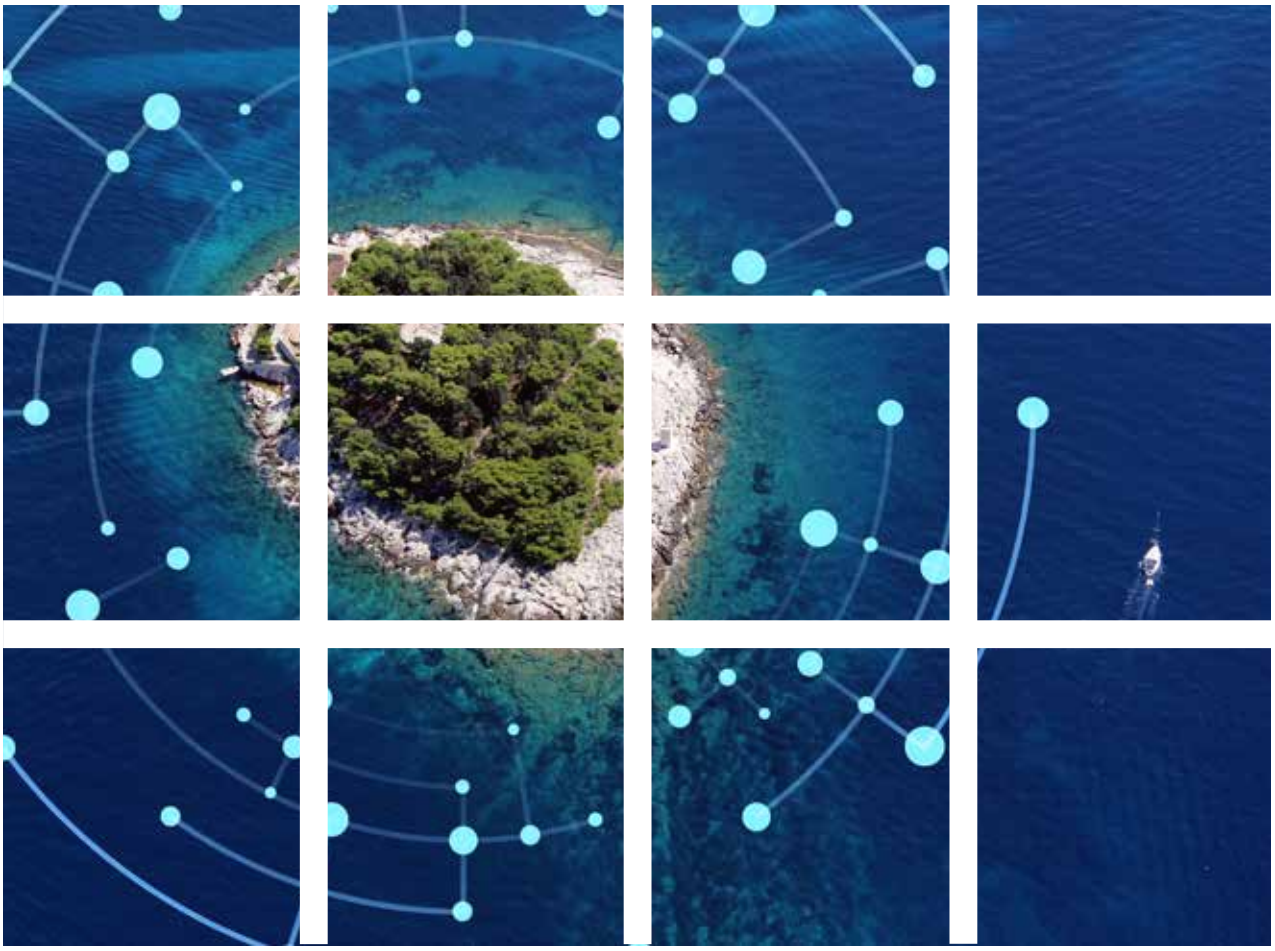
Small island developing states (SIDS) and ICTs

Mid-term review of the Samoa Pathway



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Executive Summary

Information and communication technologies (ICTs) can help mitigate many of the challenges affecting small island developing states (SIDS) and provide the foundation for digitizing and diversifying the economy. This is reflected in the Samoa Pathway report issued at the Third International Conference on Small Island Developing States held in Apia, Samoa, in September 2014:

> *"We recognize that access by Small Island Developing States to appropriate reliable, affordable, modern and environmentally sound technologies is critical to achieving their sustainable development objectives and in fostering an environment that provides incentives for innovation and entrepreneurship and that science, technology and innovation are essential enablers and drivers for sustainable development."*

SIDS have made progress in terms of the universality and affordability of their ICT networks since the 2014 Samoa conference. Mobile broadband coverage has risen from 50 per cent of the population to 85 per cent and the price of 500 megabits of mobile data has virtually halved, falling from 15 per cent of gross national income (GNI) per capita to 8 per cent. Improved connectivity has provided the foundation for boosting Internet take-up. The percentage of individuals using the Internet rose 16 percentage points between 2014 and 2018, from 40 to 56 per cent (unweighted average), and over half the SIDS have an Internet penetration rate of over 60 per cent. By 2021, five more SIDS will be connected to fibre-optic submarine cables, leaving just three unconnected from global undersea networks. As infrastructure expands and affordability improves in the SIDS, other factors such as digital skills and awareness are becoming more significant constraints to Internet take-up.

Overall, SIDS are largely on track to achieve universality and affordability targets for Internet access by 2020. According to current trends, mobile broadband coverage will reach almost 90 per cent of the population, the average price of a mobile data package will be around 5 per cent of per capita income and secondary school enrolment is projected to rise modestly to 72 per cent. Internet usage is predicted to rise to 59 per cent of the population by 2020, with future growth predicated on improvement in coverage, affordability and school enrolment.

Disruptive and transformative technologies and services, such as artificial intelligence (AI), blockchain, drones and mobile money, are being used to enhance sustainable development in SIDS. Their impacts have nevertheless been muted owing to largely limited application. Constraints include lack of technical, financial and human resources. There is a need to upgrade skills for applying digital technologies to development challenges and ensure better coordination between ICT specialists and different sectors of the economy. Digital technologies and applications, particularly social media, also pose risks, for example in terms of false information and misuse of personal information. Forward-thinking strategies, appropriate regulatory policies in areas such as data protection and regional cooperation to provide consistency and bargaining power when dealing with stakeholders are essential in order to anticipate and mitigate these dangers.

ICT is a major industry in virtually all the SIDS, generating direct and indirect economic impacts. The ICT sector tends to account for a higher share of gross domestic product (GDP) in small islands than in other countries. Telecommunication operators in the SIDS are often among the largest companies, contributing significantly to government tax revenues, and are leading sources of employment. The indirect economic impacts of ICTs are also significant, as shown by a number of recent studies.

SIDS nevertheless face various challenges that need to be overcome for a productive and sustainable ICT sector. Progress has been uneven and there is a major gap between the best-performing SIDS and

the others. Prices remain high in a number of SIDS and the use of digital technologies to contribute to sustainable development is lagging behind.

The key recommendations of the study include:

- The regulatory environment needs to be strengthened to promote a dynamic and sustainable ICT sector. Over half the SIDS are in the second generation of regulation[1] and facing difficulties confronting disruption to their ICT markets. In some SIDS, greater competition needs to be stimulated, while in others market attractiveness needs to be strengthened through transparent and flexible regulation; in addition, sufficient spectrum needs to be made available for wireless broadband, and operators diversification into new business lines such as mobile money should be considered.
- Fibre-optic connectivity via submarine cable is now or will soon be available in all but three SIDS. This has dramatically increased international bandwidth and the potential for the development of ICT-enabled services. Yet most SIDS have been slow to seize this opportunity and to foster digital entrepreneurship and innovation. Creating the conditions required to increase the use of ICT domestically and facilitate trade is vital in order to enable transformation to digital economies and reduce brain drain.
- Timely and relevant statistics are essential for policy-making and to monitor and fine-tune strategies. The availability of up-to-date ICT indicators in the SIDS varies. A few countries produce detailed sector-specific reports, some carry out annual surveys on household and individual ICT usage, while others include topics like Internet usage and household availability of digital devices in regular household surveys. The Eastern Caribbean Telecommunications Authority is notable for compiling supply-side telecommunication statistics for its five members. Most SIDS, however, collect ICT indicators sporadically, sometimes only as part of a decennial census. And in a handful of SIDS there are no official data for something as critical as Internet usage. It is imperative for SIDS to include ICT indicators in their national statistical systems.
- While SIDS share many characteristics, there are huge differences between them. This is apparent in ICT infrastructure, use and applications, where there are wide gaps. Some SIDS are far ahead, with advanced infrastructure and high levels of use, while others lag behind. Support should be tailored for these different groups. Where there is medium to high ICT take-up, the potential exists to incorporate more advanced digital technologies to tackle development challenges. For SIDS lagging behind in ICT, efforts are required to create an environment conducive to expanding network infrastructure and developing regulatory expertise. In all the SIDS, there is significant scope for making greater use of digital technologies for sustainable development in order to achieve the Sustainable Development Goals (SDGs).

[1] To help analyse the evolution of ICT regulation worldwide, ITU has developed the ICT Regulatory Tracker to identify and measure progress areas as well as gaps. Countries included in the Tracker are split into score thresholds that relate to generations of regulation, for any given year. The generations have been identified as: G1: Regulated public monopolies – command and control approach, G2: Basic reform – partial liberalization and privatization across the layers, G3: Enabling investment, innovation and access – dual focus on stimulating competition in service and content delivery, and consumer protection, and G4: Integrated regulation – led by economic and social policy goals. (https://www.itu.int/net4/itu-d/irt/#/tracker-by-country/regulatory-tracker/2018)

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1 Introduction

The United Nations recognizes small island developing states (SIDS) as a distinctive grouping. Most SIDS are in the Americas and Pacific regions, five are in Africa, and two are in Arab States (Table 1-1). They differ in demography, geography and wealth, but despite this heterogeneity SIDS are affected by common challenges arising from their small population bases and high climatic vulnerability:

> *"small size, remoteness, narrow resource and export base, and exposure to global environmental challenges and external economic shocks, including to a large range of impacts from climate change and potentially more frequent and intense natural disasters."*[1]

[1] https://sustainabledevelopment.un.org/topics/sids

Information and communication technologies (ICTs) can help mitigate many of the challenges affecting SIDS. The development community is aware of the importance of ICTs in contributing to sustainable development in SIDS, as reflected in the SAMOA Pathway document issued at the Third International Conference on Small Island Developing States held in Apia, Samoa, in September 2014:

> *"We recognize that access by Small Island Developing States to appropriate reliable, affordable, modern and environmentally sound technologies is critical to achieving their sustainable development objectives and in fostering an environment that provides incentives for innovation and entrepreneurship and that science, technology and innovation are essential enablers and drivers for sustainable development." (UN 2014)*

This document reviews progress in access to affordable and modern digital technologies since the 2014 Samoa conference. It was prepared as an input document to the September 2019 high-level review of progress made in addressing the priorities of SIDS through implementation of the SAMOA Pathway[1]. It provides examples to demonstrate progress made, showing how SIDS are using ICTs to help drive sustainable development, and includes a framework for tracking progress towards a universal and affordable Internet. The conclusions identify key challenges faced by SIDS in advancing connectivity. The Statistical Annex features key ICT indicators for the SIDS.

[1] The Third International Conference on Small Island Developing States was held from 1 to 4 September 2014 in Apia, Samoa. The conference resulted in the adoption of the Small Island Developing States Accelerated Modalities of Action–or SAMOA Pathway. On 27 September 2019, the United Nations General Assembly held a one-day high-level review of the progress made in addressing the priorities of SIDS through implementation of the SAMOA Pathway. See: https://sustainabledevelopment.un.org/sids/samoareview

Table 1-1: SIDS by ITU region and income grouping

Africa	Americas	Arab States	Asia & Pacific
Cabo Verde†	Antigua and Barbuda+	Bahrain+	Fiji‡
Guinea-Bissau§*	Bahamas+	Comoros†*	Kiribati†*
Mauritius‡	Barbados+		Maldives‡
Sao Tome and Principe†*	Belize‡		Marshall Islands‡
Seychelles+	Cuba‡		Micronesia†
	Dominica‡		Nauru‡
	Dominican Republic‡		Palau+
	Grenada‡		Papua New Guinea†
	Guyana‡		Samoa‡
	Haiti§*		Singapore+
	Jamaica‡		Solomon Islands†*
	Saint Kitts and Nevis+		Timor-Leste†*
	Saint Lucia‡		Tonga‡
	Saint Vincent and the Grenadines‡		Tuvalu‡*
	Suriname‡		Vanuatu†*
	Trinidad and Tobago+		

Note: § low income, † lower middle income, ‡ upper middle income, +high income.
Income classifications based on World Bank June 2019.
* Also LDC. Vanuatu, Solomon Islands and Sao Tome and Principe are slated for graduation in 2020, 2024 and 2024 respectively.
Not included: Non-UN Member States, non-self-governing or non-independent territories: American Samoa, Anguilla, Aruba, Bermuda, British Virgin Islands, Cayman Islands, Commonwealth of Northern Marianas, Cook Islands, Curacao, French Polynesia, Guadeloupe, Guam, Martinique, Montserrat, New Caledonia, Niue, Puerto Rico, St. Maarten, Turks and Caicos Islands, U.S. Virgin Islands.
Source: Adapted from UN-OHRLLS (http://unohrlls.org/about-sids/country-profiles/) and World Bank (https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups) and based on ITU regions.

A majority of SIDS are classified as upper and high income. Just two are classified as low income yet they represent 20 per cent of the SIDS population. In order to present statistical trends for the SIDS as a whole, group averages in the review are weighted by the number of SIDS.

Table 1-2: SIDS by income classification and population

	Population (2018)	Number of SIDS	Percentage of population	Percentage of SIDS
High income	9,533,650	9	15%	24%
Upper middle income	30,159,836	18	46%	47%
Lower middle income	12,635,430	9	19%	24%
Low income	12,997,485	2	20%	5%
SIDS	**65,326,401**	**38**	**100%**	**100%**

Source: World Bank.

2 Access to and use of ICTs

Basic ICTs, particularly wireless technologies, have proliferated throughout the SIDS. Already at the time of the 2014 Samoa summit, potential access to mobile communications was high in most SIDS, with basic mobile coverage nearly ubiquitous, and by 2018 second generation (2G) mobile population coverage in the SIDS was 94 per cent, close to the world average. In over half the SIDS, mobile phone availability in households exceeds 90 per cent[2], and in just six it is less than 75 per cent (Table 2-1). In contrast, fixed-telephone penetration in the SIDS was just 14 per 100 inhabitants in 2017.

Table 2-1: Households with a mobile phone (%), SIDS, 2018 or latest available data

>90%	<90% & >75%	<75%
Bahamas	Antigua and Barbuda	Cuba
Bahrain	Comoros	Kiribati
Barbados	Grenada	Marshall Islands
Belize	Guyana	Micronesia
Cabo Verde	Haiti	Papua New Guinea
Dominica	Palau	Tuvalu
Dominican Republic	Sao Tome and Principe	
Fiji	Solomon Islands	
Guinea-Bissau	Suriname	
Jamaica	Timor-Leste	
Maldives	Vanuatu	
Mauritius		
Nauru		
Samoa		
Seychelles		
Singapore		
Saint Kitts and Nevis		
Saint Lucia		
Saint Vincent		
Tonga		
Trinidad and Tobago		

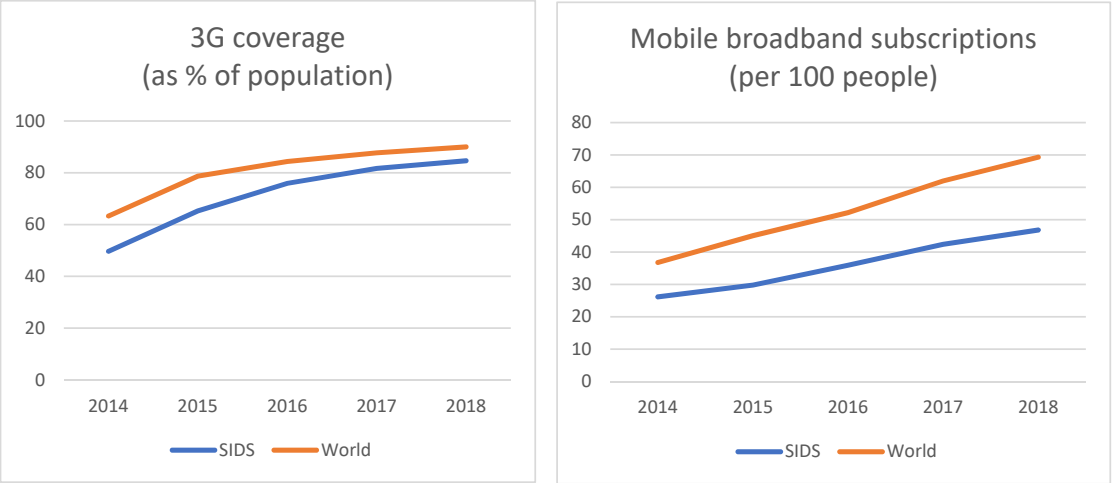
Source: ITU and national household surveys.

While low-speed mobile technology enables voice communications, text messaging and mobile money, broadband networks are essential for higher-level services such as telemedicine, online learning, climate monitoring and advanced electronic government services. Broadband triggers higher economic impacts as it is "always on", with high-speed data transmission and low latency raising productivity and enabling new business models.

Mobile broadband coverage has improved significantly in the SIDS since 2014, up 35 percentage points and reaching 85 per cent of the population in 2018 (Figure 2-1, left). Mobile broadband subscriptions rose from one quarter of the population in 2014 to almost half by 2018, but lags behind the world average by 22 percentage points (Figure 2-1, right). High-speed mobile is the predominant broadband technology in the SIDS, surpassing fixed broadband penetration—9 per cent in 2018—by a factor of five.

[2] To put that figure into perspective, penetration of cellphones in United States households was 91% in 2018. See: https://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless201812.pdf

Figure 2-1: Mobile broadband coverage and subscriptions



Source: ITU.

Some SIDs have attracted significant public and private investment for large-scale projects such as submarine cables. Notably in the Pacific, deployment of undersea fibre-optic cables has developed rapidly (ITU 2018b). At the time of the Samoa conference, all but eight SIDS were connected to at least one submarine cable network. Since then Palau obtained an undersea submarine connection in 2017, the Solomon Islands are scheduled to do so before the end of 2019, and three more SIDS will have submarine connectivity by 2021, leaving just three unconnected from global undersea fibre-optic networks (Nauru, Timor-Leste and Tuvalu) (Table 2-2).

Many of these projects are enabled by development assistance, recognizing that most SIDS face significant challenges of joining a cable whereas the economic impact would be immense. Development partners have also insisted on open access to the cables they support in order to promote lower pricing. At the same time, inclusive planning of recent regional networks has enabled some SIDS to obtain submarine connectivity through routing that passes close to their countries allowing them to connect via branching units (e.g. the Manatua cable running from Samoa to French Polynesia which will connect the Cook Islands and Niue).

Table 2-2: Number of undersea fibre-optic cables connecting to SIDS, July 2019

0	1	2	> 2
Nauru	Belize	Antigua and Barbuda	Bahamas
Timor-Leste	Cuba	Barbados	Dominican Republic
Tuvalu	Guinea-Bissau	Cabo Verde	Fiji
Planned:	Guyana	Comoros	Jamaica
Cook Islands (2020)	Marshall Islands	Dominica	Singapore
Kiribati (2021)	Micronesia	Grenada	Saint Kitts and Nevis
Niue (2020)	Palau	Haiti	Trinidad and Tobago
Solomon Islands (2019)	Sao Tome and Principe	Maldives	
	Seychelles	Mauritius	
	Suriname	Papua New Guinea	
	Tonga	Samoa	
	Vanuatu	Saint Lucia	
		Saint Vincent	

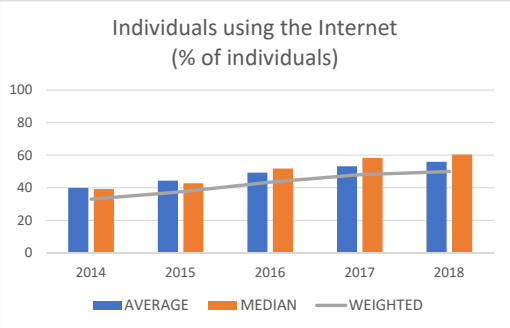
Source: ITU.

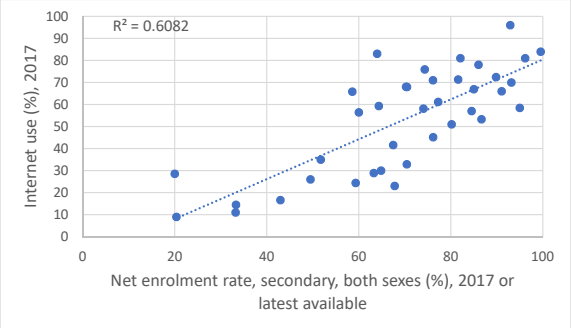
Satellite connectivity remains important, particularly for SIDS with no submarine cable access or where large segments of the population are far away from submarine landing stations. Satellite is also important for redundancy and can be more economical for operators that cannot obtain cost-based rates from submarine cable wholesalers. Continual advances in technology are making satellite connectivity faster and cheaper and a number of satellite projects exist. The ITU's Pacific Satellite Connectivity Project, for example, is partnering with Kacific[3] to connect remote and rural island communities with reliable and affordable Internet. A new Kacific satellite system scheduled for launch at the end of 2019 will offer speeds of up to 60 Gbps. Affordability will be key here but pricing of services has not been announced yet.

Improved connectivity has provided the foundation to boost Internet take-up. The percentage of individuals using the Internet increased 16 percentage points between 2014 and 2018, from 40 to 56 per cent (unweighted average), and over half the SIDS have an Internet penetration rate of over 60 per cent (Figure 2-2, left). Weighted Internet usage in the SIDS—i.e. the total number of Internet users divided by the total population—exceeded half the population in 2018, equalling the world average. Internet penetration is above 60 per cent in half of the SIDS.

As infrastructure expands and affordability improves in the SIDS, other factors such as lack of digital skills and awareness is becoming a more significant constraint to Internet take-up. In Cabo Verde, for example, around half of those who do not use the Internet said the most important reasons were lack of need and not knowing how to use it, whereas less than a third mentioned costs and five per cent said that it was because it was not available.[4] There is a high correlation between education and Internet use (ITU 2018a). This link is apparent when comparing secondary school enrolment to Internet use in the SIDS (Figure 2-2, right). Internet use is generally high in the secondary school age group and reinforced by the presence of computer labs and digital literacy courses, pointing to the importance for countries to invest in education to bring more people online and offer them new opportunities.

Figure 2-2: Individuals using the Internet in SIDS and Internet use and net secondary school enrolment rate in SIDS, 2017





Note: In the left-hand chart, the "average" number of Internet users is calculated by dividing the total number of users by the total number of SIDS. "Median" refers to the figure at which half of SIDS are above and half below. "Weighted" refers to the total number of Internet users in the SIDS divided by the total population of the SIDS.

Source: ITU and UNESCO Institute of Statistics.

[3] https://kacific.com

[4] Instituto Nacional de Estatística. 2019. *Acesso e Utilização das Tecnologias de Informação E Comunicação - IMC 2018.* http://ine.cv/condicoes-de-vida/

3 Enabling environment

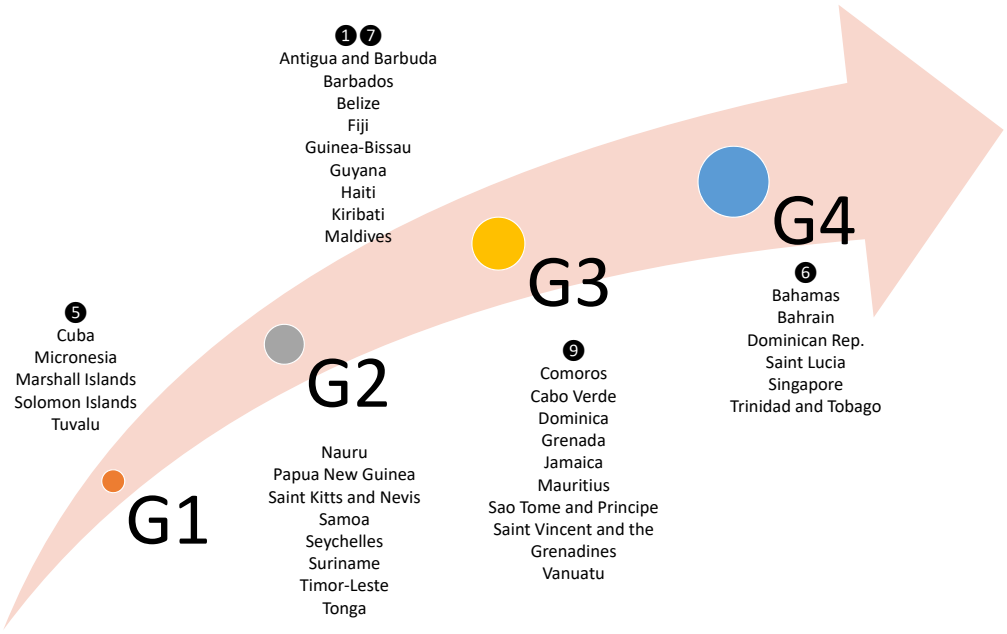
An enlightened enabling environment is essential for SIDS to attract investment and protect consumers. This includes a regulatory regime that fosters private investment for deploying ICT networks in a competitive environment that often results in lower prices and better quality. Clear government strategies for applying ICTs across a spectrum of development challenges are also critical to ensure that digital technologies have the intended impacts.

The level of required regulatory expertise changes as markets become more complex and technology evolves. The ITU-ITC Regulatory Tracker is a tool for measuring progress in ICT regulation. Four generations of regulation are identified:

- First Generation (G1): Regulated public monopolies– command and control approach
- Second Generation (G2): Basic reform – partial liberalization and privatization across the layers
- Third Generation (G3): Regulations enabling investment, innovation and access – dual focus on stimulating competition in service and content delivery, and consumer protection
- Fourth Generation (G4): Integrated regulation – led by economic and social policy goals

In general, SIDS are not highly ranked for regulatory performance. Over half are in the first and second generations of regulation (Figure 3-1). This is partly a reflection of the small market size where competition tends to be limited as well as the resource constraints faced by regulators in a number of small island states. Just half a dozen SIDS are in the fourth generation of regulation. The Dominican Republic is notable for ranking in the top ten owing to early reform efforts such as enactment of a telecommunication law and creation of an independent regulatory agency that has produced a predictable and stable environment to attract investment.[5]

Figure 3-1: Generations of ICT regulation in the SIDS



Source: ITU, see https://www.itu.int/net4/itu-d/irt/#/tracker-by-country/regulatory-tracker/2018

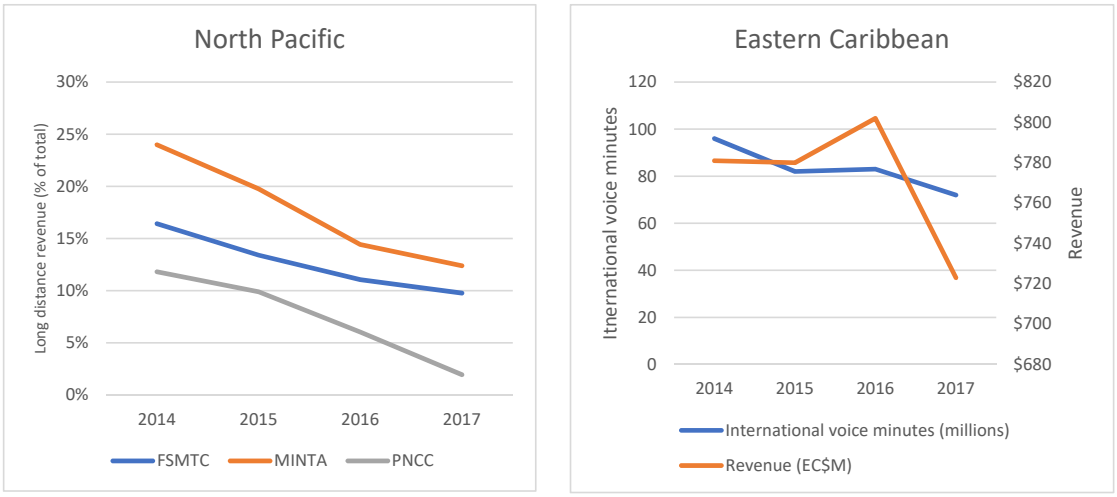
SIDS have utilized different approaches to overcome the challenge of scarce resources available for ICT regulation. One option is a multisector regulator such as the Office of Utilities Regulation in Jamaica, which has responsibility not only for telecommunications but also for water and sewerage,

[5] https://1e8q3q16vyc81g8l3h3md6q5f5e-wpengine.netdna-ssl.com/wp-content/uploads/2015/03/Case-Study-Dominican-Republic.pdf

electricity and transportation. A review of Jamaica's multisector regulatory experience found that, though there are drawbacks, *"... it offers an effective pragmatic solution[s] for small countries with limited financial resources, small technical skill pool and the risk of political intervention."*[6] Another approach is a regional regulator such the Eastern Caribbean Telecommunications Authority (ECTEL), the ICT regulatory body for Dominica, Grenada, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines.[7] Telecommunication regulators can also share responsibilities with other public agencies, as is the case in Fiji where the Competition and Consumer Commission is responsible for setting interconnection rates.[8]

Due to large diasporas and tourism, small islands have traditionally been more reliant on international calls and roaming compared to other countries. Telecommunication operators in a number of SIDS are witnessing a sharp decline in international traffic and roaming as users switch to over-the-top (OTT) applications. For example, the incumbent telecommunication operator in Micronesia witnessed a drop in call revenue of 24 per cent in 2018.[9] Other operators in the North Pacific have also witnessed falls in long-distance revenues (Figure 3-2, left). Similarly, in the Eastern Caribbean, international traffic minutes fell 25 per cent between 2014 and 2017 and overall revenues fell 7 per cent (Figure 3-2, right). While operators do earn revenue from data usage, this has been insufficient to make up for the large drop in traditional voice revenue. Operators will need to look for new business models and new sources of revenue such as mobile money, broadband television and business services such as cloud computing. This was also recognized by regulators participating in the ITU 18th session of the Global Symposium for Regulators, which adopted the Best Practice Guidelines on New Regulatory Frontiers.[10]

Figure 3-2: Long-distance revenue in the North Pacific and Eastern Caribbean



Note: FSMTC = Federated States of Micronesia Telecommunications Corporation, MINTA = Marshall Islands National Telecommunications Authority, PNCC = Palau National Communications Corporation.

Source: Operator financial statements and ECTEL (2018).

Ongoing sales of incumbent operators in SIDS are having an effect on the competitive environment and investment. Many incumbents in the SIDS are subsidiaries of large corporate groups that have recently effected numerous acquisitions and divestures (Figure 3-3). Over two dozen SIDS have been affected

6 UNCTAD. 2009. "A Decade of Regulation – Jamaica's Experience with the Multi-Sector Model." *Services, Development and Trade: The Regulatory and Institutional Dimension*. Geneva, Switzerland, 17-19 March. https://unctad.org/Sections/wcmu/docs/c1mem3p33_en.pdf

7 https://www.ectel.int/about-ectel/

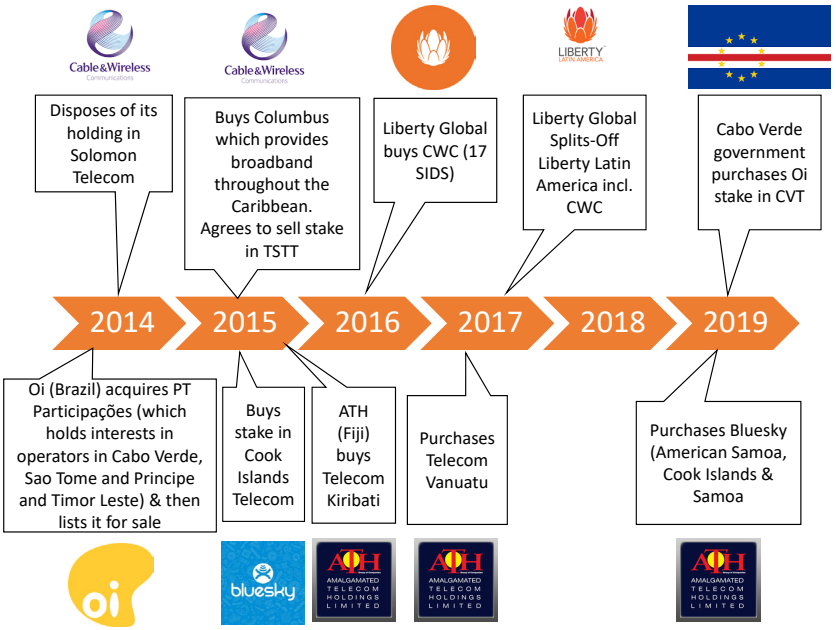
8 https://fccc.gov.fj/wp-content/uploads/2018/04/Final-FCCC-Interconnection-Rates-Authorisation_10-June-2019.pdf

9 Federated States of Micronesia Telecommunications Corporation. 2018. *Financial Statements*. http://www.fsmopa.fm/files/fy2019/FSMTC_fs18%20[FINAL%2012.28.18].pdf

10 GSR-18 Best Practice Guidelines on New Regulatory Frontiers to achieve digital transformation (https://www.itu.int/net4/ITU-D/CDS/GSR/2018/documents/Guidelines/GSR-18_BPG_Final-E.PDF)

by sales of their incumbent operators over the last few years, far higher than any other country grouping, increasing unpredictability and affecting the ability of incumbents to compete effectively (Minges and Jensen, 2017). Sometimes the divestures have created situations where the same group owns more than one operator in a country, which affects competition. Governments in a few SIDS have taken steps to inject greater local ownership, for example by repurchasing shares in the incumbent, as in Cabo Verde[11], or listing the operator on the local stock market, as in the Maldives.[12] There has also been a rise in SIDS-SIDS investment, particularly in the Pacific where Fiji's ATH has purchased telecommunication operators in American Samoa, the Cook Islands, Kiribati, Samoa and Vanuatu.

Figure 3-3: Sales of incumbent operators, SIDS, 2014-2019



Source: Updated from Minges and Jensen (2017).

11 https://macauhub.com.mo/2019/05/22/pt-grupo-brasileiro-oi-encaixa-263-milhoes-de-dolares-com-venda-da-participacao-na-cabo-verde-telecom/

12 https://www.dhiraagu.com.mv/Investor_Relations_The_Government_of_Maldives_launches_Dhiraagu_IPO_Prospectus.aspx

4 Development impacts

Digital technology is having discernible impacts on sustainable development and the economy in small islands. ICTs are contributing to the achievement of the Sustainable Development Goals (SDGs) in numerous ways and across different domains, with various technologies helping to improve healthcare, monitor the climate, enhance disaster management, expand online learning opportunities, extend financial inclusion, and more. The ICT sector is an important contributor to gross domestic product (GDP) in many SIDS, producing measurable indirect impacts and enabling innovation and entrepreneurship.

4.1 Sustainable development impacts

ICTs offer a range of solutions across a spectrum of areas relevant to SIDS that can accelerate progress towards achieving the SDGs. A number of recent examples are highlighted below, illustrating how cross-cutting digital technology is being used by SIDS in areas relevant to many of the 17 SDGs.

4.1.1 Agriculture and fishing

Digital technology can enhance rural livelihoods, which is important for many SIDS with sizable rural populations where farming and fishing are major occupations. Benefits accrue from access to larger markets; more timely and transparent pricing information for inputs and outputs; better production techniques due to easier access to relevant information; and the use of sensors to monitor climate, soil and sea conditions and track livestock and fish.

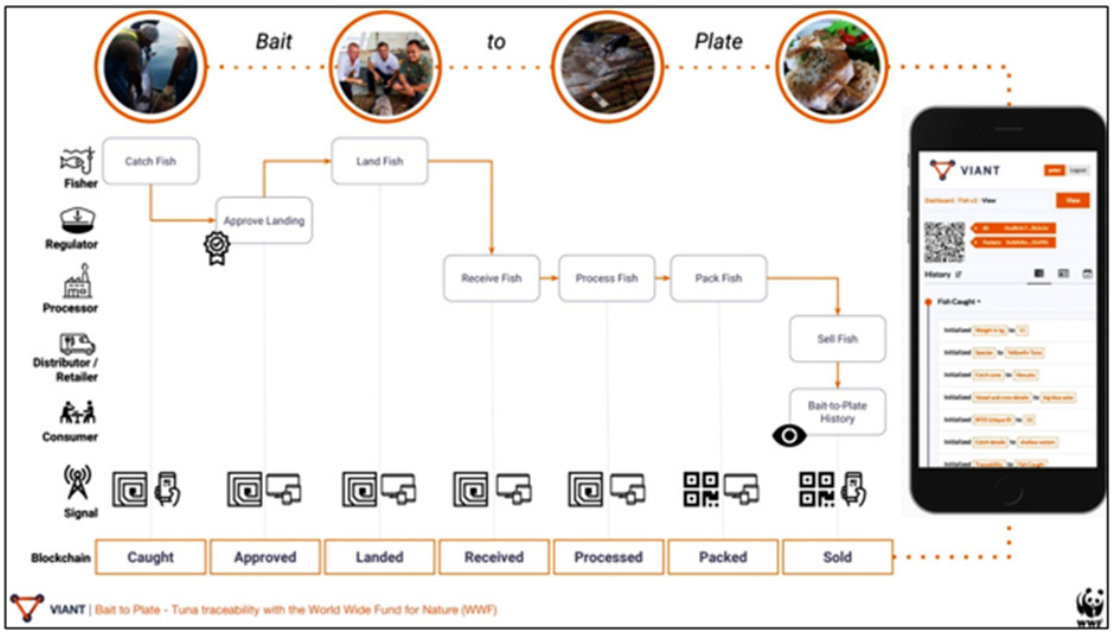
Safety for fishers in the Eastern Caribbean is being enhanced through a mobile application providing early warning of risky weather and sea conditions with users able to share their information about local conditions.[13] Blockchain technology along with radio-frequency identification (RFID) tags and quick response (QR) codes are being used in Fiji to trace the tuna supply chain (Figure 4-1) to promote sustainable and ethical fishing.[14] A "farm-to-table" example of blockchain is being deployed in Papua New Guinea for smallholder farmers to track their pigs using RFID tags and a smartphone app, verifying the animals have received the correct diet and were administered the proper vaccines.[15]

[13] "PPCR Caribbean Introduces Early Warning System for Fishers in SVG." *Press Release*, 9 March 2018. https://caribppcr.org.jm/caribbean-fisherfolk-get-new-early-warning-system/

[14] Jeremy Nation. 2018. "WWF Blockchain To Track Sustainable Tuna From Bait To Plate." *ETHNews*, 9 January. https://www.ethnews.com/wwf-blockchain-to-track-sustainable-tuna-from-bait-to-plate

[15] FAO. 2019. "Pig farmers in Papua New Guinea capitalize on blockchain technology." *e-agriculture*, 18 June. http://www.fao.org/e-agriculture/news/pig-farmers-papua-new-guinea-capitalize-blockchain-technology

Figure 4-1: Bait-to-plate with blockchain in Fiji



Source: https://www.newsdeeply.com/oceans/articles/2018/02/28/betting-on-blockchain-to-put-truly-sustainable-seafood-on-dinner-plates

4.1.2 Climate, disaster and environment

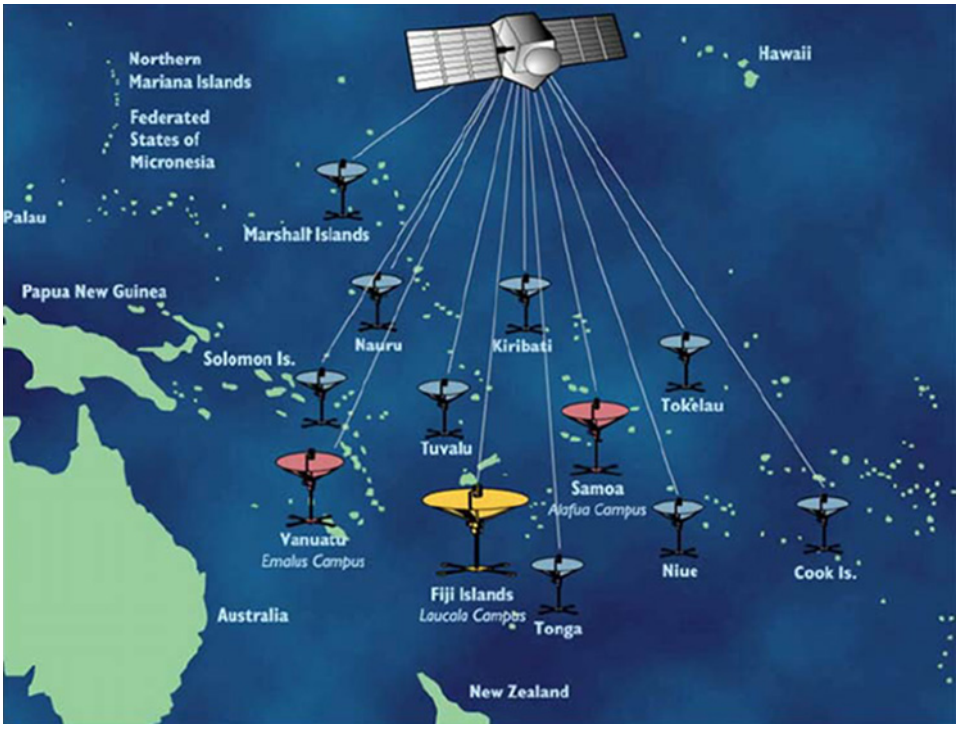
Small islands are naturally prone to disaster caused by earthquakes and severe weather events, and are being affected by climate change resulting in increased extreme weather events such as tropical cyclones and hurricanes, floods and landslides, prolonged drought and wildfires. Connectivity can help address these events by providing remote communities with access to early warning systems and real-time weather information. Remote sensing, geographic information systems (GISs), social media and drones are just some of the ICT tools being used in SIDS for risk assessment of hazards and for monitoring the impact of climate change. In Vanuatu, drones were used for rapid damage assessment following Cyclone Pam in March 2015 (ITU 2019b). In Palau, artificial intelligence (AI) is being used to analyse location data such as weather, energy costs and physical characteristics to accelerate transition from expensive and polluting diesel fuel to renewable energy.[16]

4.1.3 Education

Online access and tools are important for education and are particularly relevant for small islands separated by large distances and with small population (and student) sizes and limited schools, teachers and learning materials. The use of satellite and fibre-optic connectivity for tertiary distance education has enabled the University of the South Pacific (USP), headquartered in Suva, Fiji, to extend its presence to a dozen countries in the region; half of its students use distance education, including audio/video conferencing and Internet access (Figure 4-2). Network capacity has been progressively increased, as the highest attrition rates are in countries with poor bandwidth. New submarine cables in the region are enabling USP to acquire dark fibre supporting advanced distance-learning applications and link students and international educational research networks. The Caribbean has a similar example: the University of the West Indies Open Campus provides online learning to some 23 000 students in 17 Caribbean countries across more than forty locations.

[16] Adele Peters. 2018. "This island nation is making the fastest-ever shift to renewables." *Fast Company*, 17 July. https://www.fastcompany.com/90203041/this-island-nation-is-making-the-fastest-ever-shift-to-renewables

Figure 4-2: University of South Pacific network



Source: https://asiapacificreport.nz/2018/03/27/nz-to-give-6-million-boost-for-uspnet-communications-upgrade/

4.1.4 Financial inclusion

Improved connectivity is enhancing financial inclusion for some SIDS. Of particular relevance is mobile money, which can overcome the lack of formal banking options, especially in remote areas. In Guinea Bissau and Papua New Guinea, for example, mobile money agents outnumber commercial bank branches by a factor of 64 and 131, respectively.[17] Currently, there are 23 mobile money services in operation in 15 SIDS (Table 4-1).[18] Mobile money has proven particularly popular in the South Pacific where it has been launched in Fiji, Samoa, the Solomon Islands, Tonga and Vanuatu. These countries have large diasporas and mobile money enables users to transfer funds overseas at considerably less cost than using banks or traditional money transfer companies. If all funds remitted from overseas to the South Pacific in 2014 had used mobile money services it would have saved consumers USD 26 million in transfer fees (Minges and Stork, 2015).

[17] IMF. "Mobile Money Note 2019." http://data.imf.org/?sk=E5DCAB7E-A5CA-4892-A6EA-598B5463A34C&sId=1460040555909

[18] https://www.gsma.com/mobilemoneymetrics/#deployment-tracker

Table 4-1: Mobile money deployments, SIDS, 2010-2017

Country	Mobile money operator	2010-13	2014	2015	2016	2017
Fiji	Vodafone	✓	✓	✓	✓	✓
	Digicel	✓	✓	✓	✓	✓
Guinea-Bissau	MTN	✓	✓	✓	✓	✓
Haiti	Digicel	✓	✓	✓	✓	✓
	Haitipay	✓	✓	✓	✓	✓
Papua New Guinea	Digicel	✓	✓	✓	✓	✓
	NationWide MicroBank	✓	✓	✓	✓	✓
	ANZ	✓	✓	✓	✓	✓
Samoa	Digicel	✓	✓	✓	✓	✓
Tonga	Digicel	✓	✓	✓	✓	✓
Vanuatu	Digicel	✓	✓	✓	✓	✓
Guyana	GT&T	✓	✓	✓	✓	✓
Singapore	SingTel	✓	✓	✓	✓	✓
Solomon Islands	ANZ	✓	✓	✓	✓	✓
Dominican Republic	Orange		✓	✓	✓	✓
Timor-Leste	BNU		✓	✓	✓	✓
Dominican Republic	Claro			✓	✓	✓
Seychelles	Airtel			✓	✓	✓
Jamaica	National Commercial Bank				✓	✓
Maldives	Ooredoo				✓	✓
Guinea-Bissau	Orange					✓
Jamaica	GK					✓
Maldives	Dhiraagu					✓

Source: GSMA, Mobile money deployment tracker

4.1.5 Health

Connectivity benefits the health sector in various ways, improving the speed and accountability of administrative processes, increasing efficiency, lowering costs and offering new ways to deliver medical services and medicine. Mobile phones are used to remind patients to take their medicines, online health information is made available to citizens, and diagnostic information is transmitted over broadband networks for experts to analyse. Better connectivity among health institutions helps remote clinics to access expertise that may only be available at far-away hospitals. Benefits are substantially improved with high bandwidth and fibre-optic cables, making it possible to transmit high-quality images. The SickKids-Caribbean Initiative connects the Hospital for Sick Children in Toronto, Canada, to six Caribbean countries, enabling telemedicine to improve outcomes for children suffering from cancer.[19] In Vanuatu, where the limited number of roads across its 80 islands means that one in five children miss out on essential childhood vaccinations, drones are starting to be used to deliver medicine to remote areas.[20]

4.1.6 Public services

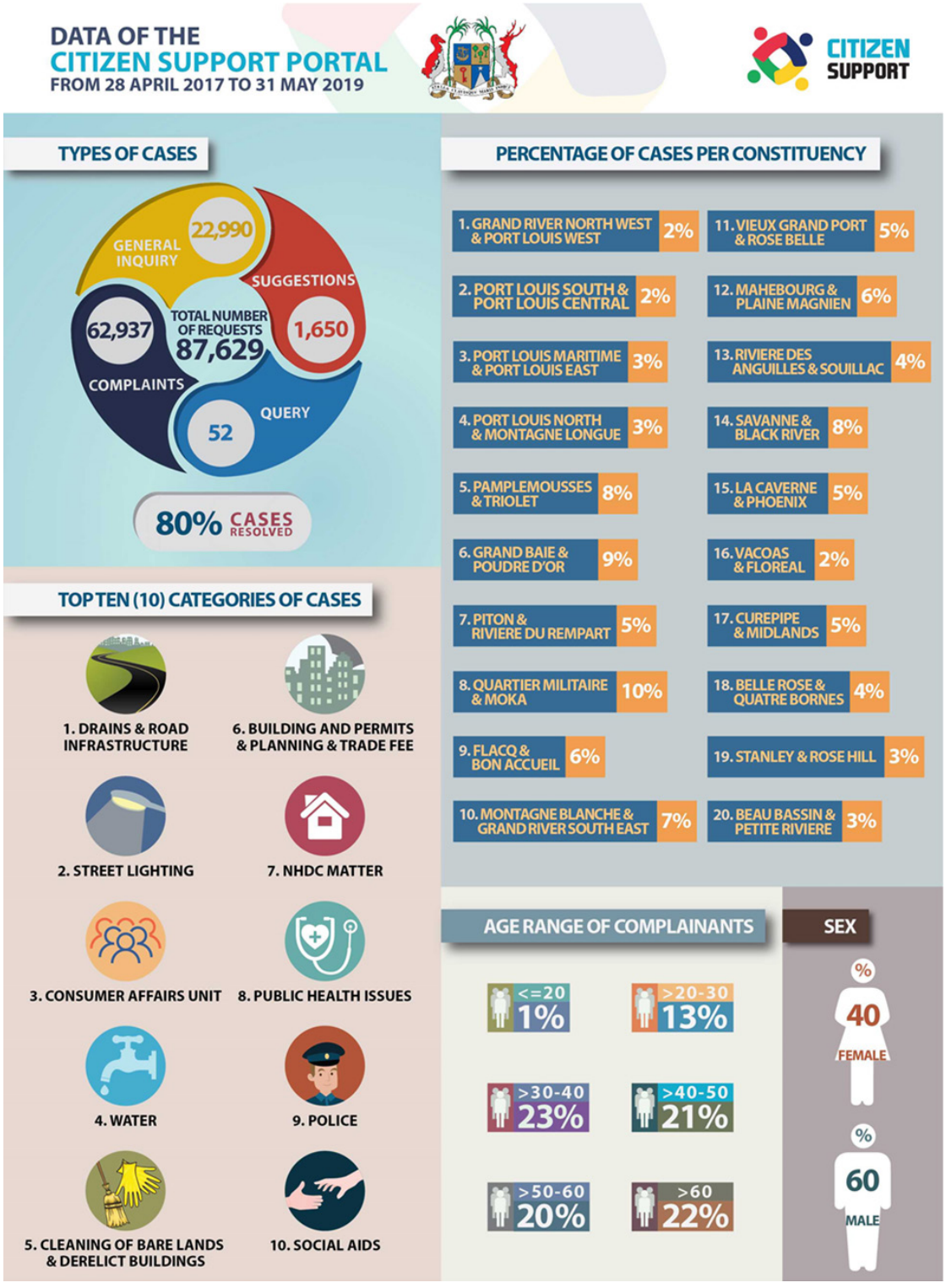
Improved connectivity makes government processes more efficient, enabling online and mobile-based delivery of public services, saving citizens and businesses time and money. Examples of the application of digital technologies for public services in the SIDS include business and voter registration, single window trade and a citizen portal. Tonga illustrates the impact that implementation of an online system can have on the time taken to register a company. Following the launch of its free online company registration system in December 2014, the number of days to register a business fell from 14 days to one (Minges and Jensen, 2017). Another example of the use of ICTs in government was seen during the 2014 elections in the Solomon Islands. Citizens were photographed and fingerprinted using a biometric voter registration (BVR) system. An SMS-based information campaign was used to inform the public about candidates, voting procedures and the locations of polling stations. The Electoral Commission cited the importance of the BVR system for registering over 80 per cent of the eligible voting population (Minges and Stork, 2015). Trade processes become more efficient and transparent by moving them online. In Barbados, the Electronic Single Window was launched in 2017 to track, manage and store digital versions of over 200 documents from traders, shippers and government.[21] The Citizen Support Portal (Figure 4-3), launched in 2017 in Mauritius, is an online service allowing citizens to directly transmit their requests and share concerns and ideas; those without access to the Internet can go to a Citizen's Advice Bureau where staff register input to the portal.

[19] Adler, Ellie, Cheryl Alexis, Zulaika Ali, Upton Allen, Ute Bartels, Cassandra Bick, Jacqueline Bird-Compton, *et al*. 2015. "Bridging the Distance in the Caribbean: Telemedicine as a Means to Build Capacity for Care in Paediatric Cancer and Blood Disorders." *Studies in Health Technology and Informatics*. https://www.ncbi.nlm.nih.gov/pubmed/25980698

[20] Chloe Taylor. 2018. "Drones deliver vaccines to one-month old baby in remote island of Vanuatu ." *CNBC*, 19 December. https://www.cnbc.com/2018/12/19/drones-deliver-vaccines-to-remote-island-of-vanuatu-.html

[21] http://www.reform.gov.bb/index.php/7-news/latest-news/141-barbados-electronic-single-window-2

Figure 4-3: Mauritius Citizen Support Portal



Source: https://www.csu.mu/statistics-details/14/statistics.html

4.2 Economic impacts

ICT is a major sector in virtually all the SIDS, generating direct and indirect economic impacts. The ICT sector tends to account for a higher share of GDP in small islands than in other countries. Telecommunication operators in small islands are often among the largest companies, contributing significantly to government budgets through taxes, and are leading sources of employment. Tourism is an important contributor to the telecommunication sector in SIDS by expanding the market for ICT services (Box 4-1).

Box 4-1: Expanding ICT market scale with tourism

Tourism is vital for the economies of many small islands and ICT plays an important role. Tourists have a direct impact on mobile operators' revenues, expanding the market and creating scale, and contributing to financial sustainability. Some 49 million tourists visited the SIDS in 2017, whose populations in comparison total 65 million, and in 14 SIDS the number of tourists outnumbered the population.[1] Most tourists bring their phones and by using roaming or buying a local SIM card they contribute to telecom operators' revenues. A survey of Chinese travellers found that 94 per cent bring their mobile phones, with a third purchasing local SIM cards during their visits and 31 per cent using international roaming.[2] In the Seychelles, the average overseas visitor spends SCR 297 (USD 22) a day on telecommunications, a figure equivalent to the average monthly amount spent by a Seychelles household.[3]

1 Derived from statistics on tourism arrivals at: https://data.worldbank.org/indicator/ST.INT.ARVL
2 Hotels.com. 2015. *Chinese International Travel Monitor*. https://www.hospitalitynet.org/file/152005665.pdf
3 National Bureau of Statistics. 2016. *Visitor Expenditure Survey 2015-Q4*. http://www.nbs.gov.sc/download-archive/resources/uploads/2016/03/VES-2015-Q4.pdf

The indirect economic impacts of ICTs are significant. ITU's global study on the economic contribution of broadband, digitization and ICT regulation in 2018[22] found evidence that broadband technologies and effective ICT regulation can have a positive impact on the growth of national economies and prosperity. Following this report, a series of regional econometric modelling reports have been prepared for all regions.

The econometric modelling for the Americas (ITU 2019) suggests that an increase of 10 per cent in mobile and fixed broadband penetration would yield an increase of 1.2 per cent in mobile and 1.9 per cent for fixed in GDP per capita for the Americas region[23]. In the case of Africa, the econometric modelling reports that 10 per cent increase in mobile and fixed broadband penetration represents an increase in GDP per capita of 2.5 per cent for mobile and 0.3 per cent for fixed[24]. Furthermore, the econometric modelling for Asia and Pacific found that the 10 per cent increase in mobile and fixed penetration yields an increase in GDP for mobile of 0.5 per cent and for fixed 1.6 per cent[25].

Another ITU study analysing the economic impact of broadband in the most vulnerable nations (i.e. SIDS, least developed countries (LDCs) and landlocked developing countries (LLDCs)) found that mobile broadband generated a 2.5 to 2.8 per cent increase in GDP per capita per 10 per cent increase in penetration and a 2.0 to 2.3 per cent increase for fixed broadband (ITU 2019b). The study concludes that the economic impact of both fixed and mobile broadband is greater in low-income countries than in other, higher-income countries.

22 https://www.itu.int/pub/D-PREF-EF.BDR-2018
23 https://www.itu.int/pub/D-PREF-EF.BDT_AM-2019
24 https://www.itu.int/pub/D-PREF-EF.BDT_AFR-2019
25 To be launched in November 2019

Pricing of services remains a key enabler for adoption of broadband. Based on the results from these studies, it was calculated that a 10 per cent drop in prices would boost adoption by more than 0.9 per cent for mobile broadband in the Americas region, and 3.1 per cent in the African region.

Other studies also illustrate the economic impact of international connectivity. Deployment of a fibre-optic submarine cable to Samoa was found by the World Bank to generate a total economic impact of USD 235 million over 25 years, far more than the USD 34 million investment.[26]

Improved international connectivity has the potential to develop offshore software industries, contributing to export earnings and employment. A World Bank report estimates that Pacific islands have the potential to create thousands of ICT services export jobs as a result of recent submarine fibre-optic connectivity (Beschorner *et al*., 2015). The World Bank estimated the potential for creating 400-1 200 direct and 1 460-4 400 indirect jobs in offshore services due to the deployment of submarine cable to Samoa.[27]

Some SIDS, such as the Dominican Republic, Jamaica, Mauritius and Singapore, have been successful at exporting computer services. The potential for ICT-enabled services needs to be spread to other SIDS. One way to do this is through government strategies—in countries such as Mauritius and Singapore this started years ago—that take a holistic approach by ensuring that all the components for an ICT-enabled outsourcing industry are in place.[28] Another way to transfer the skills required to build up offshore software services is by attracting software companies and entrepreneurs. This is the goal of Vanuatu, which hopes to leverage its submarine fibre connectivity to become a fintech hub and attract experts, with the potential to generate 3 000 jobs.[29]

[26] World Bank. 2015. *Project Appraisal Document: Pacific Regional Connectivity Program Samoa Connectivity Project*. http://documents.worldbank.org/curated/en/813211467999714829/pdf/PAD1264-PAD-P128904-IDA-R2015-0150-1-Box391454B-OUO-9.pdf.

[27] *Ibid.*

[28] See: https://www.itu.int/ITU-D/ict/cs/singapore/singapore.html and https://www.itu.int/ITU-D/ict/cs/mauritius/index.html

[29] "Vanuatu – A Rising Center of Finance and Technology in the South Pacific." *Reuters*, 22 March, 2018. https://www.reuters.com/brandfeatures/venture-capital/article?id=31484

5 Tracking progress in the SIDS

It is useful to have a framework to gauge how well prepared SIDS are to leverage digital technologies to contribute to sustainable development. ITU has developed a methodology to track progress towards achieving SDG Target 9.c, "*to provide universal and affordable access to the Internet*". Although this target was aimed at LDCs, it is relevant for and can be applied to the SIDS too. The framework consists of three key indicators related to the goal of bringing people online:

i) percentage of the population covered by a 3G network (measuring universal access to the Internet);

ii) mobile data price as a proportion of per capita income (measuring affordability); and

iii) net secondary school enrolment (proxying for the capability to use the Internet beyond simple tasks).

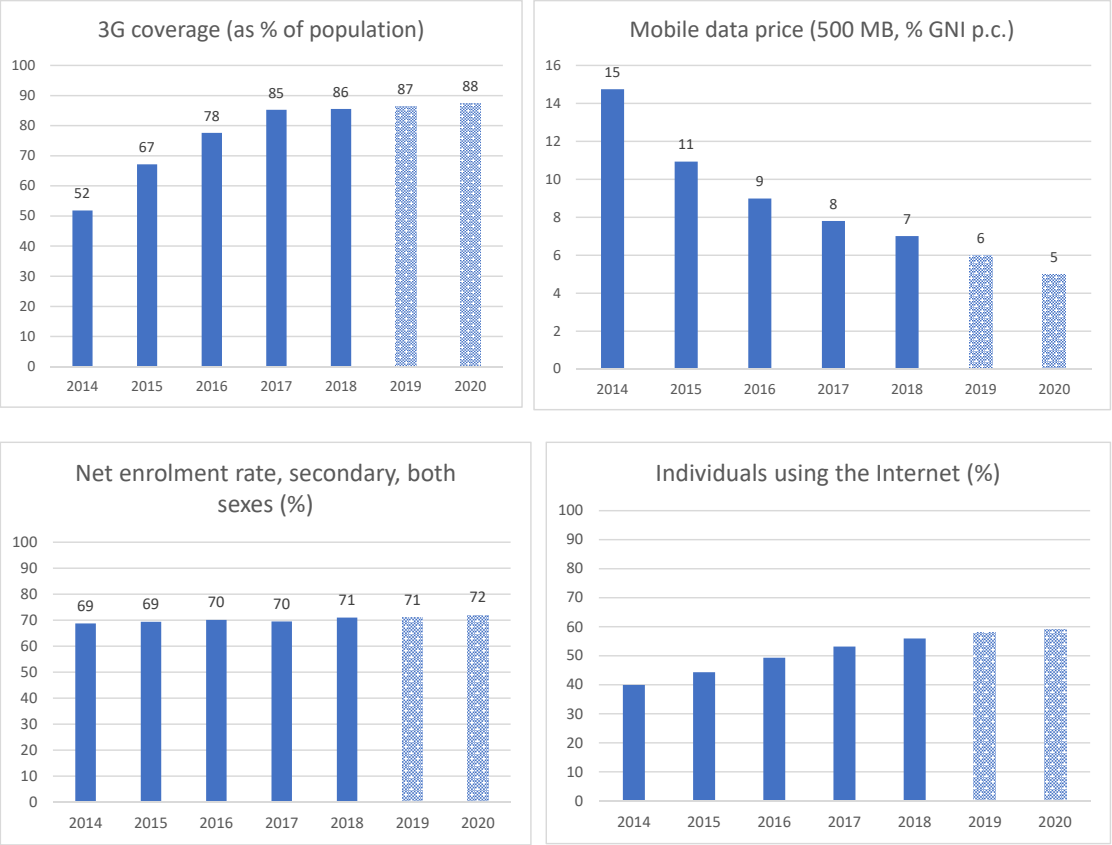
Imbalances among these three indicators can affect Internet access, take-up and use, constraining the ability of SIDS to leverage ICTs to advance sustainable development.

The progress made by individual SIDS in achieving SDG Target 9.c varies. A number of SIDS have made rapid advances towards achieving universal and affordable access to the Internet, as measured by mobile population coverage and the price of a monthly mobile Internet package. Some two dozen SIDS equal or exceed the world average for population coverage with 3G mobile broadband networks (90 per cent). While most SIDS have launched 4G/LTE (long-term evolution) networks, coverage is still relatively low with just a dozen SIDS able to provide a signal to over half the population. Around a dozen SIDS (of those with available data) have mobile broadband prices meeting the Broadband Commission for Sustainable Development target (less than 2 per cent of gross national income (GNI) per capita).[30] The weighted average of net secondary school enrolment stood at 55 per cent in 2017, which is lower than the world average of 66 per cent. This figure is misleading, however, since a few highly populated SIDS have low enrolment rates; over half the SIDS have rates above 70 per cent, which is also the unweighted average. Nevertheless, improvement is slow, with the average rising by just one percentage point every few years.

Overall, the SIDS are largely on track to achieve the universality and affordability targets for Internet access by 2020 (Figure 5-1). Mobile broadband coverage will reach almost 90 per cent of the population, the average price of a mobile data package will be around 5 per cent of per capita income and secondary school enrolment is projected to rise modestly to 72 per cent. Internet usage is predicted to rise to 59 per cent of the population by 2020, with future growth predicated on improvement in coverage, affordability and school enrolment.

[30] https://broadbandcommission.org/Documents/publications/wef2018.pdf

Figure 5-1: Projections for universal and affordable access to the Internet, SIDS



Note: Projections are shaded.

Source: ITU, UNESCO Institute of Statistics.

SIDS have been classified into three categories according to their performance on Internet universality and affordability and secondary school enrolment (Table 5-1). The leading group consists of eleven nations with 90 per cent or more broadband mobile population coverage that meet the Broadband Commission affordability target (i.e., mobile data price less than two percent of per capita GNI) and whose net secondary school enrolment exceeds the SIDS average. This group, mainly comprised of Caribbean countries along with Bahrain, Seychelles and Singapore, have connectivity that ranks among the top in the world. They are also relatively wealthy, consisting of all the high-income SIDS (except Palau) and four upper middle-income SIDS. In addition, they mostly have an advanced regulatory environment: all of the countries are deemed to belong in the most advanced generation of regulation (except the Dominican Republic, which is not included owing to its relatively low secondary school enrolment rate).

The middle group consists of nineteen heterogeneous countries, with a mix of Caribbean, Pacific and three of the four lusophone SIDS. In general, this group is performing well but lags behind in a single area. For example, the constraint in Cabo Verde (Box 5-1) is school enrolment, in Cuba it is mobile broadband coverage, and in Saint Vincent and the Grenadines it is affordability. Remedying the one area of weakness would push many up into the higher group.

The lowest group consists of eight SIDS. Five of the countries in this group are also LDCs. In the other three, market structure is the major constraint. In the North Pacific countries of the Marshall Islands and Micronesia, the mobile market is a monopoly and in the third, Papua New Guinea, the leading

operator dominates the market with a share of subscriptions of over 90 per cent.[31] Lack of competition in these SIDS affects prices and infrastructure investment.

Table 5-1: Performance across the three dimensions of Internet use: access, affordability and skills

High	Medium	Low
1. Antigua and Barbuda	1. Cabo Verde	1. Comoros*
2. Bahamas	2. Dominica	2. Marshall Islands
3. Bahrain	3. Dominican Republic	3. Haiti*
4. Barbados	4. Fiji	4. Kiribati*
5. Jamaica	5. Guyana	5. Micronesia
6. Mauritius	6. Maldives	6. Guinea-Bissau*
7. Saint Kitts and Nevis	7. Palau	7. Papua New Guinea
8. Saint Lucia	8. Samoa	8. Solomon Islands*
9. Seychelles	9. Tonga	
10. Singapore	10. Belize	
11. Trinidad and Tobago	11. Cuba	
	12. Grenada	
	13. Nauru	
	14. Saint Vincent and the Grenadines	
	15. Sao Tome and Principe*	
	16. Suriname	
	17. Timor-Leste*	
	18. Tuvalu*	
	19. Vanuatu*	

Note: Based on the average rank across three indicators: 3G coverage (% of population), price of 500 of MB mobile data (% of GNI per capita) and net secondary school enrolment. In the leading category, all countries have the same score, whereas in the middle and lower categories countries are listed by score. * Least developed country (LDC).

[31] https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2019/03/Digital-Transformation-The-Role-of-Mobile-Technology-in-Papua-New-Guinea.pdf

Box 5-1: Cabo Verde: Progressing connectivity and confronting challenges

Cabo Verde has improved its ICT connectivity over the last decade and largely achieved universal and affordable access to the Internet. More than 90 per cent of the population has mobile broadband coverage and the price of 500 MB of mobile data is equivalent to 1.2 per cent of GNI per capita, well below the Broadband Commission target of two per cent. Over half the population uses the Internet, a milestone reached in 2016.

The regulator ANAC (National Agency for Communications) was created in 2006 and mobile competition introduced the following year. 3G mobile broadband was launched in late 2011. Cabo Verde is deemed to belong in the third generation of ICT regulation.[1] It connected to the Atlantis-2 fibre-optic submarine cable as far back as 2000 and established a second connection to the West African Cable Systems (WACS) in 2012. It will soon be connected to a third cable (EllaLink) in 2020, with the CEO of the incumbent operator CVT commenting "Cabo Verde enjoys a unique geopolitical position in the Atlantic, equidistant between Europe and Latin America and close to Africa with a stable and solid commitment to order and democracy, all of which makes it the ideal hub for interconnecting these territories…".[2] Financial assistance for connecting to EllaLink was provided by the European Investment Bank.[3] A domestic fibre-optic network connecting major islands was completed in 2011.

The country has faced challenges relating to its ICT market. In 2012 mobile operator T+ was purchased by Unitel, posing competitive concerns given that both Unitel and CVT were partly owned by Portugal Telecom. Subsequently, Portugal Telecom sold its stake in lusophone operators to Brazil's Oi in 2014, leading to legal disputes.[4] In 2019, the Cabo Verde Government purchased Oi's stake in CVT.[5] OTT has impacted the incumbent with roaming and international call revenue falling sharply and over a quarter of mobile traffic generated by OTT, forcing CVT to sharply reduce expenses.[6] Uncertainty over CVT and indirect competition from OTT has delayed the introduction of 4G/LTE technology. The resolution of CVT's ownership and freeing up of the 800 MHz frequency band following the digital TV switchover in 2018 led to the launch of 4G/LTE in June 2019.

Another challenge Cabo Verde faces is that of ensuring increased Internet usage. After rising an impressive 60 per cent between 2014 and 2017, usage dropped by a percentage point in 2018. Over half of Cabo Verdeans not using the Internet gave the reason as not knowing how to use it. One of the best ways of boosting Internet usage is through schooling, yet net secondary school enrolment has been stuck at 65 per cent since 2014. Efforts are needed to get more youth into secondary school.

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1 https://www.itu.int/net4/itu-d/irt/#/country-card/CPV

2 EllaLink. 2018. "Cabo Verde Telecom and EllaLink sign agreement for connectivity to Cabo Verde on the EllaLink Submarine Cable System." *Press Release*, 13 December. https://ella.link/2018/12/13/cabo-verde-telecom-and-ellalink-sign-agreement-for-connectivity-to-cabo-verde-on-the-ellalink-submarine-cable-system/

3 https://www.eib.org/en/press/all/2019-171-eib-backs-high-speed-cabo-verde-internet-and-telecom-connection

4 https://www.telegeography.com/products/commsupdate/articles/2015/10/14/lawsuits-fly-in-each-direction-over-unitel-ownership/

5 https://macauhub.com.mo/2019/05/22/pt-grupo-brasileiro-oi-encaixa-263-milhoes-de-dolares-com-venda-da-participacao-na-cabo-verde-telecom/

6 http://www.grupocvt.com.cv/node/689

6 Conclusions and recommendations

SIDS have made progress in terms of the universality and affordability of their ICT networks since the 2014 Samoa conference. Mobile broadband coverage has risen from half of the population to 85 per cent and the price of mobile data has virtually been halved from 15 per cent of GNI per capita to 8 per cent. Technologies such as AI, blockchain and drones have been introduced to enhance sustainable development in areas such as clean energy, agriculture and disaster assessment. Progress has nevertheless been uneven and there is a big gap between the best-performing and other SIDS. Prices remain high in a number of SIDS and the use of digital technologies for contributing to sustainable development is lagging behind.

The regulatory environment needs to be strengthened to promote a dynamic and sustainable ICT sector. Over half the SIDS are in the second generation of regulation and facing difficulties confronting disruption to their ICT markets. In some SIDS, greater competition needs to be stimulated, while in others market attractiveness needs to be strengthened through transparent and flexible regulation; in addition, sufficient spectrum needs to be made available for wireless broadband, and operators diversification into new business lines such as mobile money should be considered.

Social media and disruptive technologies such as AI and Big Data, blockchain and drones offer advantages for disaster management, agriculture and fishing, health and other areas. However, their impacts have been muted owing to largely limited application. Constraints include lack of technical, financial and human resources. There is a need to upgrade skills for applying digital technologies to development challenges and ensure better coordination between ICT specialists and different sectors of the economy.

Digital technologies and applications, particularly social media, pose risks, for example in terms of false information and misuse of personal information. Forward-thinking strategies, appropriate regulatory policies in areas such as data protection and regional cooperation to provide consistency and bargaining power when dealing with stakeholders are essential in order to anticipate and mitigate these dangers.

Fibre-optic connectivity via submarine cable to the global Internet is now or will soon be available in all but three SIDS. This has dramatically increased international bandwidth and the potential for the development of ICT-enabled services and industries in areas including software development, contact centres and back-office support. Yet most SIDS have been slow to seize this opportunity and to foster digital entrepreneurship and innovation. Creating the conditions required to increase the application of ICT domestically and facilitate trade is vital in order to enable transformation to digital economies and reduce brain drain.

Timely and relevant statistics are essential for policy-making and to monitor and fine-tune strategies. The availability of up-to-date ICT indicators in the SIDS varies. A few countries such as Mauritius produce detailed sector-specific reports covering economic indicators, infrastructure and prices as well as household, individual and business usage. Some countries such as Singapore carry out annual surveys on household and individual ICT usage, while others include topics like Internet usage and household availability of digital devices in regular household surveys. The Eastern Caribbean Telecommunications Authority (ECTEL) is notable for compiling supply-side telecommunication statistics for its five members. Most SIDS, however, collect ICT indicators sporadically, sometimes only as part of a decennial census. And in a handful of SIDS no surveys including ICT questions are carried out and there are no official data for something as critical as Internet usage. It is imperative for SIDS to include ICT indicators in their national statistical systems and there are a number of manuals available to guide them.[32]

[32] For example see the ITU's "Definitions and Standards" at: https://www.itu.int/en/ITU-D/Statistics/Pages/definitions/default.aspx

While SIDS share many characteristics, there are huge differences between them. This is apparent in ICT infrastructure, use and applications, where there are wide gaps. Some SIDS are far ahead, with advanced infrastructure and high levels of use, while others lag behind. Support should be tailored for these different groups. Where there is medium to high ICT take- up, the potential exists to incorporate more advanced digital technologies to tackle development challenges. For SIDS lagging behind in ICT, efforts are required to create an environment conducive to expanding network infrastructure and developing regulatory expertise. In all the SIDS, there is significant scope for making greater use of digital technologies for sustainable development in order to achieve the SDGs.

7 Statistical annex

Table 7-1: Basic indicators, 2018

	Population, total	Population density (people per sq. km of land area)	Rural population (% of total population)	Surface area (sq. km)	GNI per capita, Atlas method (current US$)
Antigua and Barbuda	96,286	219	75	440	15,810
Bahamas, The	385,640	39	17	13,880	
Bahrain	1,569,439	2,017	11	778	21,890
Barbados	286,641	667	69	430	
Belize	383,071	17	54	22,970	4,720
Cabo Verde	543,767	135	34	4,030	3,450
Comoros	832,322	447	71	1,861	1,320
Cuba	11,338,138	109	23	109,880	
Dominica	71,625	96	30	750	7,210
Dominican Republic	10,627,165	220	19	48,670	7,370
Fiji	883,483	48	44	18,270	5,860
Grenada	111,454	328	64	340	9,780
Guinea-Bissau	1,874,309	67	57	36,130	750
Guyana	779,004	4	73	214,970	4,760
Haiti	11,123,176	404	45	27,750	800
Jamaica	2,934,855	271	44	10,990	4,990
Kiribati	115,847	143	46	810	3,140
Maldives	515,696	1,719	60	300	9,310
Marshall Islands	58,413	325	23	180	4,740
Mauritius	1,265,303	623	59	2,040	12,050
Micronesia	112,640	161	77	700	3,580
Nauru	12,704	635		20	11,240
Palau	17,907	39	20	460	16,910
Papua New Guinea	8,606,316	19	87	462,840	2,530
Saint Kitts and Nevis	52,441	202	69	260	18,640
Saint Lucia	181,889	298	81	620	9,460

	Population, total	Population density (people per sq. km of land area)	Rural population (% of total population)	Surface area (sq. km)	GNI per capita, Atlas method (current US$)
Saint Vincent and the Grenadines	110,210	283	48	390	7,940
Samoa	196,130	69	82	2,840	4,190
Sao Tome and Principe	211,028	220	27	960	1,890
Seychelles	96,762	210	43	460	15,600
Singapore	5,638,676	7,953		719	58,770
Solomon Islands	652,858	23	76	28,900	2,000
Suriname	575,991	4	34	163,820	4,990
Timor-Leste	1,267,972	85	69	14,870	1,820
Tonga	103,197	143	77	750	4,300
Trinidad and Tobago	1,389,858	271	47	5,130	16,240
Tuvalu	11,508	384	38	30	5,430
Vanuatu	292,680	24	75	12,190	2,970
SIDS	**65,326,401**	**498**	**49**	**1,211,428**	**8,756**

Source: World Bank.

Table 7-2: Fixed-telephone subscriptions per 100 inhabitants

	2014	2015	2016	2017
Antigua and Barbuda	20.1	20.0	22.3	23.5
Bahamas	32.9	31.3	31.0	28.8
Bahrain	21.3	20.4	19.6	20.1
Barbados	47.9	52.6	49.0	42.2
Belize	6.5	6.6	6.1	5.5
Cabo Verde	11.3	11.9	12.0	11.9
Comoros	3.1	1.9	1.6	2.1
Cuba	11.1	11.3	11.5	11.8
Dominica	22.6	28.1	18.1	17.5
Dominican Republic	11.8	12.4	12.6	12.4
Fiji	8.6	8.1	8.3	8.4
Grenada	25.7	25.3	25.0	30.1

	2014	2015	2016	2017
Guinea-Bissau				
Guyana	20.9	20.1	18.3	17.5
Haiti	0.4	0.1	0.1	0.1
Jamaica	8.9	8.8	10.8	10.3
Kiribati	1.8	1.3	0.6	0.7
Maldives	5.5	5.2	4.9	4.7
Marshall Islands	4.5			
Mauritius	29.6	30.2	30.9	32.7
Micronesia	6.8	6.5	6.6	6.6
Nauru				
Palau	33.8	33.8		
Papua New Guinea	1.9	1.9	1.9	1.9
Saint Kitts and Nevis	36.1	36.4	31.8	31.3
Saint Lucia	18.6	19.7	20.0	19.6
Saint Vincent and the Grenadines	21.9	22.7	18.7	18.3
Samoa	6.1	5.9	5.0	4.3
Sao Tome and Principe	3.6	3.3	2.9	2.7
Seychelles	22.7	22.8	22.1	20.7
Singapore	36.7	36.4	35.5	34.9
Solomon Islands	1.3	1.3	1.2	1.2
Suriname	15.5	16.6	15.9	15.8
Timor-Leste	0.3	0.2	0.2	0.2
Tonga	11.3	12.4	10.3	13.6
Trinidad and Tobago	21.3	19.9	19.9	18.8
Tuvalu	13.8	18.2	18.0	17.9
Vanuatu	2.2	1.8	1.7	1.6
SIDS	**14**	**15**	**14**	**14**

Source: ITU

Table 7-3: Mobile-cellular subscriptions per 100 inhabitants

	2014	2015	2016	2017
Antigua and Barbuda	121	176	178	180
Bahamas	82	80	92	89
Bahrain	174	184	210	158
Barbados	108	118	117	115
Belize	49	59	61	64
Cabo Verde	117	115	112	112
Comoros	50	55	57	58
Cuba	22	29	35	40
Dominica	102	106	107	102
Dominican Republic	80	84	82	81
Fiji	99	108	116	114
Grenada	110	112	111	105
Guinea-Bissau	64	70	71	77
Guyana	74	71	76	83
Haiti	64	68	60	57
Jamaica	105	109	113	107
Kiribati	27	36	45	40
Maldives	163	177	190	206
Marshall Islands	29	29		30
Mauritius	131	140	144	145
Micronesia		22	22	22
Nauru		83	87	88
Palau	91	112		
Papua New Guinea	43	45	47	49
Saint Kitts and Nevis	121	134	140	139
Saint Lucia	107	106	99	99
Saint Vincent and the Grenadines	105	104	103	105
Samoa	55	62	77	63
Sao Tome and Principe	67	95	89	85
Seychelles	162	158	161	177

	2014	2015	2016	2017
Singapore	149	149	150	147
Solomon Islands	65	72	70	76
Suriname	169	136	145	141
Timor-Leste	113	111	118	120
Tonga	64	69	75	100
Trinidad and Tobago	146	156	159	148
Tuvalu	35	60	68	71
Vanuatu	60	66	81	83
SIDS	**92**	**96**	**102**	**99**

Source: ITU

Table 7-4: Active mobile-broadband subscriptions per 100 inhabitants

Country	2014	2015	2016	2017	2018
Antigua and Barbuda	30	31	41	47	47
Bahamas	40	47	51	66	59
Bahrain					
Barbados	44	55	45	45	44
Belize	10	12	51	38	38
Cabo Verde	49	66	67	70	66
Comoros				38	38
Cuba					14
Dominica	29	42	41	71	91
Dominican Republic	30	40	50	55	59
Fiji	42	48	54	130	143
Grenada	3	29	33	89	89
Guinea-Bissau			7	8	9
Guyana				26	26
Haiti			10	28	30
Jamaica	38	52	55	49	52
Kiribati			1	1	1
Maldives	42	54	62	63	63
Marshall Islands					

Country	2014	2015	2016	2017	2018
Mauritius	32	37	52	59	65
Micronesia					
Nauru	10	23	33	35	35
Palau					
Papua New Guinea	6	6	9	11	11
Saint Kitts and Nevis	19	73	79	66	66
Saint Lucia	29	35	39	41	43
Saint Vincent and the Grenadines	34	39	49	79	79
Samoa	6	10	23	26	26
Sao Tome and Principe	13	18	25	34	34
Seychelles	13	19	23	76	82
Singapore	143	145	148	147	145
Solomon Islands	13	11	13	19	18
Suriname	71	66	47	47	47
Timor-Leste	30	35	61	34	30
Tonga	19	50	56	59	59
Trinidad and Tobago	28	33	47	46	47
Tuvalu					
Vanuatu	26	19	22	45	45
SIDS	**23**	**30**	**35**	**45**	**47**

Source: ITU

Table 7-5: Fixed broadband subscriptions per 100 inhabitants

	2014	2015	2016	2017
Antigua and Barbuda	10.88	10.01	9.17	8.82
Bahamas	20.19	20.94	21.41	21.97
Bahrain	21.52	18.45	16.29	14.31
Barbados	27.43	27.54	32.44	24.2
Belize	2.81	4.84	5.01	5.42
Cabo Verde	3.62	3.11	2.88	2.74
Comoros	0.21	0.21	0.21	0.18
Cuba	0.07	0.07	0.13	0.29
Dominica	14.82	20.72	21.06	20.86
Dominican Republic	5.77	6.52	7.21	7.58
Fiji	1.4	1.43	1.37	1.34
Grenada	17.69	18.5	19.4	20.62
Guinea-Bissau	0.08	0.06	0.04	0.03
Guyana	5.92	6.99	7.4	8.34
Haiti		0.01	0.01	0.27
Jamaica	5.3	7.97	9.93	8.27
Kiribati	0.45	0.1	0.06	0.07
Maldives	4.86	5.54	6.85	8.37
Marshall Islands	2.59	1.89	1.88	1.88
Mauritius	14.48	15.67	16.84	19.44
Micronesia	2.97	3.14	3.02	3.58
Nauru				
Palau	5.26	5.75		
Papua New Guinea	0.17	0.19	0.21	0.22
Saint Kitts and Nevis	26.09	30.17	29.92	28.91
Saint Lucia	15.98	16.04	16.73	17.77
Saint Vincent and the Grenadines	13.46	15.49	19.94	22
Samoa	1.05	1.08	1.11	0.86
Sao Tome and Principe	0.58	0.67	0.71	0.72
Seychelles	12.68	14.32	14.89	16.07

	2014	2015	2016	2017
Singapore	27.05	26.85	25.99	25.85
Solomon Islands	0.23	0.24	0.27	0.19
Suriname	8.47	9.52	12.75	12.64
Timor-Leste	0.08	0.08	0.08	0.26
Tonga	1.7	2.31	2.8	2.78
Trinidad and Tobago	18.32	20.48	18.72	23.87
Tuvalu	4.13	4.09	4.06	4.02
Vanuatu	1.77	1.62	1.66	1.64
SIDS	**8.1**	**8.7**	**9.2**	**9.3**

Source: ITU

Table 7-6: Percentage of population covered by at least a 3G mobile network

	2014	2015	2016	2017	2018
Antigua and Barbuda	98	98	99	99	99
Bahamas	98	98	98	98	98
Bahrain	98	98	100	100	100
Barbados	64	80	100	100	100
Belize	82	89	95	95	93
Cabo Verde	77	87	88	91	94
Comoros		73	77	90	90
Cuba				47	67
Dominica		60	95	95	95
Dominican Republic	80	99	99	99	99
Fiji	30	68	96	96	94
Grenada	69	75	82	82	82
Guinea-Bissau		20	30	30	30
Guyana			93	93	93
Haiti	40	58	60	60	60
Jamaica	60	90	95	95	98
Kiribati	22	19	20	48	48
Maldives	83	100	100	100	100
Marshall Islands					

	2014	2015	2016	2017	2018
Mauritius	90	93	95	99	99
Micronesia					15
Nauru	98	98	98	98	98
Palau		88	88	88	88
Papua New Guinea	35	35	61	64	64
Saint Kitts and Nevis	62	90	100	100	100
Saint Lucia		37	37	70	97
Saint Vincent and the Grenadines	100	100	100	100	100
Samoa	75	86	85	91	91
Sao Tome and Principe	13	19	90	93	93
Seychelles	90	90	90	90	99
Singapore	100	100	100	100	100
Solomon Islands	50	19	19	25	45
Suriname	12	80	100	100	100
Timor-Leste	96	96	97	97	96
Tonga	45	86	95	95	95
Trinidad and Tobago	75	85	89	94	99
Tuvalu		19	20	48	48
Vanuatu	24	51	80	98	98
SIDS	**52**	**67**	**78**	**85**	**86**

Source: ITU

Table 7-7: Internet users (%)

	2014	2015	2016	2017	2018
Antigua and Barbuda	68	70	73	76	81
Bahamas	77	78	80	81	82
Bahrain	87	93	98	96	96
Barbados	75	76	80	81	82
Belize	54	60	67	68	70
Cabo Verde	37	44	50	59	58
Comoros	8	10	13	17	21
Cuba	27	35	40	53	55
Dominica	58	65	67	70	71
Dominican Republic	50	54	64	68	70
Fiji	46	55	66	67	69
Grenada	52	61	70	71	72
Guinea-Bissau	7	8	8	9	10
Guyana	34	43	53	56	60
Haiti	7	14	21	29	32
Jamaica	40	42	46	58	60
Kiribati	20	21	22	23	24
Maldives	69	73	78	83	85
Marshall Islands	16	20	24	29	35
Mauritius	47	50	54	57	61
Micronesia	15	22	33	35	36
Nauru	36	37	38	42	45
Palau	39	39	46	58	70
Papua New Guinea	7	8	10	11	12
Saint Kitts and Nevis	68	76	77	78	80
Saint Lucia	40	43	47	51	52
Saint Vincent and the Grenadines	47	52	56	66	70
Samoa	21	33	53	61	70
Sao Tome and Principe	24	26	28	30	34
Seychelles	54	61	70	72	75

	2014	2015	2016	2017	2018
Singapore	79	80	79	84	87
Solomon Islands	8	9	11	14	17
Suriname	42	53	65	66	66
Timor-Leste	18	20	22	24	27
Tonga	33	37	41	45	50
Trinidad and Tobago	60	64	67	71	75
Tuvalu	27	29	31	33	35
Vanuatu	19	22	24	26	29
SIDS	**40**	**44**	**49**	**53**	**56**

Source: ITU

Table 7-8: Mobile broadband prepaid prices (500 MB), 2017

Economy	Mobile-broadband, prepaid handset-based (500 MB)			Monthly data allow-ance (MB)	Tax rate included (%)	GNI p.c., USD, 2017
	as % of GNI p.c.	USD	PPP			
Antigua and Barbuda	1.13	13.33	16.45	3072	15.0	14,170
Bahamas	0.44	10.75	9.42	2048	7.5	29,170
Bahrain	0.63	10.64	17.37	4096		20,240
Barbados	1.16	15.00	12.23	1536	17.5	15,540
Belize	4.10	15.00	26.32	2400	12.5	4,390
Cabo Verde	1.44	3.58	7.66	500	15.0	2,990
Comoros	15.19	9.62		600		760
Cuba	1.12	8.00		600		8,541
Dominica	3.50	20.37	27.92	1536	15.0	6,990
Dominican Republic	1.98	10.93	23.35	1024	30.0	6,630
Fiji	2.80	11.59	18.65	3200	9.0	4,970
Grenada	3.68	29.63	39.81	3000	15.0	9,650
Guinea-Bissau	12.49	6.87	16.40	600	15.0	660
Guyana	1.56	5.81	9.15	500	16.0	4,460
Haiti	4.39	2.78	6.35	1000	10.0	760
Jamaica	1.38	5.47	8.78	800	16.5	4,750
Kiribati	6.62	15.33		1800		2,780

Economy	Mobile-broadband, prepaid handset-based (500 MB)			Monthly data allow-ance (MB)	Tax rate included (%)	GNI p.c., USD, 2017
	as % of GNI p.c.	USD	PPP			
Maldives	0.86	6.82	8.80	500	6.0	9,570
Marshall Islands	3.80	15.00				4,740
Mauritius	0.67	5.68	10.07	800	15.0	10,140
Micronesia	10.03	30.00		2048		3,590
Nauru	2.78	23.66		1800	15.0	10,220
Palau	1.94	25.00		2000		15,500
Papua New Guinea	6.25	12.54	15.29	600	10.0	2,410
Saint Kitts and Nevis	1.03	13.70	17.93	1024	17.0	16,030
Saint Lucia	1.72	12.59	16.15	3072	15.0	8,780
Saint Vincent and the Grenadines	5.49	32.00	44.46	6144	15.0	6,990
Samoa	4.63	15.82	21.53	2080	15.0	4,100
Sao Tome and Principe	3.12	4.60	7.37	900	5.0	1,770
Seychelles	1.23	14.51	22.93	600	15.0	14,180
Singapore	0.16	7.24	8.52	1024	7.0	54,530
Solomon Islands	17.43	27.89	28.06	3277	10.0	1,920
Suriname	3.99	20.03	46.19	7168	8.0	6,020
Timor-Leste	2.68	4.00	6.13	800		1,790
Tonga	2.17	7.25	9.82	500	15.0	4,010
Trinidad and Tobago	1.33	19.59	23.42			16,620
Tuvalu	1.65	7.46		500		5,430
Vanuatu	3.10	7.53	6.90	800	12.5	2,920

Note: PPP=Purchasing Power Parity. For Cuba, GNI not available so GDP used. Data for Marshall Islands refers to "Wi-Fi access via mobile phone." Data for Tuvalu refer to 2018. Data for Trinidad and Tobago refer to 2016.

Source: ITU. GNI p.c. and purchasing power parity values are based on World Bank data.

Table 7-9: Net enrolment rate, secondary, both sexes (%)

	2014	2015	2016	2017
Antigua and Barbuda	73	74		74
Bahamas			82	
Belize	69	70	72	70
Barbados	99	99	96	96
Comoros	45			43
Cabo Verde	64	65	65	64
Cuba	87	86	87	87
Dominica		86	93	
Dominican Republic	67	68	69	70
Fiji	82	84	85	85
Micronesia	53	54	57	52
Guinea-Bissau	20			
Grenada	82	85	87	76
Guyana	60			
Haiti	20			
Jamaica	72	72	73	74
Kiribati	68			
Saint Kitts and Nevis	86			
Saint Lucia		81	78	80
Maldives	64			
Marshall Islands		64	63	
Mauritius		85	84	85
Nauru	72		67	
Palau	95	95		
Papua New Guinea			33	
Singapore			100	
Solomon Islands	33	33	34	33
Sao Tome and Principe	62	65		
Suriname	56	59		
Seychelles	82	89		90

	2014	2015	2016	2017
Timor-Leste	44	49	55	59
Tonga	75	76		
Trinidad and Tobago	82			
Tuvalu	75	81	70	
Saint Vincent and the Grenadines	86	84	90	91
Vanuatu		49		
Samoa	80	77	77	
SIDS	**72**	**73**	**75**	**76**

Note: In some cases, the earliest available data is shown in 2014.

Source: UNESCO Institute of Statistics and Ministries of Education.

Table 7-10: ICT Regulatory Tracker 2018

Country	Regulatory Authority	Regulatory Mandate	Regulatory Regime	Competition Framework	Overall	World Rank	Generation
Antigua and Barbuda	8	12	8	13	41	174	2G
Bahamas	19	19	26	25	89	35	4G
Bahrain	17	18	26	26	87	46	4G
Barbados	17	13	18	21	69	123	2G
Belize	17	19	20	7	63	141	2G
Cabo Verde	17	20	23	21	81	79	3G
Comoros	17	19	24	22	82	73	3G
Cuba	2	12	14	5	33	179	1G
Dominica	11	16	20	26	73	106	3G
Dominican Republic	19	20	28	28	95	8	4G
Fiji	13	14	19	17	63	138	2G
Grenada	14	17	20	23	74	99	3G
Guinea-Bissau	10	10	8	18	46	168	2G
Guyana	18	18	15	11	62	143	2G
Haiti	14	20	10	15	59	151	2G
Jamaica	19	13	19	28	79	90	3G
Kiribati	13	19	4	12	48	167	2G
Maldives	13	20	12	8	53	161	2G

Country	Regulatory Authority	Regulatory Mandate	Regu-latory Regime	Compe-tition Framework	Overall	World Rank	Genera-tion
Marshall Islands	2	7	4	3	16	186	1G
Mauritius	18	21	15	27	81	81	3G
Micronesia		4	4		8	190	1G
Nauru	10	12	6	23	51	163	2G
Papua New Guinea	16	20	12	11	59	151	2G
Saint Kitts and Nevis	5	15	6	20	46	168	2G
Saint Lucia	16	18	24	27	85	62	4G
Saint Vincent and the Grenadines	17	18	18	27	80	85	3G
Samoa	14	17	22	13	66	130	2G
Sao Tome and Principe	16	17	21	21	75	95	3G
Seychelles	6	12	16	28	62	143	2G
Singapore	17	22	26	27	92	26	4G
Solomon Islands	9	14	8	4	35	177	1G
Suriname	15	17	18	10	60	149	2G
Timor-Leste	13	21	3	5	42	172	2G
Tonga	1	11	15	23	50	165	2G
Trinidad and Tobago	18	19	22	26	85	61	4G
Tuvalu		4.5		5	10	189	1G
Vanuatu	17	15	14	26	71	114	3G

Source: ITU, at: https://www.itu.int/net4/itu-d/irt/#/tracker-by-country/regulatory-tracker/2018

Table 7-11: E-Government Development Index (EGDI)

Rank	Country	Sub-Region	EGDI	Online Service Component	Telecom Infrastructure Component	Human Capital Component
90	Antigua and Barbuda	Caribbean	0.5906	0.4583	0.5617	0.7518
72	Bahamas	Caribbean	0.6552	0.7014	0.5393	0.7249
46	Barbados	Caribbean	0.7229	0.6667	0.6719	0.8301
132	Belize	Central America	0.4115	0.3333	0.2247	0.6765
112	Cabo Verde	Western Africa	0.498	0.4861	0.3926	0.6152
182	Comoros	Eastern Africa	0.2336	0.0972	0.0871	0.5166

Rank	Country	Sub-Region	EGDI	Online Service Component	Telecom Infrastructure Component	Human Capital Component
134	Cuba	Caribbean	0.4101	0.2986	0.1455	0.7862
93	Dominica	Caribbean	0.5794	0.6111	0.4775	0.6497
95	Dominican Republic	Caribbean	0.5726	0.6597	0.3655	0.6927
102	Fiji	Melanesia	0.5348	0.4583	0.3562	0.7899
89	Grenada	Caribbean	0.593	0.4931	0.4658	0.8202
187	Guinea-Bissau	Western Africa	0.1887	0.0764	0.1028	0.3869
124	Guyana	South America	0.4316	0.4306	0.2541	0.6102
163	Haiti	Caribbean	0.3047	0.4444	0.1078	0.362
118	Jamaica	Caribbean	0.4697	0.3194	0.3941	0.6957
153	Kiribati	Micronesia	0.345	0.2986	0.0773	0.6591
97	Maldives	Southern Asia	0.5615	0.4931	0.5159	0.6754
149	Marshall Islands	Micronesia	0.3543	0.2292	0.1037	0.7301
66	Mauritius	Eastern Africa	0.6678	0.7292	0.5435	0.7308
161	Micronesia	Micronesia	0.3155	0.1458	0.1118	0.6889
158	Nauru	Micronesia	0.3324	0.1319	0.3033	0.5619
111	Palau	Micronesia	0.5024	0.3264	0.3346	0.8462
171	Papua New Guinea	Melanesia	0.2787	0.2708	0.0875	0.4778
71	Saint Kitts and Nevis	Caribbean	0.6554	0.5347	0.6825	0.7491
119	Saint Lucia	Caribbean	0.466	0.2847	0.411	0.7022
104	Saint Vincent and the Grenadines	Caribbean	0.5306	0.4514	0.4583	0.682
128	Samoa	Polynesia	0.4236	0.3403	0.2064	0.7241
154	Sao Tome and Principe	Middle Africa	0.3424	0.1389	0.3053	0.583
83	Seychelles	Eastern Africa	0.6163	0.6181	0.5008	0.7299
7	Singapore	South-Eastern Asia	0.8812	0.9861	0.8019	0.8557
169	Solomon Islands	Melanesia	0.2816	0.2431	0.1285	0.4732
116	Suriname	South America	0.4773	0.2917	0.4595	0.6808
142	Timor-Leste	South-Eastern Asia	0.3816	0.3125	0.2937	0.5387

Rank	Country	Sub-Region	EGDI	Online Service Component	Telecom Infrastructure Component	Human Capital Component
109	Tonga	Polynesia	0.5237	0.4722	0.2951	0.8039
78	Trinidad and Tobago	Caribbean	0.644	0.6389	0.5735	0.7195
144	Tuvalu	Polynesia	0.3779	0.2222	0.2693	0.6422
137	Vanuatu	Melanesia	0.399	0.4375	0.192	0.5675

Source: UN. 2018. United Nations E-Government Survey.

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