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ECLAC SUBREGIONAL HEADQUARTERS FOR THE CARIBBEAN

Artificial intelligence readiness in the Caribbean

An exploratory review

Dale Alexander
Lika Døhl Diouf
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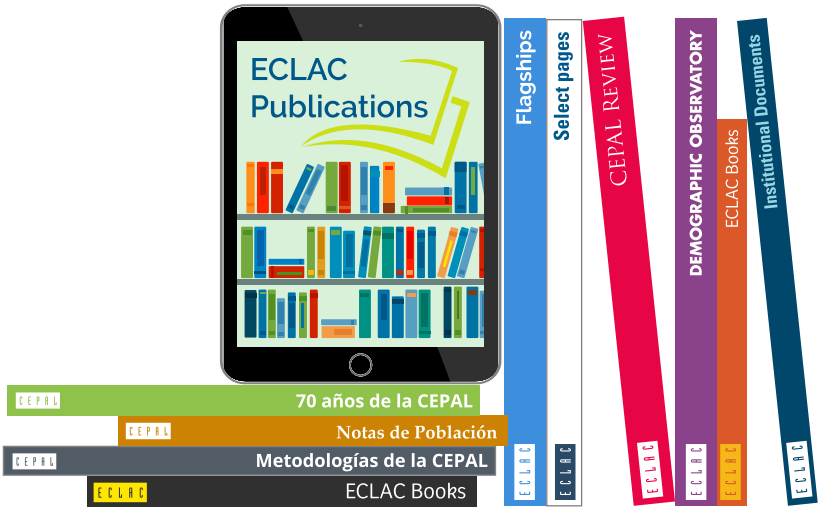

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Abstract

Artificial intelligence tools have recently become widely available, and their use has increased rapidly within just a few years. Policymakers and other stakeholders all over the world, including the Caribbean, are seeking to identify ways to use these powerful tools for sustainable development and address their associated risks. This study focuses on the Caribbean perspective by drawing together data from a wide range of sources to form an overview of the current state of AI readiness in the Caribbean. In exploring this topic, the study identifies further areas for research, and provides a set of recommendations for policymakers, academia and the private sector to enhance the AI readiness of the subregion.

Introduction

Artificial intelligence (AI) is a field of computer science that can be described simply as one striving to make machines intelligent, or able to think. Oliveira and Figueiredo (2024) note the rapid developments in the field of AI since the 1950s, explaining the many different ways in which machines are now being trained, and the increasing number of fields of application. Due to the rapid developments in the field and the many areas of application, defining AI systems is an ongoing task. The OECD (2024) defines an AI system as a "machine-based system that, for explicit or implicit objectives, infers, from the input it receives, how to generate outputs such as predictions, content, recommendations, or decisions that can influence physical or virtual environments" (p.4), with varying levels of autonomy and adaptiveness after being deployed.

AI systems, when applied well, can increase efficiency; and support resource management, climate mitigation, disaster response and economic transformation United Nations (2023a). The International Telecommunication Union (2021), asserts that big data and AI could in many ways help to address key global challenges and be a means to increase economic vitality and resolve social problems, including in the fields of health, agriculture and education. For Small Island Developing States (SIDS), the ability of AI systems to process and analyse vast amounts of data, perform multiple tasks simultaneously and automate processes, could be harnessed to significantly advance the Sustainable Development Goals (SDGs), and the SIDS agenda. Important areas of application include increasing efficiency across the productive sectors, supporting environmental management and conservation efforts, forecasting extreme weather events, and preserving the unique cultural heritage of SIDS (Simon Institute, 2023).

However, these potential benefits will not materialize automatically, and the use of AI also carries risks, such as disruption to job markets and economies, loss of cultural diversity, and new AI-enabled weapons that increase misinformation and surveillance (United Nations 2023b). Research by Vinuesa and others (2020) suggests that while AI could support the achievement of many of the targets of the 2030 Agenda for Sustainable Development (2030 Agenda) and its SDGs, it could also inhibit the achievement of others. The authors note that developments in AI technologies are biased towards SDG issues that are mainly relevant to those nations where most AI researchers live and work. As such,

without control, the authors warn, research on AI could be expected to be directed towards where funding and commercial interests are. They also express concern that "developments in AI technologies could increase inequalities both between and within countries, in ways which counteract the overall purpose of the SDGs" (p.6). This is consistent with views shared in the final report of the United Nations Secretary-General's High-level Advisory Body on AI, where 74 per cent of experts surveyed were concerned that existing or new harms resulting from AI will become substantially more serious and/or widespread in the next 18 months due to inequalities arising from differential control and ownership over AI Technologies. Such developments would break the fundamental promise of the 2030 Agenda to "leave no one behind", and directly impede the achievement of SDG 10, which aims to "reduce inequality within and among countries".

The need for governance related to digital technologies in general, and artificial intelligence systems in particular, is widely acknowledged. Recent developments in artificial intelligence are indicative of how precarious the governance gap for digital technologies has become. Public policy processes and legislation, which were useful tools in the past, have been "too siloed to anticipate and too slow to respond to the multiple ways in which innovations affect us" (United Nations 2023a, p.10). There is also a gap in international coordination, collaboration and governance related to AI. In this regard, the United Nations Secretary-General's High-level Advisory Body on Artificial Intelligence (AI Advisory Body) further stresses the need for artificial intelligence governance, "not merely to address the challenges and risks but to ensure we harness its potential in ways that leave no one behind" (p.1). In an effort to establish a baseline for discussing AI readiness in the Caribbean, this study will explore the issue from the perspective of Government readiness, Caribbean digital readiness, and sustainability considerations for Caribbean SIDS. The study advances several recommendations to Governments, academia and the private sector, including relating to strategies, policies and legislation, digital and AI skills development and capacity-building, infrastructure development, strengthening the Caribbean workforce, and bridging digital and AI divides.

A. Methodology

Against this background, this study will provide an overview on the state of Caribbean AI readiness. While the data that are available on the Caribbean is often scattered across a myriad of sources, making it difficult to gain the full picture of the subregion, this study nevertheless seeks to present a fuller understanding of where the Caribbean stands in artificial intelligence readiness, by collating available data.

Depending on the source, "Artificial intelligence readiness" can be measured in different ways. Based on existing indices and models,[1] this study has identified 3 dimensions of AI readiness to explore:

(i) Government readiness

(ii) Caribbean digital readiness

(iii) Sustainability considerations for Caribbean SIDS

The first dimension, government readiness, explores the current AI strategies and regulations that affect or originate from Caribbean nations. The second dimension explores the current state of technology infrastructure, the private sector and the population when it comes to AI. The final dimension considers the special circumstances of the Caribbean as SIDS, and the AI revolution from an environmental sustainability and resilience perspective. By providing an overview of the Caribbean

[1] Some methodologies identified include the UNESCO (2023a) "Readiness Assessment Methodology", which was developed as a tool under the *Recommendation on the Ethics of Artificial Intelligence*; the UNDP (pilot) Artificial Intelligence Readiness Assessment (AIRA); the Oxford Insights (2023) "Government AI readiness index"; and readiness models by Cisco (2023), Deloitte (2020), and Intel (2018).

landscape in these dimensions, the study hopes to provide a detailed understanding that can help determine the level of AI readiness in the subregion and gaps that need to be filled.

The aim of this study is to consolidate the many sources of information on AI in the Caribbean, providing policymakers, academics and decision makers in the Caribbean AI space with a general overview of the AI landscape in the Caribbean, while making initial recommendations and suggesting areas for future research.

Given the pace at which the field of AI is developing, and how quickly AI tools have become generally available to the public, data and research on the impacts of AI and AI readiness are limited. This study is therefore not comprehensive in its assessment. As a desk study, the research material used is limited to online sources and what the authors have been able to gather from collaborators across the world. As such, there may be gaps that originate in the source material. This study will occasionally note where such gaps exist and may identify related areas for future research. It is expected that this would also serve as valuable information for policymakers, academic researchers and others seeking to navigate or further explore the Caribbean AI landscape.

I. Government readiness

Governments play an essential role in determining the AI readiness of a country, both as policymakers and regulators, and as an important potential user of AI. This section discusses the readiness of Caribbean Governments to govern AI, both in general, using the 2023 Government AI Readiness Index (GAIRA), and specifically from a strategic and regulatory perspective. Strategic vision or strategic leadership is an essential element of readiness. Most of the AI readiness models and assessments reviewed emphasize the importance of top-down support for the implementation of AI, and use for example policies, declarations, and guidelines as evidence of strategic readiness. The section on AI regulation primarily considers AI laws and regulations that could impact the Caribbean, including implications for the Associate Member Countries.

The 2023 Government AI Readiness Index (GAIRA), prepared by Oxford Insights, assesses the AI readiness of the governments of the 193 Member States of the United Nations. The countries ranking highest for overall AI readiness were the United States with a score of 84.90 and Singapore with a score of 81.97. Of the 16 Caribbean Member States, the Dominican Republic, ranked 66th and The Bahamas, ranked 93rd had the highest scores (table 1. It should be noted that the lack of available data on some countries presented a challenge in the development of the GAIRA, and the scores of five Caribbean countries[2] were based on more than 40% (but less than 50%) imputed data (Oxford Insights 2023, pp.45-46).

Table 1
Rank and score on the 2023 GAIRA, 16 Caribbean countries
rank of 193 countries, score out of 100 points

2023 rank	Country	Total score
66	Dominican Republic	50.71
93	Bahamas	42.14

[2] Antigua and Barbuda, Dominica, Grenada, Saint Kitts and Nevis, and Saint Vincent and the Grenadines.

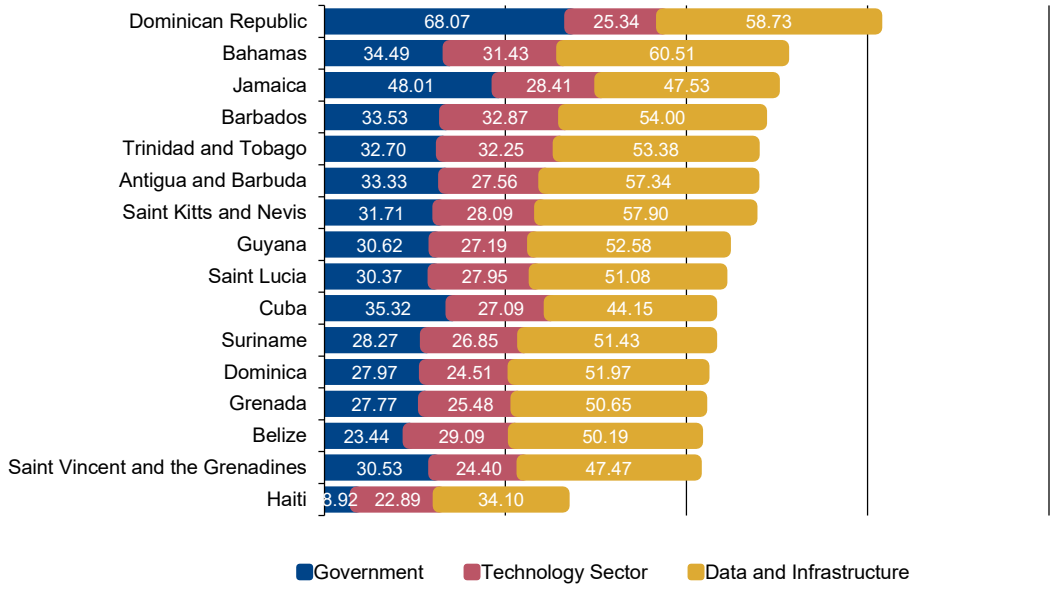
2023 rank	Country	Total score
98	Jamaica	41.32
102	Barbados	40.13
104	Trinidad and Tobago	39.44
105	Antigua and Barbuda	39.41
106	Saint Kitts and Nevis	39.23
116	Guyana	36.79
118	Saint Lucia	36.46
123	Cuba	35.52
124	Suriname	35.52
127	Dominica	34.82
128	Grenada	34.63
129	Belize	34.24
130	Saint Vincent and the Grenadines	34.13
184	Haiti	21.97

Source: Authors' elaboration based on data from Oxford insights.

The 2023 GAIRA classifies AI readiness using three pillars, each comprising dimensions and indicators specific to the pillar. The first, Government, assesses Vision; Governance and ethics; Digital capacity; and Adaptability. The second, Technology, assesses Maturity; Innovation capacity; and Human capital. The third pillar, Data and Infrastructure, assesses Infrastructure; Data availability, and Data representativeness. Using these pillars, the index considers the broader landscape and specific dimensions that lead to AI readiness.

As figure 1 illustrates, there are notable variations in the scores of the Caribbean countries. Among the 16, the Dominican Republic and Jamaica score highest on government, Barbados and Trinidad and Tobago on technology sector, and The Bahamas and the Dominican Republic on data and infrastructure.

Figure 1
Scores on the 2023 Government AI Readiness Index, by pillar



Source: Author's elaboration based on data from Oxford insights
Note: Each pillar is scored from 0 to 100 points

The widest variation in scores is found in the Government pillar, where scores range from 8.92 to 68.07. The vision dimension of the government pillar, which looks at the existence of a national AI strategy, is an area where all countries, except the Dominican Republic, score 0.00, given that they have not adopted AI strategies. Under the governance and ethics dimension, the lack of cybersecurity measures and ethical principles in effect for AI, are two areas that further pull down the scores of the Caribbean countries. The scores in the technology sector pillar range from 22.89 to 32.87, compared to 90.40 for the highest scoring country in the world (Singapore). Under each of these dimensions, there are one or more indicators where all or most of the countries score 0.00. This includes indicators on AI research conducted, activity on a relevant technology platform, and the quality of engineering and technology higher education. The data and infrastructure pillar has the highest average score for the subregion, where scores range from 34.10 to 60.51. Under data availability, the data governance indicator, which is measured through scores on the GovTech Maturity Index (2021), is primarily responsible for pulling down the scores of the Caribbean countries.

Overall, the index identifies gaps related to policy direction, governance, technology sector maturity, human preparedness, and certain types of infrastructure in the Caribbean. Additionally, there are data gaps relating to other areas that impact several Caribbean countries. Further, some of the indicators used are not suited for use in smaller countries, particularly in the Global South, such as Caribbean SIDS. There are also elements of government AI readiness that are important yet have not been assessed in the index. This includes the skills and competencies of public servants, as well as the barriers to the implementation of digital solutions in government, as assessed by public servants. Relevant competencies related to this are set out in "Artificial Intelligence and Digital Transformation: Competencies for Civil Servants" (Broadband Commission, 2022) which provides an overview of the major digital competencies that public servants would need to deal with digital transformation.

Within this context, the state of strategic and regulatory readiness must be studied further to better understand AI readiness in Caribbean governments. The following sections explore the strategic visions relating to AI and the regulatory frameworks that exist to support AI implementation.

A. Strategic readiness

Strategic readiness here considers the actions of Governments to create an enabling environment for the safe and ethical adoption of AI, including through global, regional and other international cooperation efforts. This section provides an overview of some declarations, resolutions, policies, and strategies on AI that involve or may have implications for Caribbean countries and territories. As AI policy is in its nascent stage in the Caribbean, it will also consider national policies and strategies relating to adjacent aspects of AI readiness, such as e-government and digital transformation.

1. Global

At the global level, the *Recommendation on the Ethics of Artificial Intelligence* (Recommendation) (UNESCO, 2021b) was adopted by all 193 UNESCO Member States, which includes 16 Caribbean countries (UNESCO, 2023d). The Recommendation addresses ethical issues related to AI and the features of AI systems. It provides guidance to all AI actors, including the public and private sectors, by providing a basis for an ethical impact assessment of AI systems throughout their life cycle.

The Recommendation is noted in the recently adopted United Nations General Assembly resolution 78/265, which is aimed at "seizing the opportunities of safe, secure and trustworthy artificial intelligence systems for sustainable development".[3] The resolution recognizes the risks and governance challenges associated with AI, and seeks to encourage inclusive, multi-stakeholder collaboration in the national and international governance of AI. It actively promotes the use of AI to achieve the SDGs and address global challenges. It also encourages cooperation with and the provision of assistance to developing countries, including by aiming to increase funding for SDG-related research and innovation related to digital technologies and AI. While this resolution is not the first to mention AI, it is the first to address AI comprehensively as its own topic.

In July 2024, the General Assembly also adopted resolution 78/311 on "Enhancing international cooperation on capacity-building of artificial intelligence".[4] This resolution specifically addresses the SDGs, and the "need and urgency to narrow the disparities and assist developing countries in [AI] capacity-building so that they will not be further left behind."(p.2) It also sets out the principle of AI "for good for all", and the vision of a people-centred, inclusive and development-oriented information society. It encourages the international community to increase financing and technical assistance to developing countries and strengthen cooperation and partnerships to address major structural impediments and obstacles.

2. Regional

At the regional level, the Eighth Ministerial Conference on the Information Society in Latin America and the Caribbean adopted the Digital Agenda for Latin America and the Caribbean (eLAC2024) in November 2022. The Digital Agenda contains few references to AI but seeks to promote the development of digital skills and competencies that meet current and future employment demands, especially in cybersecurity and emerging technologies. It also aims to promote the effective use of emerging digital technologies to foster productivity, innovation and entrepreneurship, including solutions derived from AI, while safeguarding human rights and the ethical use of technology.

In October 2023, 20 Latin American and Caribbean (LAC) States adopted the Santiago Declaration to Promote Ethical Artificial Intelligence (Santiago Declaration) (Declaración de Santiago, 2023). Ministers in charge of digital and AI policies from six Caribbean countries participated, namely

[3] This resolution was co-sponsored by 123 States, including The Bahamas, the Dominican Republic, Haiti, Suriname and Trinidad and Tobago from the Caribbean.

[4] The resolution had 143 co-sponsors, including Antigua and Barbuda, Barbados, Cuba, Dominica, Dominican Republic, Guyana, Suriname and Trinidad and Tobago from the Caribbean.

Cuba, the Dominican Republic, Jamaica, Saint Lucia, Saint Vincent and the Grenadines and Suriname (InvestChile, 2023). The declaration expresses a desire to deepen regional dialogue regarding the development and deployment of AI in the region. The signatories agreed to conduct a needs analysis on the elaboration and adoption of new legal frameworks and regulations for the design, development, and responsible use of AI.

The proclamations made in the Santiago Declaration cover many of the issues of concern that have been raised relating to AI, such as the impact of AI on the labour market, the need to measure the impact of AI on society, and the need to strengthen capacities related to AI. It proclaims that States should establish effective national institutional frameworks, with a human rights approach, for the proper management of AI. The declaration also has an inclusive perspective, in that it seeks to develop the capabilities of all individuals to use and benefit from AI in their personal, professional and social lives.

More recently, on 9 August 2024, 17 LAC countries signed the EU-LAC Cartagena de Indias Declaration on Governance, the Construction of AI Ecosystems, and the Promotion of AI Education in an Ethical and Responsible Manner in Latin America and the Caribbean (Cartagena Declaration). This included 5 Caribbean countries, namely Cuba, Curaçao, the Dominican Republic, Guyana and Suriname. By constructing ecosystems that would allow for the development and deployment of ethical safe and inclusive AI, the Cartagena Declaration seeks to make AI a catalyst for local innovation, sustainable development and growth. To that end, it promotes the exchange of knowledge, information, good practices, and other resources, as well as exchanges and collaboration in the areas of infrastructure, computing capacity, and scientific advancement, among others. Digital skills, including critical thinking and media literacy, are also an important focus of the Cartagena Declaration. It promotes education, training, capacity-building and upskilling in the field of AI, and the exchange of good practices related to the use of AI in education. The envisaged programmes are meant to promote inclusive digital literacy incorporating critical thinking and human-centred perspectives, covering everything from basic concepts to advanced skills. Related to governance, the Cartagena Declaration promotes data protection and regional dialogue to agree on common positions to defend the interests of the region, among others. It also stresses that any international AI governance framework has to consider the regional particularities of LAC, promote the participation of LAC countries in its design and implementation, and pay particular attention to closing gaps in access, talent, data, infrastructure and regulatory capacity.

3. Subregional

Regarding AI policies in the Caribbean, work has been ongoing through UNESCO's (2021a) Caribbean AI initiative, which developed the draft Caribbean AI Policy Roadmap in 2021. This roadmap was revised in 2024, in light of the growing interest of Caribbean governments in digital transformation and the increased public awareness of and interest in AI tools. The revised roadmap proposes four pillars for governing AI integration in the Caribbean. Through its pillars, the roadmap seeks to support the efforts of policymakers to establish robust governance frameworks to mitigate risks; provide Caribbean citizens with opportunities to acquire the skills and knowledge necessary to participate in the AI revolution; adapt to the AI revolution through multistakeholder collaboration and capacity-building; and explore how to respect and promote the region's rich cultural heritage while also capitalizing on AI's innovative potential. These are all encapsulated in an ethical, human-centred approach.

The CARICOM Declaration on Autonomous Weapons Systems (Caricom, 2023) focuses on autonomous weapons (AWS), which may use AI to operate and is particularly concerned with the disparities that AWS technologies could create, stressing that "advancements in AI and AWS should not be leveraged to undermine human rights, exacerbate prevailing inequalities, nor deepen discrimination on the basis of race, ethnicity, nationality, class, religion, gender, age, or other status" (p.2). The declaration calls upon states to acknowledge the perils of digital dehumanization, meaning "the process

whereby humans are reduced to data, which is then used to make decisions and/or take actions that negatively affect their lives" (ADR, 2022, p. 2).

In the Caribbean, ECLAC has facilitated conversations at the highest political level on AI, big data and their policy implications, including at a seminar entitled "Positioning the Caribbean in the knowledge economy: The role of data" (ECLAC, 2023b), and, in collaboration with other international stakeholders, the Big Data Forum in Trinidad and Tobago (United Nations in Trinidad and Tobago, 2023). Further, the Caribbean Telecommunications Union (CTU), in collaboration with a number of subregional actors, including from academia and the private sector, has also addressed many AI policy-related issues through online events and work with stakeholders in the Caribbean. In November 2023, it established a task force, meant to operate for one year, which so far has focused on information gathering and awareness building. Already, due to subregional interest and work, the group has evolved into a multistakeholder working group. For 2025, the working group is planning to work on a subregional AI policy framework and strategy (Cassimire, 2024).

At the national level, the development of artificial intelligence strategies is still in the emerging stages in the Caribbean. The Organization for Economic Cooperation and Development (OECD) maintains an AI policy observatory, which includes in its repository over 1000 AI policy initiatives (OECD.AI). Currently, the database does not include any policy initiatives from any Caribbean country, however additional research has identified that an AI strategy has been developed for the Dominican Republic (Gobierno de la República Dominicana, 2023), and that Cuba and Jamaica are in the process of developing their AI strategies (Oxford Insights, 2023). Trinidad and Tobago also appears to be in the process of analysing the AI landscape, with a view of crafting a policy tailored to its unique context (Martinescu, 2024).

While AI-specific strategies may be lacking in the subregion, many governments have created some form of a digital transformation strategy. Trinidad and Tobago, for example, has the National Strategy for a DigitalTT which prioritizes "digital society, digital economy, digital government, and regional linkages and global networks." Other countries have created dedicated departments such as The Bahamas' Department of Digitization and Transformation or added on to existing departments such as Belize's Ministry of Public Utilities, Energy, Logistics, and E-Governance. International organizations including the UNDP and The World Bank have partnered with countries such as Antigua and Barbuda, Dominica, Grenada, Saint Lucia, and Saint Vincent and the Grenadines to help implement digital government projects. While these strategies and projects may not address AI directly, the efforts made can serve as a foundation for AI implementation in the future.

4. SIDS and the Commonwealth

Work related to AI involving countries of the subregion has also been ongoing through SIDS mechanisms and through the Commonwealth. The Antigua and Barbuda Agenda for SIDS (ABAS, 2024) includes several provisions relating to digital transformation, innovation and bridging digital divides. AI is specifically mentioned in the sections on data collection, analysis and use, and on Science, Technology, Innovation and Digitalization (STID). Through the Agenda, States committed to strengthening data collection, storage and analysis, including by enhancing science-based and innovative approaches, including AI. They also committed to advancing digitalization in SIDS by assisting the development of policies and legislation to create an enabling environment to among other things leverage AI, taking into account SIDS' unique needs.

The Commonwealth (2023b), which includes 11 Caribbean States, has established the Commonwealth AI Consortium (CAIC), to provide support to its members in three core areas, including a Commonwealth framework for sovereign AI Strategy, a pan-Commonwealth digital upskilling of national workforces and a Commonwealth AI Cloud aimed at unlocking the full benefits of AI. In late 2023, CAIC agreed on an action plan that seeks to leverage the power of artificial intelligence (AI) tools

to support small states (2023a). The Commonwealth has also designated several AI champions, including Antigua and Barbuda and Trinidad and Tobago from the Caribbean.

Overall, it is clear that Caribbean countries, in varying configurations, are engaged in discussions on AI, and are seeking to establish a strategic direction for the subregion. While work at the national level is limited, Caribbean countries are seeking to deepen international and multistakeholder collaboration to maximize the benefits and minimize the risks associated with AI. The collaborative and international character of the ongoing work is very important, given the transboundary nature and effects of AI, and the many sectors that will be affected. It is likely that the foundations being established could lead to the development of new national policies focused on AI or including AI in the near future.

B. Regulatory readiness

Globally, AI regulation is in the very early stages of development and arguably no country or region is yet ready to fully regulate AI. Moreover, as noted by the High-level Body on AI, no one currently understands all of AI's inner workings enough to fully control its outputs or predict its evolution (United Nations 2024b). As such, governing AI presents a formidable challenge to regulators worldwide.

The European Union AI Act, which entered into force on 1 August 2024, was the first law in the world to comprehensively address AI risks, and its provisions will enter into application between 2025 and 2030. Even countries with comparatively large and mature technology and AI sectors are urgently seeking to develop their capacity to regulate AI, including the frameworks and institutions necessary to implement the EU AI Act.[5]

This section will primarily consider AI laws and regulations that could impact the Caribbean, and briefly discuss regulatory readiness in other relevant areas. As the discussions on AI regulation are more advanced in countries with more mature technological sectors, such as the United States and those in Europe, and taking into consideration several of these have territories in the Caribbean, this section will also discuss the implications of the adoption of laws and regulations in the Administering Powers on the Caribbean territories.

1. Foundational legislation

In addition to laws that specifically address and regulate AI, countries will need to adopt, or amend, legislation that regulates areas that will be impacted by artificial intelligence. This includes certain types of legislation that create the foundation for a safe and inclusive digital society, such as data protection and privacy laws and cybercrime laws. According to UNCTAD data, 12 Caribbean countries have data protection or privacy legislation either in force or in draft, while 13 have a cybercrime law in force or in draft. Some territories also have their own privacy and cybercrime legislation. Within Caribbean countries, there have been eight cybercrime and data protection laws enacted in the past five years (see Annex 1), demonstrating that countries are making an effort to strengthen their legislation. Much of the data protection legislation reviewed also enforced the ethical standards laid out by the EU's General Data Protection Regulation (GDPR). However, some of the laws date back more than 20 years, and others have been in draft for several years. Further cooperation is advised to strengthen these essential areas. Related to AI, this could encompass elements such as including the right not to be subject to a decision solely based on automated processing, and the right to access their personal data and information about the existence of automated decision-making and the logic involved, as contained in the data protection legislation of Barbados and Jamaica (OECD and CAF, 2022).

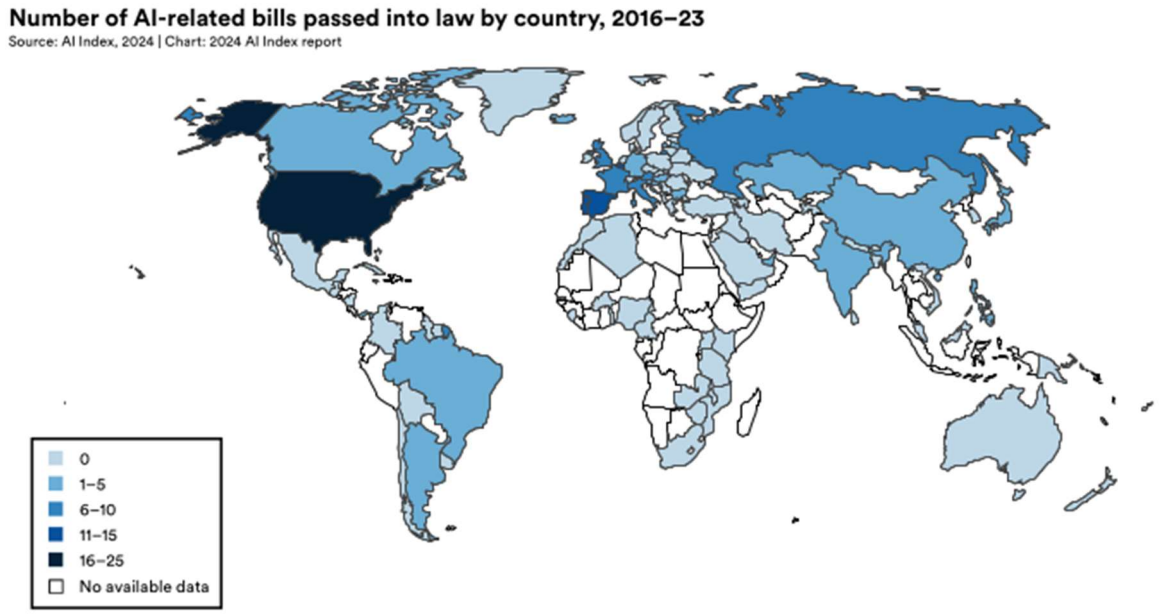
[5] See e.g. project between UNESCO and the Netherlands, "Designing Institutional Frameworks for the Ethical Governance of AI in the Netherlands", https://www.unesco.org/es/event/designing-institutional-frameworks-ethical-governance-ai-netherlands.

Such provisions would likely have implications for the design of algorithms to be used in government, as an explanation of the logic would require applied algorithms to be explainable, which is one of the fundamental principles of safe AI.

2. Caribbean national AI laws and regulations

No national AI laws or regulations have been adopted as yet in any Caribbean State. The 2024 AI Index Annual Report (Maslej and others, 2024) evaluated whether any bills mentioning AI had been passed for 128 countries, including 11 Caribbean countries and territories (see map 1).[6] The data obtained shows no bills mentioning AI adopted between 2016 and 2023 that explicitly mention AI in those 11 countries and territories.

Map 1
Number of AI-related bills passed into law by country, 2016–2023



Source: Maslej and others (2024), The AI Index 2024 Annual Report.
Note: The boundaries and names shown on this map do not imply official endorsement or acceptance by the United Nations.

Research conducted for this study has also not been able to identify any others, with the exception of one law each in Puerto Rico and the United States Virgin Islands (NCSL 2024). In Puerto Rico, HR 1097 was adopted that requires a specific commission to investigate the implications of the use of artificial intelligence technologies. In the United States Virgin Islands, B 131 was enacted to establish a real-time crime centre for government use that would employ AI to provide centralized crime data to the State Police Department.

Some Caribbean countries have begun to signal what approach they might take with regard to AI legislation. For example, Antigua and Barbuda is considering adopting an approach based on the EU AI Act and is assessing approaches taken by other nations (Loop News, 6 June 2024). Guyana is also working to create the legislative environment necessary to manage AI and the digital transformation (Guyana Chronicle, 19 March 2024). Jamaica established a taskforce in July 2023 to explore the applications and risks of AI and inform a national strategy and policy (Office of the Prime Minister, February 2024). Data from the 2024 AI Index Annual Report (Stanford University, 2024) also considered whether AI was mentioned in the legislative

[6] Antigua and Barbuda, The Bahamas, Bermuda, Barbados, Cuba, the Cayman Islands, Grenada, Guyana, Jamaica, Saint Kitts and Nevis, and Suriname.

proceedings of 83 countries, including 5 Caribbean countries and territories. Of those, Barbados and the Dominican Republic had one each, and Trinidad and Tobago had seven. In addition, several AI-related bills pending in Puerto Rico have been identified, including amendments to existing legislation adding AI use as an aggravating circumstance to crimes, and laws related to AI policy development, the use and misuse of AI during elections, and to develop an AI-based platform to tackle government corruption.

In summary, there does appear to be movement at the national level in some countries, however given the efforts made by Caribbean countries at the international level, the lack of AI laws or regulations could quickly change. Greater support for the development of legislation appropriate to national circumstances and needs would therefore be helpful. Several Caribbean countries would also likely benefit from the regulatory needs analysis to be conducted by the body established by the Santiago Declaration, which could fast-track the adoption of relevant legislation. Intensified subregional and regional cooperation in this area, including among parliamentarians, could support the development of harmonized legislation related to AI.

3. International law

At the international level, one development of potential importance to the subregion is the Framework Convention on Artificial Intelligence, Human Rights, Democracy and the Rule of Law (draft convention, AI Treaty), which was developed by the Council of Europe Committee on Artificial Intelligence, as well as several non-European States. The framework is a global instrument open to all (COE newsroom, 2024a, 2024b). Some Latin American, but no Caribbean States were involved in the negotiation of the draft convention, and its potential impact on Caribbean States can therefore only be determined after it is opened for signature. The AI Treaty could also potentially have an impact on some of the ECLAC Associate Members, if the Framework Convention on AI is ratified by France, the Netherlands, the United Kingdom or the United States. The European Union, the United Kingdom and the United States all signed the AI Treaty on 5 September 2024, when it opened for signature, but the ratification process would take some time.

Considering the constitutional regimes of each country, and assuming that no reservation is made, it is likely that if ratified by France, the AI treaty would be applicable in French Guiana, Guadeloupe, and Martinique but not in overseas collectivities such as Saint-Martin or Saint-Barthélemy. The applicability of the AI Treaty in the Kingdom of the Netherlands, which comprises Aruba, Curaçao and Sint Maarten in addition to the Netherlands, will depend on the approval of each country's legislature. It is likely to automatically apply in the Caribbean part of the Netherlands, meaning Bonaire, Saba, and Sint Eustatius. As regards the United Kingdom, unless specifically requested by the territories, it is unlikely that any ratification by the UK of the Framework Convention on AI would have an impact on the Overseas Territories in the Caribbean. Lastly, in the case of the United States Virgin Islands and Puerto Rico, these territories are considered "unincorporated territories" of the United States of America and are not subject to the treaties signed by the United States, unless explicitly extended by the United States. As such, it is unlikely that the AI Treaty will have any legal implications for these territories.

4. Laws with extraterritorial effect

The EU AI act, like the GDPR before it, will have extraterritorial effect, in that all organizations marketing or deploying AI systems in the EU will be bound to follow it, regardless of physical location. As such, it can be expected that actors in the AI space in the Caribbean will seek to align with its applicable provisions to make their system available to users in the EU. In addition to the general extraterritorial effect of the legislation, EU legislation and agreements are fully applicable in the "outermost regions" of the EU, as these are considered an integral part of the European Union. In the Caribbean, this includes French Guiana, Guadeloupe and Martinique, as well as the overseas collectivity of Saint-Martin.

As AI regulation advances across the world, other countries may also adopt laws with extraterritorial effects in order to protect their own citizens and the public order. Some major AI innovators, such as the Unites States, have adopted a self-regulation approach for AI companies. Others, such as China, are choosing to adopt laws to regulate AI, including through extraterritorial provisions. While only time will tell which countries' regulatory approaches will have the greatest impact on the global regulatory space for AI, legislators and companies in the Caribbean could benefit from monitoring the regulatory developments and thus implement measures to ensure alignment.

In summary, Caribbean countries and territories, like the majority of countries in the world, do not currently have comprehensive AI legislation in place. Given the uncertainty surrounding the technology, the rapid pace of development, and considering that policy development is in the initial stages in most countries, AI legislation is likely to take some time to develop in most countries. Few countries or territories have advanced beyond surveying the legal landscape and regulation in key areas for safe AI development. As such it is critical that foundational legislation, including data protection and cybersecurity, be strengthened to consider AI-related threats, as is already on the agenda of parliamentarians in several countries.[7]

[7] An updated cybercrime law is pending in Trinidad and Tobago as well as new data protection laws in Saint Kitts and Nevis and Suriname (see annex 1).

II. Caribbean digital readiness

Achieving readiness for artificial intelligence will first require general digital readiness, which encompasses many factors. The Pew Research Centre defines digital readiness to include digital skills ,[8] trust ,[9] and use .[10] These factors can be used to understand digital readiness at the individual level. When looking at digital readiness at the national level, factors such as infrastructure, government, and business come into play. These are some of the pillars of UNDP's Digital Readiness Assessment (UNDP n.d.), which highlights the current digital context of a country to drive further digital transformation progress. The assessment has already begun and has been completed in several countries in the Caribbean, including Trinidad and Tobago and Antigua and Barbuda (Ministry of Digital Transformation, 2022 and UNDP, 2024). The UNDP's goal with the initiative is that government officials would use the data to identify priorities and support national digital transformation.

A. Technology infrastructure readiness

Digital readiness involves infrastructure, internet access, internet quality, affordability, digital skills, and more. The revised ICT Development Index (ITU IDI), published by the International Telecommunication Union, consists of nine indicators split across two pillars, namely "Universal connectivity", covering three indicators, and "Meaningful connectivity", covering six indicators. The index covers 169 countries, including 13 Caribbean States.[11]

The highest-ranking Caribbean country overall is the Bahamas, with a rank of 40 globally, and third in the Americas, behind the United States and Chile. Saint Kitts and Nevis, at rank 69, and Antigua and Barbuda, at rank 81, are the only other countries from the Caribbean in the top half of the index.

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[8] The skills necessary for online activities.

[9] A person's capacity to determine trustworthiness.

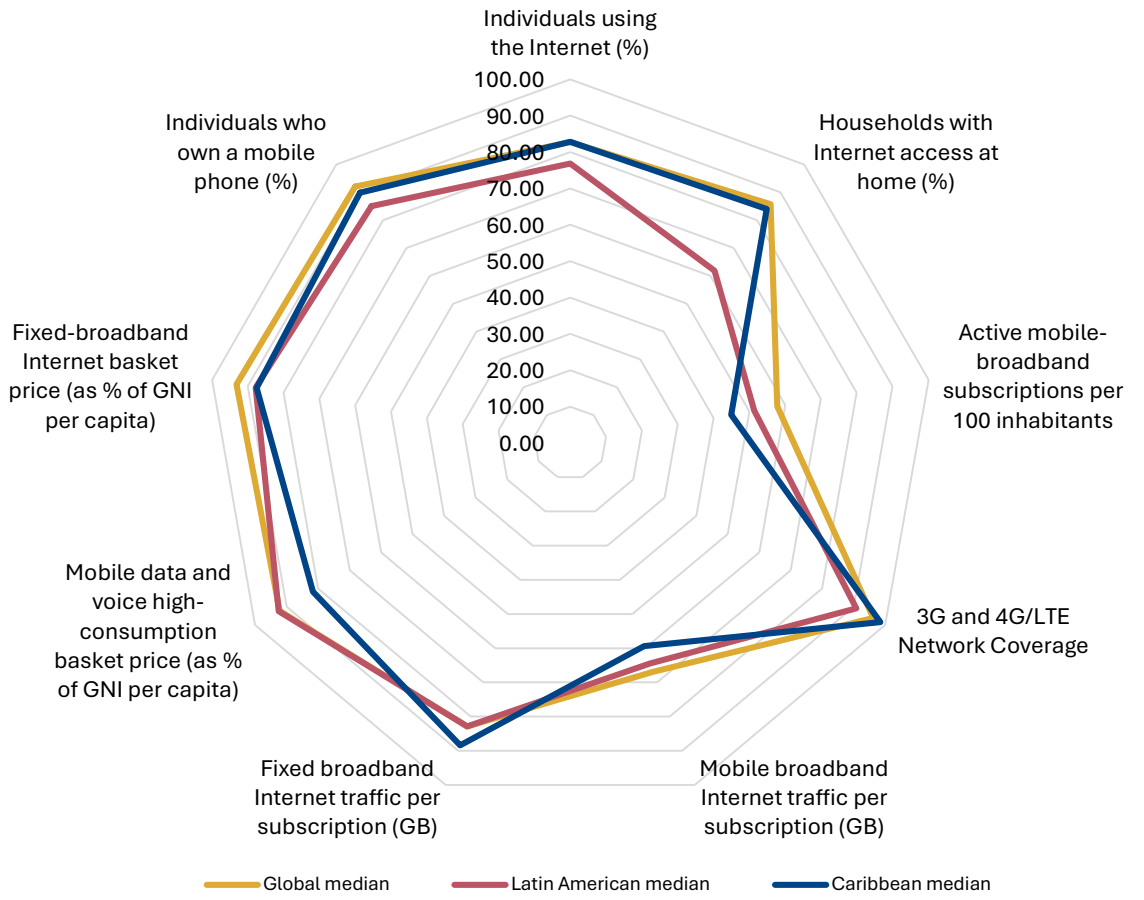
[10] The degree to which persons use digital tools.

[11] The index includes all the Member States for which enough data was available that consented to being included. The Caribbean countries not scored are Belize, Guyana and Haiti.

The lowest ranked Caribbean country is Cuba, with a rank of 135 globally. Overall, this suggests that the Caribbean as a subregion is less advanced in terms of ICT development than the global average. However, as ITU notes, this index does not cover all aspects of ICT development. There may therefore be elements that are relevant, where Caribbean countries would score well, that are not included in this measure.

Examining the normalized progress scores is useful when comparing the Caribbean with other parts of the world. Plotting the Caribbean median against the Latin American and global medians, illustrates the relative standing of the subregion on these indicators (figure 2).

Figure 2
Normalized progress scores (0-100) on each of the 9 ITU IDI Indicators
Global median, Caribbean median, Latin American median



Source: Authors' elaboration based on data from 2023 ITU IDI.
Note: Medians are based on data from up to 13 Caribbean countries (noted above) and up to 17 Latin American countries: ARG, BRA, BOL, CHL, COL, CRI, ECU, GTM, HND, MEX, NIC, PAN, PRY, PER, SLV, URY, VEN. Data availability varies by indicator.

The Caribbean scores below the global median on six of the nine indicators. The data suggests that the average Caribbean citizen uses the internet at the same rate as the average global citizen, has slightly better 3G and 4G/LTE coverage, and uses more fixed broadband internet. However, the Caribbean citizen is slightly less likely than the global citizen to have internet at home or own a mobile phone, pays significantly more for broadband internet access, especially mobile broadband, and

is significantly less likely to have an active mobile broadband subscription or to use a lot of mobile data, likely due to the high cost of mobile data. Data from the ITU ICT Price Baskets (IPB) shows that the high cost of mobile data is a common challenge among the Member States and Associate Member Countries of the Caribbean. Prices also vary among the territories, as a mobile data and voice high-consumption basket costs PPP$0.01 above the global median (PPP$23.76) in Puerto Rico, but costs 2.8 times more (PPP$66.71) in Curaçao. As the IPB prices are adjusted to cost of living, territories with higher costs are likely to experience challenges related to uptake and use of digital technology.

In this regard, one of the necessary conditions for AI uptake is robust broadband connectivity, without which the development and expansion of AI is said to be close to impossible (ESCAP, 2018). Access to fifth generation mobile networks (5G) is often considered one of those conditions, however few Caribbean markets have deployed commercially available 5G (GSMA, 2022). Representatives of operators within the subregion have stated that there is no business case for 5G in the Caribbean (Morris, 2023) which means that Governments would need to cover a larger share of the cost of investment in 5G. With broadband access already being unaffordable in the Caribbean, it is likely that 5G deployment would further widen the digital and AI divides in the subregion, unless legal and policy measures are taken to curb cost increases.

While analyses based on averages cannot represent the diversity of human experiences within a country, they can point to potential issues to be explored and addressed. In this case, the data reflects some concerns and realities that have been raised and discussed by policymakers and other experts in the subregion and by ECLAC. In response to discussions on affordability in the context of digital inclusion, ECLAC (2023a) discussed policy measures to improve broadband quality and affordability in the Caribbean. Caribbean countries have also developed national policies and initiatives to increase affordable access to broadband, which were discussed in a 2023 ECLAC study on digital inclusion in the Caribbean (Alexander et al 2023).

1. Supercomputers and data centres

In addition to essential infrastructure discussed above, AI readiness requires specific types of infrastructure, such as supercomputers or data centres. In the GAIRA, all countries in the subregion score 0.00 on the indicator relating to supercomputers, as the data is drawn from a list of the top 500 supercomputers in the world, i.e. the most powerful for which information is available. It is noted, however, that some countries opt not to share information about the capabilities of their supercomputers, and that the list may have gaps. While no comprehensive list of supercomputers globally has been identified, research has identified a supercomputer in the Caribbean, hosted at the University of the West Indies at Mona. In 2019, this supercomputer, the SPARKS Cluster, was described as the only supercomputer in the English-speaking Caribbean, but it is currently unclear if there are other supercomputers existing in the Caribbean. The National AI Strategy of the Dominican Republic includes among its aims to commission the first supercomputer in the country, suggesting that more developments are to be expected in the region in the near future.

Data centres, which are essential to effectively run cloud storage services and manage the ever-expanding use of web-enabled services, are also essential for AI readiness. The growing compute requirements of AI and machine learning systems are prompting a shift in how data centres are designed, how sites are selected, and how investments are made (JLL 2024). According to Arizton (2022), the Caribbean data centre market was valued at USD 62 million in 2021, and will nearly double by 2027, growing at approximately 11.7 per cent per year. The snapshot also notes that the Caribbean market is driven by growing investments from cloud service providers, the adoption of Big Data and IoT, and government support for data centre construction, among others. Data Centre Pricing (2020) reports that the Bahamas, Curaçao and Trinidad and Tobago have mature data centre markets. One recently constructed facility in Curaçao is already advertised as being "AI-ready". It also forecasts over

30 per cent growth from Caribbean data centres between 2020 and 2025, with markets in the Bahamas, Cayman Islands and United States Virgin Islands expected to see particularly large increases.

With the rapidly increasing demand for data centres, the disparities among countries, and the shared needs for resilient and climate-smart solutions for data centres to address sustainability concerns, the Caribbean would benefit from greater collaboration and sharing experiences in this area. Work to accelerate digital transformation through cross-border cooperation on data centres is in its infancy but is ongoing in the region and should be supported. For example, in March 2024, the Caribbean Datacenter Association was established, with representatives from Curaçao, Montserrat, Saint Lucia, Trinidad and Tobago, and the private sector attending (Datasur, 2024). Such initiatives could enable necessary advancements to take place across the subregion in this critical time.

In summary, the development of technology infrastructure needed to support AI is currently hindered by the large cost associated with it. The data show that Caribbean citizens pay significantly more for broadband infrastructure, and that advanced broadband connectivity necessary for AI expansion, such as 5G networks, would likely be unaffordable for the average citizen. The subregion also lacks the supercomputer and data infrastructure needed to support AI systems. However, ongoing regional collaboration may accelerate development and lessen the digital divide within the subregion.

B. Private sector readiness

For a country to become AI ready, they will also likely need to develop their own capacity and capability to create AI systems and related technologies. While academia is also involved in developing AI systems, they have largely been outpaced by the private sector, especially as AI models have become larger and more expensive (Stanford 2024).

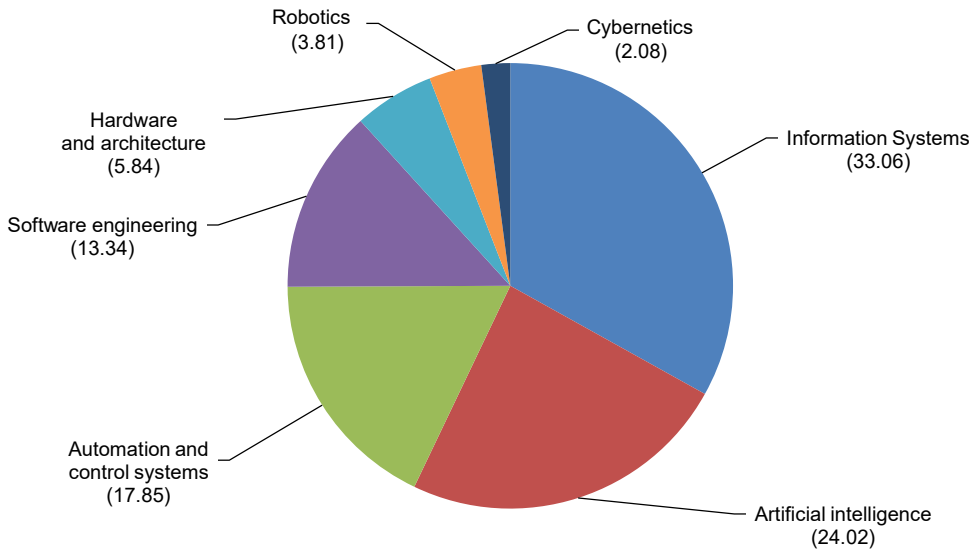
The ECLAC Digital Development Observatory on the LAC region (ODD) provides data on the number of AI companies in the Caribbean. In 2023, Caribbean AI companies were said to represent less than 2 per cent of the Latin American and Caribbean total. There were 5 start-up companies whose business models are based on AI. These are located in Barbados, the Dominican Republic, Saint Kitts and Nevis and Saint Lucia. However, this number only includes start-up companies whose business model is based on AI and may therefore not provide a complete picture of the number of companies that produce AI-related services in the subregion. Two technology-related "unicorns", i.e. privately-held start-ups valued at over one billion United States dollars were identified in Bermuda (ODD) and the Cayman Islands (CB Insights 2024). The companies work with AI and blockchain, respectively. More broadly, the ODD also identifies technology companies working within specific sectors, such as education (EdTech), finance (FinTech), and agriculture (AgroTech). Of those, FinTech companies are present in the largest number of countries (9). Only Trinidad and Tobago is said to have at least one company in all three categories, and is the only Caribbean country with an AgroTech company listed. While no data is included for any AMC in these datasets, it is noted that several territories have active technological sectors, particularly in FinTech.

1. Caribbean AI Research

The ODD also provides some information on where AI-related research gaps exist.[12] The LAC region contributes substantially to several fields of research in computer science, including AI, and has a diversity of specialized knowledge (figure 3).

[12] Digital Development Observatory, "Digital Skills and Academic and Scientific Research", https://desarrollodigital.cepal.org/en/data-and-facts/digital-skills-and-academic-and-scientific-research.

Figure 3
Scientific documents by category, Latin America and the Caribbean
(Percentages)



Source: ECLAC Digital Development Observatory (ODD).

Among the Caribbean countries included, Cuba, followed by Trinidad and Tobago, had the highest research outputs. No publications were reported for six countries in the region from 2010 to 2022, all of them in the Caribbean: Antigua and Barbuda, The Bahamas, Dominica, Saint Kitts and Nevis, Saint Vincent and the Grenadines, and Saint Lucia.

2. Digital technology in the Caribbean private sector

Artificial intelligence is of considerable importance to businesses in the Caribbean private sector. Data from Statista (2024) shows an 1106 per cent increase of AI tool users in Caribbean enterprises in just four years, from approximately 10,200 in 2020 to 123,100 in 2024, with the number of users expected to increase to 900,100 by 2030. As this data only covers five countries and territories, the figures are all the more impressive.[13] An INCUS survey (n.d.) on the State of AI in the Caribbean found that despite 58 per cent of respondents agreeing that AI is critical to the survival of their organization, only 12 per cent were currently using it.

Caribbean digital readiness surveys by PWC (2021 and 2024) illustrate how the perceived importance of AI has increased among private sector executives in just a few years. The surveys differed in the number and location of executives surveyed yet provide some interesting insights into the digital readiness of the private sector in the Caribbean.

AI is seen as an important tool across both surveys. In 2021, 29 per cent of respondents identified AI as the emerging technology most applicable to their organization's strategy, followed by Internet of Things (22 per cent) and Blockchain (20 per cent). In 2024, 45 per cent of respondents identified AI as the most critical technology to their company's strategy. The 2024 survey also highlights some challenges faced by the private sector. In the 2024 survey, 37 per cent of respondents were said to believe that their organization "faces a survival level threat from digital disruption". Cybersecurity was

[13] Cuba, Dominican Republic, Haiti, Jamaica and Puerto Rico.

also a challenge for a majority of respondents, as 55 per cent said that their company's ability to safeguard sensitive data and defend against emerging threats needs improvement.

A private sector diagnostic conducted by the World Bank (2023) for 12 Caribbean countries also highlighted other challenges for companies in the region and set out recommendations for action to address these. The high cost of electricity and gaps in digital infrastructure were among the key cross-cutting constraints to private sector growth. The diagnostic noted that despite progress made during the COVID-19 pandemic, digital development among these countries fell "short of its enormous potential" (p.10). It also argued that digital services could be leveraged to transform and reposition the region in newer and more complex services, increase the productivity of traditional sector and enhance both the quality and inclusiveness of public services.

Gender inequity is likely another limitation on the digital transformation in the Caribbean private sector that should be addressed. A 2022 IDB report (Quirós et.al., 2022) on digital transformation of business in LAC included among its recommendations some that were specific to advancing gender equity in the private sector. It urged companies to address gender inequities and gaps at the source and develop equity policies that effectively address the needs of women. The report urged that increasing the participation of women in business in the region was not merely an issue of social justice but was essential for business digital transformation in the region and could help businesses perform better.

Overall, the private sector is beginning to consider the impact of AI and what is needed to become AI ready. While research on the topic is limited, businesses are seeking to integrate AI technology. In order to support the private sector's progress, factors such as digital infrastructure and development of a digital workforce need to be improved.

C. Population readiness

A third key pillar that is critical to establishing the AI readiness of a country is that of population readiness. In this regard, individuals have to be equipped with the skills necessary to use AI, and to prevent risks and reduce harm associated with their use of AI and use those skills for the benefit of the local economy. As AI skills are fundamentally digital skills, and no agreed measures exist for the assessment of AI skills, this section will primarily discuss six aspects of population readiness: digital skills, IT at secondary school level, ICT in tertiary education, ICT professionals, the emigration of skilled labour, and public adoption of AI.

1. Digital skills

As previously noted, people in Caribbean countries own a mobile phone, use the internet and have internet access at home at approximately the same rate as the average global citizen, and at higher rates than the average Latin American citizen.

Data from Trinidad and Tobago (TATT, 2022) shows that internet usage varies with education level and ability. Sixty-nine per cent of those with lower primary education use the internet, compared with 97 per cent of those with at least tertiary education. While this is just one example, it underscores the need for digital inclusion and upskilling. The report also highlights cost as one of the major challenges identified by respondents as to why they do not use digital technologies. Adopting pro-poor and disability inclusive strategies that address the cost and educational and digital skill gaps, could support efforts to get the Caribbean population more digitally and AI ready.

Estimates from UNESCO (2024), suggest that people in Latin America and the Caribbean have relatively low rates of digital skills. In LAC as a whole, approximately 28 per cent of people aged 15 and over are estimated to be able to copy and paste text within a document, 19 per cent can use formulas within spreadsheets, and 5 per cent can write a computer program. However, individual country data

are very limited, with figures being available only for Cuba (where 22% can copy/paste, 22% can use spreadsheet formulas, 6% can code), Curaçao (29%, 21%, 4%, respectively) and Jamaica (15% and 6%, respectively, with no data on coding ability). Additionally, data from the Trinidad and Tobago National Digital Inclusion Survey 2021 show that 65% of youth and 47% of adults can copy and paste within a document, 31% of youth and 23% of adults can use formulas in a spreadsheet, and 4% of youth and adults can write a computer program.

These figures provide some insight into digital skills, but are not sufficient to assess AI readiness, except to indicate that there are large basic skills gaps that need to be filled. However, digital skills are notoriously difficult to measure, as digital literacy is multidimensional, difficult to compare over time as technology is constantly evolving, and difficult to assess in a fair manner (UNESCO 2024). While many efforts are ongoing to standardize and measure these essential skills, less than half of countries globally have defined digital skills standards, and the LAC region has the lowest rate of set digital skills standards in their education systems. Further efforts to establish digital skills standards at the national level are therefore advised. Developing and disseminating courses to strengthen the digital and AI skills of the broader population would be important in addition to such efforts.

2. CXC results in Information Technology

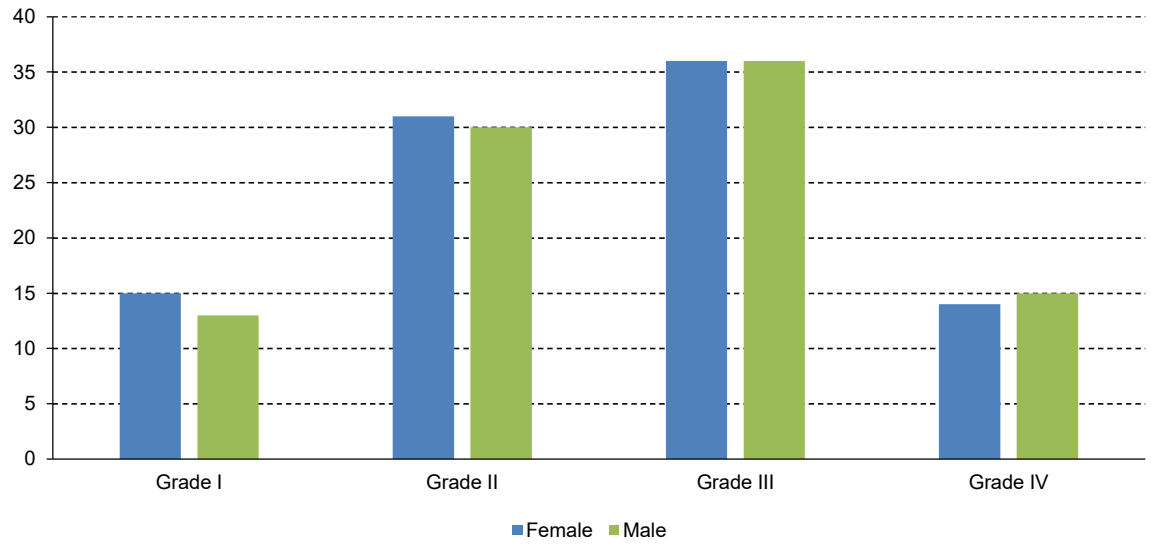
In its annual report from 2022, the Caribbean Examinations Council (CXC) provided an analysis of the performance of exam candidates in individual subjects and by gender. The report shows that in May and June 2022, CSEC examinations were held in 20 Caribbean countries and territories.[14] 21,704 students (21 per cent of sitting candidates) wrote the exam in Information Technology at the General Proficiency level.

The CSEC syllabus for this course (CXC, 2018) suggests that students that pass this exam will have a wide range of essential digital skills. The exam covers computer fundamentals and information processing, computer networks and web technologies, the social and economic impact of ICT, word-processing and web-page design, spreadsheets, database management, problem-solving and program design, and program implementation.

In total 80 per cent of students received a grade between I and III, which the CXC considers sufficient to satisfy matriculation requirements for tertiary education. An additional 14 per cent received Grade IV, which the CXC considers a satisfactory grade for entry-level employment.

[14] Anguilla, Antigua and Barbuda, Barbados, Belize, British Virgin Islands, Cayman Islands, Dominica, Grenada, Guyana, Jamaica, Montserrat, Saba, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Sint Eustatius, Sint Maarten, Suriname, Trinidad and Tobago and Turks and Caicos Islands.

Figure 4
Percentage of female and male students that received Grades I-IV in the May/June sitting of the CSEC exam in Information Technology
(Percentages)



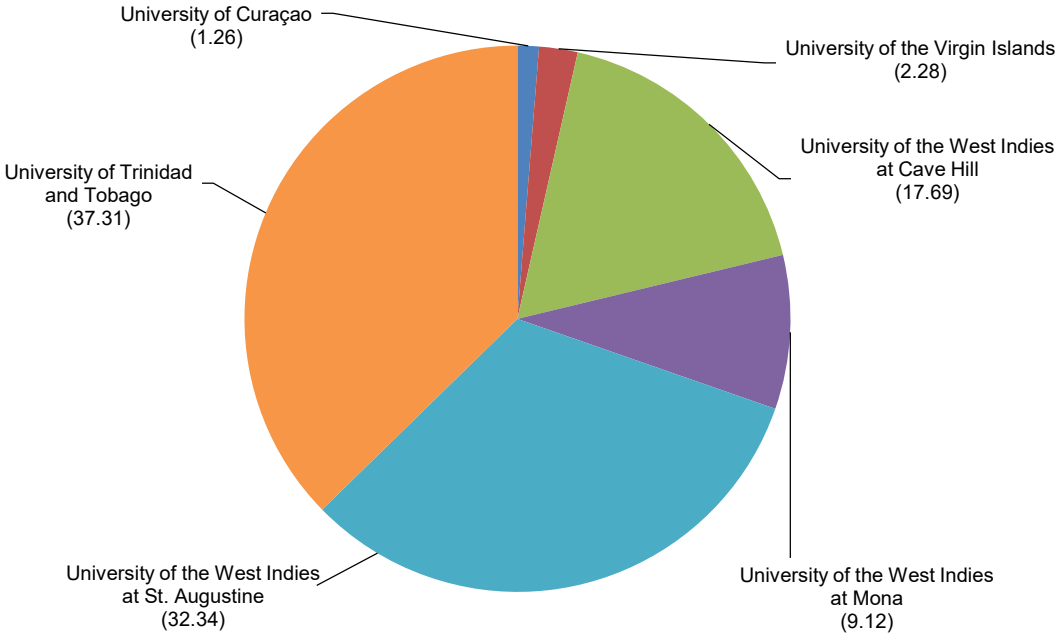
Source: Authors' elaboration based on data from CXC (2022).

From just this one sitting, 94 per cent, or over 20,400 students, would have obtained satisfactory grades for entry-level employment, and over 17,300 for university matriculation, most of them female. A glance at previous CXC reports also shows that between 24,000 and 26,000 students have been sitting the May/June exam in Information Technology every year since 2017, with 86 to 92 percent of students scoring IV or higher. While the CXC does not cover all countries and territories in the Caribbean, the data suggests that a large number of Caribbean young people are gaining, and have, at least intermediary digital skills, even before starting tertiary education. This is encouraging, as it points to a large pool of digital potential in the subregion, despite the relatively low levels of university enrolment in most countries. Further research into these results, in particular intersectional analysis by country, could support countries seeking to further develop this pool of talent.

3. Enrolment in ICT-related tertiary education

At the university level, data is available from some tertiary institutions in the Caribbean regarding the composition and distribution of their student bodies. Across the 6 universities considered, 3640 students were enrolled in ICT-related courses and programmes, of which 996 were female. Doctoral level courses have the lowest enrolment with less than one per cent. Master's degree programs followed with 6 per cent. Short-cycle tertiary courses, such as associate's degrees and postgraduate diplomas, make up 25 per cent. Bachelor's programmes make up the majority of enrolled students with 66 per cent. Enrolment levels are highest at the University of Trinidad and Tobago (figure 5) which offers eight ICT-related programmes.

Figure 5
Students enrolled in ICT-related courses in 6 Caribbean universities
(Percentage of total ICT students by university)



Source: Authors' elaboration.

It is noted that women are consistently underrepresented in short-cycle tertiary courses, as well as bachelor's and master's degree programmes in these fields. Of the 90 courses, faculties and programmes reviewed across the 6 universities,[15] only 7 had more female than male students enrolled. Excluding the courses that have three or less students, that number drops to 5 out of 57 courses. This underrepresentation in ICT or science-related education is not unique to the Caribbean, however, as similar trends can be observed in other regions. This includes areas where AI technology is more advanced, such as the European Union, where only one in five ICT specialists and ICT graduates are women (European Commission 2022), and in the United States, where women account for approximately 21.3 per cent of those who earned a bachelor's degree in computer and information sciences (WomenTech, 2024). In those regions, the scarcity of women in the digital sector has been identified as an obstacle to further development that needs to be addressed. As Caribbean countries strive for further digital development, implementing measures to ensure the digital inclusion of women could therefore help to overcome such obstacles from an earlier stage. Mainstreaming gender into digital and AI policies could be one measure to facilitate greater inclusion.

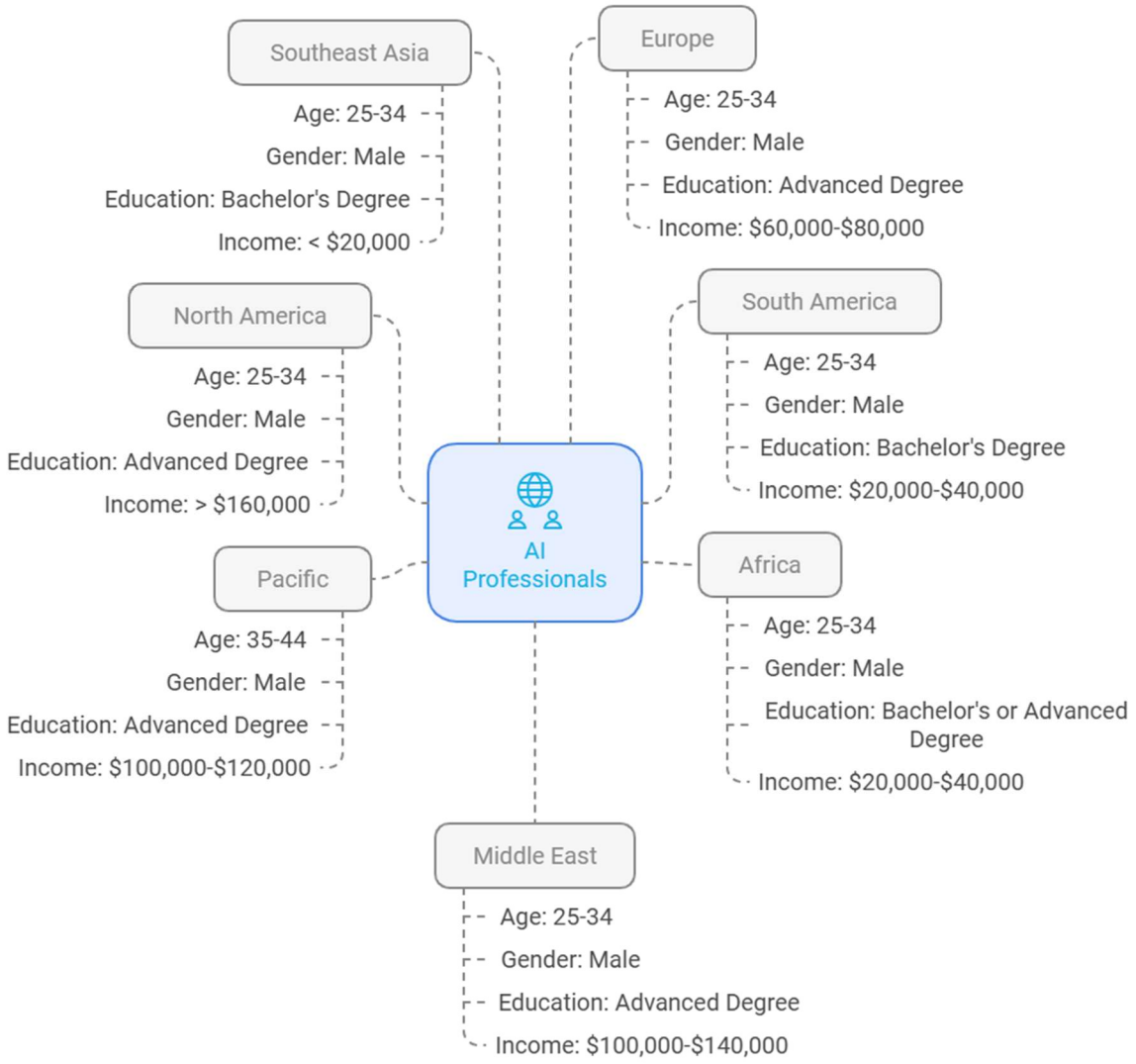
4. Existing AI Professionals

Data from the StackOverflow survey of developers paints a stark picture on who the typical AI professional is. As illustrated in Image A, the "AI professional" (data scientist/machine learning professional) in the country with the largest AI sector in each of the seven regions considered, mostly fits a single profile: Man, 25 to 34 years old, with at least a bachelor's degree. The salaries of these professionals vary greatly, with

[15] Each UWI campus is here considered as a separate university; the data from the University of Curaçao covers its entire Faculty of Engineering.

the US professional outearning all others by a large margin, and the professional in India earning the least. While data is only available for 10 Caribbean countries, with some gaps, and several having just one entry, the Caribbean AI professional appears to be most similar to the Indian professional: Male, age unknown, with a bachelor's degree, earning less than USD $20,000 per year. However, reported salaries vary greatly within the subregion, with at least one professional in Bermuda, Puerto Rico and the United States Virgin Islands reportedly earning at least USD $140,000 per year (OECD 2024; StackOverflow 2022). While this data is not representative, as it derives from a survey of a subset of AI practitioners active on StackOverflow, it is noticeable that none of the Caribbean respondents was female. It is also noted that the only areas where high salaries are reported are all territories.

Image 1
Who is the AI professional?



Source: Authors, based on data from OECD and StackOverflow.

While a full analysis was not possible within this exploratory study, it is noted that microdata from ILO suggests that there are gender disparities in some Caribbean countries related to employment in the informal STEM sector (i.e. unregistered businesses) and related to being informally employed in the STEM sector (i.e. not having a formal employment contract or access to common benefits). Based on the most recent data for each country, women in Grenada and Barbados are more likely to be informally employed, while the opposite is true in the Dominican Republic. However, men are more likely to be employed in the informal STEM sector than women in four of the five countries for which data is available, with the exception being Suriname. Additional data on these phenomena would be of significant use to policymakers who are striving to achieve inclusion and gender equity as part of their innovation and/or ICT policies.

5. Brain drain

Human capital flight, or brain drain, refers to the emigration of highly skilled and educated individuals from their home country to seek opportunities abroad, leading to a depletion of talent in the originating country. According to the Fragile States Index, all countries reported in the subregion showed elevated levels of human flight and brain drain. Jamaica produced the highest rates, the only country in the subregion to receive an FSI indicator score over 9 (out of 10) and has done so each year since 2021However, all scored countries have seen improvement since 2017, with a clear downward trend in human flight and brain drain, except for Jamaica and Cuba. It is therefore possible that countries in the subregion are increasingly retaining a greater percentage of their skilled labour than they did in the past. Despite this improving trend, the indicator showed elevated rates throughout the Caribbean.

Retaining AI professionals and qualified graduates and creating incentivised opportunities to work in the region is crucial to fostering readiness for AI in the region. Concurrently, Governments could seek to leverage the existing brain drain to increase the subregion's AI readiness, including by leveraging relevant professionals from the Caribbean diaspora.

Other potential causes for concern for countries include "virtual" brain drain, where professionals may remain in the Caribbean, but only work remotely for companies based outside the subregion, or intra-Caribbean brain drain, especially considering the wage disparities among countries and territories noted above. However, more data is needed to provide a solid analysis of this.

III. Sustainability considerations for Caribbean SIDS

The Antigua and Barbuda Agenda for SIDS (ABAS) reaffirms that SIDS remain a special case for sustainable development given their unique vulnerabilities. Any assessment of artificial intelligence readiness for the Caribbean would be incomplete without considering these countries' special circumstances as SIDS, and the impact AI would have on their sustainable development. This section focuses on the sustainable development aspects of AI readiness, by considering the potential consequences that becoming AI ready could have on the Caribbean.

AI could play a role in advancing the sustainable development of SIDS, for example by improving planning, monitoring, and prediction related to environmental management, and creating economic opportunities. AI has shown promise in predicting forest fire risk (Salhi et.al. 2023), assessing surface water quality (Rana et.al. 2023), and supporting solid waste management (UNEP 2024), and disaster risk reduction (Bari et.al. 2023), among other fields (WMO 2023). Work is also ongoing to implement AI in the systems of different sectors to reduce their greenhouse gas emissions. As such, AI has the potential to support efforts to increase the resilience of the Caribbean to natural disasters and other challenges. However, considering that the world is currently in the midst of a triple planetary crisis of climate change, biodiversity loss and waste and pollution, and that SIDS are particularly vulnerable, it is also necessary to examine how AI systems and their associated infrastructure impact this situation. True AI readiness would require readiness to address the consequences of the investment in and use of AI and associated infrastructure.

The AI revolution is dependent on the ICT sector, which has a significant, but largely hidden, environmental impact. The IPCC (Blanco et.al. 2022) notes that digital technologies have both positive and negative impacts on greenhouse gas (GHG) emissions, through their own carbon footprint, the application of technology for climate change mitigation, and induced larger social change. They also note that digital technologies also "raise broader sustainability concerns due to their use of rare materials and associated waste, and their potential negative impact on inequalities and labour demand" (p.1652). Related to climate change, the IPCC (2022) notes that digitalization can involve trade-offs across several SDGs, and that "digital technology supports decarbonization only if appropriately governed" (p.11).

The roll-out of digital infrastructure and production of digital devices require materials such as concrete, plastics or metals, all of which have their own environmental impacts. The *Global Resources Outlook* (GRO) (UNEP 2024), which focuses on natural resources and the use of materials, notes that digitalization and artificial intelligence will be accompanied by increasing demand for specific materials. More generally, the GRO warns that the current model of natural resource use to deliver economic growth and social development is driving the triple planetary crisis and proposes ambitious systemic solutions for action at the global level in terms of sustainable resource use, including the circular economy.

Digital infrastructure and digital devices require energy, often derived from fossil fuels, which release greenhouse gases. The cooling systems of infrastructure critical for AI, such as data centres, also use large amounts of water, which can pose a challenge for countries experiencing water scarcity. And the improper disposal of electrical and electronic equipment (EEE), can also contaminate soil and water, and harm human health, due to the presence of toxic heavy metals and other chemicals. Efforts to universalize access to digital technologies and increase adoption of innovative technologies and methods, including AI, Big Data, and the Internet of Things, will necessarily increase the demand for infrastructure and devices, and generate associated waste. This will, unless managed appropriately, place additional pressure on the environment, and could impede the achievement of the sustainable aspirations of countries.

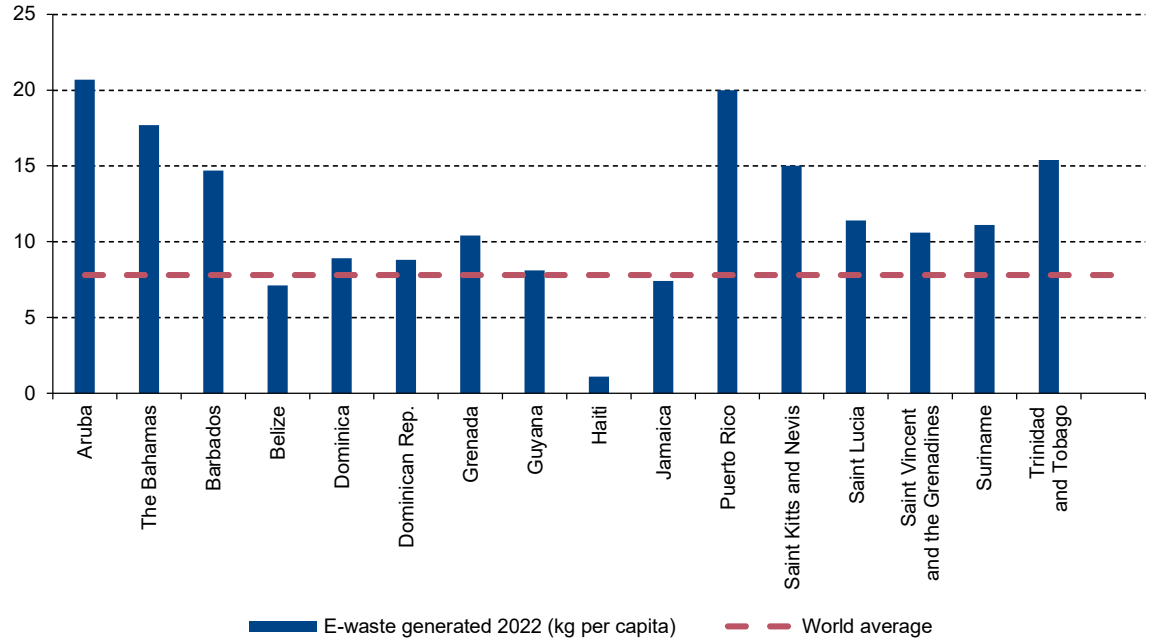
Water usage is another concern relevant to the readiness of the Caribbean for the AI revolution. The Caribbean subregion, writ large, is in a water crisis, as water demand is already outstripping supply, and several islands have been affected by droughts in recent years (Nibbs 2024). AI has the potential to address challenges related to water supply, use and management, but as the *World Water Development Report* (WWDR) (2024) notes, the water consumption of information technology companies has significantly increased in recent years, and a major share of this is attributed to the development of AI and related technologies. The liquid cooling systems of servers and other computers that run AI programmes use large volumes of water, and the process of energy generation for the centres also consumes water. As countries may wish to establish their own data centres as part of their efforts to get AI ready, the water consumption of these centres should also be considered from the planning stage onwards.

Waste from electronic and electrical equipment (e-waste), which is often improperly disposed of, is a threat to this biodiversity and human health (Mohammadi et.al. 2021). Country data from the Global E-Waste Statistics Partnership shows that Caribbean countries[16] generate, on average, 11.5 kg of e-waste per capita, compared to the world average of 7.8 kg per capita (figure 6). The subregion as a whole is noted as having a zero per cent e-waste collection rate on average, with the country with the highest formal collection rate being Saint Lucia, at two per cent. The Caribbean exports some hazardous e-waste, mainly to Europe, and also imports uncontrolled used-EEE and e-waste, even though capacity to formally collect and treat this is low.

With the exception of Haiti, all Caribbean States are parties to the *Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal*, which also covers e-waste, and most have been so since the 1990s and early 2000s. E-waste is on the agenda in Caribbean countries, as evidenced by efforts such as the *Caribbean Waste Management Regional Action Plan*, the training and technical support provided by the Basel Convention Regional Centre for Training and Technology Transfer for the Caribbean (BCRC), and the e-waste assessments done and policies proposed for countries in the region, including Guyana, Saint Lucia, Suriname and Trinidad and Tobago. Some of these assessments have also identified actors that work with e-waste that are not formally recognized, but that are following safe practices and making a difference locally.

[16] Average of the 16 Caribbean countries and territories for which data is available.

Figure 6
E-waste generated in 2022 in 16 Caribbean countries and territories
(Kilograms per capita)



Source: The Global E-Waste Statistics Partnership and the Global E-Waste Monitor (2024).

As noted in the *Global Resources Outlook*: "As the world further urbanizes and industrializes, the strain on environmental systems intensifies, leading to exacerbated environmental consequences". Though it is still too early to fully assess the precise impact that AI and its associated infrastructure will have, it is clear that there are many risks and threats that must be managed. Because the world is not currently on track to meet its climate targets, and Caribbean countries are at the forefront of the triple planetary crisis, becoming AI ready in the Caribbean would also need to account for climate and disaster risks in the planning, construction and operation phases of any digital infrastructure that is rolled out. This is particularly important for countries that seek to make their infrastructure and systems more digital, as digital infrastructure is significantly exposed to a variety of climate risks (World Bank 2024). Caribbean policymakers will also need to consider what action they need to take related to materials for infrastructure and devices, energy and water, and safe disposal of e-waste. As AI-related resource use grows, including in the general population, strategies that maximize the value of each unit of resource used should be considered. This includes circular economy strategies, the implementation of formal e-waste recycling measures, and related public education efforts. Before increasing digital infrastructure, Caribbean governments must consider these factors in order for AI and the broader digital transformation to contribute positively to sustainable development.

IV. Conclusions and recommendations

To establish a baseline for AI readiness in the Caribbean, this study has explored three dimensions: Government readiness, Caribbean digital readiness, and sustainability considerations for Caribbean SIDS. Focusing on these dimensions and considering a wide range of sources, strategic readiness, regulatory readiness, technology infrastructure readiness, private sector readiness, and population readiness were studied. In so doing, it has discussed what is already in place, and where further action or support is needed. Based on the above analysis, this study advances the following preliminary recommendations:

Regarding strategies, policies and legislation, Caribbean Governments should:

(i) Participate in work at the subregional, regional and global levels to establish a common understanding of the risks and benefits of AI, as well as approaches and best practices to mitigate and address harm.

(ii) Establish or adopt a national ethical framework for AI, bearing in mind agreed international principles and the national context.

(iii) Establish measurement frameworks and mandate the collection of disaggregated data relevant to measuring the impact of AI on society, to facilitate evidence-based decision-making.

(iv) Contribute to the needs analysis on the elaboration and adoption of new legal frameworks for the design, development and responsible use of AI to be conducted under the Santiago Declaration framework.

(v) Adopt legislation to govern the use and risks of AI at the national level, as well as foundational legislation in areas such as cybersecurity and data protection.

(vi) Prioritize data collection and sharing to ensure that AI development is informed by local contexts.

(vii) Mainstream human rights, ethics, inclusion and intersectionality throughout all strategies, laws and policies developed to govern AI, with the aim of reducing the AI divide, and combatting bias and discrimination perpetuated by AI systems.

To build Government capacity, Governments should:

(i) Engage with processes related to the Santiago Declaration, in particular the Intergovernmental Council on AI for LAC to strengthen regional capacities.

(ii) Conduct AI readiness assessments, such as the UNESCO RAM, to receive tailored and detailed feedback on national needs.

(iii) Document their capacity-building needs related to the development of AI-related legislation.

(iv) Utilize available tools to assess and develop the digital and AI skills and competencies of civil servants.

Related to infrastructure, Caribbean Governments should:

(i) Adopt national broadband policies, with the aim of further expanding access to affordable, high-quality internet to all.

(ii) Share experiences and information related to infrastructure development within the subregion and seek to collaborate for common benefit.

(iii) Establish and strengthen appropriate institutional frameworks to implement the supporting policies and legislation that have been developed.

(iv) Consider investing in, or seeking investors for, 5G networks and AI-ready data centres, to enable the establishment or growth of a local AI industry.

(v) Document their capacity-building needs related to ICT and AI infrastructure development.

To support the development of digital and AI skills, Caribbean Governments should:

(i) Create awareness-raising campaigns related to AI, its areas of use, and associated risks.

(ii) Develop publicly available courses on essential digital skills, including how to protect your personal data and information from theft and misuse.

(iii) Develop publicly available training courses on how to use AI, how to identify AI-generated content, misinformation and disinformation, and how to critically assess received information.

(iv) Provide digital literacy courses as part of adult learning programmes, particularly targeting marginalized or underserved populations.

(v) Measure effectiveness of developed courses and public sentiment related to AI, in order to better tailor programmes to national needs.

(vi) Engage the Caribbean diaspora working in ICT and AI abroad in efforts to develop digital and AI-related skills.

(vii) Document capacity-building needs related to the development of digital skills.

To develop an AI workforce, Caribbean Governments should:

(i) Investigate what percentage of students enrolled in ICT-related secondary courses go on enrol in such tertiary programmes, and their motivations for pursuing or not pursuing a career in ICT.

(ii) Establish strategies to bridge the gender gap and other gaps in ICT-related tertiary education.

(iii) Establish professional training programmes to upskill and reskill workers in digital technologies and AI.

(iv) Develop national talent retention strategies related to digital technologies and AI, in collaboration with academia and private sector entities.

To bridge AI divides and ensure inclusion, Caribbean Governments should:

(i) Measure digital development and the impact of AI on society, bearing in mind the needs and interests of marginalized or underserved populations, including women and girls, persons with disabilities, Indigenous peoples, local communities, children and youth, those living in poverty and in rural and remote areas, and those in vulnerable situations.

(ii) Consult with marginalized and underserved populations on their experiences with AI and specific capacity-building needs, including related to accessibility, affordability and cultural preservation.

(iii) Remain mindful about the risk of digital dehumanization and keep a human rights-based and human-centred approach to policymaking, considering people as people, not just data.

(iv) Seek ways to incorporate a greater diversity of views on digital and AI policymaking, favouring collaborative approaches.

To ensure environmental sustainability and resilience, Caribbean Governments should:

(i) Govern the digital transformation with sustainability and resilience in mind, mainstreaming sustainability and resilience targets throughout ICT policy and other sectoral policies.

(ii) Explore pathways to decarbonize the Caribbean digital sector, also with the aim of to reducing energy use and cost.

(iii) Develop concrete plans for the management of e-waste and establish any associated facilities, building on the existing waste management ecosystem.

(iv) Educate the public about the risks associated with e-waste and how to properly dispose of electrical and electronic items.

(v) Develop plans for a move to a circular economy approach in e-waste policy planning and include e-waste in other relevant environmental legislation and waste management frameworks and policy.

(vi) Advocate in regional and global forums for greater environmental sustainability in the ICT sector, and for the environmental and climate consequences of AI to be considered and mitigated.

(vii) Engage with private sector and other actors to support the development or deployment of environmentally sustainable solutions for identified risks.

To support the above goals, academia should:

(i) Seek to fill knowledge gaps related to AI and to assess the potential consequences of an AI transformation of the Caribbean.

(ii) Analyse the composition of their student bodies in ICT-related courses, using an intersectional approach, and implement measures to ensure greater representativeness.

(iii) Seek to collaborate with other academic institutions in the subregion on strengthening the capacity of faculty and students related to digital technologies and AI.

To advance AI and the digital transformation in the subregion, private sector entities should:

(i) Support programmes to develop digital skills among the general population or upskill or reskill professionals.

(ii) Develop sound data protection practices and cybersecurity policies for their entity.

(iii) Conduct Ethical Impact Assessments related to any AI-technology they seek to develop.

(iv) Collaborate with Governments and academia to strengthen the AI-capable workforce

(v) Establish or adopt ethical guidelines related to AI use in their business.

(vi) Seek to increase inclusion in the digital sector and increase the representation of women at all levels.

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Annex A1

Foundational legislation

Country	E-Government	Cybersecurity	Personal Data Protection	Ethical Data Policies	Artificial Intelligence
Antigua and Barbuda	No National Strategy exists but in partnership with UNDP, the state is aiming for complete digitalisation of its public services by 2030.	Electronic Crimes Act (2013) criminalises common forms of cybercrimes such as fraud, terrorism, and unauthorized access to code.	Data Protection Act (2013) protects personal data processed by public and private bodies and regulates the access, disclosure, and processing of personal data.	The Data Protection Act (2013) addresses the ethical principles of data protection established by the GDPR.	No national strategy found but is considering adopting European AI laws.
The Bahamas	Government Digital Transformation to Strengthen Competitiveness Project by the Department of Digitization and Transformation aims to streamline Government procedures.	Computer Misuse Act (2003) criminalises common forms of cybercrime such as hacking, phishing scams, and cyberstalking.	Data Protection (Privacy of Personal Information) Act (2003) protects personal data processed by public and private bodies and regulates the use, processing, and disclosure of personal data.	The Data Protection (Privacy of Personal Information) Act (2003) and Electronic Communications and Transactions Act (2003) address the ethical principles of data protection established by the GDPR.	No national strategy found.
Barbados	The Draft E-Government strategy (2006) focuses on the use of ICT to enhance public service. In 2023, GovTech Barbados Limited was established to support the government's digital transformation.	Cybercrime Bill (2024) criminalises common forms of cybercrime such as illegal access, misuse, forgery, and cyberbullying.	Data Protection Act (2019) protects personal data processed by public and private bodies and regulates the use, processing, and disclosure of personal data.	Data Protection Act (2019) addresses the ethical principles of data protection established by the GDPR.	No national strategy found.
Belize	National Digital Agenda 2022-2025 created by the Ministry of Public Utilities, Energy, Logistics, and E-Governance. Addresses digital infrastructure, digital connectivity and application of new technologies to foster a digital government.	Cybercrime Act (2020) criminalises common forms of cybercrime and was informed by the National Cybersecurity Strategy.	Data Protection Act (2021) protects personal data processed by public and private bodies and regulates processing, consent, disclosure, and erasure of personal data.	Data Protection Act (2021) addresses the ethical principles of data protection established by the GDPR.	No national strategy found.
Dominica	Dynamic Dominica National Digital Transformation Strategy 2022-2026 prioritises people, business and government and aims for citizen-centric digital public services.	An Electronic Crimes Bill was drafted in 2013 but is not yet in force.	No dedicated data protection legislation was found.	Due to the lack of cybersecurity and data protection legislation, no regulation regarding the ethical management of data was found.	No national strategy found.

Country	E-Government	Cybersecurity	Personal Data Protection	Ethical Data Policies	Artificial Intelligence
Grenada	No national strategy exists but The Digital Government for Resilience Project is in development with the support of The World Bank.	Electronic Crimes Bill (2013) criminalises common forms of cybercrime such as unauthorized access, violation of privacy and fraud. Grenada is a signatory to the Budapest Convention.	Data Protection Bill (2023) protects personal data processed by public and private bodies and regulates processing, consent, and use of personal data.	The Data Protection Bill (2023) addresses the ethical principles of data protection established by the GDPR.	No national strategy found.
Guyana	No national strategy exists but the Information and Communications Technology Masterplan 2030 is in development, which involves digitising Ministry services.	Cybercrime Act (2018) criminalises common forms of cybercrime such as illegal access, illegal data interference and acquisition.	Data Protection Act (2023) protects personal data processed by public and private bodies and regulates processing, consent, and use of personal data.	The Data Protection Act (2023) addresses the ethical principles of data protection established by the GDPR.	No national strategy found but has stated that policymakers are working on laws to regulate AI.
Jamaica	Information and Communications Technology Authority Act (2019) established an ICT authority responsible for digitising government operations. The Authority is not yet fully functional, and the government is considering a digital strategy to guide the ICT Authority.	National Cybersecurity Strategy, supported by the Cybercrimes Act (2015) criminalises common forms of cybercrimes such as unauthorized access, malicious communication, and fraud.	The Data Protection Act (2020) protects personal data processed by public and private bodies and regulates processing, collection, storage, and disclosure of personal data.	The Data Protection Standards covered by the Data Protection Act (2020) addresses the ethical principles of data protection established by the GDPR. These standards are ensured by the Office of The Information Commissioner.	Established a task force in 2023 to explore effective strategies to inform a national policy.
Saint Kitts and Nevis	The Whole of Government Technology Strategy developed by the Department of Technology focuses on digital transformation, digital infrastructure development, and digital skills development.	Electronic Crimes Act (2017) follows the Budapest Convention and criminalises common forms of cybercrime such as illegal access, data interference, fraud, and disclosure.	Data Protection Act (2018) regulates notice and choice, disclosure, security, retention, data integrity and access. The act was published but is not yet in force.	The Electronic Crimes Act (2017) criminalises interfering with data and unlawful disclosure. Once in force, the Data Protection Act (2018) will address the ethical principles of data protection established by the GDPR.	No national strategy found.
Saint Lucia	Division of Public Sector Modernisation is responsible for the DigiGov project digitising government processes. It is tasked with embracing and applying ICT and developing the policy framework.	Computer Misuse Act (2021) criminalises common forms of cybercrimes such as unauthorized access, unauthorized modification, and fraud.	Data Protection Act (2011) protects personal data processed by public and private bodies and establishes data protection principles for collection, processing, and use of personal data. Also established the Data Protection Commissioner.	Data Protection Act (2011) addresses the ethical principles of data protection established by the GDPR.	No national strategy found.

Country	E-Government	Cybersecurity	Personal Data Protection	Ethical Data Policies	Artificial Intelligence
Saint Vincent and the Grenadines	A National Information and Communication Technology Strategy was developed for 2010-2015 by the Ministry of Telecommunications, Science, Technology and Innovation. While the strategy has not been updated, SVG is part of the Caribbean Digital Transformation Project designed to integrate modern technology across the government.	Cybercrime Act (2016) criminalises common forms of cybercrime such as illegal access, forgery, fraud, and violation of privacy.	The Privacy Act (2003) was drafted to regulate the processing of personal data however it was not proclaimed and did not come into effect.	Once in force, The Privacy Act (2003) will address the ethical principles of data protection established by the GDPR.	No national strategy found.
Suriname	National Digital Strategy 2023-2030 developed with the support of UN Development Programme aims to digitise key government services.	No dedicated cybersecurity legislation found.	Privacy and Protection Act and Personal Data Bill was drafted in 2018 but never passed.	Due to the lack of cybersecurity and data protection legislation, no regulation regarding the ethical management of data was found.	No national strategy found.
Trinidad and Tobago	National Strategy for A DigitalTT 2023-2026 by the Ministry of Digital Transformation: Covers 4 areas of interest (Digital Society, Digital Economy, Digital Government, and Regional Linkages and Global Networks).	Computer Misuse Act (2000) legislation against the misuse of electronic devices. The Cybercrime Bill was drafted in 2017 to replace the Computer Misuse Act but was not passed in Parliament. In 2015, The Ministry of National Security established the Cyber Security Incident Response Team. Trinidad and Tobago is an observer country to the Budapest Convention.	Data Protection Act (2011) protects personal data processed by public and private bodies and regulates the access, disclosure, and processing of personal data. The act has only been partially proclaimed, with the Ministry of Digital Transformation aiming to conclude it at the end of 2024.	The Data Protection Act (2011) addresses the ethical principles of data protection established by the GDPR. The Central Statistical Office is also regulated by the Statistics Act which prescribes strict confidentiality of staff.	The Ministry of Digital Transformation has stated that it is working towards understanding and integrating AI in existing processes before crafting a strategy.

Source: Authors' compilation.

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